

## **Industry contagion in loan spreads**\*

Michael G. Hertzel  
Department of Finance  
W. P. Carey School of Business  
Arizona State University  
Phone: (480) 965-6869  
Email: michael.hertzel@asu.edu

Micah S. Officer  
Department of Finance  
Marshall School of Business  
University of Southern California  
Los Angeles, California 90089  
Phone: (213) 740-6519  
Email: officer@marshall.usc.edu

**First draft:** November 13, 2007

**This draft:** June 4, 2008

---

\* We would like to thank Harry DeAngelo, Wayne Ferson, Victoria Ivashina, Oguzhan Ozbas, Michael Roberts, Tony Sanders, Berk Sensoy, Mark Westerfield and seminar participants at Arizona State University, Boston College, Cal State Fullerton, Claremont McKenna College, and the University of Alberta for helpful comments and suggestions.

## **Industry contagion in loan spreads**

### **Abstract**

Spreads on new and renegotiated corporate loans are significantly higher when the loan originates (or is renegotiated) in the two years surrounding bankruptcy filings by industry rivals. This contagion appears to be an industry, not an economy-wide, phenomenon, and is particularly severe in the middle of industry bankruptcy waves. Furthermore, contagion in loan spreads is mitigated in concentrated industries, consistent with the hypothesis and evidence in Lang and Stulz (1992) that bankruptcy filings in concentrated industries can have positive consequences for rivals (increased market share and/or power). There is also some evidence that contagion affects non-spread terms in loan contracts.

*Classification:* G30, G33

*Keywords:* Bankruptcy; Financial distress; Contagion; Loan spreads

## 1. Introduction

The nature, extent, and consequences of financial contagion have received increased attention in the academic literature. One line of research examines the effects of financial distress and bankruptcy on the stock prices of economically linked firms. Early work by Lang and Stulz (1992) demonstrates that intra-industry rival stock price reactions to a competitor's bankruptcy are significantly negative on average across all bankruptcy filings (contagion effects), but significantly positive for highly concentrated industries with low leverage (competitive effects). Hertz, Li, Officer, and Rodgers (2008) show that suppliers to filing firms experience negative and significant stock price reactions around filing and pre-filing distress dates. Jorion and Zhang (2007) expand the investigation to credit markets by examining the effect of financial distress on the spreads of industry competitors' credit default swaps. Depending on the nature of the credit event, they find evidence of both negative (contagion) and positive (competitive) effects.

Despite the fact that bankruptcy is a significant credit market event, to date there is no evidence on how providers of debt capital to other firms in the same industry react to bankruptcy filings by rivals. In this paper, we attempt to fill this gap by examining the intra-industry effects of bankruptcy and financial distress on bank loan contracting. Specifically, we examine the effect of bankruptcy filings on the spread and non-spread terms of new (and renegotiated) loans to industry rivals in the year prior to, and the year following, industry bankruptcies. Because distress events that precipitate bankruptcy often occur well in advance of actual filings, we use long windows to examine the effect of bankruptcy filings by industry rivals on the terms of new bank loans.

Bank loan contracting provides a useful experimental laboratory for studying financial contagion because bank loans are an important source of corporate financing and the multiple dimensions of bank loan contracts allow a more comprehensive examination of creditor response to increased uncertainty and risk.<sup>1</sup> In addition to providing new evidence on direct pricing effects of contagion, ours is the first study to examine how contagion is manifested in non-spread loan contract terms. Our analysis of bank loan pricing also provides a different perspective on the effects of industry

---

<sup>1</sup> Other papers that consider multi-dimensional aspects of bank loan contracts include Melnik and Plaut (1986), Strahan (1999), Benmelech, Garmaise, and Moskowitz (2005), Chava, Dierker, and Livdan (2005), Bae and Goyal (2006), Qian and Strahan (2006), and Graham, Li, and Qiu (2007).

contagion from studies that focus on short-run stock returns over narrow announcement windows (event studies, such as Lang and Stulz, 1992, or Hertznel , Li, Officer, and Rodgers, 2008) which may not have long-run implications for the financing costs and investment policies of firms in the industry.

Our study is similar in spirit to Graham, Li and Qiu (2007), which presents an event-study style analysis of the impact of financial restatements on debt contracting for the restating firm. Our study differs in that we focus on how events at one firm affect loan contracting at *other* firms in the same industry.<sup>2</sup> We know of no other study that considers the intra-industry loan contracting effects of a credit event.<sup>3</sup>

We begin our analysis with a univariate comparison of loan spreads for two groups of loans: those for which there is at least one bankruptcy in the same SIC 4-digit industry in the year prior and all other loans. We find that the average (median) spread on loans to industry competitors following a bankruptcy filing is 210 (200) basis points versus 170 (150) basis points for all other loans; the difference in means (medians) test is highly significant. Multivariate tests that control for borrower-, time-, and loan-specific characteristics confirm that loan spreads are significantly higher for loans to industry rivals in the period immediately preceding or following an industry bankruptcy filing, although the magnitude of the contagion is reduced to approximately 10 – 20 basis points.<sup>4</sup>

The extent to which credit events cluster and the implication of default correlations is essential to our understanding of credit contagion. To provide some insight on this we examine the extent to which bankruptcy *waves* (both industry and economy-wide) explain contagion in loan spreads. Our evidence suggests that contagion appears to

---

<sup>2</sup> Gleason, Jenkins, and Johnson (2005) do examine the contagion effects of accounting restatements but focus on the effects on shareholder wealth.

<sup>3</sup> Although credit risk concerns are of primary importance, information asymmetry plays a role to the extent that firms know more about their credit quality than outside investors. In this way our study also differs from Graham, Li, and Qiu (2007) in that a financial restatement raises questions about firm opacity and resulting concerns about information asymmetry. Although a financial restatement is not, per se, a credit risk event, Graham, Li, and Qiu do find that most firms that restate are financially distressed.

<sup>4</sup> We do not control for performance pricing contingencies that might be contained in the loan agreements we study. To the extent that post-industry-filing loans are more likely to contain interest-increasing performance pricing provisions, we are likely understating contagion effects. Asquith, Beatty and Weber (2005) provide theoretical arguments (and empirical evidence consistent with) why income-increasing performance pricing is more likely when credit quality is likely to deteriorate and why this leads to lower initial loan rates.

be an industry, and not an economy-wide, phenomenon. Furthermore, loan spread contagion is most pronounced as industry bankruptcy waves are building, and tapers off near the end of bankruptcy waves. Loans taken out in the middle of industry bankruptcy waves, for example, appear to have spreads that are 20 – 25 basis points higher than other comparable loans (all else equal). This evidence suggests that contagion is largely driven by lenders anticipating industry distress, as opposed to lenders reacting to the incidence of filings in the past.

We also examine the effect of industry concentration on loan spread contagion. Consistent with the hypothesis and evidence in Lang and Stulz (1992), that bankruptcy filings in concentrated industries can have positive consequences for rivals (increased market share and/or market power), we find evidence that contagion in loan spreads is mitigated in concentrated industries. Evidence that there are contagion effects in competitive industries, but not in concentrated industries has important implications not only for borrowers, but also for lenders concerned with managing credit risk.

Because credit contracts have many important non-price dimensions, we also investigate how financial contagion affects non-price terms in credit agreements. This analysis is based on, and contributes more broadly to, the literature on bank loan contracting. Previous research shows that the use of collateral is associated with risky borrowers (Berger and Udell, 1990; Jimenez, Salas, and Saurina, 2006; and Roberts and Sufi, 2007) and enhances efficient monitoring (Rajan and Winton, 1995). We find univariate and multivariate evidence of increased use of collateral by lenders to firms in distressed industries, which is consistent with stricter monitoring of firms in such industries. We also find that new loans to industry rivals following a bankruptcy filing are of shorter maturity, consistent with an increase in information asymmetry (Barclay and Smith, 1995) and a shift from intermediate to higher credit risk (Diamond, 1991).<sup>5</sup> We also find univariate evidence that, following a bankruptcy filing, industry rivals are more likely to have covenants in their bank loans, but this effect is not particularly robust

---

<sup>5</sup> Roberts and Sufi (2007) argue that “Renegotiation and contingencies can make the effective maturity of debt agreements significantly shorter than the stated maturity...” suggesting caution when interpreting stated maturities of debt agreements. For example, they show that the U-shaped relation between credit quality and stated maturity documented in earlier studies disappears when actual maturities are considered. In our context, the shift to shorter maturities may be driven by bank concerns about the ability to force renegotiation as credit quality deteriorates.

(to controlling for other determinants of covenant inclusion, for example). To the extent that industry contagion does affect the use of financial covenants in loans, however, our evidence is consistent with the line of the banking literature that establishes a negative relation between the financial health of a firm and the presence and intensity of covenants in private debt contracts (Smith and Warner, 1979; Bradley and Roberts, 2004).

Finally, we make an attempt to distinguish between *information transmission* and *socially costly* forms of contagion. As discussed in Lang and Stulz (1992), contagion can be interpreted as bankruptcy filings providing information to lenders about average credit quality in the industry (the benign view) or interpreted as suppliers (of capital, in this case) retreating from otherwise healthy firms in the industry and thereby damaging the business and prospects of those firms. After controlling for the pre-loan level of, and post-loan change in, credit quality of borrowers, we continue to find that industry contagion significantly affects loan spreads. It is difficult to draw strong conclusions about the social costs of industry contagion, because lenders may simply have greater uncertainty about industry prospects around the time of a rival's bankruptcy filing and increase spreads to other firms in the industry because they are unable to determine which firms in the industry are likely to be in distress in the near future. However, our findings provide preliminary evidence of how intra-industry contagion can be socially costly.

To summarize, our paper is the first to provide evidence on how a bankruptcy filing by an industry rival affects the cost (and terms) of bank debt. By examining the cost of new (or renegotiated) bank loans in periods surrounding bankruptcy filings by industry rivals, we provide direct evidence of higher costs of debt capital as set by informed insiders (lenders) providing capital to the firm. With this evidence, we are able to provide perspective on the causes of contagion within industries. Finally, our analysis contributes to the loan contracting literature by examining how lenders respond to financial contagion by altering price and non-price contract terms.

The remainder of the paper proceeds as follows. Section 2 describes our data, sample selection procedure, and summary statistics. Section 3 provides evidence on intra-industry loan pricing contagion effects. Section 4 examines the effect of bankruptcy waves on contagion. Section 5 looks at the effect of industry concentration and Section 6 investigates whether contagion spreads to non-price contractual terms. In Section 7 we

discuss whether evidence of industry contagion in loan spreads can be interpreted as socially costly, and Section 8 concludes.

## 2. Data

Our corporate loan data is from Loan Pricing Corporation's (LPC) *Dealscan* database. This database contains detailed information about commercial (primarily syndicated) loans made to U.S. and foreign corporations, with data from about the mid-1980s (albeit with thin coverage) to 2007. According to Carey and Hrycray (1999), the *Dealscan* database covers between 50% and 75% (by value) of all commercial loans in the U.S during the early 1990s and the "large majority" of sizable commercial loans after 1995. Approximately half the loan data are gathered from SEC filings and the remainder from contacts with major banks.<sup>6</sup> Roberts and Sufi (2007) find that approximately half the observations in their subset of the *Dealscan* database are renegotiations of prior credit agreements. Therefore, the observations in our corporate loan data are likely to be a mix of both original loans and renegotiations of pre-existing agreements.<sup>7</sup>

Our initial sample of loans contains all commercial loans denominated in U.S. dollars and made to U.S. borrowers. To be included in the final sample, we require that the borrowing firm can be matched to the Center for Research in Security Prices (CRSP) stock price database so that we can obtain firm-specific information from CRSP and the CRSP/Compustat merged file. Borrowing firms are hand-matched to CRSP by borrower name and ticker (provided in the *Dealscan* data). There are approximately 35,000 loans in *Dealscan* that meet this criterion.

Each loan in the *Dealscan* database is a "facility" (or tranche). Facilities (or tranches) are frequently packaged into deals where multiple facilities are initiated at the same time. For example, in July 2001, Fortune Brands (the producer of Jim Beam bourbon, Laphroaig scotch, and Titleist golf equipment) entered into a US\$1.25 billion deal consisting of two facilities: a 364-day loan for \$500 million and a five-year revolving line of credit for \$750 million. Both loans were unsecured, contained financial

---

<sup>6</sup> Bradley and Roberts (2004).

<sup>7</sup> The only problem with using a sample of loans containing renegotiations of existing credit facilities occurs if some of the renegotiations happen around filing events in the industry and for borrowers that are impaired by same fundamentals as the filing firm. Controlling for borrower creditworthiness (Table 8) should, however, alleviate this concern.

covenants, had “corporate purposes” as the primary purpose, and were syndicated amongst multiple lending institutions (Sufi, 2007).

Given that the facilities that comprise deals are not independent, and because the general loan terms and pricing are typically set at the deal level, our unit of observation is a “deal.” Because deals are often made up of multiple facilities (for example, Ivashina, 2007, reports an average of 1.4 facilities per deal), we need a rule for choosing which facility will represent each deal in our sample. We choose the largest tranche in each deal, and this selection criterion has been shown in prior literature (Carey et al., 1998; Ivashina, 2007) to not significantly affect the distribution of the sample loans or the results of quantitative analysis.<sup>8</sup>

Finally, because the last observation in our sample of bankruptcy filings (described below) is in October 2004, and we study the effects of filings by firms in the same industry as the borrower in the 12 months after each loan is originated, we limit our sample to deals originated prior to the end of October 2003. This results in a sample of 18,636 deals from the *Dealscan* data, for which the loan terms reflect the largest tranche in each deal. The first deal in this final sample is initiated in June 1982 and the last deal is initiated in October 2003. Table 1, Panel A documents the time series of corporate loans in our final sample. Even though the first loan is originated in 1982, there are only 10 loan observations in the sample from 1982 to 1985. The number of observations increases slightly in 1986 (to 29), but the bulk of the data begins in 1987 with 338 observations. Apart from a gradual increase in the number of loan observations per year over the late 1980s to mid 1990s, there is no remarkable pattern in the time series of loans.

Panel B shows the distribution of loans by industry of the borrower, where industries are defined using Fama and French’s 12 broad industry categories.<sup>9</sup> The loans in our sample are well distributed across a variety of industries, with slight concentrations in finance, manufacturing, wholesale and retail, business equipment, and “other” (which includes construction, entertainment, business services, and transportation).

---

<sup>8</sup> In the unlikely event that the two largest tranches in a deal are of equal size, we select the tranche with the shortest maturity. This is not a common occurrence in our data. However, all our results are qualitatively unchanged using the individual facilities (or tranches) as the unit of observation.

<sup>9</sup> See Ken French’s website for details ([http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/Data\\_Library/det\\_12\\_ind\\_port.html](http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/Data_Library/det_12_ind_port.html)).

The loan terms available for each of the loans in our sample include loan type, loan purpose, loan amount, loan maturity, and loan spread. The four most common types of loans in our data are revolving loans with greater than 1 year maturity (borrowers draw down capital over time: 51% of the sample), term loans (complete withdrawal of funds at inception: 13% of the sample), 364-day facilities (short-term, revolving credit: 12% of the sample), and revolving loans with less than 1 year maturity (10% of the sample). The most commonly cited “primary” purposes of the facilities in our sample are corporate purposes (34%), debt repayment (23%), working capital (16%) and acquisition-related (13%). The distribution of our sample loans amongst types and purposes is generally consistent with prior research using the *Dealscan* database (e.g., Bradley and Roberts, 2004).

The principal dependent variable in our study is the loan spread, which is measured in basis points above 6-month LIBOR. For loans not based on LIBOR, *Dealscan* converts the coupon spread into a LIBOR spread by adding or subtracting a constant differential reflecting the historical averages of the relevant spreads (see Hubbard, Kuttner, and Palia, 2002, for details).<sup>10</sup>

The *Dealscan* database contains two potentially useful spread measures: the coupon spread and the all-in-drawn spread. The latter is computed as the sum of the coupon spread and any recurring annual fees on the loan, both measured in basis points. As the all-in-drawn spread is the sum of the simple coupon spread and the annual fee, we use the coupon spread as our dependent variable and separately examine the determinants of recurring annual fees. Combining the two constructs (the coupon spread and the annual fee) into one measure (the all-in-drawn spread) potentially creates noise in the variable of interest. All of our empirical results are, however, robust to using the all-in-drawn spread (or the log of the all-in drawn spread) as the dependent variable in place of the coupon spread.

---

<sup>10</sup> Loans in this sample often include “performance pricing” clauses, in which the spread (and fees) following initiation is a function of the firm’s credit rating (by one of the major rating agencies) or some other financial indicator. The “spread” referred to throughout this paper is, therefore, the loan spread at origination. While we do not explicitly account for performance pricing in our analysis, the prevalence of performance pricing (Bradley and Roberts, 2004, estimate that 44% of loans between 1993 and 2001 contain such a feature) makes any observed contagion between industry distress and loan spreads even more remarkable, as a loan contract with a performance pricing feature would already specifically account for the spread impact of future changes in the borrowing firm’s credit risk.

Our data on corporate bankruptcies comes from an initial sample of 1,695 bankruptcy filings between 1978 and (October) 2004 from the Bankruptcy DataSource Index. These data were used in Hertz, Li, Officer, and Rodgers (2008). For each loan in our sample, we measure the number of bankruptcy filings in the 12-month period before and after the loan origination date by firms with the same four-digit SIC code (from CRSP) as the borrowing firm. Because we require that the filing firm be matched to the CRSP database to obtain the filing firm's SIC code, the number of filings used in this study is reduced to 1,354. Panel A of Table 1 displays the time series of this sample of filings: coverage is relatively thin in the early part of the sample. However, because our main tests require matching of filings to loans from *Dealscan* data, only the filings from about 1986 onwards are important in this study (the bulk of data in the loan sample begins in 1987).

Panel B shows the distribution of bankruptcy filings by industry. The filings are also well distributed across industries, except for the small number of filings in the Utilities and Chemicals industries. Similar to the loan data, there are slight concentrations of filings in the finance, manufacturing, wholesale and retail, business equipment, and "other" industries. While there could be a mechanical relation between the number of loans taken out by firms in an industry and the number of subsequent bankruptcy filings in that industry, it could also simply be the case that these industries contain a large number of firms and therefore, coincidentally, those industries account for the highest concentrations of both loan activity and bankruptcy filings.

### *2.1. Summary statistics and univariate tests*

Table 2 presents summary statistics for loan contract terms (Panel A) and borrower characteristics (Panel B) for our sample of loans from *Dealscan*. In both panels, the sample is split based on whether or not at least one four-digit SIC code industry competitor files for bankruptcy in the year prior to loan origination.

Panel A shows that the mean (median) loan spread when there is a bankruptcy filing in the industry within the past year is 210 (200) basis points, compared to a mean (median) loan spread of 170 (150) basis points when there has not been an industry bankruptcy. The differences in means and medians are both statistically significant at the

1% level. These univariate comparisons show that loans made to firms in industries with bankruptcy filings in the prior year have approximately 24% higher loan spreads than loans without proximate filings by rivals. Not only are coupon spreads higher (relative to other loans), but annual fees on such loans are also significantly higher. Whether measured using the simple coupon spread or the annual fee associated with a line of credit, borrowing costs appear to be substantially higher for industry rivals in the year following bankruptcies in an industry.

However, bank loan contracts are more complicated than can be represented by the spread. In response to perceived increases in credit risk in an industry (following filings), lenders can protect themselves by making loans of shorter maturity, of smaller amount, containing more protective covenants, and/or requiring greater collateral. We find evidence of significant adjustments along all these dimensions. Compared with other loans, originations that follow filings in the same industry are, on average, smaller (\$239 million versus \$310 million), have shorter maturities (1,211 versus 1,306 days), are more likely to have protective financial covenants (43% versus 38%), are more likely to be secured (47% versus 37%), and are more likely to involve a single lender (as opposed to being syndicated; 21% versus 17%). Differences in medians (for the continuous variables) paint a similar picture. Thus, there is considerable evidence in Panel A of Table 2 that lenders tighten all important lending terms for borrowers initiating loans in the year following filings by industry rivals. Furthermore, it appears that at such times single lenders (as opposed to syndicates) are more likely to be able to resolve information asymmetry problems about borrowers in potentially distressed industries, or facilitate renegotiation should the need arise to restructure the loan.

Of course, such univariate comparisons are only evidence of *abnormally* tighter credit conditions if the *type* of borrower is the same in the two sub-samples. If post-industry-bankruptcy loans are taken out by otherwise riskier borrowers, for example, then risk differences would explain the tighter credit terms. Panel B provides means and medians of financial and accounting variables for borrowers in the two sub-samples. All accounting data is from the Compustat database for the fiscal quarter preceding loan origination. Compared to borrowers at all other times, the median borrower after filings in the same industry is significantly smaller (\$326m of total assets versus \$551m), has

slightly lower return on assets (defined as operating income before depreciation divided by total assets; 2.86% versus 3.29%), and has higher cash flow volatility (defined as the standard deviation of operating income before depreciation divided by total assets over the 20 fiscal quarters preceding the loan initiation; 2% versus 1%).

These characteristics are consistent with the notion that post-industry-filing borrowers are “riskier” (smaller, less profitable, and with more volatile cash flows) than borrowers originating loans at other times. On the other hand, post-industry-filing borrowers do not appear “riskier” on several other dimensions. For example, such borrowers have significantly lower pre-deal leverage (defined as the sum of the book value of long-term and short-term debt divided by total assets; 27% versus 30% at the median), significantly more tangible assets as a fraction of total assets (defined as property, plant, and equipment divided by total assets; 35% versus 32% at the mean), and insignificantly different market-to-book ratios at the median compared to borrowers in all other loans. Because there is no clear pattern in borrower characteristics, apart from significant differences with differing implications for the riskiness of the borrower, it is clear that multivariate regressions are needed to determine whether spread differences exist holding other loan and borrower characteristics constant. It is this issue that we turn to next.

### **3. The effect of industry bankruptcy filings on new loan spreads**

Table 3 contains the results of multiple regressions examining the *ex ante* and *ex post* effects of bankruptcy filings on loan spreads for loans to industry competitors of the filing firm(s). The dependent variable is the loan spread (described above), and all regressions use deal-level data (each observation is the largest tranche in each deal). To measure *ex post* effects (the effects on loans initiated *after* filings), for each loan we generate an indicator variable that is equal to one whenever there is at least one bankruptcy filing in the same industry (four-digit SIC code) in the 12 months before the loan initiation (and zero otherwise). To measure *ex ante* effects (the anticipatory effects on loans initiated *before* filings), we use an indicator variable that is equal to one

whenever there is at least one bankruptcy filing in the same industry in the 12 months after the loan initiation (and zero otherwise).<sup>11</sup>

All regressions in Table 3 include the following borrower-specific control variables, defined in the prior section: (log of) total assets, market-to-book assets, ROA, leverage, tangibility, and cash-flow sigma. The regressions also control for the following loan-specific variables: (log of) deal amount, (log of) original maturity, the presence of financial covenants, whether the loan is secured, whether there is a sole lender, and whether the base rate is prime. Finally, the various specifications also include fixed effects controls for industry (Fama-French 48 industry definitions), year, senior debt rating (from Compustat), and the type and purpose of the loan (both described above). All results are reported with heteroskedasticity-consistent standard errors, and regressions (5) and (6) have standard errors that are clustered at the borrower level (as loans by the same borrower are unlikely to be independent observations).

The results in Table 3 provide evidence of significant spread contagion in credit markets. Specifically, regressions (1) and (2) examine the individual *ex ante* and *ex post* effects, and find that both effects increase loan spreads and are highly statistically significant. Loans that follow at least one bankruptcy filing in the same industry as the borrowing firm have spreads that are higher by 19.5 basis points, and loans prior to such filings have spreads that are 16 basis points higher than otherwise similar loans originated at other times (both significant at the 1% level). To put these effects in context, the unconditional average spread is around 200 basis points over LIBOR, and these point estimates suggest that, controlling for deal and borrower characteristics, corporate loan spreads are higher by about 8 to 10% when there are bankruptcy filings in the borrower's industry in the year before or after loan origination.

The remaining specifications in Table 3 (regressions (3) through (6)) demonstrate that while the magnitudes are affected by changing the control variables (particularly the fixed effects), the statistical significance of these contagion effects remains unchanged regardless of the specification. Specifically, the *ex post* and *ex ante* contagion effects are

---

<sup>11</sup> The results in Table 3 are qualitatively unchanged if the ex-ante and ex-post periods are defined using 6 month windows (as in Massa, Rehman, and Vermaelen, 2007) rather than 12 month windows. If anything, the *ex ante* effect is much stronger, and the *ex post* effect a little weaker, if the indicator variables are defined using 6 month windows.

orthogonal to one another, in the sense that both are significant when both variables are included in the model at the same time (regression (3)). Furthermore, the effects are robust to including year and industry fixed effects (regression (4)), type and purpose of loan fixed effects (regression (5)) or all fixed effects (regression (6)). Clustered standard errors (by borrower, to account for the unobserved correlations at the firm level; regressions (5) and (6)) do little to change the statistical significance of these contagion effects.

Intuitively, one can interpret evidence of *ex post* and *ex ante* contagion effects as suggesting that loans spreads are higher for borrowers in industries containing firms that are already in distress or will be in distress in the near future. The magnitude of these effects is, conservatively (using the coefficients in regression (6)), a 3 – 5% increase in loan spreads for new loans to borrowers in distressed industries – the year fixed effects, in particular, appear to diminish the magnitude of contagion relative to the economic magnitude in regressions not including year fixed effects (such as regressions (1) and (2)).<sup>12</sup>

The signs of the coefficients on the control variables in Table 3 are generally consistent with expectations. Loan spreads are significantly higher for firms that are smaller, less profitable, have fewer tangible assets, and have higher cash flow volatility. Spreads are also generally higher for smaller loans and loans that are tied to the U.S. prime rate (despite the fact that *Dealscan* converts non-LIBOR spreads into LIBOR-equivalent spreads). The sign on the Financial Covenants variable changes in the various specifications, but in the specifications containing year fixed effects (regressions (4) and (6)) the sign suggests that spreads are lower for loans containing covenants that protect lenders interests. Interestingly, the sign on the Secured indicator variable, indicating loans that are secured over some pledged assets, is consistently positive, suggesting, counter intuitively, that secured loans have higher credit spreads (all else equal). This curious result has been a facet of almost all empirical analyses using *Dealscan* data (for an early

---

<sup>12</sup> These estimates of the magnitude of contagion are likely to be conservative because of sample truncation. While one can study the stock price reactions for all publicly traded stocks in an industry, we only observe spreads on loans actually taken out by borrowers. In other words, it is likely that there are firms in distressed industries that do not take out loans because the spreads quoted to them by potential lenders are too high and they have alternatives for raising capital (e.g., equity markets). We, therefore, only observe loan spreads on deals that are not priced in a way that deters the borrower.

example, see Booth, 1992), and is probably the result of the Secured indicator picking up some component of credit risk that is missing from the other control variables.

One notable facet of the results in Table 3 is that the *ex ante* effect is as strong as the *ex post* effect, if not stronger. Similar to Hertz, Li, Officer, and Rodgers (2008), who argue that participants in equity markets anticipate financial distress and price the implications of such distress into equity prices well before actual bankruptcy filings, lenders appear to anticipate industry distress and increase spreads on new loans to borrowers in the same industry.

#### **4. Industry bankruptcy waves and spreads in new loans**

The results in Table 3 suggest that the borrowers most affected by contagion in loan spreads are those that take out loans at a time when there are bankruptcy filings by industry rivals *both* in the year before and after the loan origination date. In other words, borrowers that take out loans in the middle of an industry *bankruptcy wave* are likely to be most affected by loan spread contagion. Industry waves of various types are extremely important in other empirical contexts in corporate finance (e.g., mergers (Matsusaka, 1993; Mitchell and Mulherin, 1996; Harford, 2005) and stock repurchases (Massa, Rehman, and Vermaelen, 2007)), and the evidence in Tables 3 suggests that waves may be no less important in explaining contagion in loan spreads.

We employ three indicator variables to represent where a loan falls in an industry bankruptcy wave. A loan that is originated after a single bankruptcy filing by an industry (four-digit SIC code) rival in the year prior but before multiple bankruptcy filings in the year after is at the *beginning* of an industry wave. A loan that is originated after multiple bankruptcy filings by industry rivals in the year prior and before multiple filings in the year after is in the *middle* of an industry wave. Finally, a loan that is originated after multiple bankruptcy filings by industry rivals in the year prior but before a single filing in the industry in the year after is at the *end* of an industry wave. We introduce these three variables into regressions similar to those shown in Table 3, with identical control variables to those in regression (6) in that table.

The results are shown in Table 4. Loan deals that take place at either the beginning or middle of an industry bankruptcy wave have significantly higher loans

spreads than other, comparable, loans. When all three wave indicator variables are included in the regression at the same time (column (4)), the point estimates of the coefficients suggest that deals originated in the middle of bankruptcy waves are especially susceptible to contagion from industry filings. The point estimates suggest that, all else equal, spreads on loans taken out in the middle of industry bankruptcy waves are approximately 24 basis points higher than spreads on other loans. On the other hand, loans initiated at the end of an industry bankruptcy wave do not have significantly higher spreads, with an insignificant coefficient on the “end of wave” indicator variable.

These results suggest that loan spread contagion is most pronounced as industry bankruptcy waves are building, and largely tapers off near the end of bankruptcy waves. This provides an interesting perspective on the main results presented earlier – while both past and future industry filings appear to cause contagion in spreads (Table 3), wave-based indicator variables that weight *future* filings more heavily appear to have greater significance in picking up contagion than do wave-based indicators that weight the *past* more heavily. This suggests that contagion is principally driven by lenders anticipating future filing activity by industry rivals, as opposed to lenders reacting to the incidence of filings in the past.

This conclusion is supported by the impact on loan spreads of the *number* of bankruptcy filings in the same industry before and after a loan is originated. Instead of relying on indicator variables, as in Table 4, the regressions in Table 5 employ count variables to measure bankruptcy activity. Furthermore, in the analysis documented in Table 5, we consider the contrasting effects of industry versus economy-wide bankruptcy waves on the cost of new bank debt. To measure pre-loan and post-loan economy-wide bankruptcy activity, we use the number of filings in the year before the deal and the year after the deal, respectively. To measure industry activity, we limit our counts to bankruptcies within the respective four-digit SIC code industries.

The results show no evidence of credit market contagion for economy-wide counts, either before or after loan origination. The coefficients on the economy-wide filing count variables are extremely small in magnitude and statistically insignificant. This suggests that loan spread contagion is not an economy-wide phenomenon on average, and that such contagion is industry-specific. With respect to industry bankruptcy

filings, however, the number of filings in the industry in the year *after* a loan is initiated shows a positive and significant contagion effect on loan spreads. On the other hand, the number of filings in the industry in the year *before* the loan is taken out has no significant effect on spreads on new loans, all else equal. This latter result supports the conclusion that contagion in loan spreads is not only an industry phenomenon, but is also largely based on anticipated future filings by industry cohorts. These results also help address the issue of whether the spread contagion reported in Table 3 is driven by the use of indicator variables: contagion from past filings is not robust to the use of count variables, while anticipated future filings appear to be the dominant and source of contagion in this context.

### **5. The effect of industry concentration on loan spread contagion**

Prior research on contagion and competitive effects of bankruptcy filings finds evidence of *positive* rival stock returns to bankruptcy filings in concentrated industries. Lang and Stulz (1992) hypothesize that rivals of filing firms in concentrated industries benefit from increased market power and/or ability to capture the market share of a distressed rival, thereby inducing a *competitive* effect that more than offsets any (benign or malign) contagion. In this section, we investigate whether such competitive effects also diminish the spread contagion observed in credit markets.

Table 6 reports results of regressions documenting the effect of industry concentration on spread contagion in the middle of industry bankruptcy waves, controlling for the same loan and borrower characteristics used as control variables in Table 3. Since the evidence in Table 4 suggests that spread contagion is the most extreme for loans taken out in the *middle* of industry bankruptcy waves (as defined in the discussion of Table 4), we focus our analysis on the question of whether this contagion is mitigated by the competitive effects proposed by Lang and Stulz (1992).

To measure industry concentration, we calculate the Herfindahl-Hirschman Index (HHI) as the sum of squared industry market shares using sales data for all firms in the same four-digit SIC code from Compustat in the fiscal quarter immediately prior to loan origination. In regression (1), we employ an indicator variable equal to one if the borrower's industry has a higher HHI than the median HHI across all industries in the

fiscal quarter before the deal (and zero otherwise). In specification (2), we use level of HHI as a continuous variable.

The results in Table 6 show evidence of *competitive* credit market effects of bankruptcy filings in concentrated industries. Specifically, the coefficient on the bankruptcy wave indicator variable is significantly positive but the coefficient on the interaction term capturing bankruptcy waves in concentrated industries (higher than median HHI) is significantly negative and of approximately the same magnitude as the contagion coefficient. The same result holds using continuous measures of concentration. In column (2) of Table 6 the coefficient on the indicator for the middle of a bankruptcy wave is significantly positive while the coefficient on the interaction of a bankruptcy wave and the industry's concentration index (HHI) is significantly negative. This again suggests that spread contagion in the middle of bankruptcy waves is mitigated in concentrated industries.

In summary, we observe contagion in credit markets for borrowers in competitive industries, but not for borrowers in concentrated industries. It is likely that this pattern in contagion mimics the contagion and competitive effects observed in stock returns (Lang and Stulz, 1992). These results are consistent with the existence of competitive benefits to industry rivals stemming from the bankruptcy filing of a competitor. If the remaining rivals are able to capture market share and/or market power in concentrated industries around the distress of other firms in the industry, then those competitive benefits can explain both positive stock price reactions for the remaining rivals (Lang and Stulz, 1992) and the lack of loan spread contagion in new loans taken out by those rivals.

## **6. Does contagion spread to non-spread contractual terms and loan structure?**

Our analysis has thus far focused entirely on loan spread (or price) contagion from distress in the same industry as the borrower. However, loans are multidimensional contracts that contain many important non-spread terms that have the potential to reflect credit risk. Table 2 offers suggestive evidence that many of these non-spread terms are also affected by industry contagion – for example, lenders appear significantly more likely to demand security or the inclusion of financial covenants in a loan taken out in the year following at least one filing in the same industry as the borrower (Table 2). In this

section, we examine whether this contagion in non-spread contractual terms is evident after controlling for other determinants of the contractual features of loan contracts.

In the spirit of the spread analysis in Table 3, Table 7 shows the results of three regressions analyzing whether *ex ante* or *ex post* contagion affects the probability that the borrower has to provide security or collateral, the loan maturity, or the annual loan fees paid by the borrower. The first regression is a probit model, and the reported coefficients are marginal effects (of a change from zero to one for explanatory indicator variables, for example). The reported t-statistics (in parentheses) are, however, based on the underlying probit coefficients and computed using robust techniques. The last two regressions (maturity and annual fees) are OLS regressions with White heteroskedasticity-consistent standard errors. The regressions in Table 7 all contain borrower- and loan-specific control variables, as well as year, loan type, loan purpose, and senior debt rating fixed effects.<sup>13</sup>

The results in Table 7 show significant industry contagion effects in non-spread loan terms. Specifically, lenders reacting to filings by industry rivals are significantly more likely to require collateral (security) in private credit agreements, loans that precede industry filings are of significantly shorter maturity, and both *ex ante* and *ex post* forms of contagion significantly affect the ongoing, annual fees paid by borrowers for the use of credit facilities.

The base predicted probability of observing a secured loan is approximately 29% (measured at the means of the continuous variables and setting all indicator variables equal to zero). Loans originated in the year after at least one filing in the industry are about 3.5 percentage points more likely to contain financial covenants, which is approximately a 12% increase in the probability of observing a secured loan. Loans made prior to industry defaults in the following year are of shorter maturity than other loans, but the magnitude of the coefficient suggests that the effect is on the order of a 30 day difference in maturities. While *ex ante* contagion appears to significantly impact loan maturity, the effect is not economically large. Finally, the magnitude of the coefficients in the annual fees regression suggests that industry contagion (either *ex ante* or *ex post*) is

---

<sup>13</sup> Industry fixed effects are generally not statistically significant in these regressions, so industry fixed effects are omitted from the table.

responsible for increases in annual fees paid by borrowers of approximately 1 – 2 basis points. Again, this effect is statistically significant but not large in economic terms.

The other univariate effects shown in Table 2 are not robust in multivariate regressions. In other words, reaction to, or anticipation of, bankruptcy filings by firms in the industry has no significant effect on the use of financial covenants, whether the loan is secured, or whether the loan is provided by a sole lender or syndicated in multivariate regressions controlling for borrower-, time-, and loan-specific variables.<sup>14</sup>

### **7. Socially costly contagion?**

An interesting, but challenging, question is whether the loan spread contagion documented in Table 3 is an *information transmission* effect, as lenders react rationally to increased perceived credit risk for borrowers in distressed industries (as argued in Jorion and Zhang, 2007), or a *socially costly* form of contagion whereby important suppliers of capital overact to filings (or anticipated filings) and tighten credit terms for borrowers in the same industry regardless (or in spite of) of the financial health of those rivals.<sup>15</sup> The implications of the socially costly form of contagion are broad, as increased borrowing rates imply higher costs of capital for firms in distressed industries, higher hurdle rates for capital investment, and potentially inefficiently lower investment by firms in the industry.<sup>16</sup>

While it is difficult to isolate socially costly contagion, one way to attempt to distinguish between these alternatives is to introduce into the regressions controls for forward-looking proxies for whether the borrowing firm *itself* is likely to enter financial or economic distress during the loan period. The idea is that if loan spread contagion is still evident after controlling for predictive proxies for future borrower distress, then this contagion may not be driven by (ex-post) rational perception by lenders of increased credit risk. In other words, if the introduction of forward-looking distress proxies into the regressions does not substantially reduce evidence of spread contagion, this would be at

---

<sup>14</sup> We intend to gather more data from the *Dealscan* database to allow us to examine the effect of contagion on syndicate size and structure in greater detail than is afforded by a simple indicator variable for a sole lender.

<sup>15</sup> The information transmission (benign) and socially costly (malign) forms of contagion are discussed in Lang and Stulz (1992).

<sup>16</sup> If firms in the distressed industry are prepared to borrow at higher rates at all.

least consistent with the possibility that contagion in loan spreads is driven by overreaction by lenders rather than credit risk fundamentals. This would provide some evidence of financially healthy firms paying higher costs of capital because they are “guilty” by (industry) association.

The most direct forward-looking proxy for borrower distress is a measure of whether the borrower files for bankruptcy during the duration of the loan. In other words, can perfect foresight on the part of lenders (about whether the borrower files for bankruptcy) explain increased loan spreads in times of industry distress and crowd out the contagion effect from filings by competitors? Ideally we would like to control for whether the borrowing firm renegotiates the loan (Roberts and Sufi, 2007) or violates financial covenants – outcomes that unambiguously suggest higher credit risk. Given the difficulty in screening over 18,000 loans for such characteristics, however, we use *ex post* bankruptcy filing as a crude proxy for higher *ex ante* assessed credit risk by lenders.

Column (1) in Table 8 reports the results of regressions including an indicator variable equal to one if the borrowing firm files for bankruptcy over the life of the loan (and zero otherwise) with the same control variables as reported in column (6) of Table 3. Loans to firms that file for bankruptcy during the loan period (and for which lenders could potentially *predict* greater credit risk *ex ante*) are priced at spreads of 32.5 basis points higher than otherwise comparable loans. Furthermore, the coefficients on the industry filing indicator variables are virtually unchanged by the inclusion of the borrower-specific filing variable, suggesting that it is possible that loan spread contagion is more than an *information transmission* effect. It is possible that a socially costly form of contagion is at work in credit markets, as lenders overreact to perceptions of industry risk that are not *ex post* justifiable by outcomes for borrowers.

In regressions (2) and (3) we report results using another proxy for forward-looking expectations of default. The Altman Z score (Altman, 1968) is a commonly-used indicator of distress, with a lower Z score suggesting a higher probability of future default. We measure the borrower’s modified Z score<sup>17</sup> in the fiscal quarter before the loan is originated and the forward-looking change in Z score over the first year of the

---

<sup>17</sup> As in Graham, Li, and Qiu (2007), we use a modified Z score excluding the term related to the market value of equity because the market to book assets ratio is already included in the regressions.

loan's life. While borrower Z scores are significantly negatively related to loan spreads in regressions *excluding* the industry contagion variables (as in Graham, Li, and Qiu, 2007), neither the level nor the change in Z score is significantly related to loan spreads in columns (2) and (3) of Table 8 when the regressions include the industry-filing indicators. More importantly, the inclusion of borrower Z scores (pre-loan levels and forward-looking changes) into the regressions does not alter the sign, magnitude, or significance of the coefficients on the industry-filing indicator variables. In other words, the effect of industry contagion on credit spreads appears to crowd out the effect of the borrower's own financial stability in determining the cost of debt capital.

Our last forward looking proxy for borrower distress is the borrower's abnormal stock return before and after loan origination. Abnormal returns are measured as the firm's monthly return minus the monthly return on the CRSP value-weighted index, and compounded over the 6 month periods leading up to and following the month containing the loan origination date. Forward-looking changes in credit risk could be reflected in abnormally low returns in the periods surrounding the loan origination, and if such changes in risk are important determinants of spreads then the inclusion of these variables should crowd out the contagion effect from industry filings. Column (4) in Table 8 shows that this is not the case – while loans spreads are negatively related to compound abnormal stock returns, indicating higher spreads for firms with lower abnormal stock returns, neither coefficient is statistically significant. Furthermore, the sign, magnitude, and significance of the coefficients on the industry contagion variables are unaffected by the inclusion of return-based proxies for credit risk.

In summary, the contagion effects documented in Table 3 are robust to controlling for *forward-looking* borrower-specific proxies for credit risk. It is possible, therefore, that the contagion effects that we document reflect irrational perceptions of higher borrower credit risk, offering suggestive evidence of a socially costly form of contagion where financially healthy borrowers pay higher costs of debt capital because those borrowers are in the same industry as firms that have filed, or will file, for bankruptcy.

The reason that this evidence is suggestive rather than conclusive, however, is that there are rational explanations for higher credits spreads in distressed industries even after controlling for forward-looking proxies for borrower default. For example, it could

be more difficult (or costly) for lenders to conduct due diligence about potential borrowers in distressed industries, and the higher spreads documented here could be efficient compensation for the lender's greater effort in updating the probability of default. More generally, evidence of higher loan spreads even after controlling for borrower-specific credit risk proxies could simply reflect lender uncertainty about which firms in the industry are likely to become distressed in the future. If it is difficult for lenders to accurately predict which of the firms in an industry are likely to follow their peer(s) into bankruptcy, lenders may rationally increase spreads for all loans to firms in that industry.

## **8. Conclusion**

Prior research into intra-industry contagion effects of financial distress has focused on short-run industry stock price reactions (and CDS spread changes) measured over narrow event-time windows. Whether such effects are permanent or transitory, and whether they have long-term implications for industry competitors is not well-understood.

Furthermore, whether such effects reflect an allocatively efficient response to new information about industry prospects or, alternatively, an inefficient and socially costly response based on, perhaps, investor overreaction, is an unanswered question. This paper provides an analysis of price and non-price terms of new loans to industry competitors around bankruptcy filings to provide insight on these questions and other issues.

We find that spreads on new loans to industry competitors are significantly higher when the loan originates in the two years surrounding a bankruptcy filing (or bankruptcy filings) by industry rivals. The contagion we document appears to be an industry, not an economy-wide, phenomenon, and is particularly severe in the middle of industry bankruptcy waves. Furthermore, contagion in loan spreads is mitigated in concentrated industries, consistent with the hypothesis in Lang and Stulz (1992) that bankruptcy filings in concentrated industries can have positive consequences for rivals (increased market share and/or power). We also find some evidence that contagion affects non-spread terms in loan contracts.

## References

- Altman, E. I., 1968, Financial ratios, discriminant analysis, and the prediction of corporate bankruptcy, *Journal of Finance* 23: 589-609.
- Bae, K. H. and V. Goyal, 2006, Creditor rights, contract enforcement, and costs of loan financing, Working Paper, Queen's University and Hong Kong University of Science and Technology.
- Barclay, M. J. and C. W. Smith, 1995, The maturity structure of corporate debt, *Journal of Finance* 50: 609-631.
- Benmelech, E., M. J. Garmaise, and T. J. Moskowitz, 2005, Do liquidation values affect financial contracts? Evidence from commercial loan contracts and zoning regulation, *Quarterly Journal of Economics* 120: 1121-1154.
- Berger, A. N. and G. F. Udell, 1990, Collateral, loan quality, and bank risk, *Journal of Monetary Economics* 25: 21-42.
- Booth, J. R., 1992, Contract costs, bank loans, and the cross-monitoring hypothesis, *Journal of Financial Economics* 31: 25-41.
- Bradley, M., and M. R. Roberts, 2004, The structure and pricing of corporate debt covenants, Working paper, Duke University.
- Carey, M., and M. Hrycray, 1999, Credit flow, risk, and the role of private debt in capital structure, Working paper, Federal Reserve Board.
- Carey, M., M. Post, and S. A. Sharpe, 1998, Does corporate lending by banks and finance companies differ? Evidence on specialization in private debt contracting, *Journal of Finance* 53: 845-878.
- Chava, S., D. Livdan, and A. Purnanandam, 2007, Do shareholder rights affect the cost of bank loans? Working paper, Texas A&M University and University of Michigan.
- Diamond, D. W., 1991, Debt maturity structure and liquidity risk, *Quarterly Journal of Economics* 106: 709-737.
- Fama, E. and K. R. French, 1993, Common risk factors in the returns on stocks and bonds, *Journal of Financial Economics* 33: 3-56.
- Gleason, C. A., N. T. Jenkins, and W. B. Johnson, 2005, Financial statement credibility: The contagion effects of accounting restatements, Working paper, University of Iowa.

- Graham, J. R., S. Li, and J. Qiu, 2007, Corporate misreporting and bank loan contracting, *Journal of Financial Economics*, forthcoming.
- Harford, J., 2005, What drives merger waves? *Journal of Financial Economics* 77: 529-560.
- Hertzel, M. G., Z. Li, M. S. Officer, and K. J. Rodgers, 2008, Inter-firm linkages and the wealth effects of financial distress along the supply chain, *Journal of Financial Economics* 87: 374-387.
- Hubbard, R. G., K. N. Kuttner, and D. N. Palia, 2002, Are there bank effects in borrowers' costs of funds? Evidence from a matched sample of borrowers and banks, *Journal of Business* 75: 559-581.
- Ivashina, V., 2007, Agency effects on syndicated loan rates, Working paper, Harvard Business School.
- Jimenez, G., V. Salas, and J. Saurina, 2006, Determinants of collateral, *Journal of Financial Economics* 81: 255-281.
- Jorion, P., and G. Zhang, 2007, Good and bad credit contagion: Evidence from credit default swaps, *Journal of Financial Economics*, forthcoming.
- Lang, L., and R. M. Stulz, 1992, Contagion and competitive intra-industry effects of bankruptcy announcements, *Journal of Financial Economics* 32: 45-60.
- Massa, M., Z. Rehman, and T. Vermaelen, 2007, Mimicking repurchases, *Journal of Financial Economics* 84: 624-666.
- Matsusaka, J. G., 1993, Takeover motives during the conglomerate merger wave, *RAND Journal of Economics* 24: 357-379.
- Melnik, A and S. Plaut, 1986, Loan commitment contracts, terms of lending, and credit allocation, *Journal of Finance* 41: 425-435.
- Mitchell, M. L., and J. H. Mulherin, 1996, The impact of industry shocks on takeover and restructuring activity, *Journal of Financial Economics* 41: 193-229.
- Qian, J. and P. E. Strahan, 2006, How laws and institutions shape financial contracts: The case of bank loans, *Journal of Finance*, forthcoming.
- Rajan, R. and A. Winton, 1995, Covenants and collateral as incentives to monitor, *Journal of Finance* 50: 1113-1146.

Roberts, M. R., and A. Sufi, 2007, Contingency and renegotiation of financial contracts: Evidence from private credit agreements, Working paper, University of Pennsylvania.

Smith Jr., C. W. and J. B. Warner, 1979, On financial contracting: An analysis of bond covenants, *Journal of Financial Economics* 7: 117-161.

Strahan, P. E., 1999, Borrower risk and the price and non-price terms of bank loans, Working paper, Federal Reserve Bank of New York.

Sufi, A., 2007, Information asymmetry and financing arrangements: Evidence from syndicated loans, *Journal of Finance* 62: 629-668.

Table 1

## Distribution of loans and bankruptcy filings by year and industry

This table shows the distribution of the sample of corporate loans from DealScan and the sample of bankruptcy filings from the Bankruptcy DataSource Index by year (Panel A) and industry (Panel B). Year is the year of containing the loan date for the loan sample and containing the filing date for the bankruptcy sample. Industry is defined using four-digit SIC codes from CRSP and the Fama-French 12-industry categorization.

**Panel A: Corporate loans and bankruptcy filings – time series**

Year	# of loans	# of filings
1981	0	7
1982	2	21
1983	0	19
1984	1	24
1985	7	33
1986	29	38
1987	338	30
1988	712	43
1989	715	64
1990	757	77
1991	707	86
1992	844	54
1993	906	58
1994	1,151	35
1995	1,076	47
1996	1,328	43
1997	1,682	45
1998	1,562	69
1999	1,500	88
2000	1,476	102
2001	1,423	165
2002	1,351	111
2003	1,069	71
2004	0	24
Total	18,636	1,354

**Panel B: Corporate loans and bankruptcy filings – industry**

---

Industry	# of loans	# of filings
1. Consumer nondurables	1,284	97
2. Consumer durables	490	46
3. Manufacturing	2,507	135
4. Energy	1,028	86
5. Chemicals	502	15
6. Business equipment	2,336	190
7. Telecom	621	79
8. Utilities	987	14
9. Wholesale, Retail	2,415	271
10. Healthcare	1,134	76
11. Finance	2,643	117
12. Other	2,689	228
Total	18,636	1,354

---

Table 2  
Summary statistics

This table presents means [medians] for loan terms (Panel A) and borrower-specific variables (Panel B) for two subsamples: loans for which there is at least one bankruptcy filing in same industry (defined by CRSP four-digit SIC code) in year prior and all other loans. All loan contact terms in Panel A come from DealScan data for the largest tranche (by face value) in each deal. Spread is the annual coupon spread on the loan measured as equivalent basis points over LIBOR (prime-based spreads are converted into LIBOR-equivalent spreads) at initiation (not counting future performance pricing), Annual fees are payable on the drawn portion of the loan, Upfront fees are payable on the face value of the deal, Deal amount is the sum of the face values of the tranches in each deal, Length (days) is the number of calendar days between the facility origination date and the facility maturity date, and Financial covenants, Loan is secured, Sole lender, and Base rate is Prime are indicator variables equal to one if the loan possesses the described feature (and zero otherwise). All borrower accounting variables in Panel B are from Compustat data for the fiscal quarter prior to loan origination. Assets is total assets (data44), leverage is long term debt (data 51) + short term debt (data 45) divided by total assets. Return on assets is operating income before depreciation (data 21) divided by total assets, market to book (assets) is the market value of equity (data61\*data14) minus the book value of equity (data59) plus total assets all divided by total assets, tangibility is property, plant, and equipment (data42) divided by total assets, and cash-flow sigma is the standard deviation of operating income before depreciation divided by total assets over the 20 quarters before the quarter containing the loan origination date. The number of observations in each cell is in parentheses. \*\*\*, \*\*, or \* indicates significantly different means or medians at the 1%, 5%, or 10% level (respectively).

**Panel A: Loan terms**

	Loans with:		t-test for difference in means	Wilcoxon test for difference in medians
	At least one bankruptcy filing in same industry in year prior	All others		
Spread	210.11 [200.00] (2,927)	170.34 [150.00] (12,038)	-13.71***	-14.67***
Annual fees	21.39 [15.00] (730)	17.09 [12.50] (3,989)	-4.78***	-5.51***
Upfront fees	56.14 [37.50] (926)	55.93 [33.33] (3,362)	-0.08	-1.61
Deal amount (\$m)	239.16 [65.00] (3,600)	309.56 [100.00] (15,036)	5.09***	11.08***
Length (days)	1,210.72 [1,095.00] (3,237)	1,306.10 [1,096.00] (13,368)	4.58***	4.43***
Financial covenants (indicator)	0.43 (3,600)	0.38 (15,036)	-5.45***	
Loan is secured (indicator)	0.47 (3,600)	0.37 (15,036)	-10.37***	
Sole lender (indicator)	0.21 (3,600)	0.17 (15,036)	-4.97***	
Base rate is Prime (indicator)	0.14 (3,600)	0.10 (15,036)	-7.25***	

**Panel B: Borrower characteristics**

---

	Loans with:			
	At least one bankruptcy filing in same industry in year prior	All others	t-test for difference in means	Wilcoxon test for difference in medians
Assets (\$m)	4,908.68 [326.42] (3,422)	5,002.23 [551.34] (14,273)	0.22	10.62***
Leverage	0.30 [0.27] (3,151)	0.32 [0.30] (12,763)	3.18***	6.24***
Return on assets	0.02 [0.0286] (2,969)	0.03 [0.0329] (12,091)	6.53***	8.96***
Market to book (assets)	1.92 [1.34] (3,314)	1.68 [1.34] (13,817)	-7.99***	-0.11
Tangibility	0.35 [0.26] (3,264)	0.32 [0.26] (13,422)	-5.52***	-2.60***
Cash-flow sigma	0.19 [0.02] (2,944)	0.04 [0.01] (11,927)	-2.92***	-13.87***

---

Table 3

Loan spread contagion

The dependent variable in all regressions in this table is the loan spread, defined in Table 2. All regressions use deal-level data where each observation is the largest tranche in each deal from DealScan. At least one bankruptcy filing in same industry in year *before (after)* deal is an indicator variable equal to one if at least one firm in the same CRSP four-digit SIC code industry as the borrower files for bankruptcy in the year before (after) the loan origination date (and zero otherwise). For fixed effects, industry is defined using the Fama-French 48 industry categories (Fama and French, 1993), Year is the calendar year containing the loan origination date, both Type of loan (revolving credit agreement, term loan, note, etc.) and Purpose of loan (general corporate purposes, working capital, debt repayment, acquisition) are from DealScan data, and Senior debt rating is from DealScan data (or from Compustat for the fiscal quarter immediately before the quarter containing the loan origination date if the senior debt rating is missing in DealScan). All other variables are described in previous tables. All regressions have White-corrected standard errors (in parentheses). Columns (5) – (6) have robust standard errors clustered at the borrower level. \*\*\*, \*\*, or \* indicates that the regression coefficient is significantly different from zero at the 1%, 5%, or 10% level (respectively).

	(1)	(2)	(3)	(4)	(5)	(6)
Intercept	357.28*** (23.35)	359.20*** (23.35)	352.52*** (23.50)	335.31*** (51.89)	538.58*** (47.94)	404.52*** (36.86)
At least one bankruptcy filing in same industry in year <i>before</i> deal	19.50*** (2.79)		15.84*** (2.82)	8.51*** (2.83)	13.62*** (2.90)	6.10** (2.99)
At least one bankruptcy filing in same industry in year <i>after</i> deal		16.04*** (2.64)	11.03*** (2.66)	9.01*** (2.76)	8.54*** (2.89)	8.43*** (2.90)
<i>Borrower-specific control variables</i>						
Log(assets)	-14.16*** (1.12)	-13.98*** (1.12)	-14.11*** (1.12)	-17.83*** (1.13)	-11.51*** (1.34)	-11.23*** (1.52)
Market-to-book assets	-5.49*** (0.95)	-5.53*** (0.95)	-5.67*** (0.95)	-5.87*** (0.96)	-5.56*** (1.06)	-4.40*** (0.91)
ROA	-267.84*** (41.00)	-273.27*** (40.80)	-264.26*** (40.70)	-241.75*** (39.66)	-269.59*** (41.90)	-275.86*** (48.77)
Leverage	100.73*** (7.85)	100.49*** (7.79)	101.48*** (7.81)	99.03*** (7.99)	88.18*** (8.80)	65.16*** (9.37)
Tangibility	-18.65*** (4.14)	-17.29*** (4.17)	-19.30*** (4.15)	-21.93*** (5.85)	-27.69*** (7.03)	-11.21 (6.83)
Cash-flow sigma	2.11** (0.85)	2.14** (0.81)	2.12** (0.84)	2.15*** (0.78)	1.93* (0.78)	1.88** (0.78)
<i>Loan-specific control variables</i>						
Log(deal amount)	-8.40*** (1.51)	-8.57*** (1.50)	-8.28*** (1.51)	-6.59*** (1.52)	-7.98*** (1.67)	-5.29*** (1.71)
Log(maturity)	-1.03 (1.55)	-1.01 (1.56)	-0.86 (1.56)	3.08* (1.67)	-15.64*** (2.60)	-12.67*** (2.99)
Financial covenants (0/1)	8.47*** (2.17)	8.68*** (2.18)	8.29*** (2.17)	-8.99*** (3.03)	12.51*** (2.24)	-8.88*** (2.92)
Base is prime (0/1)	149.07*** (4.55)	149.68*** (4.58)	149.17*** (4.56)	148.66*** (4.61)	143.83*** (4.99)	149.56*** (6.00)
Sole lender (0/1)	-12.43*** (4.26)	-13.05*** (4.25)	-12.34*** (4.26)	-2.26 (4.34)	-14.94*** (4.58)	0.85 (5.11)
Secured (0/1)	77.94*** (2.73)	78.42*** (2.72)	77.78*** (2.72)	74.11*** (2.67)	67.79*** (2.86)	58.65*** (2.98)
<i>Fixed effects</i>						
Industry	No	No	No	Yes	Yes	Yes
Year	No	No	No	Yes	No	Yes
Senior debt rating	No	No	No	No	No	Yes
Type of loan	No	No	No	No	Yes	Yes
Purpose of loan	No	No	No	No	Yes	Yes
R <sup>2</sup>	0.54	0.54	0.54	0.58	0.60	0.63
N	9,463	9,463	9,463	9,421	9,421	8,446

Table 4  
Bankruptcy waves and loan spread contagion

The dependent variable in all regressions in this table is the loan spread, defined in Table 2. All regressions use deal-level data where each observation is the largest tranche in each deal from DealScan. Deal is at the beginning of an industry bankruptcy wave is an indicator variable equal to one if exactly one firm in the same CRSP four-digit SIC code industry as the borrower files for bankruptcy in the year prior to the loan origination date and more than one firm in the same CRSP four-digit SIC code industry as the borrower files for bankruptcy in the year after the loan origination date (and zero otherwise). Deal is in the middle of an industry bankruptcy wave is an indicator variable equal to one if more than one firm in the same CRSP four-digit SIC code industry as the borrower files for bankruptcy in the year prior to the loan origination date and more than one firm in the same CRSP four-digit SIC code industry as the borrower files for bankruptcy in the year after the loan origination date (and zero otherwise). Deal is at the end of an industry bankruptcy wave is an indicator variable equal to one if more than one firm in the same CRSP four-digit SIC code industry as the borrower files for bankruptcy in the year prior to the loan origination date and exactly one firm in the same CRSP four-digit SIC code industry as the borrower files for bankruptcy in the year after the loan origination date (and zero otherwise). All regressions have the same control variables as column (6) in Table 3 (not tabulated), with White standard errors clustered at the borrower level (in parentheses). \*\*\*, \*\*, or \* indicates that the regression coefficient is significantly different from zero at the 1%, 5%, or 10% level (respectively).

	(1)	(2)	(3)	(4)
Intercept	406.73 <sup>***</sup> (36.61)	404.20 <sup>***</sup> (36.86)	407.91 <sup>***</sup> (36.62)	402.04 <sup>***</sup> (36.92)
Deal is at the beginning of an industry bankruptcy wave	14.02 <sup>**</sup> (6.80)			16.25 <sup>**</sup> (6.89)
Deal is in the middle of an industry bankruptcy wave		21.56 <sup>***</sup> (8.38)		23.95 <sup>***</sup> (8.50)
Deal is at the end of an industry bankruptcy wave			3.03 (5.75)	6.27 (5.83)
<i>Control variables</i>	Same as column (6), Table 3			
R <sup>2</sup>	0.63	0.63	0.63	0.63
N	8,446	8,446	8,446	8,446

Table 5  
 Bankruptcy waves – industry and economy-wide count variables

The dependent variable in all regressions in this table is the loan spread, defined in Table 2. All regressions use deal-level data where each observation is the largest tranche in each deal from DealScan. Number of filings in the year *before (after)* deal is the count of the number of bankruptcy filings in the 12 months before (after) the loan origination date regardless of the industry of the filer. Number of filings in the industry in the year *before (after)* deal is the count of the number of bankruptcy filings in the 12 months before (after) the loan origination date by firms in the same CRSP four-digit SIC code industry as the borrower. All regressions have the same control variables as column (6) in Table 3 (not tabulated), with White standard errors clustered at the borrower level (in parentheses). \*\*\*, \*\*, or \* indicates that the regression coefficient is significantly different from zero at the 1%, 5%, or 10% level (respectively).

	(1)	(2)	(3)
Intercept	399.71*** (38.18)	403.16*** (36.77)	396.09*** (38.30)
Number of filings in the year <i>before</i> deal	0.13 (0.13)		0.12 (0.13)
Number of filings in the year <i>after</i> deal	0.08 (0.10)		0.06 (0.10)
Number of filings in the industry in the year <i>before</i> deal		2.24 (1.60)	2.19 (1.59)
Number of filings in the industry in the year <i>after</i> deal		3.35*** (1.30)	3.33** (1.30)
<i>Control variables</i>	Same as column (6), Table 3		
R <sup>2</sup>	0.63	0.63	0.63
N	8,446	8,446	8,446

Table 6

## Bankruptcy waves, industry concentration, and loan spread contagion

The dependent variable in all regressions in this table is the loan spread, defined in Table 2. All regressions use deal-level data where each observation is the largest tranche in each deal from DealScan. Industry HHI in the quarter before deal is the Herfindahl-Hirschman Index (HHI) for the four-digit SIC code industry containing the borrower for the fiscal quarter prior to loan origination. The HHI is the sum of squared market shares for all firms in the industry, with market shares computed using net sales (data2) from Compustat. Industry has *higher* than median HHI in the quarter before deal is an indicator variable equal to one if the HHI for the four-digit SIC code industry containing the borrower is higher than the median HHI for all industries in the fiscal quarter prior to loan origination. All regressions have the same control variables as column (6) in Table 3 (not tabulated), with White standard errors clustered at the borrower level (in parentheses). \*\*\*, \*\*, or \* indicates that the regression coefficient is significantly different from zero at the 1%, 5%, or 10% level (respectively).

	(1)	(2)
Intercept	400.43*** (36.91)	403.63*** (37.11)
Deal is in the middle of an industry bankruptcy wave	31.64*** (10.53)	41.81*** (12.54)
Deal is in the middle of an industry bankruptcy wave * Industry has <i>higher</i> than median HHI in the quarter before deal	-42.50*** (13.71)	
Industry has <i>higher</i> than median HHI in the quarter before deal	-4.27* (2.42)	
Deal is in the middle of an industry bankruptcy wave * Industry HHI in the quarter before deal		-114.75** (47.97)
Industry HHI in the quarter before deal		-13.49* (7.03)
<i>Control variables</i>	Same as column (6), Table 3	
R <sup>2</sup>	0.63	0.63
N	8,380	8,380

Table 7

Does contagion affect non-spread loan contract terms?

The dependent variable for each regression is listed at the top of each column. All regressions use deal-level data where each observation is the largest tranche in each deal from DealScan. The dependent variable in the first column is an indicator variable, and the coefficients come from a Probit regression. The reported coefficients in the first column are marginal effects, while the significance tests (using robust standard errors – in parentheses) are based on a test for whether the underlying coefficient is significantly different from zero. All explanatory variables are defined in previous tables. The dependent variables in the last two columns are continuous variables and the regressions use White standard errors (in parentheses). \*\*\*, \*\*, or \* indicates that the regression coefficient is significantly different from zero at the 1%, 5%, or 10% level (respectively).

<b>Dependent variable:</b>	<b>Loan is secured</b>	<b>Log(maturity)</b>	<b>Log(annual fees)</b>
At least one bankruptcy filing in same industry in year <i>before</i> deal	0.0351*** (0.0135)	-0.0169 (0.0145)	0.0605** (0.0287)
At least one bankruptcy filing in same industry in year <i>after</i> deal	-0.0020 (0.0130)	-0.0285** (0.0144)	0.0497* (0.0299)
<i>Borrower-specific control variables</i>			
Log(assets)	-0.0943*** (0.0057)	-0.0490*** (0.0061)	0.0221* (0.0123)
Market-to-book assets	-0.0107** (0.0054)	0.0012 (0.0043)	-0.0330*** (0.0126)
ROA	-1.2699*** (0.1866)	0.8662*** (0.1512)	-1.104** (0.4772)
Leverage	0.1111*** (0.0309)	-0.0852*** (0.0293)	0.2256*** (0.0783)
Tangibility	-0.0385* (0.0216)	0.1235*** (0.0223)	-0.0456 (0.0467)
Cash-flow sigma	-0.0023 (0.0023)	0.0000 (0.0010)	0.2295 (0.4489)
<i>Loan-specific control variables</i>			
Log(deal amount)	-0.0054 (0.0058)	0.1205*** (0.0067)	-0.0713*** (0.0130)
Base is prime (0/1)	0.2506*** (0.0267)	-0.1589*** (0.0269)	0.4341*** (0.0891)
<i>Fixed effects</i>			
Industry	No	No	No
Year	Yes	Yes	Yes
Senior debt rating	Yes	Yes	Yes
Type of loan	Yes	Yes	Yes
Purpose of loan	Yes	Yes	Yes
(Pseudo) R <sup>2</sup>	0.35	0.65	0.44
N	11,218	9,971	3,068
Predicted probability at means of regressors	0.2898		

Table 8

## Does loan spread contagion reflect increased borrower risk?

The dependent variable in all regressions in this table is the loan spread, defined in Table 2. All regressions use deal-level data where each observation is the largest tranche in each deal from DealScan. Borrower files for bankruptcy during the loan period is an indicator variable equal to one if the borrower itself files for bankruptcy during the period between the loan origination and maturity dates. Borrower pre-loan Z score is the borrower's Z score measured in the fiscal quarter prior to loan origination, and Change in borrower Z score is the change in the borrower's Z score between the fiscal quarter prior to loan origination and four fiscal quarters following loan origination. Z score is defined as in Graham, Li, and Qiu (2007). Borrower compound abnormal stock return 6 months before is the compounded abnormal return (from CRSP) to the common stock of the borrower over the 6 months prior to loan origination, where the monthly abnormal return is the difference between the borrower's stock return and the return on the CRSP value-weighted index. Borrower compound abnormal stock return 6 months after is defined in a similar way, except over the 6 month period following loan origination. All other variables are described in previous tables. All regressions have the same control variables as column (6) in Table 3 (not tabulated), with White standard errors clustered at the borrower level (in parentheses). \*\*\*, \*\*, or \* indicates that the regression coefficient is significantly different from zero at the 1%, 5%, or 10% level (respectively).

	(1)	(2)	(3)	(4)
Intercept	405.82 <sup>***</sup> (36.78)	527.24 <sup>***</sup> (68.17)	451.55 <sup>***</sup> (43.70)	391.35 <sup>***</sup> (38.34)
At least one bankruptcy filing in same industry in year <i>before</i> deal	5.94 <sup>**</sup> (2.97)	5.98 <sup>*</sup> (3.24)	5.53 <sup>*</sup> (3.35)	7.49 <sup>***</sup> (2.88)
At least one bankruptcy filing in same industry in year <i>after</i> deal	8.17 <sup>***</sup> (2.89)	9.30 <sup>***</sup> (3.11)	10.08 <sup>***</sup> (3.21)	7.59 <sup>***</sup> (2.78)
Borrower files for bankruptcy during the loan period	32.53 <sup>***</sup> (7.65)			
Borrower pre-loan Z score		-4.32 (2.97)	-3.98 (3.09)	
Change in borrower Z score			-0.39 (3.48)	
Borrower compound abnormal stock return 6 months before				-2.83 (3.16)
Borrower compound abnormal stock return 6 months after				-0.09 (3.70)
<i>Control variables</i>		Same as column (6), Table 3		
R <sup>2</sup>	0.63	0.63	0.62	0.64
N	8,446	7,607	6,961	7,946