

# Bank Risk Rating of Business Loans

William B. English and William R. Nelson

Federal Reserve Board  
20th and C Streets, NW  
Washington, DC 20551  
(202)-736-5645 (English)  
(202)-452-3579 (Nelson)

Draft: November 1998

## Abstract

In recent years many banks have attempted to improve the measurement and management of credit risk by assigning risk ratings to business loans. Virtually all large banks now assign such ratings. However, until recently there has been little information on the use of risk ratings by smaller banks. Recent revisions to the Federal Reserve's Survey of Terms of Business Lending and telephone consultations with more than 100 banks on the survey panel provide data on the prevalence and precision of risk rating systems at banks of all sizes. We find that the use of risk rating systems is quite widespread, but that smaller banks generally have less detailed systems than do larger banks. In addition, the new survey data allow us to assess the relationships between loan risk ratings and loan terms. Not surprisingly, riskier loans generally carry higher interest rates, even after taking account of other loan terms. There are more complex relationships between loan risk and other loan terms. Regression results indicate that banks of all sizes price for risk. We do not find a relationship between reported loan risk and delinquency and charge-off rates. However, this may reflect how recently the risk rating data have become available.

Key Words: Business Loans, Risk Ratings

JEL Classification: G21

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\*The analysis and conclusions in this paper are those of the authors and do not indicate concurrence by other members of the research staffs, by the Board of Governors, or by the Federal Reserve Banks. We thank Tom Brady, Bob Avery, Allen Berger, Mark Carey, and John Mingo for comments and suggestions during the revision of the STBL. We thank the STBL contacts at the Reserve Banks for conducting the consultations with the banks and providing summaries. Adrian Sosa provided research assistance. All remaining errors are ours.

## Introduction

In the past, many banks did not differentiate among "pass" loans — i.e., those new loans that the bank was willing to make. However, in recent years banks have improved their ability to monitor and manage the credit risk associated with their business loan portfolios by assigning their pass loans one of a number of internal risk ratings. The riskiness of the portfolio can then be assessed by examining the distribution of loans by risk rating and changes in that distribution. In part, this development may reflect the blurring of the distinctions between large syndicated loans and bonds, which carry ratings. The same factor has led some bond rating agencies to assign their own ratings to some syndicated credits.<sup>1</sup> The rating agencies' decision to rate loans may also have given greater impetus to banks' efforts to rate their loans.

Banks have developed their rating systems in an idiosyncratic manner, and those with rating systems have not generally made their design public. Recent work by Carey and Treacy (1998) has shed light on the use of internal risk ratings at large banks. However, there is little information available on the use of risk ratings by small and medium-sized U.S. banks and by the U.S. branches and agencies of foreign banks. This paper presents information from two new sources to investigate how common risk rating is at all banking institutions in the U.S., what fraction of business loans are assigned ratings, how fine the gradations generally are, and how risk ratings are related to loan price and non-price terms.

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1. Both Moodys and Standard and Poors have been rating large syndicated credits since 1994.

Taken together, these information sources suggest that risk rating is extremely widespread among banks of all sizes, but the complexity of the rating systems appear to differ greatly depending on bank size. While most banks —including small banks —assign risk ratings to most business loans, smaller banks' systems tend to have fewer categories. In addition, a large fraction of small and medium-sized banks assign the bulk of their new loans to a single rating category. The rating behavior of U.S. branches and agencies of foreign banks appears to be similar to that of larger U.S. banks.

Despite the concerns raised by some observers that banks do not price risk properly, the survey data show that the ratings are reflected in loan pricing and other loan terms. Not surprisingly, loan interest rates rise with loan risk. Links between loan risk and non-price terms, such as collateralization and maturity, are more complicated, however, likely reflecting the influence of borrower risk on the terms banks are willing to offer. The data on risk ratings have only been available for a short time, and so it is not yet clear how well the ratings forecast future loan losses.

## **I. Information From Telephone Consultations**

Federal Reserve staff collected data on the risk rating systems used by 114 banks of all sizes and in all parts of the country by telephone consultations in the fall of 1995.<sup>2</sup> These consultations indicated that larger banks were both more likely to have rating systems and that their rating systems were more detailed than those of smaller banks.

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2. As noted in the data appendix, these consultations were undertaken in preparation for revisions to the Federal Reserve's Survey of Terms of Business Lending (STBL). Unfortunately, U.S. branches and agencies of foreign banks were not consulted because such institutions were not covered by the STBL at that time. They were added to the survey in May 1997, however, and their responses are discussed below.

## A. Who Rates Loans?

About 85 percent of the banks that participated in the telephone consultations (97 out of 114) had an internal risk rating system for business loans, business borrowers, or both (table 1).<sup>3</sup> Systems under which loans are rated were considerably more common than systems under which borrowers are rated: about 80 percent of the banks had ratings for loans, while only about 60 percent had ratings for borrowers. A large number of banks had ratings for both; very few rated only borrowers and not loans. All of the large banks (those with commercial and industrial loans of \$1 billion or more as of the September 1995 Call Report) reported that they rated one or the other. Almost all of the medium-sized banks (those with commercial and industrial loans between \$100 million and \$1 billion) had risk rating systems. By contrast, only about two-thirds of the smaller banks (those with less than \$100 million of commercial and industrial loans) reported having a risk rating system of either type.

Regardless of size, the banks that assigned risk ratings generally assigned them to all or virtually all new business loans. On average, 95 percent of loans, accounting for 97 percent of the dollar volume of loans, received ratings. When asked, the banks that did not rate a portion of their loans pointed most frequently to small business loans as being most likely to be unrated, perhaps reflecting the high cost of assigning ratings relative to the benefit of having ratings for small loans.

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3. We have judged as not having a rating system five banks that reported that they had an internal risk rating system, but that the system had only one "pass" rating in addition to ratings for classified assets. The focus here is on the management of risk for new loans, and if a risk rating system has only one pass category, then it cannot discriminate between the riskiness of the bulk of new loans.

## B. What Do Rating Systems Look Like?

Most of the rating systems were numerical, with the lowest-risk loans rated 1 and higher ratings implying higher risk. About a sixth of the banks had non-numeric rating systems. These systems include letters (e.g., A, B, C,...), brief descriptive names (e.g., Pass, Lower Pass, Special Mention,...), and mixtures of numbers and letters (e.g., 1, A, 2, 3, ...). A few of the numeric systems did not begin with 1, and two were in reverse order (i.e., 1 was the rating for the worst loans rather than the best).<sup>4</sup>

Banks can probably better use a risk rating system to measure and manage the credit risks on new loans the larger the number of categories for acceptable credits. In practice, larger banks were more likely to have rating systems with a large number of pass categories. Banks with large business loan portfolios averaged 8.7 possible ratings, while those with small portfolios averaged just 7.2 categories. On average, the bottom 3 or 4 categories comprise the examination classifications "other assets especially mentioned" (OAEM), "substandard," "doubtful," and "loss." Fairly commonly there was another rating above OAEM but below the lowest acceptable category for new loans (a "watch" category). As a result, the number of potential categories for new loans averaged just 4.0, ranging from 4.8 for the bigger business lenders down to just 3.4 for the smaller ones.

Perhaps in part because of the greater number of pass categories, large banks were less likely to assign the bulk of new loans to a single category. On average, the larger business lenders assigned 10 percent or more of new loans to 3.0 rating categories, while the

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4. In the discussion of the telephone consultations that follows, we have normalized the best rating to 1 and assigned each succeeding risk rating progressively higher integers. As described below, the ratings collected on the STBL are normalized into a range of 1 to 5 by the respondents.

medium-sized and small lenders assigned more than 10 percent of new loans to just 2.2 categories. About half of the small and medium-sized business lenders assigned 75 percent or more of new loans to a single rating, while less than an eighth of the large lenders did so. Looked at another way, on average, the loan category with the most loans accounted for about two-thirds of the average banks' new loans. This fraction varied from a little more than half for large banks to nearly three-quarters for small banks.

Generally, the banks reported that the bulk of their new loans were accounted for by the higher-risk pass categories, with relatively fewer loans getting ratings of 1 or 2. More detailed interviews with eight survey panel members conducted at the time of the telephone consultations suggested that the fairly small number of loans in the lowest-risk category or categories generally were for investment grade firms and loans collateralized by cash or securities. By contrast, an unsecured loan to a borrower with a bond rating of BBB — a fairly typical bank loan — would, on average, get a rating of about 3 from banks of all sizes.

Surprisingly, for small banks the average rating for an unsecured loan to a BBB borrower was reportedly about the same as the minimum acceptable rating for new loans. Given that the loss rate on BBB bonds was just 0.19 percent per year over 1986-92 (Carey, 1998), while the charge-off rate on commercial and industrial loans at banks not among the top 100 averaged 1.6 percent over the same interval, these responses may suggest that small banks either underestimate the risk of loss on their loans or overestimate that risk on BBB bonds.

The more detailed interviews indicated that risk ratings are assigned on a judgmental basis by loan officers, rather than based on an explicit formula. Some of the banks noted, however, that the policy for assigning risk ratings was quite detailed and specific. One bank

noted that, when tested by internal examination teams, the ratings provided by loan officers were replicated about 95 percent of the time.

Several of the bank officials we spoke with indicated that the definitions of the risk ratings should not change appreciably over time. In particular, they should not vary over the business cycle. Those banks that had risk rating systems in place for some time noted that the average risk rating deteriorated significantly when the economy slumped in the early 1990s. Indeed, some of the banks argued that their internal ratings are more useful than public bond ratings because they can be adjusted rapidly when conditions change and can also take account of differences in the details of loan contracts (such as collateral and covenants).<sup>5</sup>

## **II. Information From the Revised Survey of Terms of Business Lending**

The results of the telephone consultations were used to design the risk-rating portion of the revised Survey of Terms of Business Lending, which was implemented in May 1997. (For a description of the survey, see the data appendix.) On the survey, the panel banks report a variety of loan terms for each business loan extended in the first full business week of the middle month of each quarter. The reporting of loan risk ratings on the survey provides another source of information on the prevalence of such ratings among banks of all sizes, as well as by U.S. branches and agencies of foreign banks.

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5. Indeed, bond ratings are not intended to change over the cycle, since they are based on the long-term risk of default, while bank loan ratings reflect expected losses over a shorter horizon. See the discussion in Carey and Treacy (1998).

## **A. The Reported Data**

The survey asks those respondents assigning internal risk ratings to business loans to report that rating among the five ratings provided in the instructions to the survey that corresponds most closely to their internal risk rating for each loan reported. The five rating categories employed on the survey included four pass categories ("minimal risk" (a rating of 1), "low risk" (a rating of 2), "moderate risk" (a rating of 3), and "acceptable risk" (a rating of 4)). There is also one "fail" category ("special mention or classified asset" (a rating of 5)), intended to apply primarily to workout loans. (See the data appendix for the actual definitions of the categories provided in the survey instructions.)

In cases where banks were unable to report a risk rating, they report a zero. By contrast, if a bank does not rate loans at all, then they leave the risk rating item blank. Thus, the survey allows one to differentiate between unrated loans made by banks with risk rating systems and loans made by banks that do not have a risk rating system. As a result, the responses to the STBL can be used to estimate the fraction of all banks that have internal risk rating systems, the fraction of new loans being assigned ratings by such banks, and to obtain some evidence about the distribution of new loans across rating categories at banks that rate loans.

## B. The Use of Risk Ratings

As reported in table 2, about 83 percent of the STBL respondents provided risk ratings for some or all of their new loans on the August 1998 STBL.<sup>6</sup> Using the sample weights, these responses imply that about 75 percent of all banks would report ratings.<sup>7</sup> Medium-sized banks were the most likely to provide ratings, but the differences across size class were small (where, as before, the size categories are defined to be those with commercial and industrial loans under \$100 million, between \$100 million and \$1 billion, and greater than or equal to \$1 billion, respectively, at the time of the June 1998 Call Report).

These results are somewhat surprising given the responses to the telephone consultations reported earlier, which suggested that larger banks were more likely to have risk rating systems and smaller banks were considerably less likely to do so. However, the differences may be partly the result of differences in reporting. On the one hand, small banks may be reporting risk ratings despite the fact that they do not have an internal rating system. The smallest banks in the survey panel report very few loans (about a third of the small banks reported fewer than 5 loans in the August survey), and the instructions explicitly note that banks without internal risk ratings can either leave the risk rating item blank or report the STBL rating that applies to the loan. On the other hand, some large banks that do have risk rating systems are likely failing to report ratings because of the difficulty of doing so. The

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6. We do not count a bank as having "assigned ratings to some new loans," if the only ratings employed are "0" and "5," since such banks evidently do not differentiate between pass loans. See footnote 3, above. We report results from the August 1998 survey because it is the most up to date information we have, and also because the reporting of the new item has likely improved over time.

7. These results, and those reported on the rest of the table, weight each bank by the ratio of business loan volume outstanding at all banks within a given size class to that accounted for by the panel banks in that stratum. See the data appendix for a discussion of the structure of the survey.

largest banks in the panel report several hundred loans for each survey week. Thus, if reporting risk ratings requires any manual intervention (because automated systems either are not in place for this survey or have not yet been updated following the changes to the survey), then the large banks may simply be unable to provide the risk ratings at this time. Supporting this possibility is the fact that one of the large banks that indicated in the consultations that they rated all new business loans has not yet been able to report risk ratings on the STBL.

A second divergence between the consultations and the survey results is that small loans appear to be only slightly less likely to be rated than large loans (table 2, bottom panel). This result could reflect the increased use of credit scoring models for such loans in recent years, which may make assigning risk ratings to such loans easier. Respondents to a Federal Reserve survey of senior loan officers at large banks (the Senior Loan Officer Opinion Survey on Bank Lending Practices, or BLPS), conducted in November 1994, generally indicated that statistically based credit scoring models were not used as a part of the risk rating process at that time (table 3). However, credit scoring has become much more common since, and the respondents did note that such models were somewhat more likely to be used in the case of loans to small businesses. It is also possible, however, that some banks are assigning ratings to small loans for the STBL that do not receive ratings in their internal system, either mapping directly from credit scores to the STBL risk ratings or, if the loans do not have a credit score, assigning the STBL rating judgementally, perhaps for classes of loans rather than for individual loans. Whatever the explanation, those banks that assign ratings generally assign them to virtually all of their loans.

The STBL data show that large banks commonly report loans in a broader range of risk categories than small banks:<sup>8</sup> Even after converting to the common risk rating system, less than a quarter of the large banks give the same rating to 75 percent or more of new loans, while about half of the medium-sized banks and two-thirds of the small banks do so. The most common rating category at each bank includes, on average, about 80 percent of all loans at the small banks, but only about 60 percent at the large banks. Moreover, the number of categories getting more than 10 percent of new loans averaged about 2.4 for the large banks, but only 1.6 for the small banks. These differences may reflect more detailed risk rating systems at the large banks (and so the conversion to the common ratings provides a wider range), and perhaps also that the large banks actually extend loans with a greater range of riskiness.

The branches and agencies of foreign banks generally resembled the large and medium-sized domestic banks in the coverage and distribution of their risk ratings. These institutions most often lend to large corporate customers, and the frequency with which they reported ratings likely reflects the sophistication of their lending operations. Their ratings appear somewhat more concentrated than those of large banks, perhaps because the customer of branches and agencies tend to be more homogenous.

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8. The results discussed in this paragraph refer only to banks that rated at least half their loans and reported at least five rated loans.

### **C. The Distribution of Loan Volume by Risk Ratings**

As one would expect from the definitions of the ratings used in the survey, the distribution of the dollar volume of new loans by rating has been centered on the moderate risk category, a rating of 3 (distributions for the August 1998 survey are shown in figure 1). At the domestic banks, the volume of loans rated 2 and 4 was about half that rated 3, and only fairly small fractions of loan volume were rated 1 or 5. By contrast, at the foreign branches and agencies, similar fractions of loans were assigned ratings 2-4, and a larger fraction of loans (about 10 percent) were rated 5. (Ratings at the foreign respondents were substantially better on average in quarters prior to the onset of the recent economic difficulties in developing economies in Asia and elsewhere, likely reflecting the foreign institutions greater exposure to firms with links to those economies.)

### **III. Risk Ratings and Loan Terms**

The responses to the November 1994 Senior Loan Officer Opinion Survey suggest that, while loan terms generally reflect loan risk, there may not be a direct link between loan terms and risk ratings (table 3 (cont.)). About half of the survey respondents indicated that non-price terms (such a tenor, size, and collateralization) would be varied based on risk grades "most or all of the time" or "some of the time," with about a third selecting "most or all of the time." Similar fractions indicated that non-price terms would depend on a less formal assessment of the obligor's risk "most or all of the time" or "some of the time." Given the non-price terms, loan pricing appears somewhat more likely to be tied to formal risk ratings, at least for large and middle market firms. About 60 percent of the respondents

indicated that loan pricing for such firms would vary depending on the risk rating of the obligor "most or all of the time" or "some of the time," while only about 35 percent indicated that pricing would reflect a less formal assessment of the obligor's risk. For small businesses, however, these shares are roughly reversed, with loan pricing less dependent on risk ratings and more dependent on less formal assessments of risk.

The interviews with lending officials at larger banks conducted at the time of the telephone consultations support these conclusions. Most of the officials indicated that loan terms, such as fees and spreads, were related to risk ratings, although the closeness of the relationship varied, depending on the attributes of the customer. Officials at one bank indicated that there was a tight relationship between risk rating and spreads for corporate customers, involving a fairly rapid widening of spreads as the risk rating worsened. On the other hand, officials at other banks indicated that the link was clearer for small firms than it was for large firms where income from other business with the customer might lead the bank to offer a lower-than-expected loan rate. For the riskiest rating categories, pricing might not reflect risk in any case, since such loans would likely be workout loans at sub-market rates.

#### **A. Bivariate Results**

*Loan interest rates.* Despite these complications, the new STBL results show a clear influence of risk rating on loan interest rates. As shown in table 4, which contains results for the August 1998 survey, the effective loan interest rate generally rises with the risk rating.<sup>9</sup>

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9. The effective interest rate is the effective annual rate calculated from the stated rate and the frequency with which loan interest is either paid or compounded.

As shown in the table, for each of the three size classes of domestic bank and for the foreign banks, loan interest rates generally rise with the risk rating. The difference between the average rate on loans rated 1 and those rated 5 is over 200 basis points. For loans with the same risk rating, interest rates at smaller banks are higher than those at larger banks. Rates at the foreign branches and agencies are similar to those posted by the large domestic banks, likely reflecting their similar clientele.

The differences in loan interest rates across risk ratings are broadly similar to what might be expected given the yield differentials across bonds of different ratings. The STBL instructions explicitly relate the rating of 1 with AA rated corporate bonds and the rating of 2 with BBB rated bonds. The spread between yields on bonds with those ratings at the time of the August survey was about 35 basis points —just about the average spread between rates on loans rated 1 and 2, although larger than the spread reported by the domestic banks. For the loans rated worse than 2 it is difficult to provide a bond equivalent, but loans rated 5 would surely be, at best, in the “junk” category. At the time of the August survey, the spread between yields on AA rated bonds and junk bonds was about 2-1/4 percentage points, similar to that between loans rated 1 and 5 reported on the STBL.

Relationships between loan risk and non-price terms are also apparent in some cases, although non-price terms on business loans generally do not rise or fall monotonically with the loan risk rating (table 5). In part, these mixed results likely reflect selection effects in the setting of loan terms. For example, if banks are willing to extend loans without collateral only to their less risky customers, then one could find a positive correlation between loan risk and collateralization even if collateral reduces loan risk. Indeed, Berger and Udell (1990)

find that, on average, collateralized loans have higher interest rates, suggesting that this sort of selection effect may be important. The results here show an interesting pattern, with loan loans rated 1 (lowest risk) more likely to be collateralized than those of intermediate risk, but high risk loans (those rated 5) the most likely to be collateralized. This pattern suggests that most bank borrowers must provide collateral to obtain a rating of 1, while riskier firms have to provide collateral in order to receive a loan. Similar mixed effects of selectivity and risk are suggested by the patterns shown for loan amount, commitment amount, whether the loan is callable, and whether it has a prepayment penalty.

By contrast, the fraction of loans extended under commitment is decreasing in loan risk, suggesting that banks are more willing to offer commitments to less risky firms. This result is consistent with the results in Avery and Berger (1991), who find that banks that make a larger share of loans under commitment subsequently enjoyed somewhat lower delinquency and charge-off rates. It is possible, however, that this effect, or at least its magnitude, is cyclical. As demonstrated by Morgan (1998), banks appear to pull back on loans to those without commitments during periods of monetary stringency. In such circumstances, they would likely lend only to high-quality applicants not having commitments, while they would not choose to lend to some of their borrowers that have commitments.

Repricing intervals are also strictly decreasing in loan risk. This pattern likely reflects the market convention that highly rated loans are likely to be priced for a few months relative to LIBOR or other market rates, while riskier loans are priced relative to the prime rate, which can adjust at any time.

## B. Regression Results

The relationship between loan interest rates and risk ratings shown in table 4 may be contaminated by the differences in other loan terms across loans with different risk ratings. Of course, if the reported risk ratings accurately capture the expected loss on loans, then many of these non-price terms should not enter a regression of loan interest rates on risk ratings. For example, collateral presumably affects loan pricing primarily because it improves the return in the event of default. But, if this effect is accounted for by the risk rating, then collateral should have no additional effect (except perhaps a small increase in the rate, owing to the cost of monitoring the collateral).

However, for a number of reasons the reported risk ratings may be an imprecise measure of loan risk. First, banks may differ in their interpretations of the common set of ratings used in the survey. Second, the survey ratings reflect a translation of banks' internal ratings into the common ratings, and the match between the two sets of categories may be poor in some cases. Third, some banks rate only borrowers and not loans, and in such cases non-price terms should clearly be reflected in the loan interest rate. More fundamentally, we do not know that banks' internal ratings are intended to measure the expected cost of future losses —as opposed to default probabilities or other possible measures of loan risk —and so it is not clear that the ratings should capture the influence of all of the other loan terms on loan interest rates via the effect of these other terms on loan risk. Of course, some terms influence the loan rate for reasons other than the risk of loss: Because the yield curve generally slopes up, longer repricing intervals would be expected to be significantly related to the rate charged on the loan. Alternatively, some terms, such as loan size or whether the loan

is made under commitment, may importantly effect the cost to the bank of servicing the loan and therefore the loan rate.

To take account of these possible influences, table 6 shows the results of regressing loan interest rates on loan risk ratings while controlling for the effects of other loan terms. These controls include dummy variables to take account of different repricing intervals, maturities, loan sizes, and bank types. In addition, there are dummy variables for loans that can be called or that have prepayment penalties, for loans made under commitment, for loans secured with collateral, and for amortizing loans. As shown in the first column, even controlling for these other variables, risk ratings have a large and statistically significant effect on the loan rate charged. Loans with a rating of 1 (“minimal risk”) have rates that are about 135 basis points lower than on loans rated 5 (“classified”) having the same non-price terms. Loan interest rates rise monotonically with risk rating, with the largest jump in rate coming between the loans rated 2 and 3.

Despite the significance of risk ratings, the control variables do have a statistically significant effect on loan rates. In general, those variables that would be expected to mitigate loan risk (including callability, prepayment penalties, and collateral) are associated with lower loan interest rates. Loans that are made under commitment tend to have lower interest rates, consistent with the findings in Avery and Berger (1991). By contrast, amortizing loans tend to carry higher rates, perhaps because they are made to borrowers that are riskier in ways not captured by the loan ratings.

A comparison of the results in the first column with those in the second, which exclude the risk ratings, show that the ratings boost the adjusted  $R^2$  by about a tenth, from .33

to .36. With two exceptions, the inclusion of the ratings does not greatly affect the other coefficients. First, the coefficient on collateralization, which is insignificantly positive without the ratings, is statistically significantly negative when the ratings are included. This result seems plausible, since earlier work (Berger and Udell, 1990) has shown that secured loans generally carry higher rates than unsecured loans, suggesting that they are riskier. However, once explicit account is taken of loan risk, it appears that collateralization reduces the loan rate, likely reflecting the higher recovery that collateral provides in the event of default. The second difference between the two sets of parameters is that the effect of bank size on the loan rate is amplified when the risk ratings are included. This result is consistent with the observation that small banks tend to report that their loans are lower risk than do larger and foreign banks even though the average rate charged by small banks is higher. As a result, the coefficient on the small bank dummy variable is higher when the risk ratings are included to adjust for this inconsistency.

One might be concerned that these regression results are contaminated by differences across banks in their application of the loan risk ratings. One way to test for such problems is to calculate mean values for each variable for each bank, and estimate the “within” regression that uses only information on the deviations from the bank means. This regression is shown in the third column of table 6; the effect of risk ratings on loan interest rates is somewhat larger in this regression than in the baseline regression shown in column 1.

One notable difference in this case is that the sign on the callable termination option, which is significantly negative in the baseline regression is positive and significant here. Similarly, the coefficient on the prepayment penalty dummy variable is smaller, although it

remains negative. By contrast, the coefficient on the amortization dummy variable remains positive and is considerably larger in magnitude. These differences may reflect the same sort of selection effects that were apparent in the bivariate results shown in table 4, coupled with some imprecision in the assignment of risk ratings. For example, the termination option results suggest that some banks that make relatively low rate loans make relatively heavy use of callability and prepayment penalties, and the baseline regression attributes a portion of the lower rates to those variables. However, if some banks require callability or prepayment penalties in order to limit the risk of marginal loans in a way not captured by the risk ratings, the within regression could find that these loans carry higher, rather than lower, rates. Similarly, the results for amortization could result if some banks are more willing to provide credit to marginal borrowers in the form of amortizing term loans, but those banks making many amortizing term loans are not particularly high-rate lenders.

The within regression results do not provide evidence on whether or not the banks are assigning the risk ratings in a similar way. To test that hypothesis, one needs to look at whether those banks that, on average, assign their loans to higher risk categories generally charge higher loan rates once the effects of other variables have been accounted for. The final column of table 6 shows the results of the “between” regression, which uses the average data for each bank in the sample. This regression shows a statistically significant effect of risk ratings on loan rates, with the estimated spread between loans rated 1 and 5 about twice as large as in the baseline regression. The effects of other loan terms are often not statistically significant, reflecting the sharp reduction in the number of observations (the August survey includes data on roughly 42 thousand loans, but only 239 banking institutions).

However, the adjusted  $R^2$  for the between regression is nearly twice as high as for the within regression, suggesting that the differences in the application of the ratings across banks may not be an important concern.

Another way to test to see if banks are pricing differences in the reported risk ratings in a similar manner is to split the sample by bank type. Table 7 shows regression results for three size groups of domestic banks and for branches and agencies of foreign banks. As before, the size groups for the domestic banks are based on the volume of commercial and industrial loans to U.S. addressees as of the June 1998 Call Report, with large banks having more than \$1 billion of such loans and small banks having less than \$100 million. (There are 69 large banks, 67 medium-sized banks, and 117 small banks in the survey sample.) The results show statistically significant effects of risk ratings on loan interest rates for all four groups of banks. Perhaps surprisingly, given the concerns that some have expressed about banks' pricing of risk, the smallest domestic banks appear to have taken risk into account the most when pricing loans, charging a spread of about 250 basis points between loans rated 1 and those rated 5, as compared to spreads of about 170 basis points at large domestic banks, 125 basis points at medium-sized domestic banks, and 85 basis points at the foreign banks.<sup>10</sup> The influence of the control variables is mixed across the different classes of institution, perhaps reflecting the different customer bases of the different groups as well as the smaller number of observations available for the small domestic and foreign bank groups.<sup>11</sup>

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10. However, for the branches and agencies of foreign banks, the rates on loans rated 1 appear oddly high relative to those rated 2.

11. A statistical test of the equality of the coefficients across the different bank groups is rejected overwhelmingly at any plausible level of significance.

#### IV. Are the Ratings Right?

Another basic question about the risk ratings is whether or not they are correct measures of loan risk. Because the STBL collects data only at the time a loan is made, and not on how the loan performs subsequently, it does not allow a direct test of the risk rating data. In the future we will be able to test to see if banks that make loans with higher risk ratings subsequently have higher loan losses, but with ratings available only since May 1997, our ability to perform such a test is limited. Table 8 shows average risk ratings, the share of loans rated above and below three, and business loan quality measures for the three domestic bank size categories and for foreign banks. The small banks claim to be making the safest new loans, despite their relatively high delinquency and charge-off rates. Indeed, small banks have had generally higher delinquency and charge-off rates than larger banks for more than a decade. One plausible explanation is that small bank customers are generally riskier than large bank customers, but because small banks do not see the large banks' customers (and do hear about well-publicized losses at large banks), they think that their customers are relatively low risk.<sup>12</sup> By contrast, the foreign banks report making relatively risky loans, but their delinquency rates are lower than those of the domestic banks. This pattern may reflect the riskiness of loans to businesses engaged in activities in developing economies in Asia and elsewhere, which are not yet evident in the delinquency rate. (Indeed, delinquency rates have increased in recent quarters for these firms.)

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12. An added complication is that very small banks (those with assets under \$300 million) report delinquent loans and loan charge-offs for less tightly defined loan categories, rather than for the loan categories generally used for the Call Report. We have used these banks' reported data to estimate their delinquency and charge-off rates for business loans.

Table 9 shows the results of regressing banks' charge-off rates on the share of loans rated 1 or 2 and the share of loans rated 4 or 5. When calculating the shares, the loan extensions are weighted by their size times their maturity to roughly approximate their probable distribution in outstanding loans.<sup>13</sup> The charge-off rate is the average of the four quarterly rates ending in June 1998. The loan shares are the average of the five quarterly shares ending in August 1998. We calculate the charge-off rate as a four quarter average because charge-off rates have a pronounced seasonal. The five quarters of STBL data are all that are currently available excluding the first survey after the addition of the risk ratings (for which reporting errors likely were more common than usual.) In addition, the log of the outstanding amount of C&I loans at each bank as of June 1998 is included to control for differences in risk ratings across bank size. Banks that in any of the five quarters rated fewer than 5 loans or less than 50 percent of reported loans are excluded.

The outcome is disappointing. Banks' charge-off rates on business loans are not significantly related to the reported share of high-risk loans and are significantly positively related to the share of low-risk loans. This finding may be driven by the data for small banks. As noted above, these banks have relatively high delinquency rates on average, but report a considerably smaller fraction of their loans in categories 4 and 5 than do the other domestic banks. Nonetheless, even when the regressions are run separately for the three size categories of bank, only the large banks show a marginally statistically significant link between the fraction of high-risk loans extended and delinquency rates. Moreover, the point

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13. The maturity reported on the survey is used with the following adjustments: Loans without maturity are assumed to have a maturity of three months. Maturities greater than a year are set equal to one year to prevent such loans, which are not uncommonly repaid or called before maturity, from swamping the calculations. Finally, the reported maturities of amortizing loans are divided by two.

estimate of the size of the effect is very small, indicating that an increase of 25 percent in the share of loans in categories 4 and 5 would boost a bank's delinquency rate by only a quarter of a percentage point.

One difficulty with relating loan risk ratings and loan quality is that expected loan loss rates increase much faster than linearly as loan ratings worsen, so it is unclear how to specify the relationship (Carey, 1998). Table 10 presents the result of regressing charge-off rates on the risk premium appropriate for the riskiness of each bank's loan portfolio. The premium is estimated using the coefficients on the risk-rating dummies from the loan rate regression in column 1 of table 6 and an estimate of the stock of loans by risk rating derived from the ratings of new loans reported on the STBL.<sup>14</sup> In an environment of risk neutrality, the loan rate should increase one-for-one with the expected loss rate, so the risk premium of a bank's loan portfolio should be positively related to the bank's charge-off rate, with a coefficient of approximately one. Unfortunately, the results are similar to those using the share of risky and safe loans. The estimates suggest a marginally significant negative relationship between the risk premium and the charge-off rate, with this inverted result again reflecting the behavior of the small banks.

The lack of a clear relationship between the riskiness of new loans and delinquency and charge-off rates could reflect simultaneity. While it is possible that banks that employ a high-risk high-return strategy would have persistently higher delinquencies and charge-offs as well as riskier new loan extensions, it is also possible that banks with poor loan quality (because of risky loans made in the past or because of adverse shocks) would become more

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14. The average premium by category of bank is shown in the final line of table 8.

careful in their lending. In that case, however, banks with high delinquencies and charge offs would have relatively less risky new loan extensions. If both of these effects are present, then the lack of any clear relationship in the data may not be a surprise.

## **V. Implications**

Despite concerns that banks do not evaluate and price risk appropriately (e.g., Greenspan, 1994), the data presented here show that most banks have at least rudimentary risk rating systems in place, and that loan risk is indeed reflected in price and non-price terms. While smaller banks generally have cruder rating systems in place, loans by such institutions were still very likely to be rated, and the terms of such loans appear to be quite sensitive to risk, as measured by the reported ratings.

Risk rating matters because it can help banks to improve their operations in a number of ways. First, it forces the loan officer to make an explicit assessment of the risk of a loan at the time it is approved. Second, it provides management with a way to assess the risk of the current portfolio, and so decide how much additional risk is desirable. Finally, it provides a quantitative measure of how current lending decisions are affecting the riskiness of the loan portfolio. Taken together, these three benefits suggest that risk ratings should allow banks to price the credit risk of a loan more precisely. Another benefit is that monitoring resources can be allocated more efficiently — lower rated loans can receive more careful scrutiny and the downgrading of a loan may provide a signal to the bank that actions should be taken to avoid a loss. Finally, if banks can convince investors that risk ratings provide a consistent measure of risk, ratings may boost the ability of banks to securitize business loans much as

mortgage and consumer loans have been.<sup>15</sup> The resulting improvement in the liquidity of business loans would be expected to lower their cost. Thus, the widespread application of risk ratings by banks of all sorts documented in this paper should be good news both for the banking industry and for the economy so long as subsequent data show that ratings provide significant information about future loan losses.

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15. Indeed, the dramatic rise in issuance of Collateralized Loan Obligations in 1997 may have been facilitated by the increased use of loan risk ratings. For example, two prominent securitizations of business loans included early amortization provisions triggered by an aggregate risk measure based on the internal risk ratings of the securitized loans.

## Data Appendix

The information on loan risk ratings used in this article is taken from two sources: the Federal Reserve's Survey of Terms of Business Lending and a series of telephone interviews with survey respondents. The Federal Reserve's Survey of Terms of Business Lending (STBL) was substantially revised in early 1997.<sup>16</sup> This survey, which has been conducted since February 1977, asks a stratified random sample of banks of all sizes and in all parts of the country to report a variety of data for each business loan extended in the first full business week of the middle month of each quarter.<sup>17</sup> The domestic respondents are divided into six strata based on their volume of commercial and industrial loans to U.S. addressees, and weights are constructed reflecting the panel's coverage of business loans by banks in the stratum. These weights are used to calculate estimates of the average terms on loans of various types at all banks during the survey week. The results of the survey are published in the Federal Reserve's E.2 statistical release.

As discussed in the text, starting with the May 1997 STBL, banks having internal risk rating systems have been asked to report a risk rating for each loan by translating their internal rating into one of the five common ratings provided in the survey instructions. (The definitions of these ratings are shown in table A1). These categories were defined based on an assessment of both what information would be most useful, and what the respondents

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16. Through February of 1997 the survey was called the Survey of Terms of Bank Lending to Business. Owing to the inclusion of U.S. branches and agencies of foreign banks in the survey panel starting in May 1997, the name was changed to the Survey of Terms of Business Lending. We refer to the survey in both periods as the "STBL." Branches and agencies of foreign banks were added to the survey panel in May 1997 as well. A summary of the changes made to the survey in May 1997 is provided in Nelson (1997) and Brady, et al., (1998).

17. In practice the survey is somewhat more complicated because some larger banks are allowed to report for only a portion of the survey week or for only a subset of offices.

could reasonably be expected to report. On the one hand, more categories would have allowed those banks with more than four pass categories to provide greater detail in their reporting of risk ratings. On the other hand, having more pass categories used for the survey than for a bank's internal rating system presents the bank with the burdensome task of mapping a coarser rating system into a finer one. Moreover, a larger number of pass categories in the survey might have suggested greater accuracy in the assignment of risk ratings than is warranted by the internal rating systems at most banks.

The second source of information used in this paper is data collected in a set of telephone consultations with more than 100 banks on the STBL panel conducted in November 1995. These consultations were undertaken to inform the design of the new items to be included in the STBL. The results of the consultations provide fairly detailed information on risk rating systems at a wide variety of U.S. banks at that time. The telephone interviews were conducted by Federal Reserve Bank staff members. In addition, in eight cases Board and Reserve Bank staff met with representatives of panel banks and conducted more substantial interviews that provide richer details about the risk rating methods at these banks.

**Table A1**  
Instructions for Reporting Risk Ratings on the STBL

If your institution assigns internal risk ratings to business loans, enter the numerical designation from the list provided below that most closely matches the definition of the internal rating assigned to this loan. Do not enter your institution's own internal risk rating.

If your institution rates loans, but a particular loan is unrated, or not yet rated, enter 0 for that loan.

If your institution does not assign internal risk ratings to business loans, either (a) leave this column blank or (b) use the categories presented below to make the assignment.

The definitions provided here take account of both the characteristics of the borrower and the protections provided in the loan contract. Note that the definitions are intended to characterize ranges of risk; hence the definition of your institutions's internal rating for a loan probably will not exactly match any of the provided definitions. Enter the numerical designation that corresponds *most closely* to the internal rating of your institution.

The risk rating categories provided here are not intended to establish a supervisory standard for the maintenance or reporting of internal risk rating systems.

**Minimal Risk (Enter 1)**

Loans in this category have virtually no chance of resulting in a loss. They would have a level of risk similar to a loan with the following characteristics:

- o The customer has been with your institution for many years and has an excellent credit history.
- o The customer's cash flow is steady and well in excess of required debt repayments plus other fixed charges.
- o The customer has an AA or higher public debt rating.
- o The customer has excellent access to alternative sources of finance at favorable terms.
- o The management is of uniformly high quality and has unquestioned character.
- o The collateral, if required, is cash or cash equivalent and is equal to or exceeds the value of the loan.
- o The guarantor, if required, would achieve approximately this rating if borrowing from your institution.

**Table A1 (Cont.)**  
Instructions for Reporting Risk Ratings on the STBL

Low Risk (Enter 2)

Loans in this category are very unlikely to result in a loss. They would have a level of risk similar to a loan with the following characteristics:

- o The customer has an excellent credit history.
- o The customer's cash flow is steady and comfortably exceeds required debt repayments plus other fixed charges.
- o The customer has a BBB or higher public debt rating.
- o The customer has good access to alternative sources of finance at favorable terms.
- o The management is of high quality and has unquestioned character.
- o The collateral, if required, is sufficiently liquid and has a large enough margin to make very likely the recovery of the full amount of the loan in the event of default.
- o The guarantor, if required, would achieve approximately this rating if borrowing from your institution.

Moderate Risk (Enter 3)

Loans in this category have little chance of resulting in a loss. This category should include the average loan, under average economic conditions, at the typical lender. Loans in this category would have a level of risk similar to a loan with the following characteristics:

- o The customer has a good credit history.
- o The customer's cash flow may be subject to cyclical conditions, but is adequate to meet required debt repayments plus other fixed charges even after a limited period of losses or in the event of a somewhat lower trend in earnings.
- o The customer has limited access to the capital markets.
- o The customer has some access to alternative sources of finance at reasonable terms.
- o The firm has good management in important positions.
- o Collateral, which would usually be required, is sufficiently liquid and has a large enough margin to make likely the recovery of the value of the loan in the event of a default.
- o The guarantor, if required, would achieve approximately this rating if borrowing from your institution.

**Table A1 (Cont.)**  
Instructions for Reporting Risk Ratings on the STBL

Acceptable Risk (Enter 4)

Loans in this category have a limited chance of resulting in a loss. They would have a level of risk similar to a loan with the following characteristics:

- o The customer has only a fair credit rating but no recent credit problems.
- o The customer's cash flow is currently adequate to meet required debt repayments, but it may not be sufficient in the event of significant adverse developments.
- o The customer does not have access to the capital markets.
- o The customer has some limited access to alternative sources of finance possibly at unfavorable terms.
- o Some management weakness exists.
- o Collateral, which would generally be required, is sufficient to make likely the recovery of the value of the loan in the event of default, but liquidating the collateral may be difficult or expensive.
- o The guarantor, if required, would achieve this rating or lower if borrowing from your institution.

Special Mention or Classified Asset (Enter 5)

Loans in this category would generally fall into the examination categories: "special mention," "substandard," "doubtful," or "loss." They would primarily be workout loans, as it is highly unlikely that new loans would fall into this category.

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**Table 1**  
**Results of Consultations with U.S. Banks**  
**(Conducted in November 1995)**

<i>Risk Rating System Characteristics</i>	Size of Bank			
	All	Large	Medium	Small
1. Percentage of banks that rate loans, borrowers, or both	85.09	100.00	94.12	68.75
1a. Percentage rating loans	78.95	84.38	88.24	68.75
1b. Percentage rating borrowers	59.65	75.00	67.75	43.75
2. Percentage of new loans assigned ratings	95.19	97.43	93.87	94.55
3. Percentage of dollar volume of new loans assigned ratings	96.55	97.96	95.92	95.85
4. Average number of rating categories	7.79	8.66	7.56	7.18
5. Average number of categories for classified assets	3.70	3.63	4.00	3.48
6. Average number of pass categories	4.00	4.77	3.77	3.43
7. Average number of categories with at least 10 percent of the volume of new loans	2.49	3.04	2.22	2.24
8. Percentage of banks with 75 percent of the volume of new loans in one category	37.66	12.00	47.83	51.72
9. Average percentage of new loan volume in the most common category	64.81	53.60	68.40	71.62
10. Average rating of unsecured loan to borrower of BBB quality	3.29	3.66	2.96	3.20
11. Number of banks	114	32	34	48

Note: 114 domestic banks selected from the STBL panel participated in the consultations. In the table above, large banks had more than \$1 billion of C&I loans outstanding as of September 1995, small banks had less than \$100 million. The statistics reported above are unweighted.

**Table 2**  
**Information on the Distribution of Risk Ratings**  
**Survey of Terms of Business Lending, August 1998**

	Respondent Characteristics					
	Domestic				Foreign	All
	All	Large	Med.	Small		
1. Percentage providing ratings (sample)	81.82	84.06	85.07	78.63	96.43	83.27
2. Percentage providing ratings (population)	74.93	82.51	84.14	74.43	96.43	75.29
3. Average percentage of loans with ratings*	98.70	92.47	99.52	98.77	99.88	98.73
4. Average dollar volume of loans with ratings*	98.24	92.30	99.60	98.28	99.97	98.28
5. Average number of rating categories with at least 10 percent of volume of loans**	1.61	2.41	1.77	1.58	2.25	1.63
6. Percentage of banks with at least 75 percent of loan volume in one category**	60.24	14.64	55.41	62.01	20.83	58.88
7. Average percentage of loan volume in most common category**	79.64	57.94	75.08	80.66	64.07	79.10
8. Number of banks	253	69	67	117	28	281

\* At lenders that rate loans.

\*\* At lenders that rated at least half their loans and made at least five rated loans.

	Loan Size (Domestic Banks)				
	All	Jumbo	Large	Medium	Small
Percentage of Loans Rated	73.86	78.91	76.06	80.91	71.94

Note: In order to better represent the population characteristics, the statistics reported above are weighted to account for the sparser coverage of smaller banks in the STBL sample, except for row 1, which is unweighted. Large banks had more than \$1 billion of C&I loans outstanding as of June 1998, small banks had less than \$100 million. Foreign institutions are the U.S. branches and agencies of foreign banks. Small loans are those less than or equal to \$100,000. Medium loans are those greater than \$100,000 but less than or equal to \$1 million. Large loans are those greater than \$1 million but less than or equal to \$10 million. Jumbo loans are those greater than \$10 million.

**Table 3**  
**Information on the Prevalence of Risk Rating Systems**  
**Senior Loan Officer Opinion Survey on Bank Lending Practices**  
**November 1994**  
**Percentage of Respondents**

<i>Percentage of banks which "risk-grade" firms applying for commercial and industrial loans</i>	<b>Borrower Size</b>		
	Large firms	Middle-market firms	Small businesses
In most or all cases	93.1	91.4	78.9
In some cases	1.7	3.4	12.3
Rarely or never	5.2	5.2	8.8
<i>Percentage of those banks that assigns risk grades which uses a statistically-based credit scoring model</i>			
Yes	20.4	16.7	24.5
No	75.9	79.6	69.8
Bank does not assign risk grades for firms of this size	3.7	3.7	5.7

(continued)

**Table 3 (cont.)**  
 Information on Use of Risk Ratings for Assigning Loan Terms  
 Senior Loan Officer Opinion Survey on Bank Lending Practices  
 November 1994  
 Percentage of Respondents

<i>Percentage of banks varying loan price and non-price terms based on obligor's risk</i>	Borrower Size		
	Large firms	Middle-market firms	Small businesses
<u>Non-Price Terms</u>			
Most or all of the time, based on the obligor's assigned risk grade	36.8	36.2	35.7
Most or all of the time, based on a less formal assessment of the obligor's risk	36.8	41.4	41.1
Some of the time, based on the obligor's assigned risk grade	15.8	13.8	7.1
Some of the time, based on a less formal assessment of the obligor's risk	7.0	3.4	8.9
Rarely or never	3.5	5.2	7.1
<u>Price Terms</u>			
Most or all of the time, based on the obligor's assigned risk grade	40.4	39.7	28.1
Most or all of the time, based on a less formal assessment of the obligor's risk	28.1	25.9	38.6
Some of the time, based on the obligor's assigned risk grade	17.5	19.0	10.5
Some of the time, based on a less formal assessment of the obligor's risk	10.5	12.1	14.0
Rarely or never	3.5	3.4	8.8

Note: Fifty-eight banks participated in the survey. The banks are selected from among the largest banks in each Federal Reserve District. The statistics reported above are unweighted.

**Table 4**  
**Average Loan Rate by Risk Rating**  
**Weighted by Loan Volume**  
**August 1998 Survey of Terms of Business Lending**

Respondent Characteristics	Risk Rating						All
	1	2	3	4	5	Not Rated	
Domestic	6.33	6.49	7.24	7.85	8.57	7.66	7.26
Large	6.14	6.34	7.10	7.69	8.48	7.55	7.12
Medium	6.64	7.58	8.13	9.65	8.94	8.80	8.41
Small	8.38	8.81	9.54	9.46	11.16	9.17	9.16
Foreign	6.31	6.88	6.63	6.88	8.57	7.13	6.96
TOTAL	6.32	6.70	7.03	7.34	8.57	7.61	7.13

Note: In order to better represent the population characteristics, the statistics reported above are weighted to account for the sparser coverage of smaller banks in the STBL sample. The statistics are also weighted by loan volume. Large banks had more than \$1 billion of C&I loans outstanding as of June 1998, small banks had less than \$100 million. Foreign institutions are the U.S. branches and agencies of foreign banks. A risk rating of 1 is defined to include the lowest risk loans; a rating of 3 is defined to include a typical loan at a typical bank under normal economic conditions; and a rating of 5 is defined to include special mention and classified assets.

**Table 5**  
**Non-Price Loan Characteristics by Risk Rating**  
**Weighted by Loan Volume**  
**August 1998 Survey of Terms of Business Lending**

	Risk Rating						
	1	2	3	4	5	Not Rated	All
<i>Loan Terms</i>	<i>Weighted by Loan Volume</i>						
Loan amount (\$mil)	.85	1.89	.68	.84	1.38	.40	.79
Percentage with Collateral	48.1	24.0	39.4	35.8	79.1	44.3	38.3
Median maturity, days	234	191	270	285	145	300	270
Median repricing interval, days	90	26	1	0	0	1	1
Percentage made under commitment	81.5	79.2	79.5	74.0	23.3	65.8	73.7
Commitment amount (\$mil)	8.28	10.25	6.14	6.56	5.84	4.52	6.31
Percentage callable	5.2	12.8	19.2	15.3	6.2	16.7	15.2
Percentage with a prepayment penalty	56.1	36.9	24.6	19.9	76.1	5.5	28.8

Note: In order to better reflect the population characteristics, the statistics reported above are weighted to account for the sparser coverage of smaller banks in the STBL sample. The statistics are also weighted by loan volume (except for the loan amount and the commitment amount). Loans not made under commitment were excluded in the calculation of average commitment size. A risk rating of 1 is defined to include the lowest risk loans; a rating of 3 is defined to include a typical loan at a typical bank under normal economic conditions; and a rating of 5 is defined to include special mention and classified assets. The repricing interval is the number of days between when the loan is made and when it can next reprice. Since many prime-based loans can reprice whenever the lending bank's prime rate changes, prime-based loans often have a repricing interval of zero.

**Table 6**  
**Regression for Loan Rate**  
**August 1998 Survey of Terms of Business Lending**  
(Standard errors in parentheses)

<u>Type:</u>	<u>OLS</u>	<u>OLS</u>	<u>Within</u>	<u>Between</u>
<u>Independent Variables</u>				
Constant	8.16 (0.20)	8.08 (0.03)		8.47 (0.42)
<u>Risk Rating</u>				
1	-0.66 (0.04)		-0.84 (0.04)	-1.12 (0.35)
2	-0.63 (0.02)		-0.70 (0.02)	-0.46 (0.25)
3	0.09 (0.01)		0.13 (0.01)	0.02 (0.22)
4	0.29 (0.01)		0.43 (0.02)	-0.09 (0.29)
5	0.70 (0.03)		0.72 (0.03)	1.53 (0.93)
Missing	0.20 (0.02)		0.27 (0.03)	0.12 (0.33)
<u>Repricing Interval</u>				
Zero	0.57 (0.02)	0.61 (0.02)	0.60 (0.02)	0.02 (0.31)
Daily	0.63 (0.02)	0.64 (0.02)	0.61 (0.03)	-0.10 (0.33)
2-30 days	-0.16 (0.03)	-0.16 (0.03)	-0.18 (0.03)	-0.48 (0.37)
31-365 days	-0.33 (0.03)	-0.35 (0.03)	-0.33 (0.03)	-0.40 (0.35)
>365 days	0.06 (0.04)	0.06 (0.04)	-0.02 (0.04)	-0.12 (0.40)
Missing	-0.76 (0.09)	-0.80 (0.09)	-0.69 (0.08)	1.08 (1.33)
<u>Maturity</u>				
Overnight	-1.08 (0.04)	-1.18 (0.04)	-0.96 (0.04)	-1.99 (0.83)
2-30 days	0.04 (0.02)	0.09 (0.02)	0.06 (0.02)	0.26 (0.51)
31-365 days	0.30 (0.01)	0.33 (0.02)	0.24 (0.01)	0.62 (0.27)
>365 days	0.25 (0.02)	0.26 (0.02)	0.19 (0.02)	0.47 (0.30)
None	0.49 (0.02)	0.50 (0.02)	0.46 (0.02)	0.64 (0.30)

**Table 6 (cont.)**  
 Regression for Loan Rate, OLS  
 August 1998 Survey of Terms of Business Lending  
 (Standard errors in parentheses)

Type:	<u>OLS</u>	<u>OLS</u>	<u>Within</u>	<u>Between</u>
<u>Independent Variables</u>				
<u>Loan Size</u>				
Small	1.15 (0.02)	1.20 (0.02)	1.00 (0.02)	1.95 (0.44)
Medium	0.31 (0.02)	0.35 (0.02)	0.28 (0.01)	0.26 (0.50)
Large	-0.42 (0.02)	-0.44 (0.02)	-0.36 (0.02)	-0.74 (0.61)
Jumbo	-1.04 (0.03)	-1.11 (0.04)	-0.91 (0.03)	-1.47 (1.28)
<u>Termination Options</u>				
Callable	-0.09 (0.02)	-0.08 (0.02)	0.16 (0.03)	-0.16 (0.17)
Prepayment Penalty	-0.18 (0.02)	-0.23 (0.02)	-0.07 (0.03)	-0.32 (0.25)
<u>Other</u>				
Under Commitment	-0.18 (0.02)	-0.18 (0.02)	-0.25 (0.03)	-0.16 (0.18)
Secured	-0.07 (0.02)	0.02 (0.02)	-0.07 (0.02)	-0.52 (0.26)
Amortizing	0.13 (0.03)	0.11 (0.04)	0.38 (0.03)	0.19 (0.30)
<u>Bank Type</u>				
Small	0.73 (0.03)	0.56 (0.04)		0.33 (0.15)
Medium	0.05 (0.02)	0.06 (0.02)		-0.20 (0.13)
Large	-0.29 (0.02)	-0.22 (0.02)		-0.26 (0.13)
Foreign	-0.49 (0.03)	-0.41 (0.03)		0.13 (0.22)
$\bar{R}^2$	0.36	0.33	0.29	0.54
Number of Observations:	41772	41772	41772	239

**Table 6 (cont.)**  
Regression for Loan Rate, OLS  
August 1998 Survey of Terms of Business Lending

Note: The regressions are unweighted. The coefficients on each set of dummies that are exhaustive (repricing interval, maturity, size, and bank type) are restricted to sum to zero. The size dummies are defined as follows: Small loans are those less than or equal to \$100,000. Medium loans are those greater than \$100,000 but less than or equal to \$1 million. Large loans are those greater than \$1 million but less than or equal to \$10 million. Jumbo loans are those greater than \$10 million. Large banks had more than \$1 billion of C&I loans outstanding as of June 1998, small banks had less than \$100 million. Foreign institutions are the U.S. branches and agencies of foreign banks. A risk rating of 1 is defined to include the lowest risk loans; a rating of 3 is defined to include a typical loan at a typical bank under normal economic conditions; and a rating of 5 is defined to include special mention and classified assets. The repricing interval is the number of days between when the loan is made and when it can next reprice. Since many prime-based loans can reprice whenever the lending bank's prime rate changes, prime-based loans often have a repricing interval of zero.

**Table 7**  
 Regression for Loan Rate, By Bank Type  
 August 1998 Survey of Terms of Business Lending  
 (Standard errors in parentheses)

<u>Type:</u>	<u>Domestic</u>			<u>Foreign</u>
	<u>Large</u>	<u>Medium</u>	<u>Small</u>	
<u>Independent Variables</u>				
Constant	7.55 (0.04)	8.85 (0.11)	9.73 (0.26)	7.62 (0.12)
<u>Risk Rating</u>				
1	-0.92 (0.05)	-0.56 (0.07)	-1.02 (0.13)	-0.26 (0.19)
2	-0.59 (0.03)	-0.58 (0.06)	-0.36 (0.12)	-0.78 (0.10)
3	0.17 (0.02)	-0.01 (0.03)	0.00 (0.11)	-0.22 (0.09)
4	0.33 (0.02)	0.32 (0.03)	0.04 (0.14)	0.02 (0.10)
5	0.77 (0.03)	0.71 (0.06)	1.55 (0.40)	0.59 (0.13)
Missing	0.23 (0.02)	0.12 (0.07)	-0.20 (0.23)	0.65 (0.38)
<u>Repricing Interval</u>				
Zero	0.60 (0.02)	0.33 (0.06)	0.60 (0.02)	1.10 (0.08)
Daily	0.69 (0.02)	0.34 (0.07)	0.41 (0.27)	-0.10 (0.10)
2-30 days	-0.16 (0.03)	0.28 (0.07)	-0.28 (0.16)	-0.81 (0.10)
31-365 days	-0.47 (0.03)	-0.16 (0.07)	-0.18 (0.15)	-0.61 (0.07)
>365 days	0.20 (0.05)	-0.46 (0.08)	-0.04 (0.18)	0.41 (0.14)
Missing	-0.86 (0.09)	-0.34 (0.09)	0.01 (0.59)	--
<u>Maturity</u>				
Overnight	-0.86 (0.06)	-0.86 (0.34)	-0.26 (0.69)	-0.86 (0.10)
2-30 days	0.00 (0.03)	0.01 (0.10)	0.24 (0.23)	0.11 (0.11)
31-365 days	0.27 (0.02)	0.18 (0.09)	0.17 (0.19)	0.05 (0.06)
>365 days	0.15 (0.02)	0.34 (0.09)	0.04 (0.20)	0.23 (0.06)
None	0.45 (0.02)	0.32 (0.09)	-0.19 (0.22)	0.47 (0.09)

**Table 7 (cont.)**  
 Regression for Loan Rate, By Bank Type  
 August 1998 Survey of Terms of Business Lending  
 (Standard errors in parentheses)

<u>Type:</u>	<u>Domestic</u>			<u>Foreign</u>
	<u>Large</u>	<u>Medium</u>	<u>Small</u>	
<u>Independent Variables</u>				
<u>Loan Size</u>				
Small	1.22 (0.02)	1.26 (0.09)	1.02 (0.15)	0.43 (0.06)
Medium	0.36 (0.02)	0.53 (0.10)	0.29 (0.17)	0.00 (0.04)
Large	-0.38 (0.02)	-0.45 (0.11)	-1.31 (0.29)	-0.15 (0.04)
Jumbo	-1.19 (0.04)	-1.33 (0.27)	--	-0.28 (0.06)
<u>Termination Options</u>				
Callable	-0.09 (0.02)	0.15 (0.04)	-0.10 (0.10)	0.52 (0.07)
Prepayment Penalty	-0.09 (0.03)	-0.88 (0.07)	-0.22 (0.26)	0.00 (0.06)
<u>Other</u>				
Under Commitment	0.13 (0.03)	-0.87 (0.04)	-0.29 (0.09)	0.21 (0.08)
Secured	-0.17 (0.02)	0.00 (0.04)	-0.10 (0.11)	0.25 (0.06)
Amortizing	0.35 (0.03)	-0.10 (0.05)	-0.46 (0.13)	-0.27 (0.30)
$\bar{R}^2$	0.33	0.28	0.17	0.47
Number of Observations:	32242	6358	870	2302

**Table 7 (cont.)**  
Regression for Loan Rate, By Bank Type  
August 1998 Survey of Terms of Business Lending

Note: The regressions are unweighted. The coefficients on each set of dummies that are exhaustive (repricing interval, maturity, and size) are restricted to sum to zero. The size dummies are defined as follows: Small loans are those less than or equal to \$100,000. Medium loans are those greater than \$100,000 but less than or equal to \$1 million. Large loans are those greater than \$1 million but less than or equal to \$10 million. Jumbo loans are those greater than \$10 million. Large banks had more than \$1 billion of C&I loans outstanding as of June 1998, small banks had less than \$100 million. Foreign institutions are the U.S. branches and agencies of foreign banks. A risk rating of 1 is defined to include the lowest risk loans; a rating of 3 is defined to include a typical loan at a typical bank under normal economic conditions; and a rating of 5 is defined to include special mention and classified assets. The repricing interval is the number of days between when the loan is made and when it can next reprice. Since many prime-based loans can reprice whenever the lending bank's prime rate changes, prime-based loans often have a repricing interval of zero. There were no loans at foreign banks that did not have a repricing interval; there were no loans at small domestic banks that were for more than \$10 million.

**Table 8**  
**Risk Ratings and C&I Loan Performance**  
**Survey of Terms of Business Lending and Call Reports**

	Size of Bank					
	Domestic				Foreign	All
	All	Large	Medium	Small		
Delinquency rate	2.51	1.48	1.81	2.68	1.01	2.42
Charge-off rate	0.35	0.26	0.38	0.34	.	.
Average risk rating	2.69	2.92	3.02	2.62	2.92	2.71
Percentage rated 1 or 2 (low risk)	33.2	31.0	20.4	35.5	29.9	33.0
Percentage rated 4 or 5 (high risk)	12.1	23.2	20.9	9.9	25.7	12.9
Implied Risk Premia	-0.12	-0.08	-0.01	-0.15	-0.05	-0.12

Note: In order to better reflect the population characteristics, the statistics reported above are weighted to account for the sparser coverage of smaller banks in the STBL sample. Charge-off rates are calculated relative to average loans for the quarter and are net of recoveries. Delinquency rates are as of quarter end. For each bank, the delinquency and charge-off rates are the average of the rates calculated from the four quarterly Call Reports ending in June 1998. The percentages are average of the percentages calculated for each of the five quarterly STBL's ending in August 1998. For each quarter the risk-percentages are calculated by weighting the reported risk rating by the product of the loan size and an estimate of likely weighted-average time to repayment in order to better to approximate the stock of loans on banks' balance sheets with the indicated riskiness. The risk premia are similarly weighted averages of the risk premia estimated for each risk rating by the regression reported in the first column of table 6. Only banks that rated at least half their loans and made at least five rated loans are included in the sample. Large banks had more than \$1 billion of C&I loans outstanding as of June 1998, small banks had less than \$100 million. The foreign institutions are U.S. branches and agencies of foreign banks. These institutions do not report loan charge-offs. A risk rating of 1 is defined to include the lowest risk loans; a rating of 3 is defined to include a typical loan at a typical bank under normal economic conditions; and a rating of 5 is defined to include special mention and classified assets.

**Table 9**  
Regressions of Average C&I Loan Charge-Off Rates on Reported Loan Portfolio Risk

<u>Independent Variables</u>	Parameter Estimates	T-Statistic
<u>All Banks</u>		
Constant	0.57	1.17
High Risk Loans	0.01	1.39
Low Risk Loans	0.01	2.46
Log(C&I Loans Outstanding)	-0.04	-1.19
R <sup>2</sup>	0.06	
Number of Observations	114	
<u>Small Banks</u>		
Constant	-0.07	-0.16
High Risk Loans	0.00	0.01
Low Risk Loans	0.01	1.54
R <sup>2</sup>	0.09	
Number of Observations	25	
<u>Medium Banks</u>		
Constant	0.17	1.00
High Risk Loans	0.01	1.24
Low Risk Loans	0.00	0.79
R <sup>2</sup>	0.04	
Number of Observations	42	
<u>Large Banks</u>		
Constant	-0.05	-0.33
High Risk Loans	0.01	1.97
Low Risk Loans	0.00	1.45
R <sup>2</sup>	0.09	
Number of Observations	47	

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Note: The regressions are unweighted. The dependent variable is the average charge-off rate on C&I loans made to U.S. addressees. The charge-off rate is the average of the rates calculated from the four quarterly Call Reports ending in June 1998. The independent variables are the percentages of loans reported on the STBL with ratings greater than 3 (high risk loans) and with ratings less than 3 (low risk loans). The shares are averaged over the five quarterly surveys ending in August 1998. The risk-percentages are weighted by the product of the loan size and an estimate of likely weighted-average time to repayment in order to better approximate the stock of loans on banks' balance sheets with the indicated riskiness. Only banks that rated at least half their loans and made at least five rated loans are included in the sample. Large banks had more than \$1 billion of C&I loans outstanding as of June 1998, small banks had less than \$100 million.

**Table 10**  
**Regressions of Average C&I Loan Charge-Off Rates on Portfolio Risk Premium**  
**Call Reports and Survey of Terms of Bank Lending,**

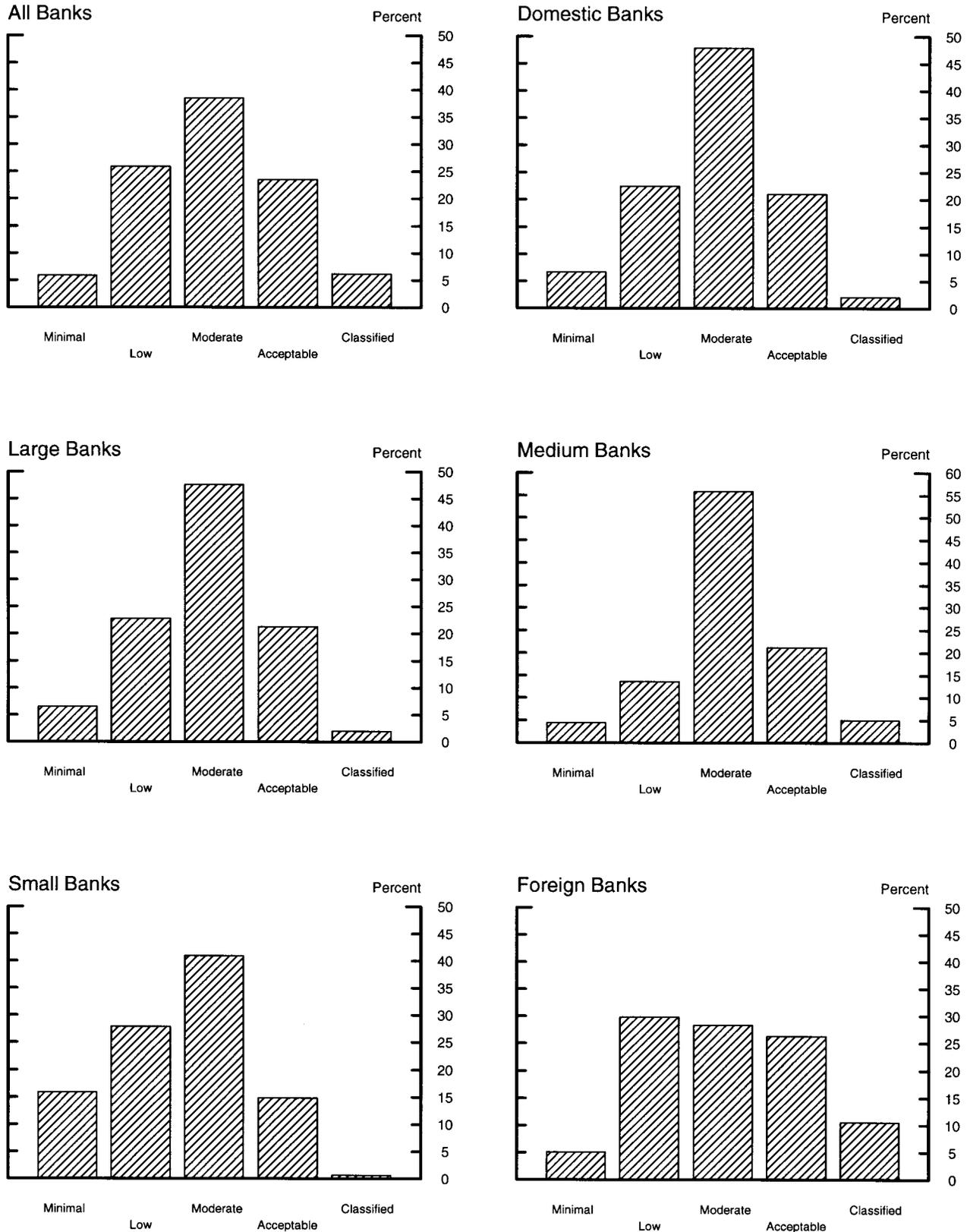
<u>Independent Variables</u>	Parameter Estimates	T-Statistic
<u>All Banks</u>		
Constant	0.67	1.38
Risk Premium	-0.62	-1.79
Log(C&I Loans Outstanding)	-0.03	-0.84
R <sup>2</sup>	0.03	
Number of Observations	114	
<u>Small Banks</u>		
Constant	0.15	0.48
Risk Premium	-1.81	-1.75
R <sup>2</sup>	0.10	
Number of Observations	25	
<u>Medium Banks</u>		
Constant	0.35	3.65
Risk Premium	-0.13	-0.27
R <sup>2</sup>	0.00	
Number of Observations	42	
<u>Large Banks</u>		
Constant	0.22	3.58
Risk Premium	0.01	0.03
R <sup>2</sup>	0.00	
Number of Observations	47	

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Note: The regressions are unweighted. The dependent variable is the average charge-off rate on C&I loans made to U.S. addressees. The charge-off rate is the average of the rates calculated from the four quarterly Call Reports ending in June 1998. The independent variable is the risk premium appropriate for the riskiness of the loan portfolio of each bank on the STBL where the risk premia are the coefficients on the risk-rating dummies in the regression for the effective loan rate reported in the first column of table 6. The risk premia are averaged over the five quarterly surveys ending in August 1998. The risk premia are weighted by the product of the loan size and an estimate of likely weighted-average time to repayment in order to better approximate the stock of loans on banks' balance sheets with the indicated riskiness. Only banks that rated at least half their loans and made at least five rated loans are included in the sample. Large banks had more than \$1 billion of C&I loans outstanding as of June 1998, small banks had less than \$100 million.

Figure 1

## Distribution of Loan Volume By Risk Rating\* (August 1998 Survey of Terms of Business Lending)



\* Excludes unrated loans.