Evidence on the Trade-Off between Risk and Return for IPO and SEO Firms

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Do the low long-run average returns of equity issuers reflect underperformance due to mispricing or the risk characteristics of the issuing firms? We shed new light on this question by examining how institutional lenders price loans of equity issuing firms. Accounting for standard risk factors, we find that equity issuing firms' expected debt return is equivalent to the expected debt return of nonissuing firms, implying that institutional lenders perceive equity issuers to be as risky as similar nonissuing firms. In general, institutional lenders perceive small and high book-to-market borrowers as systematically riskier than larger borrowers with low book-to-market ratios, consistent with the asset pricing approach in Fama and French (1993). Finally, we find that firms' expected debt returns decline after equity offerings, consistent with recent theoretical arguments suggesting that firm risk should decline following an equity offering. Overall, our analysis provides novel evidence consistent with risk-based explanations for the observed equity returns following IPOs and SEOs.

Firms conducting initial and seasoned equity offerings have historically experienced relatively low long-run equity returns (Ritter, 1991; Loughran and Ritter, 1995). Additionally, these returns covary with firm characteristics such as size and book-to-market (Brav, Geczy, and Gompers, 2000; Eckbo and Norli, 2005). Two explanations for these phenomena have been offered. The first is predicated on rational investor behavior and argues that the low average returns are commensurate with the issuing firms' risk characteristics, as captured, for example, by size and book-to-market. The second argues that firms are able to time their equity offerings and raise capital by selling overvalued equity. Thus, the poor long-term performance of the equity issues reflects the gradual correction of asset prices to their true fundamental value and any correlation with firm characteristics is more indicative of security mispricing, as opposed to additional dimensions of systematic risk (Krigman, Shaw, and Womack, 1999; Michaely and Womack, 1999).

We shed light on this debate by examining the initial pricing of loans by institutional investors to firms that have recently issued equity. Our focus on the private debt market as a laboratory within which to study the risk of equity issuing and nonequity issuing firms is intentional. Private debt is held primarily by large financial institutions, as opposed to individuals. These institutions are more likely to mitigate informational asymmetries arising between firms and

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investors (Shleifer and Vishny, 1986; Allen, Bernardo, and Welch, 2000) and to specialize in monitoring and gathering information about borrowers (Diamond, 1984, 1991; Rajan, 1992). In conjunction with the repeated interactions with borrowers and lending institutions (Petersen and Rajan, 1994), these features of the private loan market suggest that loan prices are less likely to contain behavioral biases relative to equity prices. Additionally, our focus on private debt rather than public debt has an advantage in terms of data coverage. Relatively few seasoned equity offering (SEO) firms, and even fewer initial public offering (IPO) firms, have access to public debt markets (Faulkender and Petersen, 2005) and even fewer have publicly traded debt outstanding. Thus, by examining how institutions price those loans, we are able to not only mitigate the impact of behavioral biases in our tests, but also examine a large sample of equity issuers.

The rational explanation to pricing of equity issuing firms has several implications that we test. The first implication is that institutional lenders should demand, ex ante, similar risk-adjusted returns for equity issuers relative to similar nonissuers. That is, after controlling for systematic and default risk, we should expect to observe no differences in the debt returns of equity issuers and nonequity issuers similar to what has been observed in the equity markets (Brav, Geczy, and Gompers, 2000; Eckbo and Norli, 2005). Second, institutional lenders should view key firm characteristics, such as firm size and book-to-market, in a manner that is consistent with that observed in the equity market. For instance, we examine whether small growth firms that issue equity have low expected debt returns, similar to their equity returns. Thus, by focusing on private debt markets, we are able to provide fresh results on the asset pricing implications of equity issuances.

Because our sample of equity issuers that also borrow money in the private debt market is, by construction, not randomly selected, we begin our investigation with a comparison of the equity returns and firm characteristics of our sample to those of the broader population of equity issuers over our sample period. The distribution of our IPO and SEO firms across the Fama and French (1993) size and book-to-market portfolios closely resembles that of the general population of equity issuers. Additionally, our equity issuers' long-term price performance is similar to that of the full universe of issuers, suggesting that our sample is representative of the broader population of equity issuers along these key dimensions.

Our first set of results is found in a comparison of the yield, defined as the spread charged over the London Interbank Offered Rate (LIBOR), on loans for equity issuers to the yield on loans for nonequity issuers. Unconditionally, we find relatively little difference in the level of loan yields between equity issuers and nonissuers. However, loan yields are determined by factors that may not be related to systematic risk. In particular, a significant component of the loan yield may be driven by default risk, which may not be associated with the cross-sectional variation in expected rates of return. Netting out this component of the yield is challenging as default-related risk is unobservable. Therefore, we undertake two approaches to the modeling of expected loan return. The first is based on a regression analysis in which we attempt to control directly for variables that proxy for default-related risk. In the second two-step approach, we first model default and then back out the component of the yield that is attributed to the expected loan return.

Our regression results indicate that qualified by firm characteristics and features of the loan contract (e.g., profitability, loan maturity, loan amount), the pricing of loans to issuing firms (both IPOs and SEOs) does not differ from that of loans to nonissuing firms. There are neither statistically nor economically significant differences between the firms that recently issued equity and those that have not. Thus, holding constant the determinants of both systematic and default risk, we find that institutional lenders price loans of issuing and nonissuing firms similarly. This finding is strikingly similar to that found in equity markets (Brav, Geczy, and Gompers, 2000; Eckbo and Norli, 2005). Further, a battery of robustness tests help to ensure that our finding is not an artifact of any assumptions concerning the modeling of default risk.

We also find that firm characteristics, such as size and book-to-market, are related to private debt expected returns in a manner similar to that of public equity expected returns. Specifically, small value firms are deemed riskier, thus requiring higher expected rates of return, ex ante. This evidence is important as it provides a new test for corroborating the interpretation of these firm characteristics as proxies for systematic risk (Fama and French, 1993; Carlson, Fisher, and Giammarino, 2004; Zhang, 2005). Put differently, assuming that institutional investors are rational and focusing on the pricing of private debt by institutions, we are able to provide evidence that is consistent with the notion that size and book-to-market capture exposure to systematic risk that is compensated in expected returns.

Finally, we examine recent theoretical claims suggesting that raising and subsequently investing capital is tantamount to the exercise of a call option that results in a reduction of the firm's overall risk (Benninga, Helmantel, and Sarig, 2005; Carlson, Fisher, and Giammarino, 2004, 2006). It is difficult to assess the validity of this claim in the equity market since changes in the underlying risk characteristics are difficult to detect in the short sample period around equity offerings. Using the loan market, we demonstrate that the expected debt return for issuing firms changes around the offerings in a manner consistent with the above models. Both the yield and the expected return show a significant decline around the time firms raise additional equity capital.

The rest of the paper is organized as follows. Section I introduces the data and presents several summary statistics. Section II develops the empirical hypotheses of the paper in light of the relevant theory, providing a road map for the remainder of the paper. Section III presents the results of our analysis of loan yields. Section IV performs a similar analysis on the expected return component of the loan yield, which is isolated from any expected default risk. Section V examines changes in loan returns around equity issuing events. Section VI concludes.

I. Data

For our analysis, we employ four databases containing information on corporate loans (Loan Pricing Corporation's Dealscan), stock prices and accounting data (Center for Research in Security Prices [CRSP]/Compustat), IPOs and SEOs (Securities Data Corporation [SDC] Global New Issues), and bankruptcy filings (Bankruptcy.com). To merge these databases, we assign permanent numbers (PERMNOs) and global company keys (GVKEYs) to firms in each database using the CRSP historical header file. Specifically, we match firms by company name, event date (e.g., loan inception, quarterly filing, issuance, bankruptcy filing), and, when available, cusip and stock ticker. This matching approach provides a unique key among the databases and ensures that we avoid matching on "stale" information.

We restrict our analysis to loans whose borrowers are not in the farming (Standard Industrial Classification [SIC] codes less than 1000), financial (SIC codes between 6000 and 6999), or utility (SIC codes between 4900 and 4999) sectors. We further narrow our sample to include only loans whose borrowers have common shares (share code 10 or 11 in CRSP). In addition, we include only loans whose borrowers can be found in the merged CRSP/Compustat database and that have a strictly positive yield, maturity, and loan amount. Our final sample of loans consists of 22,048 loans taken out by 5,337 firms.

A. Loan Information: Dealscan

Our loan data are an extract of the Loan Pricing Corporation (LPC) Dealscan database. The basic unit of observation in Dealscan is a loan. The data consist of dollar-denominated private loans made by bank (e.g., commercial and investment) and nonbank (e.g., insurance companies and pension funds) lenders to US corporations during the period 1987-2003. According to Carey and Hrycray (1999), the database contains between 50% and 75% of the value of all commercial loans in the United States during the early 1990s. From 1995 onward, Dealscan coverage increases to include an even greater fraction of commercial loans. According to LPC, approximately half of the loan data are from Securities and Exchange Commission (SEC) filings (13Ds, 14Ds, 13Es, 10Ks, 10Qs, 8Ks, and registration statements). The other half is obtained from LPC's contacts in the credit industry.

Table I presents a longitudinal view of our sample of loans. We begin by noting the frequency of borrowers, loans, and packages in our sample by year. A package is a bundle of loans issued to a borrowing firm at the same time. The number of loans and borrowers in our sample increases dramatically from 1987 to 1996. This is largely due to the fact that LPC's coverage improved over time, particularly after 1995. To ensure that our empirical findings are not driven by this increase in loan coverage, we include year fixed effects in our regressions. Promised yields, measured in basis points above the six-month LIBOR at the time the loan is issued, range from a low of 188 in 1995 to a high of 264 in 1989. LPC computes this figure, known as all-in-drawn spread (AIS), as the sum of the coupon spread and any recurring fees (e.g., annual fee). For loans not based on LIBOR, LPC converts the coupon spread into LIBOR terms by adding or subtracting a constant differential reflecting the historical averages of the relevant spreads.[1] The AIS enables comparisons across multiple facilities, independent of the underlying fee and rate structure. In the empirical analysis, we use AIS as the promised yield of the debt. Loan maturities are, on average, approximately 3.5 years long and vary relatively little over the duration of our sample (the maturities are reported in Table I in months). Average loan amounts, all deflated to year 2000 dollars, range from $99 million in 1991 to $241 million in 2001, with an average over all years of $171 million.

B. Borrower Information: CRSP/Compustat and SDC

We obtain accounting data and equity market data for our sample of Dealscan borrowers from the merged CRSP/Compustat database. All borrower information, when available, is lagged one quarter from the inception of the loan to ensure that this information was known to the lender prior to the structuring of the loan. Matching IPO/SEO data from SDC to CRSP/Compustat produces a final sample of 4,446 IPOs and 5,182 SEOs between 1987 and 2003 after excluding unit offerings and firms whose share codes on CRSP differ from 10 or 11 (as well as imposing the previous existing screen on farming, financial firms, and utilities). We then identify the subset of these issuers that take on a loan in Dealscan any time between the issuance day and two years after the issuance. While the choice of two years is admittedly arbitrary, we also examine alternative window lengths (2.5 years, 1.5 years, and 1 year) with little effect on our results.[2] We are able to identify 1,299 firms that entered into a loan agreement in the two years after their IPO and 1,936 firms in the two years after their follow-on equity offerings corresponding to a total of 2,152 IPO loans, 2,911 SEO loans, and 16,985 nonissuer loans.

[1]As of December 31, 2003, the differentials used in the calculation of AIS reported by LPC are +255 basis points (BP) for the prime rate, +3 BP for the commercial paper rate, −34 BP for the T-bill rate, −18 BP for bankers' acceptance rate, −6 BP for the rate on CDs, and 0 BP for the federal funds rate, cost of funds rate, and money market rate. Hubbard, Kuttner, and Palia (2002) indicate that replacing these constants with time-varying differentials based on year-specific average spreads has a minimal effect on any pricing implications.

[2]Using private loan transactions prior to the IPO/SEO is problematic as it introduces a selection bias (at the time the loan is taken, the market does not know that the firm is about to raise equity capital).

Table I. Dealscan Loan Data Summary Statistics

The sample consists of all nonfarm, nonfinancial, nonutility domestic firms entering into US dollar-denominated loans between 1987 and 2003 and appearing in both the Dealscan and merged CRSP/Compustat databases. The table presents summary statistics for our sample of loans by year and across all years. Promised yield is measured as the spread in basis points above six-month LIBOR.

Year	All	1987	1988	1989	1990	1991	1992	1993	1994
No. of loans	22,048	445	990	897	903	790	1,022	1,269	1,476
No. of packages	15,758	328	682	632	676	604	796	946	1,072
No. of companies	5,337	268	533	513	558	496	670	812	942
Promised yield (bps)	219.54	221.78	260.44	263.93	239.04	259.68	248.04	235.39	192.41
Loan amount ($ mil)	171.47	169.40	174.57	181.33	110.34	99.17	95.01	113.50	164.98
Maturity (months)	42.43	45.73	46.31	47.13	43.34	36.81	40.36	40.40	44.99
Year	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**
No. of loans	1,365	1,796	2,120	1,761	1,664	1,570	1,481	1,351	1,148
No. of packages	965	1,271	1,493	1,174	1,090	1,098	1,071	989	871
No. of companies	860	1,125	1,311	1,043	976	964	941	900	763
Promised yield (bps)	187.94	203.34	189.68	194.99	224.76	213.02	217.21	238.76	235.22
Loan amount ($ mil)	173.26	152.61	175.67	175.28	183.90	227.94	241.49	187.17	209.71
Maturity (months)	46.19	44.96	45.48	45.99	44.13	40.58	35.01	34.36	37.68

Panel A of Table II summarizes loan characteristics across the subsamples of IPO, SEO, and nonissuer loans in our Dealscan sample. The average (median) IPO loan yield is 232 (225) basis points above LIBOR; the average (median) SEO loan yield is 180 (163) basis points above LIBOR. For nonissuer loans, the average (median) yield is 225 (225) basis points above LIBOR. The average loan size is $91 million for IPOs, $199 million for SEOs, and $177 million for nonissuing firms. IPO firms tend to take out large loans (relative to book value of assets) of approximately the same maturity as nonissuing firms, while SEO firms take out smaller loans (relative to their book value of assets) of a slightly longer maturity than nonissuing firms.

Panel B of Table II provides information about borrower characteristics across our subsamples of issuer and nonissuer loans. The last four columns correspond to the Dealscan samples described in Panel A. The first column labeled Compustat provides average and median firm characteristics for all nonfarming, nonfinancial, nonutility firms in the merged CRSP/Compustat database during the period from 1987 to 2003. The second and third columns provide average and median statistics for the subsample of IPO and SEO firms in Compustat. A comparison of the Dealscan columns in Panel B of Table II provides information about the differences between issuing and nonissuing firms that use the private debt. IPO borrowers are smaller, have lower book-to-market ratios, and have fewer tangible assets than nonissuers. SEO firms' characteristics are more similar to nonissuers' than to IPO firms' characteristics.

Focusing on the Compustat and Dealscan columns in Panel B enables a comparison of the firms in the Dealscan database with those in the merged CRSP/Compustat database. The median firm included in the Dealscan database tends to be slightly more levered (total debt/total assets) than the median firm on Compustat, an unsurprising result given that our sample conditions on a debt issuance. Dealscan firms tend to be somewhat larger than the average or median Compustat firm and their mean book-to-market ratio is lower. This latter finding is due to a long right tail in the Compustat book-to-market distribution since the median book-to-market ratios of the Compustat

Table II. Firm Characteristics

The sample consists of all nonfarm, nonfinancial, nonutility domestic firms entering into US dollar-denominated loans between 1987 and 2003 and appearing in both the Dealscan and merged CRSP/Compustat databases. Panel A presents mean and median loan characteristics for the entire Dealscan sample (all firms), the subsample of Dealscan loans occurring within two years after the IPO (IPOs), the subsample of Dealscan loans occurring within two years after the SEO (SEOs), and the subsample of Dealscan loans not occurring within the two years following the IPO or SEO (nonissuers). Promised yield is the spread in basis points above six-month LIBOR. Panel B presents mean and median firm characteristics for the four samples in Panel A and three additional samples: 1) the entire merged CRSP/Compustat database during the period 1987-2003 (Compustat), 2) all IPO firms on the SDC database that are matched to CRSP/Compustat (all IPOs), and 3) SEO firms on the SDC database that are matched to CRSP/Compustat (all SEOs). Book leverage is the ratio of total debt (short term + long term) to total assets. Firm size is the GDP-deflated market capitalization. Book-to-market is the ratio of book equity to market equity. Tangible assets is the ratio of new PPE to total assets. Profitability is the ratio of EBITDA to total assets. Cash flow volatility is the standard deviation of historical (or future when missing) operating cash flows.

Panel A. Loan Characteristics

	All Firms		**Nonissuers**		**IPOs**		**SEOs**	
Variables	**Mean**	**Med**	**Mean**	**Med**	**Mean**	**Med**	**Mean**	**Med**
Promised yield	219.54	225.00	224.86	225.00	231.69	225.00	179.55	162.50
Loan amount	171.47	44.79	176.91	43.97	91.16	23.45	198.72	82.63
Loan amount/assets	0.31	0.16	0.30	0.16	0.42	0.22	0.26	0.18
Maturity	42.43	36.00	41.49	36.00	44.22	36.00	46.59	48.00
364-day loan	0.08	–	0.09	–	0.02	–	0.07	–
Term loan	0.25	–	0.25	–	0.24	–	0.22	–
Revolving loan	0.61	–	0.59	–	0.67	–	0.65	–
Corporate purposes	0.24	–	0.24	–	0.23	–	0.24	–
Debt repayment	0.26	–	0.25	–	0.26	–	0.30	–
Takeover	0.12	–	0.11	–	0.13	–	0.15	–
Working capital	0.17	–	0.17	–	0.18	–	0.15	–
Obs.	22,048	–	16,985	–	2,152	–	2,911	–

(*Continued*)

Table II. Firm Characteristics (*Continued*)

Panel B. Firm Characteristics

							Dealscan Subsamples							
	Compustat		All IPOs		All SEOs		All Firms		Nonissuers		IPOs		SEOs	
Variables	**Mean**	**Med**	**Mean**	**Med**	**Mean**	**Med**	**Mean**	**Med**	**Mean**	**Med**	**Mean**	**Med**	**Mean**	**Med**
Book leverage	0.58	0.24	0.38	0.27	0.27	0.26	0.32	0.29	0.33	0.30	0.31	0.26	0.30	0.29
Firm size (mcap)	1,165.83	77.70	385.43	113.79	1,216.59	297.28	1,793.08	188.43	1,985.85	171.39	476.82	125.04	1,724.05	438.54
Firm size (assets)	1,260.96	70.42	208.63	23.75	1,339.63	150.15	1,716.05	243.98	1,873.44	260.97	623.98	98.04	1,738.93	389.02
Book-to-market	2.06	0.54	0.36	0.29	0.37	0.28	0.58	0.49	0.61	0.52	0.51	0.41	0.52	0.44
Tangible assets	0.32	0.24	0.24	0.17	0.32	0.24	0.32	0.26	0.32	0.27	0.27	0.20	0.32	0.26
Profitability	−0.08	0.03	−0.01	0.03	0.02	0.04	0.03	0.03	0.03	0.03	0.03	0.04	0.04	0.04
Cash flow volatility	0.30	0.04	0.16	0.04	0.15	0.03	0.04	0.03	0.04	0.03	0.04	0.02	0.03	0.02
Obs.	883,292	–	4,446	–	5,182	–	22,048	–	16,985	–	2,152	–	2,911	–

and Dealscan samples are quite similar. A comparison of the medians also indicates that with respect to tangible assets, profitability, and cash flow volatility, Dealscan and Compustat firms are not qualitatively different. An examination of the distribution across industries (not reported) also does not reveal substantial differences. However, all of our regression analysis below incorporates industry fixed effects for the 48 Fama and French (1997) industries.

Next, focusing on the Dealscan IPOs and non-Dealscan IPOs enables a comparison of IPOs that appear in the Dealscan database and those that do not. IPO firms that take out loans within two years after the IPO represent approximately one quarter of all IPOs during the period from 1987 to 2003, although the proceeds raised by our sample of IPOs represent almost half of the total proceeds generated. Thus, our IPOs represent a significant economic share of IPO activity. IPO firms in our sample are larger, more profitable, have higher book-to-market ratios, and have a higher fraction of tangible assets and lower cash flow volatility. These differences are consistent with the notion that more speculative IPOs are less likely to tap the private debt market. A comparison of our samples of Dealscan SEOs and non-Dealscan SEOs yields similar differences. Our analysis, which is conditioned on equity issuing firms' access to the private debt market, is, therefore, indicative of the pricing behavior of slightly larger issuers. However, as we report below, the return characteristics of our sample are similar to those of the entire IPO population.

C. Equity Returns and Size and Book-to-Market Composition

Finally, it is well known that issuing firms, both IPOs and SEOs, tend to underperform against marketwide indices (Ritter, 1991). Since our goal is to shed light on the pricing of equity by IPO and SEO firms, it is important to establish that the long-term average return of the Dealscan IPO and SEO sample is similar to that of the overall set of equity issuers. To this end, we conduct two tests. In the first, we compute event time, five-year, buy-and-hold abnormal returns against a value-weighted market portfolio. We find that Dealscan (full sample) IPOs' average abnormal returns is −25.5% (−13%) while Dealscan (full sample) SEO firms' average abnormal return is −15.6% (−24.1%) (note that these correspond to all of our IPO firms, regardless of whether or not a SEO occurred within two years after the IPO). These comparisons suggest that equity issuers on Dealscan exhibit underperformance against the market portfolio that is common with the full sample of issuers over our sample period.

In the second test, designed to examine equity return characteristics of firms issuing equity on Dealscan, we estimate calendar-time portfolio regressions as in Loughran and Ritter (1995). We find that the standard size and book-to-market factors proposed by Fama and French (1993) explain return comovement of these issuers as in earlier studies (Brav and Gompers, 1997). For example, Dealscan issuers with low book-to-market ratios share a common negative exposure to the Fama and French (1993) book-to-market factor and issuers with low market capitalizations share a common positive loading on the Fama and French (1993) size factor. In addition, the alphas in these regressions are in line with those found in past studies. In the IPO calendar-time portfolio regressions that sort on book-to-market groupings, the alphas range from −0.43 to −0.02. In the SEO calendar-time portfolio regressions that sort on book-to-market groupings, the alphas range from −0.38 to −0.13. In all regressions, the alphas are insignificant.

Our final test examines the distribution of firms across Fama and French (1992) size and book-to-market portfolios. An immediate concern by implicitly conditioning on Dealscan is that our sample of issuers will be biased toward larger firms. Panel A of Table III presents the distribution for IPO firms, while Panel B presents that for SEO firms. Both panels present frequencies conditional on nonmissing data for both market capitalization and the book-to-market ratio. Interestingly, we see that the majority of our IPO firms are classified as small or growth

Table III. Size and Book-to-Market Distribution of IPOs and SEOs

The table presents the size and book-to-market distribution of IPO and SEO firms that have taken out a private loan in the two years after their equity issuance. The breakpoints for the distributions are taken from Ken French's website. The numbers reported in each cell correspond to the number of IPOs (Panel A) and SEOs (Panel B).

Panel A. IPO Firms

Size Portfolio	IPOs	Book-to-Market Portfolios	IPOs
Small	711	Growth	601
2	341	2	286
3	158	3	186
4	59	4	105
Big	16	Value	107

Panel B. SEO Firms

Size Portfolio	SEOs	Book-to-Market Portfolios	IPOs
Small	760	Growth	835
2	527	2	440
3	331	3	337
4	205	4	182
Big	113	Value	142

firms according to the breakpoints used by Fama and French (1993). This is reassuring given that much of the abnormal returns are concentrated among these particular types of IPO firms. The SEO sample (Panel B) reveals a similar distribution to that of the IPO sample. These results are qualitatively similar to those presented in Brav and Gompers (1997) for the entire sample of equity issuers. Overall, these findings are reassuring in the sense that our sample selection has resulted in a sample of equity issuers whose equity return characteristics closely mimic those found in the larger population of equity issuers.

II. Hypothesis Development

The difficulty in using equity markets alone to test whether newly issued equity returns reflect rational asset pricing or irrational asset pricing is that one can always argue that a risk factor that eliminates observed underperformance in the equity markets is actually a proxy for the kind of firms whose equity is mispriced. While recent theoretical contributions (Carlson, Fisher, and Giammarino, 2004; Zhang, 2005; Lyandres, Sun, and Zhang, 2008) provide a rational framework that explains why equity issuers are priced efficiently, ultimately, one can also tell a story in which factors that proxy for rational systematic risk might actually measure mispricing (Brav and Heaton, 2002). Thus, while there have been theoretical contributions making risk-based and behavioral theoretical justifications for the evidence from the equity market, this evidence provides a relatively low power test of the rational null.

Our idea is to use the pricing behavior of large institutions in the private debt market to see whether debt claims on the assets of equity issuers are priced in the same manner as equity claims on those same assets. If the existing equity market evidence reflects rational asset pricing, then debt should be priced in a manner consistent with equity, since debt and equity are claims written on the same assets. Thus, the association between expected returns and key firm characteristics that proxy for systematic risk should be the same across the two types of securities if the debt and equity claims are priced in a similar manner. This test goes beyond the pricing of equity issuing firms as we are able to examine more generally whether firm characteristics such as size and book-to-market are associated with expected return in the same manner as they are in the debt market. If we were to find support for this notion, it does not unambiguously prove that the pricing of new equity issues reflects rational asset pricing. However, we believe our analysis moves us closer to eliminating the alternative of mispricing, since mispricing is less likely to occur in the private debt market, as argued in the introduction.

There are three specific hypotheses that we test:

Hypothesis 1: Cross-sectionally, the coefficients on systematic risk factors in debt pricing models should be of the same sign as the coefficients on systematic risk factors in equity pricing models.

We test Hypothesis 1 by examining how systematic risk factors such as book-to-market and firm size are priced in the cross-section of expected debt return. Obviously, we must control for default risk and we do so in two ways. First, we include default risk factors as the right-hand-side variables in cross-sectional regressions where total yield is the dependent variable. Second, we explicitly model default and calculate measures of expected debt return, which we use as our left-hand-side variable in the cross-sectional pricing equations. In particular, we include the standard measures of systematic risk in the literature—size, book-to-market, leverage, and liquidity.

Our next two hypotheses focus more directly on the pricing of equity issuing firms. Under the null of rational pricing in the private debt market, there should not be any differences in the expected return on debt between equity issuing firms and nonissuing firms, with the appropriate control for systematic risk such as book-to-market ratio and firm size.

Hypothesis 2: Under the rational null, after controlling for systematic risk, there should not be a difference in debt returns of both IPO and SEO firms relative to nonequity issuing firms.

We test Hypothesis 2 by including IPO and SEO firm dummies in our cross-sectional debt pricing equations. After controlling for default and systematic risk using standard risk factors, we should observe that the coefficient on the IPO and SEO dummies are insignificant. In particular, after controlling for other factors that reflect differences in systematic risk between issuing and nonissuing firms (e.g., size, book-to-market) that have been documented in the empirical literature reviewed previously to reduce or eliminate the equity return differences between issuing and nonissuing firms, we should expect there will be no difference in the debt returns of issuing and nonissuing firms.

It is worthwhile to emphasize again that tests of Hypothesis 2 differ from standard tests of equity issuers' pricing in two major ways. First, we make use of ex ante returns (whether the debt yield or debt expected return) rather than ex post realized rates of returns as our left-hand-side variables as done in past studies (Brav, Lehavy, and Michaely, 2005; Campello, Chen, and Zhang, 2008). Second, we intentionally focus on the pricing of private debt since it is held by large financial institutions, as opposed to individuals. These institutions specialize in monitoring and gathering information about borrowers. The repeated interactions between borrowers and lending institutions suggest that the loan prices are less likely to contain behavioral biases relative to equity prices.

The third hypothesis that we test is based on recent theoretical contributions that point out that raising and subsequently investing capital is tantamount to the exercise of a call option that results in a reduction of the firm's overall risk (Benninga, Helmantel, and Sarig, 2005; Carlson, Fisher, and Giammarino, 2007). Consistent with this prediction, Carlson, Fisher and Giamarrino (2007) demonstrate that in the equity markets, there is a decline in equity returns following an equity issuance that can be linked to measures of a decrease in firms' underlying asset risk. As with the motivation for the previous hypothesis, our tests provide an alternative testing methodology since it is difficult to detect changes in expected returns in the equity market with ex post rates of return in the short sample period around equity offerings. Using the loan market data, we can more cleanly examine whether the expected debt return for issuing firms changes around the offerings in a manner consistent with the above models. The prediction from these rational models is that both the yield and the expected return will show a significant decline around the time firms raise additional equity capital.

Hypothesis 3: Equity issuers' debt returns should decline following the issuance due to a decrease in the underlying systematic risk of the firms' assets.

We test Hypothesis 3 by examining the change in the predicted debt return due to a change in the firms' nonleverage risk factors following the equity issuance. The rational asset pricing prediction is that we should also observe a decline in ex ante debt returns related to a decrease in the underlying asset risk, following the issuance of new equity.

III. Loan Yields

A. Two-Way Sorts on Size and Book-to-Market

We begin our examination of the loan pricing differential between IPO/SEO and nonissuing firms with a nonparametric analysis. We sort all borrowers into size (total assets) and book-to-market quintiles each year.[3] For each of the resulting 25 portfolios of loans, we separate the IPO and SEO loans from the nonissuer loans and compute the average yield, which is presented in Table IV, along with the number of loans in parentheses. Several aspects of the results are worth highlighting.

First, there is a large "size effect" in loan yield spreads. For almost every book-to-market quintile, yield spreads decline significantly and monotonically with firm size. For example, nonissuing (IPO) firms in the lowest book-to-market and smallest size quintile pay 347 (256) basis points above LIBOR, whereas large nonissuing (IPO) firms in the low book-to-market pay 103 (157) basis points above LIBOR. When we average across book-to-market quintiles (unreported), small nonissuing (IPO) firms pay, on average, 310 (275) basis points above LIBOR. Non-IPO (IPO) firms in the largest size quintile pay, on average, 99 (147) basis points above LIBOR. A similar pattern is found for SEO loans.

Second, the association between book-to-market and loan yield spreads appears to be positive but is less distinct than the relation between size and yield spreads. For small nonissuing firms, yield spreads are mostly flat across the book-to-market quintiles. As we move to larger-quintile firms, a positive association between book-to-market and yields begins to emerge, becoming stronger with each successive size quintile. While the relation between book-to-market and yield

[3]Book value of equity to market value of equity is calculated as book equity plus deferred taxes and investment tax credit, when available, all divided by market capitalization. We use total assets as a measure of size to maintain consistency with the banking literature (e.g., Drucker and Puri, 2005) and because of near-zero correlation with book-to-market. We also examine a measure of market capitalization, orthogonalized to book-to-market by a univariate regression, in our analysis and find very similar results.

Table IV. Average Yield Spreads for Size and Book-to-Market Portfolios

The sample consists of all nonfarm, nonfinancial, nonutility domestic firms entering into US dollar-denominated loans between 1987 and 2003 and appearing in both the Dealscan and merged CRSP/Compustat databases. The table provides average yields, measured in basis points above the six-month LIBOR, for portfolios of loans formed on GDP-deflated total assets and book-to-market quintiles. The number of loans in each portfolio is presented in parentheses below the average yield. The nonissuing loans sample consists of all loans not occurring within two years after an IPO or SEO. The IPO loans sample consists of all loans occurring within two years after the IPO. The SEO loans sample consists of all loans occurring within two years after the SEO. The portfolio breakpoints are determined from quintiles based on the entire Dealscan sample (i.e., common breakpoints are used for both nonissuing, IPO, and SEO loans).

	Book-to-Market														
	Nonissuing Loans					IPO Loans					SEO Loans				
Size	Low	2	3	4	High	Low	2	3	4	High	Low	2	3	4	High
Small	347	308	295	291	297	256	287	284	259	285	323	270	286	265	270
	(702)	(527)	(516)	(497)	(611)	(141)	(178)	(132)	(87)	(49)	(58)	(31)	(42)	(25)	(25)
2	270	220	235	244	273	223	216	226	222	263	241	195	196	233	229
	(434)	(487)	(557)	(641)	(761)	(156)	(157)	(156)	(97)	(82)	(103)	(128)	(105)	(97)	(47)
3	217	184	195	203	253	218	214	223	191	246	172	185	176	191	200
	(434)	(540)	(544)	(632)	(706)	(103)	(113)	(93)	(77)	(79)	(127)	(133)	(137)	(118)	(68)
4	180	144	154	170	220	212	159	200	169	191	158	149	162	171	184
	(463)	(528)	(634)	(603)	(594)	(58)	(41)	(47)	(50)	(40)	(93)	(181)	(184)	(148)	(92)
Big	103	71	90	99	139	157	136	155	156	138	108	96	109	117	131
	(563)	(562)	(592)	(661)	(447)	(21)	(19)	(18)	(20)	(40)	(105)	(79)	(128)	(130)	(60)

seems to be positive for issuing firms as well, the relation is weaker and depends upon the particular size quintile.

In drawing comparisons of these two-way sorts with similar sorts for equity returns, it is important to remember that the yield on a loan is the sum of both an expected return and a default risk premium. To the extent that book-to-market ratios reflect collateral values, with high book-to-market firms having higher collateral values and recovery rates, we might expect book-to-market to be negatively related to the default premium on loans. However, if value firms are more likely to enter financial distress and default on their loans, then book-to-market may be positively associated with the default premium. Hence, book-to-market may have opposing effects on the systematic and default premium components of loan yields, which might explain the weak relationship between book-to-market and loan yield spreads observed in our two-way sorts (we investigate this possibility below.)

Finally, holding size and book-to-market quintiles fixed, the difference in IPO and nonissuer loan yield spreads is not always positive. In the first two size quintiles, IPO loans have slightly lower yield spreads than nonissuer loans and SEO loans have the lowest spreads. In the middle-size quintile, IPO and nonissuer loan yield spreads are roughly similar. In the top two size quintiles, IPO loan yield spreads are larger than nonissuer loan yield spreads. Thus, spread differentials across issuers and nonissuers fail to reveal an obvious relation, consistent with our earlier conjecture based on the sample summary statistics.

B. Loan Yield Regressions

A shortcoming of the previous analysis is that it fails to control for other differences between issuers and nonissuers that were identified in the summary statistics (e.g., loan maturity). Therefore, we now examine whether there is a difference in the loan yields of issuing and nonissuing firms after controlling for firm characteristics and other features of the loan contracts in a regression framework. This analysis enables us to reexamine the differences in yield spreads across IPO, SEO, and nonissuing firms in a setting that accounts for the confounding effects of multiple factors beyond size and book-to-market examined above.

We first regress the loan yield spread on various proxies for risk and additional control factors using the largest sample of loans, which we call our base regression. Our goal is that by holding proxies for risk, both systematic and idiosyncratic constant, we can better estimate any yield differences between issuers and nonissuers. The first column of Table V provides estimated coefficients and robust *t*-statistics for the base regression.[4] The inclusion of size and book-to-market is motivated by asset pricing specifications (Fama and French, 1992) and can be interpreted in this framework as capturing systematic risk factors. Similarly, equity beta is a standard measure of systematic risk that we use as a proxy for assets' systematic risk. We also control for the leverage effect by including book leverage in the regression. Asset tangibility (net physical plant, property, and equipment divided by total assets) is used to capture the firm's ability to secure the loan and, thus, as another proxy for default-related risk of the loan. We control for the maturity and relative size of the loan to account for contractual differences, as well as the type of loan using fixed effects (not reported). Book leverage is a control for capital structure effect on risk. Profitability (earnings before interest, taxes, depreciation, and amortization [EBITDA]/total assets), cash flow volatility (historical standard deviation of EBITDA/total assets), and idiosyncratic return volatility (Campbell and Taksler, 2003) are proxies for information asymmetry and default risk.

[4]The *t*-statistics are robust in the sense that our standard errors are computed by assuming that within-firm observations are dependent with a constant correlation. We control for longitudinal dependence by incorporating year dummies into the regression specification.

Table V. Loan Yield Regressions

The sample consists of all nonfarm, nonfinancial, nonutility domestic firms entering into US dollar-denominated loans between 1987 and 2003 and appearing in both the Dealscan and merged CRSP/Compustat databases. The table presents the estimated coefficients from a regression of loan yield, measured in basis points above the six-month LIBOR, on various determinants. Four different regressions are presented, varying only in the specification of the right-hand-side variables. The base specification presents our primary specification. The beta/vol specification further conditions on the firms equity beta and idiosyncratic volatility. The lender specification further conditions on the availability of lender data. The covenant specification further conditions on the availability of covenant data. The All specification further conditions on the availability of both lender and covenant data. IPO indicator is an indicator variable equal to one if the loan occurred within two years after the IPO. SEO indicator is an indicator variable equal to one if the loan occurred within two years after the SEO. Maturity is the loan maturity, measured in months. Loan amount/assets is the ratio of the loan principal to the total assets of the firm in the quarter preceding the loan. Book leverage is the ratio of total debt (short term + long term) to total assets expressed in percentage. Log(assets) is the log of the GDP-deflated total assets. Log(book-to-market) is the log of the ratio of book equity to market equity. Tangible assets is the ratio of net PPE to total assets expressed in percentage. Profitability is the ratio of EBITDA to total assets expressed in percentage. Cash flow volatility is the standard deviation of historical (or future when missing) operating cash flows expressed in percentage. Equity beta is estimated using 24-60 months (as available) of monthly returns data over the period beginning in the month after the issuance. The beta is the sum of the estimated coefficients on the contemporaneous and lagged excess market return. Equity idiosyncratic vol is the root mean squared error (RMSE) from the beta regression. Depository Inst. (Insurance Co.; nondepository Inst., brokerage) is an indicator variable equal to one if the lead back on the deal is of the corresponding type denoted by their SIC code. Syndicate size is the number of banks in the lending syndicate. Covenant index equals the number of covenants present in the loan contract. Obs. is the number of observations. Also included in the regressions, but not reported, are fixed effects for the Fama-French 48 industries, calendar year, deal purpose, and type of loan. All standard errors are cluster adjusted for dependence within firms. The *t*-statistics are presented in parentheses.

Variable	Base	Beta/Vol	Lender	Covenant	All
Intercept	534.09***	497.17***	515.13***	274.10***	412.10***
	(7.17)	(4.95)	(5.94)	(7.98)	(7.29)
IPO indicator	−0.35	−2.87	5.22	1.52	9.77
	(−0.11)	(−0.80)	(1.13)	(0.26)	(1.24)
SEO indicator	−6.40**	−8.49***	−6.45*	−10.37**	−0.27
	(−2.24)	(−2.74)	(−1.78)	(−2.10)	(−0.04)
Log(maturity)	−21.21***	−17.75***	−19.72***	−39.33***	−24.88***
	(−9.25)	(−7.59)	(−5.57)	(−5.97)	(−2.79)
Loan amount/assets	−0.01***	−0.01***	−0.01***	−0.01***	−0.01***
	(−5.70)	(−4.35)	(−11.30)	(−3.20)	(−3.98)
Book leverage	1.24***	1.22***	1.19***	1.10**	0.91***
	(17.36)	(14.97)	(13.12)	(10.23)	(6.79)
Log(assets)	−36.26***	−33.17***	−29.37***	−25.67***	−16.13***
	(−41.39)	(−33.51)	(−20.90)	(−14.47)	(−5.83)
Log(book-to-market)	13.43***	10.75***	15.66***	15.91***	9.34***
	(8.55)	(5.83)	(7.99)	(6.13)	(2.60)
Tangible assets	−0.15**	−0.01	−0.02	0.20*	0.14
	(−2.13)	(−0.10)	(−0.28)	(1.88)	(1.08)
Profitability	−4.41**	−3.13***	−2.97***	−5.69***	−3.87***
	(−9.81)	(−7.05)	(−4.24)	(−6.39)	(−4.03)
Cash flow volatility	0.30	1.00***	0.87***	1.38**	1.15
	(1.44)	(3.17)	(2.81)	(2.42)	(1.47)

(*Continued*)

Table V. Loan Yield Regressions (*Continued*)

Variable	Base	Beta/Vol	Lender	Covenant	All
Equity beta	–	2.30	–	–	1.40
	–	(1.52)	–	–	(0.41)
Equity idiosyncratic vol	–	2.30***	–	–	1.00*
	–	(7.45)	–	–	(1.80)
Depository Inst.	–	–	−20.95**	–	−21.85*
	–	–	(−2.45)	–	(−1.75)
Insurance Co.	–	–	16.27	–	0.00
	–	–	(0.32)	–	–
Nondepository Inst.	–	–	95.79**	–	10.54
	–	–	(9.21)	–	(0.60)
Brokerage	–	–	35.51**	–	16.26*
	–	–	(5.83)	–	(1.89)
Log(syndicate size)	–	–	−1.81	–	−5.39*
	–	–	(−0.98)	–	(−1.79)
Covenant index	–	–	–	9.62***	12.06***
	–	–	–	(8.22)	(8.23)
Adj. R^2	0.50	0.53	0.59	0.56	0.66
Obs.	13,228	9,396	5,780	2,877	1,147

***Significant at the 0.01 level.
**Significant at the 0.05 level.
*Significant at the 0.10 level.

Leverage and profitability may also proxy for potential agency costs (Jensen and Meckling, 1976; Jensen, 1986). Finally, also included in the specification are fixed effects for calendar years and Fama-French (1997) 48 industries (not reported).

The regression results provide several important insights, beginning with confirmation of our earlier evidence in Table IV. Loan yield spreads are strongly inversely related to firm size consistent with the view that small firms are riskier. We also see a significantly positive association between yields and book-to-market, consistent with the evidence found in the equity markets that value firms experience higher costs of capital (Fama and French, 1992). If the assumption that institutional investors are more rational than investors in the equity market is correct, then this evidence suggests that risk is an important factor behind the higher expected returns that we observe for firms with higher book-to-market ratios. The coefficient on equity beta is positive, but insignificant, consistent with the findings in the equity market.

Most important, the base regression results indicate that IPO firms command roughly the same yield as otherwise similarly seasoned firms, as revealed by the IPO indicator variable. Under most specifications, SEO firms' yield is significantly below the bond yield of nonissuing firms, although the economic significance of the estimated differences is small. A 6.4-basis-point differential (base specification), in conjunction with the average loan size of approximately $171 million, translates into just over $100,000. This evidence suggests that the unconditional results reported earlier are not driven by differences in firm characteristics and the type of loan into which issuing and nonissuing firms enter. After accounting for these differences, we see that issuing and nonissuing firms face similar interest rates on their loans.

In the third and fourth columns of Table V, we add additional variables suggested by the empirical banking literature as relevant for determining loan spreads (Bradley and Roberts, 2003;

Drucker and Puri, 2005). The inclusion of these variables reduces our sample size significantly. However, we briefly note the following. First, the estimated coefficients on these additional variables coincide with results found in previous studies. Second, their inclusion has little meaningful effect on the estimated coefficient on IPO or SEO dummies. Specifically, the coefficients on the IPO and SEO dummies are never economically significant. The largest effect that we find is a 10 basis-point-differential for SEO firms, a differential that translates into $171,000. This amount is less than the transaction costs associated with originating most loans.

IV. Loan Expected Returns

The evidence thus far suggests that issuing firms' loans are viewed by institutional lenders as being of equal risk to that of similar nonissuing firms' loans. This analysis, however, is based on the use of a set of control variables that are meant to simultaneously capture cross-sectional variation in both systematic and default-related risk. In this section, we turn to an alternative empirical approach in which we first attempt to model default directly and then isolate cross-sectional variation in expected loan returns. The former component is a function of the likelihood of default and the loan recovery rate.

Our approach to computing the expected return follows Benninga (2000) by computing the internal rate of return corresponding to each loan's expected cash flows. We first calculate the semi-annual coupon payments, conditional on the loan not defaulting, by adding the loan's coupon rate and the realized six-month LIBOR.[5] Then, using estimated firm default probabilities and an assumed loan recovery rate, we calculate the expected cash flow in each six-month period of the loan's maturity. Since we know the loan's price at issuance, we are able to compute the loan's internal rate of return, which is our estimate of the loan's expected rate of return. The difference between our estimated expected return and the corresponding loan yield is our estimate of the loan default risk premium.

Before continuing, we make two comments. First, the private debt market is often characterized by lack of liquidity in its secondary market. However, the first-order effect of illiquidity is on the pricing level of all loans. Since our focus is on differential pricing of loans, this issue is not likely to affect our results. Second, our valuation approach is simply the "physical" counterpart to risk-neutral valuation. Rather than using the risk-neutral probabilities in conjunction with the risk-free rate to price the loans, we are using the physical (or subjective) probabilities in conjunction with banks' ex ante prices of the loan to back out the ex ante expected loan returns.

To maintain focus, we postpone a complete discussion of the mechanics behind our estimation of default probabilities and assumed recovery rates to the Appendix in Sections A, B, and C. Instead, we now turn to our analysis of expected returns, computed as the promised yield on the loan less the expected loss in default (i.e., the probability of default times the assumed recovery rate).

A. Loan Expected Return Summary Statistics

Table VI presents the average and median expected excess (over LIBOR) loan returns (i.e., default-adjusted loan spreads) corresponding to our different estimates of default probabilities. The expected excess loan returns provide an estimate of the part of the loan yield spread corresponding to systematic risk. The unadjusted yield spread statistics are also presented for ease of reference. Focusing on the fourth row containing the expected excess loan return using our

[5]For loans ending after 2004, we use the forward yield curve in place of the actual spot rates.

Table VI. Default Probabilities and Loan Expected Returns

The sample consists of all nonfarm, nonfinancial, nonutility domestic firms entering into US dollar-denominated loans between 1987 and 2003 and appearing in both the Dealscan and merged CRSP/Compustat databases. The table presents average (medians in brackets) unadjusted and default-adjusted yield spread for the pooled sample of loans, nonissuer loans, IPO loans, and SEO loans. Loan expected returns are computed as the internal rate of return to the loan, based on the par value and expected cash flows. The different loan expected returns vary based on the model used to predict the probability of default. The empirical loan expected return is the loan yield spread minus the average empirical fraction of loan defaults in a loan category times (1 − loan recovery rate). The assumed recovery rate on a defaulted loan is 70%.

Variable	Pooled	Nonissuer	IPOs	SEOs
Yield	219.54	218.23	231.69	179.55
	[225.00]	[212.50]	[225.00]	[162.50]
Loan expected return (hazard Zmijewski [Zmi])	165.91	164.21	181.30	132.98
	[155.75]	[152.71]	[175.53]	[116.19]
Loan expected return (hazard Altman [Alt])	164.01	162.10	181.48	134.83
	[153.89]	[150.72]	[177.20]	[120.34]
Loan expected return (panel logit Zmi)	175.77	173.68	194.79	141.45
	[172.84]	[170.24]	[192.36]	[131.52]
Loan expected return (panel logit Alt)	174.32	171.99	195.64	139.94
	[168.58]	[165.33]	[188.18]	[128.17]
Loan expected return (empirical)	164.94	162.43	173.49	128.25
	[170.40]	[156.70]	[166.80]	[111.20]

baseline measure of default likelihood (i.e., the Zmijewski, 1984, panel logit model), we see that the magnitude of the expected excess loan returns is approximately 75% of that of the raw yield spreads. IPO firms experience an average expected excess loan return that is significantly larger (21.1 basis points) than that faced by nonissuing firms. SEO firms experience an average expected excess loan return that is significantly lower (32.2 basis points) than that faced by nonissuing firms. Whether these differences remain after controlling for differences in firm characteristics and loan features is examined below.

B. Loan Expected Return Regressions

Using our estimates of loan expected excess returns, we now repeat the regression analysis conducted in Section III.B, but the dependent variable is now the loan expected return rather than the loan total promised yield. Estimation of this regression allows us to uncover differences in systematic risk between issuing and nonissuing firms while controlling for heterogeneity in loans and the characteristics of the borrowing firms. Additionally, we also wish to see whether the key variables that lead to large differences in total yield (e.g., firm size, leverage, and book-to-market ratio) retain their explanatory power. To avoid spurious correlations, we drop book leverage and profitability from the right-hand side of the regressions, as they appear implicitly on the left-hand side through the estimated default probabilities (see the Appendix Sections A and C for details). The results are presented in Table VII, whose format mimics that of Table V.

We see that the results from Table V are largely unaffected by the default risk adjustment. The coefficient on the IPO indicator is insignificant across all specifications, and the coefficient on the SEO indicator is significant, but negative in all but one of the specifications. This suggests that institutional investors view SEO firms' loans to be less risky than otherwise identical nonissuing firms' loans. The estimated coefficient on firm size is unaffected by the adjustment, as is that on

Table VII. Loan Expected Return Regression

The sample consists of all nonfarm, nonfinancial, nonutility domestic firms entering into US dollar-denominated loans between 1987 and 2003 and appearing in both the Dealscan and merged CRSP/Compustat databases. The table presents the estimated coefficients from a regression of the expected loan return (i.e., the internal rate of return measured in basis points above the six-month LIBOR, using the Zmijewski, 1984, panel logit model of firm default and assuming a loan recovery rate of 70%) on various determinants. The base specification presents our primary specification. The lender specification further conditions on the availability of lender data. The covenant specification further conditions on the availability of covenant data. The All specification further conditions on the availability of both lender and covenant data. IPO indicator is an indicator variable equal to one if the loan occurred within two years after the IPO. SEO indicator is an indicator variable equal to one if the loan occurred within two years after the SEO. Maturity is the loan maturity, measured in months. Loan amount/assets is the ratio of the loan principal to the total assets of the firm in the quarter preceding the loan. Log(assets) is the log of the GDP-deflated total assets. Log(book-to-market) is the log of the ratio of book equity to market equity. Tangible assets is the ratio of net PPE to total assets expressed in percentage. Cash flow volatility is the standard deviation of historical (or future when missing) operating cash flows expressed in percentage. Equity beta is estimated using 24-60 months (as available) of monthly returns data over the period beginning in the month after the issuance. The beta is the sum of the estimated coefficients on the contemporaneous and lagged excess market return. Equity idiosyncratic vol is the RMSE from the beta regression. Depository Inst. (Insurance Co.; nondepository Inst., brokerage) is an indicator variable equal to one if the lead bank on the deal is of the corresponding type denoted by their SIC code. Syndicate size is the number of banks in the lending syndicate. Covenant index equals the number of covenants present in the loan contract. Also included in the regressions, but not reported, are fixed effects for the Fama-French 48 industries, calendar year, deal purpose, and type of loan. All standard errors are cluster adjusted for dependence within firms. The *t*-statistics are presented in parentheses.

Variable	Base	Beta/Vol	Lender	Covenant	All
Intercept	486.99***	442.21***	515.32***	317.36***	475.97***
	(5.82)	(4.22)	(5.70)	(8.99)	(7.66)
IPO indicator	−0.31	−2.43	4.54	−3.62	10.86
	(−0.09)	(−0.66)	(0.96)	(−0.58)	(1.35)
SEO indicator	−7.28**	−9.11***	−7.42**	−11.90**	0.84
	(−2.45)	(−2.75)	(−1.96)	(−2.27)	(0.11)
Log(maturity)	−14.49***	−11.10***	−13.24***	−31.7***	−19.64**
	(−6.27)	(−4.67)	(−3.78)	(−5.13)	(−2.21)
Loan amount/assets	−0.01***	−0.01***	−0.01***	−0.01***	−0.01***
	(−5.67)	(−4.70)	(−12.53)	(−3.82)	(−4.84)
Log(assets)	−37.21***	−33.85***	−31.37***	−25.57***	−17.53***
	(−41.95)	(−33.17)	(−21.55)	(−13.50)	(−5.59)
Log(book-to-market)	16.52***	13.91***	17.39***	14.23***	10.87**
	(9.75)	(6.88)	(7.97)	(4.46)	(2.52)
Tangible assets	−0.43***	−0.27***	−0.26***	−0.14	−0.21
	(−5.29)	(−2.90)	(−2.57)	(−1.07)	(−1.16)
Cash flow volatility	0.26	0.55	−0.01	0.74	−0.29
	(1.58)	(1.18)	(−0.03)	(−1.37)	(−0.31)
Equity beta	–	2.75*	–	–	0.88
	–	(1.78)	–	–	(0.22)
Equity idiosyncratic vol	–	2.37***	–	–	0.64
	–	(7.42)	–	–	(0.98)
Depository Inst.	–	–	−20.31**	–	−31.87***
	–	–	(−2.30)	–	(−2.69)

(*Continued*)

Table VII. Loan Expected Return Regression (*Continued*)

Variable	Base	Beta/Vol	Lender	Covenant	All
Insurance Co.	–	–	12.82	–	0.00
	–	–	(0.28)	–	0.00
Nondepository Inst.	–	–	96.91***	–	13.50
	–	–	(9.19)	–	(0.80)
Brokerage	–	–	38.73***	–	16.88
	–	–	(5.49)	–	(1.60)
Log(syndicate size)	–	–	−0.94	–	−4.10
	–	–	(−0.49)	–	(−1.25)
Covenant index	–	–	–	11.70***	13.91***
	–	–	–	(9.58)	(8.99)
Adj. R^2	0.48	0.52	0.58	0.51	0.61
Obs.	13,198	9,372	5,759	2,868	1,141

***Significant at the 0.01 level.
**Significant at the 0.05 level.
*Significant at the 0.10 level.

the book-to-market ratio: small firms and high book-to-market firms have higher expected loan returns. Both loan maturity and tangible assets still exhibit significantly negative coefficients, though the magnitude of these estimates has been amplified by the adjustment. The covenant index coefficient is still positive and significant, indicating that riskier firms' loans have both higher yield and more restrictive covenants. The simultaneous determination of covenants and yield may cause an endogeneity problem. Therefore, the results of this regression should be interpreted with caution. In the next subsection, we address the endogeneity issue directly.

In sum, the default adjustment to yields has little effect on our previous results and conclusions. Institutional lenders appear to view IPO firms and nonissuing firms in a similar fashion with respect to risk, both total and systematic, and appear to view SEO firms as slightly less risky than similar nonissuing firms.

C. Endogeneity of Contract Features

Many studies suggest that lenders can adjust the maturity of the loans and vary the number of covenants in conjunction with the pricing of the loans (Smith and Warner, 1979; Berger and Udell, 1990; Booth, 1992; Barclay and Smith, 1995). This idea that certain loan features are determined simultaneously also has empirical support from studies by Bradley and Roberts (2003) and Chava, Kumar, and Warga (2009). While previous work examining expected bond returns has largely ignored this issue, it remains an empirical question as to whether the endogeneity of maturity and covenant structure has a meaningful effect on any inferences concerning expected returns. Therefore, we model the determination of loan yield, maturity, and covenants jointly to determine the impact of endogeneity on our results and conclusions thus far.

The challenge, of course, is in finding exogenous variation in loan maturity and covenants. Our instruments for the covenant index are lender variables, such as syndicate size and dummy variables, corresponding to the lead bank SIC code. Our instruments for loan maturity are deal purpose dummies. The motivation for the covenant instruments is that the market for loans is priced competitively, but where banks are more easily differentiated is on the covenant specification. Indeed, in discussions with commercial lenders, loans often begin with boiler plate covenant specifications, most likely unique to the lender. Additionally, some firms may prefer more monitoring or information gathering than others and this is indirectly reflected in the covenant provisions. The maturity instruments are motivated by the idea that firms match asset and liability durations. Thus, the maturity of the loan will be likely to be dictated by the use of its funds.

Table VIII reports coefficient estimates from a system of equations for loan expected excess return, loan covenants, and loan maturity. We first estimate a Poisson regression for the covenant index and use the predicted values from this regression in a second-stage seemingly unrelated regression of loan maturity and yield. Because so many loans (over half of our sample) are missing covenant information, estimating the covenant equation first enables us to use imputed values for the second stage. Additionally, the nonlinearity and nonnormality associated with the Poisson regression would make simultaneous estimation of all three equations extremely burdensome, as joint normality is no longer an appropriate assumption.

Turning to the results, the syndicate size variable and depository institution and brokerage dummy variables enter significantly in the covenant index equation. Similarly, the coefficients on the deal purpose dummies in the maturity equation are statistically significant, except for that on the takeover variable (not reported). In the covenant equation, both the IPO dummy coefficient and the SEO dummy coefficient are statistically insignificant. Issuing firms are treated in the same way as similarly seasoned firms when institutional lenders set their loan covenants. The maturity equation, however, indicates that both IPOs and SEOs firms issue debt with longer maturity than nonissuing firms, as both the IPO dummy coefficient and the SEO dummy coefficient are statistically significant.

The coefficient on the IPO indicator variable in the expected excess return equation is also insignificantly different from zero. Consistent with prior results, the coefficient on the SEO dummy is negative and significant, suggesting that SEO firms' loans are issued with lower expected returns even with other loan and firm characteristics held constant. This result confirms our suspicions that allowing for endogeneity does not alter our main conclusion. IPO loans have similar expected returns as those of similar nonissuing firms and SEO loans have slightly lower expected returns than nonissuing firms. Most of the sensitivities on the remaining independent variables are similar to those reported in Tables V and VII. Firm size is inversely related to loan yield, while the book-to-market ratio is positively related to the yield. Cash flow volatility retains its sign but loses significance in the joint estimation. Overall, our results are very similar to those presented earlier and our conclusions remain unchanged.[6]

V. Changes in Loan Returns around Equity Issuances

We have presented evidence that the private debt market does not price IPO and SEO firms' loans differently than nonissuing firms' loans when we control for firm characteristics, such as size, book-to-market, and default risk. Moreover, assuming that institutions are rational, our analysis suggests that institutional lenders view firm characteristics, such as size and book-to-market, when pricing loans in a manner consistent with the asset pricing model of Fama and French (1993). In our final analysis, we use the time dimension of our sample of IPO and SEO loans to examine the recent theoretical arguments put forth by Carlson, Fisher, and Giammarino

[6]In unreported results, we have repeated the analysis in this section conditioning on loans whose maturity is longer than 34 months, the average loan maturity in our sample, as the pricing of these loans might better reflect long-run risks that borrowing firms face. We find, however, that our results regarding IPO and SEO pricing remain unaltered.

Table VIII. Simultaneous Equation Model

The sample consists of all nonfarm, nonfinancial, nonutility domestic firms entering into US dollar-denominated loans between 1987 and 2003 and appearing in both the Dealscan and merged CRSP/Compustat databases. The table presents coefficient estimates from a system of equations for covenant index, loan maturity (measured in months), and expected loan return (measured in basis points, using the Zmijewski, 1984, panel logit model of firm default and assuming a loan recovery rate of 70%). Covenant index, which assigns one point for each covenant present in the loan, is estimated separately in a first stage using a Poisson regression. The predicted values from this regression are then used in a second-stage seemingly unrelated regression of maturity and loan yield. The instruments for the covenant index equation include lender variables, such as syndicate size and lead bank SIC code. The instruments for the maturity equation include deal purpose dummies. The table presents the estimated coefficients for the three equations: 1) loan yield (measured in basis points above the six-month LIBOR), 2) covenant index, and 3) maturity (measured in months). IPO indicator is an indicator variable equal to one if the loan occurred within two years after the IPO. SEO indicator is an indicator variable equal to one if the loan occurred within two years after the SEO. Loan amount/assets is the ratio of the loan principal to the total assets of the firm in the quarter preceding the loan. Book leverage is the ratio of total debt (short term + long term) to total assets expressed in percentage. Log(assets) is the log of the GDP-deflated total assets. Log(book-to-market) is the log of the ratio of book equity to market equity. Tangible assets is the ratio of net PPE to total assets expressed in percentage. Profitability is the ratio of EBITDA to total assets expressed in percentage. Cash flow volatility is the standard deviation of historical (or future when missing) operating cash flows expressed in percentage. Depository Inst., nondepository Inst., brokerage are indicator variables equal to one if the lead bank on the deal is of the corresponding type denoted by their SIC code. Syndicate size is the natural logarithm of the number of lenders in the lending syndicate. Workcap is an indicator variable equal to one if the deal purpose is for working capital. Corpurp is an indicator variable equal to one if the deal purpose is for corporate purposes. Debt repay is an indicator variable equal to one if the deal purpose is for debt repayment. Takeover is an indicator variable equal to one if the deal purpose is for a takeover. Also included in the regressions, but not reported, are fixed effects for the Fama-French 48 industries, calendar year, and type of loan. All standard errors are cluster adjusted for dependence within firms. The *t*-statistics are presented in parentheses.

Variable	Yield	Covenant Index	Log(Maturity)
Intercept	402.73***	17.69***	1.63***
	(17.28)	(32.69)	(10.09)
Def adj yield	–	–	−0.00***
	–	–	(−3.77)
Log(maturity)	−9.84***	–	–
	(−4.36)	–	–
Covenant index	5.43***	–	0.09***
	(2.92)	–	(6.76)
IPO indicator	3.45	−0.02	0.05*
	(0.85)	(−0.13)	(2.28)
SEO indicator	−8.12**	0.05	0.00***
	(−2.31)	(0.29)	(4.17)
Loan amount/assets	−0.01***	−0.00***	0.00
	(−3.83)	(−8.22)	(1.57)
Book leverage	–	0.02***	0.09***
	–	(5.35)	(10.43)
Log(assets)	−32.59***	−0.72***	−0.05***
	(−26.36)	(−9.38)	(−5.29)
Log(book-to-market)	18.81***	0.19***	0.00**
	(12.33)	(2.96)	(2.32)
Tangible assets	−0.27***	0.00	0.02***
	(−4.06)	(0.56)	(7.78)

(*Continued*)

Table VIII. Simultaneous Equation Model (*Continued*)

Variable	Yield	Covenant Index	Log(Maturity)
Profitability	–	−0.04**	−0.00**
	–	(−2.05)	(−2.01)
Cash flow volatility	0.32	−0.02	–
	(1.20)	(−0.85)	–
Depository Inst.	–	0.71**	–
	–	(2.49)	–
Nondepository Inst.	–	−0.34	–
	–	(−0.99)	–
Brokerage	–	0.83***	–
	–	(5.84)	–
Syndicate size	–	0.41***	–
	–	(5.30)	–
Work cap	–	–	−0.25***
	–	–	(−8.88)
Corp purp	–	–	−0.20***
	–	–	(−8.27)
Debt repay	–	–	−0.05**
	–	–	(−2.12)
Takeover	–	–	0.03
	–	–	(1.39)
Adj R^2	0.46	–	0.47
Obs.	5,758	1,691	5,758

***Significant at the 0.01 level.
**Significant at the 0.05 level.

(2006) and Benninga, Helmantel, and Sarig (2005). These studies argue that equity issuances should be associated with lower exposure to risk since raising capital and investing it is tantamount to the exercise of a call option and acquisition of the underlying asset. Thus, in keeping with these arguments, we should observe loan yields' and returns' decline following IPOs and SEOs due to a reduction in firm asset risk.

To test this implication, we examine the change in loan yields and returns around the time of IPOs and SEOs. We require each issuing firm in our sample to have at least one pair of loans (one loan before the equity issuance and one after) with 18 months to two years difference in the loan dates. For each pair of loans, we calculate the change in loan yields and returns following the IPO or SEO.[7] We do this for all IPO and SEO loan pairs in which the later loan is taken out in any of the four six-month event windows following the equity issuance—event windows ([0,0.5], [0.5,1.0], [1.0,1.5], and [1.5,2.0]).[8]

The average loan yield changes following equity issuances are reported in Table IX. Panel A reports yield changes for IPO firms and Panel B reports yield changes for SEO firms. Turning first to the IPO firms in Panel A, the results indicate an economically meaningful drop in loan

[7]If the firm takes out more than one loan at the same time, we take the weighted average (by loan amount) of the loan yields.

[8]The results using yields and expected returns are very similar. Therefore, to conserve space we only report the results using yields.

Table IX. Change in Equity Issuer Loan Yields in Event Time

The base sample consists of all nonfarm, nonfinancial, nonutility domestic firms entering into US dollar-denominate loans between 1987 and 2003 and appearing in both the Dealscan and merged CRSP/Compustat databases. We further restrict the sample to those firms entering into at least one loan before and after an equity issuance. The event window defines the time, in years, after either an IPO (Panel A) or SEO (Panel B). For example, the (0,0.5) window corresponds to loans taken out in the six months following equity issuance. Δ Yield is the average change in loan yields. Thus, loans entered into within six months of an IPO have a yield that is 56 basis points lower than loans taken out prior to the IPO. Δ Predicted yield performs a similar exercise only using predicted yields from the base regression calculated by multiplying the estimated coefficient on that firm characteristic in the base loan pricing regression by the average change in the characteristic following the equity issuance. For example, to calculate the contribution of firm size (Log(Assets)) to the total change in predicted yield for the 44 IPO firms taking out a loan in the six months after their IPOs, we take the coefficient on size in our base loan pricing regression and multiply it by the average change in firm size for these 44 firms following their IPOs.

Panel A. IPOs

Event Window (IPO = 0)	No. of Firms	Δ Yield	No. of Firms	Δ Predicted Yield	Δ Predicted Value Due to		
					Size	Book-to-Market	Leverage
(0, 0.5)	44	−56.0	6	−15.8	−8.7	0	−7.3
(0.5, 1.0)	66	−63.9	15	−30.1	−26.4	4.6	−8.9
(1.0, 1.5)	93	−31.4	50	−12.1	−20.2	4.3	−10.2
(1.5, 2.0)	86	11.7	56	1.0	−15.9	5.5	−1.2

Panel B. SEOs

Event Window (SEO = 0)	No. of Firms	Δ Yield	No. of Firms	Δ Predicted Yield	Δ Predicted Value Due to		
					Size	Book-to-Market	Leverage
(0, 0.5)	67	−35.8	33	−22.7	−16.7	−6.0	1.7
(0.5, 1.0)	79	−38.6	35	−42.7	−20.9	−0.6	−2.5
(1.0, 1.5)	87	−25.4	46	−31.0	−20.3	4.4	−2.6
(1.5, 2.0)	96	20.4	53	12.8	−10.3	4.7	0.7

yields following IPOs. For the 44 firms in our sample that took out a loan in the six months following their IPOs, the average decline in their loan yields following their IPOs is 56 basis points. For the 66 firms that took out a loan six months to one year after their IPOs, the average decline in their loan yields following their IPOs is 64 basis points. The average decline in loan yields for the 93 firms that took out loans one year to 18 months after their IPOs diminishes to 31 basis points. Finally, for the 86 firms that took out a loan 18 months to two years after their IPOs, the average change in their loan yields is actually positive, though smaller in absolute value than the previous yield declines.

The pattern revealed in Panel A indicates that most of the decline in loan yield following an IPO happens around the time of the IPO and in the year following. Loan yields decline less and ultimately stop declining in the second year following an IPO. The pattern for SEO firms' loan yields is similar, though the yield declines following SEOs are less pronounced than the declines following IPOs. The changes in loan yields following IPOs and SEOs we uncover are consistent with the real options models mentioned above (Carlson, Fisher, and Giammarino, 2004; Benninga, Helmantel, and Sarig, 2005).[9] However, it is also possible that the decline in

[9]The pattern for expected loan returns is similar to that for total loan yields.

loan yields following IPOs and SEOs could be explained by other factors, such as the greater bargaining power of IPO firms vis-à-vis banks after going public and a decrease in firm leverage following equity issuances, both for IPOs and SEOs.

To examine whether these alternative explanations are behind the observed decline in yields following equity issuances, we also examine the changes in predicted loan yields and returns for our sample of IPOs and SEOs. We take our loan yield and return pricing model in the base regression in Table V as given and ask what the changes in loan yields and returns charges to firms following IPOs and SEOs should be, given the observed changes in loan yield and return determinants following IPOs and SEOs. We then ask which of these changes in loan yield and return determinants lead to an economically meaningful change in loan yields and returns according to our base loan pricing regression. Examining changes in predicted loan yields and returns allows us to investigate whether changes in yields and returns can be largely attributed to changes in firm-level factors consistent with the real options models, such as size and book-to-market, or factors consistent with the alternative explanations, such as leverage.

In Table IX we report the total change in predicted yields for both IPO and SEO firms as well as the contribution of three firm characteristics to the total change in predicted yields: size, book-to-market, and leverage. The contribution of a firm characteristic to the total change in predicted yield is calculated by multiplying the estimated coefficient on that firm characteristic in the base loan pricing regression by the observed firm-level change in the characteristic between the pre- and post-equity issuance dates. For example, to calculate the contribution of firm size (log(assets)) to the total change in predicted yield for the 44 IPO firms taking out a loan in the six months after their IPOs, we take the coefficient on size in our base loan pricing regression and multiply it by the average change in firm size for these 44 firms following their IPOs.

Several of the findings are worth mentioning. First, the change in predicted yields following equity issuances, like the change in actual yields, is negative, though declines are less pronounced for IPO firms. Second, the majority of the decline in predicted yields can be attributed to the increase in firm size. At least 50% of the change in the predicted yield can be attributed to this factor. Third, the book-to-market variable is not a significant factor in the yield change. Additionally, the leverage effect is economically significant, but its effect is always lower than the size effect. Thus, while reduction in leverage following an equity issuance does lower predicted yield (especially on IPO loans), it cannot explain the majority of the reduction in predicted yields. The findings on changes in predicted yields, once again, support the interpretation of the decline in loan yield stemming from a reduction in underlying asset risk following an equity issuance.

VI. Conclusions

Firms conducting initial and seasoned equity offerings have historically experienced relatively low long-run equity returns. There is lack of consensus as to whether low average returns are due to mispricing or that these returns rationally reflect the risk characteristics of the issuing firms. By examining how institutional lenders perceive the risk of issuing and nonissuing firms, we are able to shed new light on this issue. We have examined how institutional lenders perceive the risk of equity issuing firms relative to nonissuing firms by focusing on the pricing of loans to these two groups of firms. We find, first, that equity issuing and otherwise similar nonissuing firms face comparable yields on their loans, even after adjusting for default risk and accounting for potential endogeneity between the various components of the loan contract.

Second, we find that firm characteristics that have been identified in equity market research, such as size and book-to-market, play a similar role in the pricing of private debt. In particular, small, high book-to-market "value" firms are deemed riskier, thus requiring higher expected rates of return, ex ante. This evidence is consistent with that from the equity market indicating that IPOs and SEOs earn returns similar to seasoned firms with the same characteristics, including size and book-to-market.

These findings have important implications concerning the interpretation of the long-term performance observed in the data. Since the debt in our sample is being held by institutions, and it is likely that institutions are more rational than individual investors, the findings are consistent with the notion that the motive for the long-term performance is rational. That is, in a market dominated by rational investors, we document the same return pattern that has been found in the equity market.

Our findings have implications beyond the pricing of issuing and nonissuing firms. Specifically, firms' expected loan returns are positively correlated with their book-to-market ratios, consistent with a rational risk interpretation as posited by Fama and French (1993). This evidence provides an additional test corroborating the interpretation of these firm characteristics as proxies for systematic risk (Fama and French, 1993). Recently, Campello, Chen, and Zhang (2008) have demonstrated, using publicly traded debt, that firm size and book-to-market ratio are priced consistent with the idea that smaller firms and those with high book-to-market ratios are expected to earn higher rates of return. Our evidence relies on a broader and markedly different set of firms, since most firms do not have publicly traded debt (Faulkender and Petersen, 2005). Thus, we provide an additional piece of evidence consistent with the idea that size and book-to-market capture exposure to systematic risk that is compensated in expected returns.

Finally, we find that firms' loan yields and returns decline following equity issuances and that this decline is due, in large part, to an increase in the size of the equity issuing firm. This evidence is consistent with the predictions of models in Carlson, Fisher, and Giammarino (2004) and Benninga, Helmantel, and Sarig (2005), in which firms issue equity to exercise a real option and, after doing so, experience a reduction in the risk of their underlying assets. ■

Appendix

A. Estimating the Probability of Default

For each loan in our sample, we predict the probability that the borrowing firm defaults in each six-month period of the loan's maturity, conditional on having not defaulted in the previous six months. To estimate firm-level models of default, which we then use to predict default probabilities for our loans, we must first obtain data on bankruptcies. We use two data sources to identify bankruptcies. We use BankruptcyData.com to obtain Chapter 11 filings by publicly traded companies between 1987 and 2004, which we merge to the CRSP/Compustat database using firm name and bankruptcy filing date in conjunction with the historical header file. Since BankruptcyData.Com does not collect information on Chapter 7 bankruptcy filings until the late 1990s, we use Compustat footnote 35 to identify firms that were deleted from Compustat due to Chapter 7 liquidations from 1987 to 2003.[10] We classify a loan as having defaulted if the borrowing firm files for bankruptcy prior to the maturity of the loan.

While this definition is intuitively appealing, it can be a noisy measure of loan defaults for several reasons. First, loans can be prepaid prior to maturity. Second, revolving loans may not be drawn down before the bankruptcy event. These two facts will lead us to overstate loan defaults.

[10]We assume that the Chapter 7 bankruptcy filing date happens during the last quarter the firm has information in Compustat.

Additionally, loans may be renegotiated before a firm actually files for bankruptcy. This third fact will lead us to understate the number of loan defaults.[11]

With our bankruptcy measure, we estimate four different models of firm default. (See Subsection C for a detailed discussion.) We estimate two types of default models: 1) a panel logit model similar to that estimated by Shumway (2001) and 2) a Cox proportional hazard model. For each type of model, we estimate two different specifications. One specification contains the explanatory variables in Altman (1968) and the other contains the explanatory variables of Zmijewski (1984). We estimate the panel logit because it enables us to more easily use time-varying covariates. However, a drawback of this model is that it requires that we explicitly form estimates of the private lender's forecasts of the evolution of the borrower's characteristics over the life of its loan in order to predict loan default probabilities. Therefore, we also estimate Cox proportional hazard models, which only use information about the borrower in the quarter in which it takes out a loan to forecast loan default probabilities. This is the same as saying the lender assumes the firm characteristics will remain constant over the life of the loan.

We use the estimates from our four firm default models to predict four sets of default probabilities over each six-month interval of each loan's life. For the panel logit, this requires that we have predictions of the firm's financial statement variables that appear in the model for each six-month interval of the loan's life. In our two panel logit models presented here, we assume that lenders have rational expectations and use the actual realizations as our private lender predictions when these data are available. If we run out of Compustat data because the maturity of the loan ends after our sample, we assume that future values of the firm-level variables are equal to their last values. For our Cox proportional hazard models, we require the private lender to use only the previous quarter's information about the firm in forecasting the probabilities of default in each six-month interval.

Table A.I reports the average predicted cumulative probabilities of default over the life of the loans in our sample from each of our four models, as well as the fraction of loans undertaken in each year of our sample whose borrowers ultimately default (i.e., empirical probabilities). We report these default probabilities separately for IPO, SEO, and nonissuer loans. There are several insights that emerge from Table A.I. IPO loans are, on average, more likely to default (6.46%) than either SEO loans (5.37%) or nonissuers loans (4.85%). Loans reveal cyclicality in their default rates, reflected in higher default rates for loans taken out in the first several years of the sample and in the period from 1998 to 2000. Additionally, issuers default rates appear to exhibit greater variation over time than those of nonissuers loans. Overall, the initial evidence appears consistent with the possibility that lenders set higher yields for IPO firms because of higher default risk. More generally, default probabilities appear to increase during the 1997-2000 period, contemporaneous with the increase in average yield spreads (see Panel A of Table I). Recall that the figures in Table A.I correspond to the fraction of loans undertaken during each of these years that eventually default or are predicted to default, as opposed to the fraction of defaults occurring in each of those years. We also mention that the predicted hazard model probabilities are closer in magnitude to the empirical fraction of loans that ultimately default. This result is due to the sample used for the estimation, which consists only of firms that appear in our Dealscan sample. For the panel logit model, our estimation sample uses information on any firm that ever took out a loan on Dealscan, both before and after the firm appeared on Dealscan.

[11] Loans in the Dealscan database can also experience technical default (e.g., due to a covenant violation), be renegotiated, and then re-appear as a new loan in the database. However, this fact does not contaminate the yield analysis since all loans taken out by the same firm are assumed to be dependent observations. Indeed, a renegotiated loan is technically a new loan that reflects the changed characteristics of the firm and perception by the bank of the risk of the firm's debt.

Table A1. Default Probabilities and Loan Expected Returns

The sample consists of all nonfarm, nonfinancial, nonutility domestic firms entering into US dollar-denominated loans between 1987 and 2003 and appearing in both the Dealscan and merged CRSP/Compustat databases. The table presents average predicted loan default probabilities by year for IPO loans, SEO loans, and nonissuer loans defined as all loans occurring within two years after the IPO, all loans occurring within two years after the SEO, and all other loans, respectively. Empirical fraction is the ratio of the number of loans issued that ultimately default to total loans issued in a particular year. Hazard Zmijewski (Altman) is the average predicted probability of loan default at issuance averaged across all loans issued in a particular year, where the individual loan default probabilities are obtained from an estimated hazard model of firm default whose covariate specification is the same as in Zmijewski (1984) (Altman, 1968). Logit Zmijewski (Altman) is the average probability of loan default at issuance averaged across al loans issued in a particular year, where the individual loan default probabilities are obtained from an estimated panel logit model of firm default whose covariate specification is the same as in Zmijewski (1984) (Altman, 1968). For example, in 1987, the empirical fraction reveals that 5.72% of the loans taken out by nonissuer firms ultimately defaulted, whereas the predicted probability of loan defaults according to the Hazard Zmi estimate is 5.4%.

Year	Nonissuer Loans					IPO Loans					SEO Loans				
	Empirical Fraction	Hazard Zmi	Hazard Alt	Logit Zmi	Logit Alt	Empirical Fraction	Hazard Zmi	Hazard Alt	Logit Zmi	Logit Alt	Empirical Fraction	Hazard Zmi	Hazard Alt	Logit Zmi	Logit Alt
1987	5.72	5.40	5.85	4.33	5.22	2.17	4.76	2.93	2.88	3.59	2.99	5.21	5.29	4.34	5.68
1988	7.90	5.27	5.73	4.70	5.02	2.70	5.86	5.18	4.39	5.04	3.19	5.23	5.21	4.52	5.01
1989	5.89	5.87	6.02	4.79	5.34	2.38	5.01	4.97	3.52	3.87	5.41	5.05	5.10	4.40	5.32
1990	4.46	5.45	5.60	4.23	4.93	1.49	5.18	4.85	3.39	3.92	6.85	4.54	4.79	2.67	3.82
1991	3.96	5.00	4.88	3.71	4.01	0.00	4.13	3.35	2.76	3.18	4.00	4.01	3.90	2.98	3.12
1992	2.24	5.66	5.33	3.76	4.23	2.63	6.17	3.69	2.96	3.09	0.67	5.10	4.68	3.42	3.70
1993	2.43	5.51	5.55	3.74	3.99	3.83	5.77	4.56	3.26	3.69	3.35	5.84	5.24	3.64	4.21
1994	2.99	5.76	5.60	4.21	4.45	3.27	6.17	5.27	3.70	4.37	3.93	5.53	5.38	3.68	4.20
1995	5.24	5.51	5.92	4.62	4.65	2.08	6.10	5.39	4.51	4.45	3.93	5.80	5.80	4.33	4.85
1996	5.78	5.53	5.50	4.21	4.43	6.06	6.33	4.78	4.22	4.00	4.24	6.17	5.17	4.96	4.89
1997	6.32	5.72	5.89	4.41	4.70	10.03	5.97	4.67	4.59	4.53	7.94	5.68	5.43	4.84	4.89
1998	7.18	5.58	5.56	4.69	4.82	12.25	6.64	5.11	4.39	4.81	9.93	6.09	5.18	4.96	5.21
1999	6.79	5.18	5.17	4.03	4.39	11.51	5.77	5.40	5.06	5.47	8.73	6.19	5.73	4.91	5.69
2000	6.55	4.94	4.96	4.11	4.35	16.67	6.88	4.79	5.32	4.68	10.59	6.34	5.46	4.34	4.45
2001	3.50	4.24	4.49	3.50	3.58	4.17	5.00	4.04	2.89	2.44	4.88	4.45	4.23	3.91	3.91
2002	3.18	4.26	4.52	3.13	3.35	0.00	6.42	4.58	3.06	2.97	0.71	5.15	4.78	3.65	3.76
2003	1.53	4.93	4.94	3.21	3.34	0.00	6.38	7.90	8.09	6.36	0.62	6.13	5.56	3.88	3.81
All years	4.85	5.24	5.32	4.06	4.33	6.46	5.99	4.88	4.06	4.25	5.37	5.64	5.23	4.27	4.59

While our subsequent results are robust to all four of our estimated firm default models, we present results using the panel logit model with the Zmijewski (1984) covariates as our model of firm default. Our approach to estimating expected debt returns differs from several previous studies that use Moody's historical default rates tables and transition matrices for public bonds of different credit ratings (Elton, Gruber, Agrawal, and Mann, 2001; Campello, Chen, and Zhang, 2008). Explicitly modeling the default likelihood for borrowing firms provides two advantages. First, the use of credit rating information will reduce the size of our sample significantly as most of our sample consists of private loans without credit ratings. Second, we are able to employ firm characteristics to assess the likelihood that a loan will default, which is what credit scorers do when they assign a credit score to a bond. Thus, our estimation procedure offers a significantly finer estimate of default risk relative to the methods used in previous studies.

B. Loan Recovery Rates

To estimate the expected returns for our sample of loans, we need an estimate of the loan recovery rate (in addition to our estimates of firm default probabilities). Unfortunately, information on private debt recovery rates is sparse in comparison to the information available for public debt. We assume a recovery rate of 70% throughout the analysis, using Moody's studies' average estimated recover rate for private debt (Moody's Investors Service, 1998, 2000). However, we also examine the effect of alternative recovery rates (60%, 80%) and varying the recovery rate across firm types (lower recovery rates for small, growth firms and higher recovery rates for large value firms). None of these perturbations have a significant effect on our results.

C. Default Model Estimation

In this Appendix, we describe the estimation of the firm default models and how we use them to predict the loan default probabilities to calculate our expected loan returns in Section IV. We estimate four different models of firm default. First, we estimate two panel logit models, one with the covariates of Altman (1968) and one with the covariates of Zmijewski (1984). We then estimate two Cox proportional hazard models using the two different sets of covariates.

The panel logit models take the form:

$$\Pr(\textit{Firm } j \textit{ defaults in quarter } t) = \Lambda(b_0 + b_1 X_{j,t-1} + e_t). \tag{A1}$$

Here, Λ is the standard cumulative logistic distribution function, and X is a matrix of firm-level accounting information taken from the previous quarter.

In the Altman (1968) specification of the panel logit, the covariates are WC/TA (WC = working capital = current assets – current liabilities; TA = total assets), RE/TA (RE = retained earnings), EBITA/TA (EBITA = earnings before interest, taxes, and amortization), ME/TL (ME = market equity; TL = total liabilities), and S/TA (S = sales).

In the Zmijewski (1984) specification, the covariates are NI/TA (NI = net income), TL/TA (TL = total liabilities; TA = total assets), and CA/CL (CA = current assets; CL = current liabilities). We estimate these two panel logit models on the subsample of firms in Compustat that also appear in Dealscan (i.e., they take out a loan from 1987 to 2003, as recorded in Dealscan). We include all quarters for which we have Compustat data in our estimations. In both models, we also include a dummy variable *LOAN*, which equals one in the quarter in which a firm takes out a loan. The estimated coefficients for both the Altman (1968) and Zmijewski (1984) models are reported in the last two columns of Table A.II.

Table A2. Default Probability Model

The sample consists of all nonfarm, nonfinancial, nonutility domestic firms entering into US dollar-denominated loans between 1987 and 2003 and appearing in both the Dealscan and merged CRSP/Compustat databases. The table presents coefficient estimates from four empirical models of default differing in the econometric method employed (hazard model or panel logit) and covariate specification (variables used by Zmijewski, 1984, or Altman, 1968). The hazard specifications are estimated on the Dealscan sample only. The panel logit specification is estimated on the entire Compustat database over the period 1987-2003, using an indicator variable (LOAN) to identify Dealscan firms. WC/TA is the ratio of working capital (current assets – current liabilities) to total assets. RE/TA is the ratio of retained earnings to total assets. ME/TL is the ratio of market equity to total liabilities. S/TA is the ratio of sales to total assets. NI/TA is the ratio of net income to total assets. TL/TA is the ratio of total liabilities to total assets. CA/CL is the ratio of current assets to current liabilities. Obs. is the number observations. The *t*-statistics are presented in parentheses.

Variable	Hazard Zmijewski	Hazard Altman	Logit Zmijewski	Logit Altman
Constant			−4.785***	−5.488***
			(−24.12)	(−17.90)
WC/TA		0.150		−0.573***
		(0.61)		(−8.08)
RE/TA		−0.134**		0.054***
		(−1.96)		(4.58)
EBITA/TA		−2.296***		−1.659***
		(−7.11)		(−8.76)
ME/TL		0.081***		−0.361
		(−3.99)		(−1.32)
S/TA		0.217***		0.133
		(3.75)		(0.87)
NI/TA	−1.125***		−0.998***	
	(−6.71)		(−7.95)	
TL/TA	1.268***		0.092**	
	(7.61)		(2.53)	
CA/CL	0.064**		−0.930***	
	(1.99)		(−6.31)	
LOAN			0.920***	0.928***
			(7.24)	(−7.32)
Obs.	13,515	11,624	250,725	250,725
Pseudo-R^2			(0.086)	(0.087)

***Significant at the 0.01 level.

**Significant at the 0.05 level.

Using our panel logit estimates, we calculate the probability that the borrowing firm defaults in each six-month period of its loan. The predicted probability that a firm defaults in a given quarter is

$$PP_{i,t} \equiv \Pr\ edicted\ \Pr\ ob\, Firm\, j\, defaults\, in\, quarter\, t = \Lambda(\hat{b}_0 + \hat{b}_1 X_{j,t-1}), \tag{A2}$$

where $\hat{b}$ are the estimated coefficients. The probability of firm default in a six-month period is $1 - ((1 - PP_{j,t}) * (1 - PP_{j,t-1}))$, or one minus the probability that the firm does not default in either of the two quarters comprising the six-month period, $(1 - PP_{j,t}) * (1 - PP_{j,t-1})$.

When predicting probabilities using the panel logit estimates, we use realized financial statement numbers and assume that banks can accurately predict the evolution of firms' characteristics.

Thus, the predicted loan default probability is a function of the borrowing firm characteristics at the time of the loan, the bank's prediction of the firm's future characteristics, and the loan maturity. If future data for a firm are not available, then we assume future values of the covariates equal the final observed values.

The Cox proportional hazard model takes the form of:

$$h(t, X_j) = h(t, 0)\exp[\beta' X_j]. \tag{A3}$$

The function $h(t, X_j)$ is the hazard rate at time t for a firm j with covariate X, or the probability that a firm with covariate X defaults conditional on surviving to time t. The dependent variable in our Cox proportional hazard model is the time it takes a firm to default from the point at which it takes out a loan on Dealscan. A loan is classified as defaulting if the borrower files for bankruptcy before the maturity of the loan. The maximum likelihood estimation accounts for right censoring in the time to default dependent variable. The first two columns of Table A.II report the estimated coefficients for the two different hazard models using the Altman (1968) and Zmijewski (1984) covariates.

To predict the probability of firm default for each six-month period of a loan, we compute the survival function at the end of the six-month period and subtract it from the survival function at the beginning of the six-month period. The survival function is defined as

$$S(t) = \exp(-H(t)), \tag{A4}$$

where $H(t)$ is the integrated hazard function given by:

$$H(t) = \int_0^t h(s, 0)\exp(\beta' X_j)\, ds. \tag{A5}$$

We use the predicted firm default probabilities in each six-month period of a loan, together with an assumed recovery rate, to compute expected cash flows and an internal rate of return, or expected rate of return, for our sample of loans as described in Section IV.

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