An Empirical Analysis of the Cost of Borrowing*

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Abstract

This paper studies the cost of borrowing of firms using a novel security-level database of US firms that includes both bank loans and corporate bonds. Our findings reveal significant within-firm dispersion, with firms issuing various securities at different interest rates within each quarter. For the average firm, there is a 42 basis points gap between the highest and average interest rates paid on new originations. Within-firm dispersion explains over 19% of the total variance in interest rates across the dataset, rising to 45% for large firms that issue both bank loans and corporate bonds. After controlling for observable characteristics, we find that bank loans are 100 bps cheaper than corporate bonds on average, with the bond-loan spread widening for firms with high default probability.

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*The views expressed here are those of the authors and do not necessarily reflect official positions of the Federal Reserve Bank of St. Louis, the Federal Reserve System, or its Board of Governors.

1 Introduction

An important question in macro-finance is what is the actual cost of capital for firms. We study a measure of the cost of capital for US firms by constructing a novel security-level database that captures both bank loans and corporate bonds issuances. Our research uncovers a significant amount of within-firm dispersion in the cost of borrowing. Firms borrow from multiple sources each quarter, often at very different costs. As a consequence, the cost of capital is heterogeneous even within the boundaries of each individual firm.

For a typical firm, the highest interest rate paid within a quarter exceeds the average interest rate on new debt by about 70 basis points. This reflects a significant amount of within-firm dispersion in interest rates, which accounts for over 25% of the total variance of interest rates in the entire dataset. For large firms, who borrow across multiple types of credit instruments, this within-firm variation accounts for up to 60% of total variation in interest rates. Our analysis uncovers significant differences between bank loans and corporate bonds, with bank loans being on average cheaper than bonds once observable characteristics and contractual terms are controlled for. We find that this observed bond-loan spread rises for firms with higher default probabilities.

Almost all of the existing studies on borrowing costs rely on loan data from Dealscan, which only covers large syndicated loans, and firm financial data from Compustat, which contains detailed financial information only for US publicly traded firms. Using detailed supervisory data on loans, we compile a new security-level database of US firms issuing both bank loans and corporate bonds. Our analysis relies on two main data sources. First, we use the Federal Reserve's FR Y-14Q Schedule H.1 which contains detailed information on loan facilities originated by large US banks, as well as detailed financial for those borrowers. We then merge this data with the Mergent Fixed Income Securities Database (FISD), which provides us with detailed information on the characteristics of corporate bond issuances. The final output is a quarterly, security-level database with detailed information on bank loans, corporate bonds, and firm financials. This final dataset encompasses 323 thousand loans and about 12.4 thousand bonds issued by 154 thousand unique firms.

Our analysis begins in section 3 by proposing new measures of the cost of capital of firms. We compute three indicators at the firm level: (i) the average interest rate paid on all outstanding liabilities, (ii) the average interest rate on all new issuances at each quarter, and (iii) the maximum interest rate contracted each quarter. After aggregating each of these measures, we find an average gap between new and maximum new rates of about 75 basis points (bps). This suggests that these is considerable heterogeneity in interest rates contracted by the average firm. We also find that the average interest rate in new issuances is consistently below the average rate on existing issuances for most of the sample, a likely consequence of the low interest rate period that follows the 2007-08 Financial Crisis and subsequent Great Recession. These results are not driven by the level of interest rates in the economy, and we obtain similar conclusions by looking at credit spreads instead.

Next, in section 3.2, we investigate this within-firm heterogeneity in interest rates further. Specifically, we find that, on average, the gap between the average interest rate on new issuances and the highest rate on these new issuances is of 50 bps, which again is consistent with the idea that there is substantial heterogeneity in interest rates contracted by firms in any given period. In section 4, we perform a variance decomposition of the interest rates that we observe in our sample. We find that, out of the total variance of interest rates, 19% can be attributed to time effects, 57% is attributed to within-firm variation, and 24% is residual variation (within firm and time variation). We show that observable characteristics such as credit amounts, or maturity of the security do not explain a very significant share of this residual variation. Among large firms, which regularly issue both bonds and loans, we find that the security type can explain up to 8% of total interest rate dispersion within a firm and a quarter.

Based on these observations, Section 5 defines the *bond-loan spread* as the difference in the interest rate between bonds and loans for the same borrower in a given quarter. First, to estimate the bond-loan spread we perform a within-firm estimation and find that loans are, on average, 100 basis points (bps) cheaper than bonds, after we control for many confounding factors. This estimate accounts for firm-time fixed effects as well as security-level controls such as the maturity, the size of the issuance, and loss given default on the security. This result is robust to several alternative specifications, such as considering term loans and credit lines separately, comparing syndicated vs non-syndicated loans, grouping issuances by amount, maturity or firm's probability of default, using an interest rate spread, or using a full sample of observed securities instead of just securities at origination. We also find that this bond-loan spread is increasing in the borrower's probability of default.

2 Data Description

Main Datasets and Scope. We build a novel security-level panel spanning 2013Q1 to 2022Q3 that contains information on lending from large bank holding companies (BHC), corporate bonds, and firms' balance sheets. We rely on two main sources of data: (i) the Federal Reserve's FR Y-14Q H.1 schedule, which contains information for loan facilities and firm balance sheet data, and (ii) Mergent Fixed Income Securities Database (FISD), which provides information on corporate bonds.

The FR Y-14Q H.1 schedule contains detailed data on commercial & industrial lending for large BHCs. All BHCs with more than $50 billion in total consolidated assets prior to 2019, and $100 billion after, are required to report detailed balance sheet data to the Fed for stress testing purposes. For most of our sample, the data includes reporting by 33 BHCs. For each of these, we observe all loan facilities that have committed exposures of $1 million or more.[1] Banks only report loan facilities on their balance sheets, and so we stop observing a loan if it is sold or securitized. We see quarterly loan facility level data on interest rates, maturity, seniority, facility type, committed and utilized exposure, collateral market value, loss given default (LGD), and syndicated status, among other loan characteristics. Furthermore, we observe financial data at the firm level such as assets, liabilities, sales, income, and probability of default (PD). Two major advantages of the Y-14 data are the size of the data and the ability to see both small and large firms. Commonly used loan datasets such as the Shared National Credit database or Dealscan tend to contain only syndicated loans, which restricts the sample to larger firms.

The Mergent Fixed Income Securities Database (FISD) is our main source of data for bond issuances. The FISD covers a significant number of US corporate issuances, and provides information on bond issuance, offering amount, maturity, coupon, seniority, issuer, and a number of bond type flags (callable, putable, covenant, asset-backed, or rule 144a for example).

To define a firm, we use the S&P Business Entity Cross Reference Service (BECRS). The BECRS creates a linkage between firms and their ultimate parent, allowing us to identify subsidiaries and treat them as the same firm as their parent company. This is particularly important given the disaggregated nature of the FR Y-14 dataset, where the main firm identifier is the borrower's Tax Identification Number (TIN). Large corporate groups can have dozens or even hundreds of subsidiary companies, each with their own TIN. We create a firm id using the 6-

[1] A loan facility may be comprised of many separate loan types grouped into one facility.

digit firm CUSIP, grouping together CUSIPs with the same ultimate parent. Using CUSIPs, we then merge the firm id to both the Y-14 and FISD. For firms in the Y-14 without a match to the BECRS data, we rely on the TIN as the firm id.[2]

Sample Selection. We apply a series of filters in order to clean the data and exclude observations that are not comparable for our purposes. First, we keep only US firms and exclude firms in finance (NAICS code 52) and public administration (NAICS code 92). We exclude convertible bonds. We augment our dataset with information on whether a bond has been called or not from Bloomberg.[3]

Summary Statistics. Table 1 presents summary statistics for the main variables used in the empirical analysis that follows. The final dataset contains over 392 thousand observations, for 154,429 unique firms, where each observation is a security origination. We observe a larger number of bank loans (322,937 unique loans) than corporate bonds (12,418 unique bonds). The discrepancy between the total number of observations and the number of unique loans and bonds is related to the re-issuance of loans, which occurs if the terms of a loan are substantially altered.

Panels A and B report summary statistics on standard contractual characteristics for bonds and loans, respectively. First, we see that the average maturity of bonds is almost twice as long as that of loans: 11.7 vs. 6.2 years.[4] A significant percentage of loans tend to have a very short maturity (the 10th percentile of loan maturities is less than 1 year), while a significant share of bonds have maturities over 30 years (the 90th percentile).

Second, the Table shows that bond issuances tend to be much larger in dollar amounts than loans: almost $700 M for the average bond versus $10 M for the average loan. The 90th percentile of loan sizes is considerably below the 10th percentile of bond sizes.

Third, we find that average interest rates on bond issuances are higher than those of loans, which is perhaps not surprising in light of the two previous facts: the average and median interest rates are 79 bps and 70 bps higher, respectively. We also compute interest rate spreads

[2]For more details on the definition of a firm, see A.3

[3]Appendixes A.1, A.3, and A.3 provide additional details on the cleaning and construction of the variables.

[4]Demand loans and revolving credit lines do not have an associated maturity, so we can interpret them as having infinite maturity. Given the existence of a positive term spread, we make a conservative assumption and assign a maturity of 30 years for these securities. Our main results are robust to assuming shorter maturities.

by taking the difference between the interest rate at origination and the yield on a government security with equivalent maturity on the date of origination. We use nominal yield data from Gurkaynak et al. (2007).[5] By computing the spread using a maturity-matched yield, our measure of spreads partly accounts for the term premium. As a result, we find more compressed differences in spreads: 28 bps on average and -25 bps for the median. There are many other reasons and characteristics for why interest rates should vary between bonds and loans. Later, in section 5, we conduct a more thorough analysis where we show that there are systematic differences between the prices of these two types of securities even when other observable security and firm characteristics are taken into account.

Panel C of Table 1 presents summary statistics on some of the firm-level characteristics that we include in our analysis. Some of these statistics are computed using reported balance sheet data from the FR Y-14Q, or by aggregating the security-level data at the firm level.[6] The table shows that only 4.34% of firms in our sample issue bonds. The loan share, defined as the ratio of loans to the sum of loans and bonds is 96.31% on average, which reflects the relative rare usage of bonds as a financing instrument. Once we condition on issuing bonds, the loan share becomes 14.95%, which reflects the previously discussed fact that bond issuances tend to be much larger than loans in dollar terms.

The leverage ratio in our sample is of 67.76%, which is a reasonable value for non-financial firms. The tangible share of assets (tangible assets over total assets) is about 89%. Total assets show that our coverage of firms is wide and skewed right – the median firm has about 23 million in total assets, while the mean firm has 1.3 billion. The probability of default, at the firm level, is 2.5%.[7] Finally, the two last rows of Panel C show that security issuance is relatively infrequent, with the average firm issuing 0.2 securities per quarter, and the 90th percentile equal to zero. The following row repeats this analysis for firms that issue both loans and bonds; these tend to be larger firms that issue securities more often, and thus the average number of issued securities is 1.55 per quarter.

Table 2 breaks down the different types of loans that we observe in the dataset. As opposed

[5]Data available from the Federal Reserve Board here.

[6]We do not necessarily observe firm financial information on every quarter.In our analysis, we only consider the quarters for which we have financial data, resulting in just over 580k firm-quarter observations. As robustness, we have also created a yearly median of financial data, and interpolated the missing observations using prior year financial variables. This procedure generates very similar results.

[7]This probability of default is reported by the FR Y-14Q lenders, and refers to the expected probability of default over the next year.

Table 1: Summary Statistics

Security Level	mean	sd	p10	p50	p90
Panel A: Bonds					
Maturity (yrs)	11.81	9.96	4.05	8.54	30.04
Amount (mil$)	698.71	718.49	122.57	500.00	1,350.00
Interest Rate (bps)	432.20	180.43	219.15	412.50	683.40
Interest Rate Spread (bps)	216.34	167.39	60.77	157.40	473.43
Panel B: Loans					
Maturity (yrs)	6.33	7.40	0.93	4.98	15.01
Amount (mil$)	10.37	40.05	0.82	2.73	24.82
Interest Rate (bps)	366.76	159.36	180.63	348.00	584.00
Interest Rate Spread (bps)	190.95	137.24	25.59	185.16	361.89
Loss Given Default	32.07	16.81	8.00	31.90	50.00
Panel C: Firms					
Share of Firms with Bonds	4.50	20.73	0.00	0.00	0.00
Loan Share, $l/(l+b)$	96.16	18.09	100.00	100.00	100.00
Loan Share given $b>0$	14.63	17.78	0.58	7.47	40.61
Leverage	67.26	25.60	35.15	67.13	95.52
Tangible Share of Assets	89.13	19.15	60.69	98.69	100.00
Total Assets ($ mil)	1,395.65	12,110.47	3.62	23.91	862.66
Probability of Default	2.47	7.72	0.16	0.76	4.10
Securities Issued	0.18	0.95	0.00	0.00	0.00
Securities Issued given $b>0$	1.50	3.29	0.00	0.00	4.00
Panel D: Observations					
N	395798				
N Firms	158455				
N Loans	333629				
N Bonds	13520				

to standard datasets (such as Dealscan or SNC), the majority of the loans are non-syndicated (72%). The data contains slightly more credit lines than term loans (50% vs. 43%), both syndicated and non-syndicated. Additionally, 6% of our loans are neither term loans or credit lines, with most of these being classified as capitalized lease obligations.

Table 2: Loan Types

	Freq.	Percent
Non-syndicated Credit Line	131293	36.46
Non-syndicated Term Loan	128210	35.61
Syndicated Credit Line	46935	13.03
Syndicated Term Loan	30867	8.572
Other	22779	6.326

Coverage. To measure the aggregate coverage of our Y-14/ FISD merged dataset, we compare our data to aggregate measures of outstanding bonds and Commercial & Industrial lending. Figure 1 compares amounts outstanding in our merged dataset to these aggregate measures. For bonds, we compare our data to a measure of bonds issued by the nonfinancial corporate sector from the Flow of Funds (FL103163003Q). We consistently obtain slightly larger amounts outstanding than what is reported in the flow of funds (above 14% more), which could reflect either the fact that we miss some bonds that have been called, or imputation issues with the flow of funds. For loans, we compare total amounts outstanding in our dataset to measures of all C&I lending, and C&I lending by large banks from FRED (BUSLOANS and CIBOARD, respectively). We cover an average of 95% of C&I lending by large banks, with the remaining 5% likely representing loans under the Y-14 reporting threshold. This is supported by the fact that we tend to miss a larger share in 2020, at a time when many firms were tapping into their credit lines and increasing their borrowing supported by public programs such as the Paycheck Protection Program.

Figure 2 plots the histogram of liability coverage at the firm-level. From the Y-14, we can observe firm financials, including total liabilities, at certain quarters. For those quarters, we compute the ratio of total loans and bonds outstanding to total liabilities of the firm. The figure shows that average coverage is 60%, with median coverage being 42%.[8]

[8] A significant share of liabilities for nonfinancial firms consists of trade credit and accounts payable.

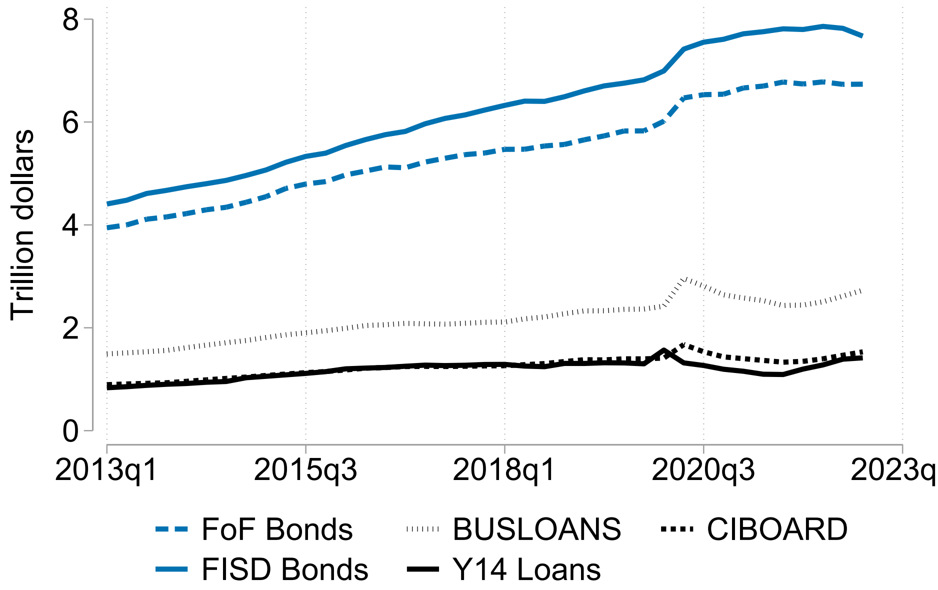


Figure 1: Aggregate data vs. merged Y-14/FISD dataset

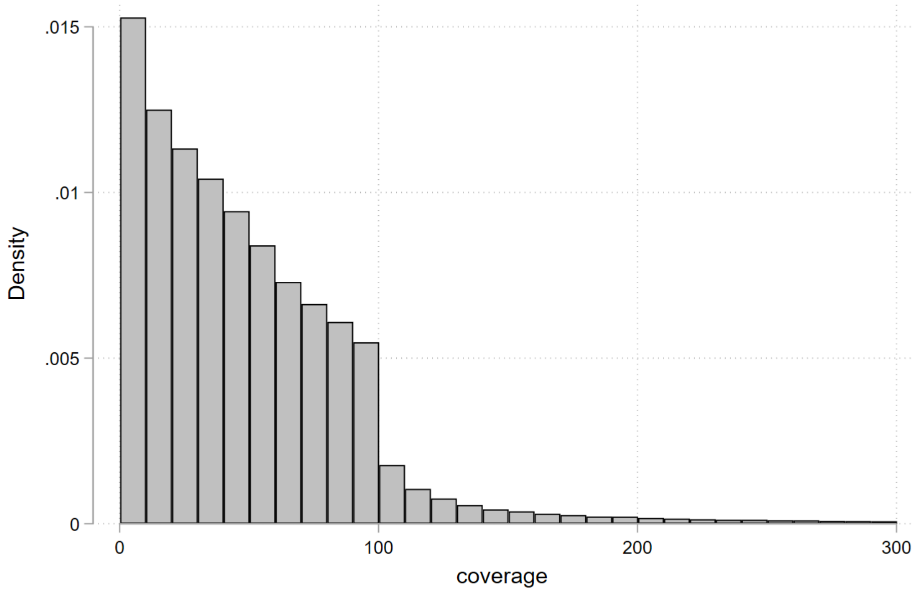


Figure 2: Histogram of Utilized Exposure over Liabilities by firm-quarter

3 The Cost of Capital

We begin our analysis by computing a series of measures of cost of borrowing at the firm level.

3.1 Interest Rate Measures

First, we define the **average interest rate** as the average interest rate a firm pays on all existing securities in a given quarter, weighted by the size of the security (measured as amount outstanding for the case of bonds and amount utilized for the case of loans). This is similar to the "implied average interest rate" that can be computed from Compustat data, by dividing interest expenditures by debt outstanding.

Next, we define two new measures based on security issuance activity in a given quarter. We define the **new interest rate** to be the average interest rate a firm pays on all newly issued securities in a given quarter, again weighted by the size of each security. Finally, we define the **marginal interest rate** as the highest interest rate that a firm pays among all newly issued security in a given quarter. These two measures coincide if a firm only issues one security in a given quarter.

To understand the variation in the data consider the following hypothetical examples. First, if we only observe one security for a firm, the three measures (average, new, and marginal) will be equal. Second, if we observe multiple securities for a firm, but only one new issuance in a given quarter, the new and marginal will be equal, but the average will not. Third, if the firm issues multiple securities each quarter, then the three measures can potentially be different. Therefore, these measures capture the within-firm variation both across and within each quarter.

Figure 3 plots the aggregate time series for each of the three measures of the cost of capital. These aggregate time series are computed as medians across firms, weighted by total amount utilized on newly issued securities. Panel (a) shows the three measures for interest rates, while panel (b) show the three measures for interest rate spreads. By construction, the marginal interest rate is always weakly larger than the new interest rate: this gap is about 75 bps, on average. This reveals that there can be substantial heterogeneity in interest rates paid by each particular firm within a quarter.

For almost the entire sample, the average interest rate is higher than the new. This is to be expected given the low interest rate period that followed the 2007-08 Great Financial Crisis and subsequent Great Recession, with higher average interests reflecting past issuances. Additionally, both during and after the COVID-19 crisis , the marginal interest rate is higher than the average interest rate, meaning that some newly issued securities pay higher rates than the average interest rate for securities in firms' balance sheets. This happened for two different reasons. During COVID-19 we observed an increase in credit spreads while starting in 2021 we observed an increase in the underlying risk-free rate as the Fed started tightening monetary policy.

One way to partly account for this interest rate level effect is to consider instead maturity-matched interest rate spreads, as shown in Panel (b) of the same figure. This figure shows that the average and new spreads are quite similar, with the only significant deviations between the two occurring during the COVID crisis. The marginal spread is between 25 and 124 bps above the new credit spread, an indication that there is still significant within-firm heterogeneity even when variation in maturity of newly issued securities is taken into account.

There are still many other security characteristics beyond simple maturity that could account for this heterogeneity among interest rates paid by firms, such as the type of security they are issuing, the amount they are borrowing, or the fact that different firms may have different probabilities of default.

3.2 Gap Measures

A related way to look at how this within-firm heterogeneity in interest rates evolves is by looking at the marginal rate gap: the difference between the marginal and the new interest rates.

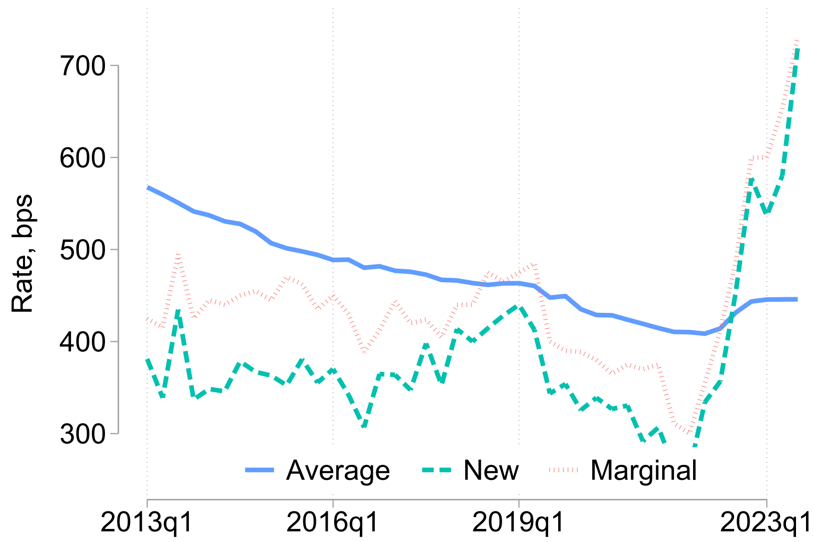
$$\text{Marginal Rate Gap}^{\text{new}}_{t,f} = \text{Marginal Interest Rate}_{t,f} - \text{New Interest Rate}_{t,f}$$

If all the securities issued by firm f in period t have the same interest rate, then the marginal rate gap would be zero. Instead, if a firm pays different interest rates across securities issued in the same quarter, the marginal rate gap is strictly positive. We also define a gap as the difference between the marginal and the average interest rates. The two gaps measure the extent the within firm heterogeneity on the interest rates being paid in a given quarter. Panel (a) of Figure 4 shows the weighted median of firms' interest rate gaps, conditioning on firms that have two or more new issuances in each quarter.

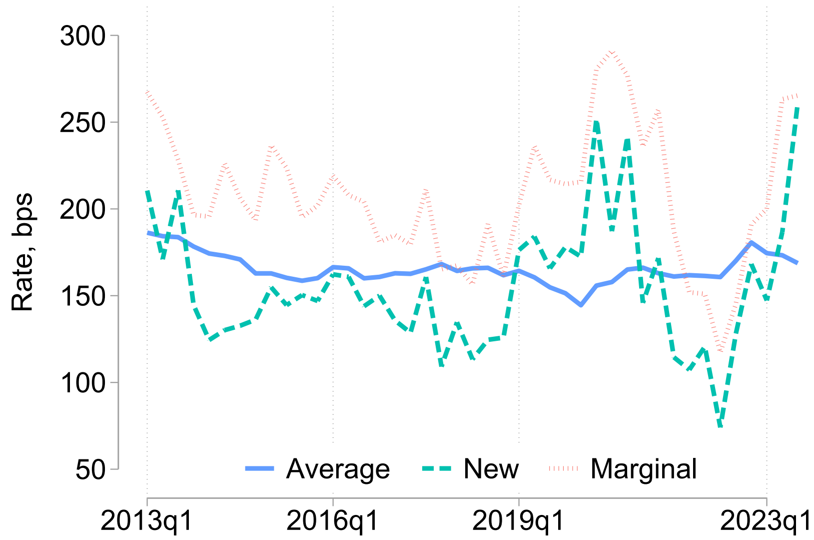
The Marginal Rate Gap$^{\text{new}}$ is over 50 bps for most of our sample, implying substantial within firm variation on interest rates that are being issued each quarter. The Marginal Rate Gap$^{\text{avg}}$ has a higher variance across time, and is even negative for some quarters, implying that the most expensive issuance in a quarter can still be cheaper than the average interest rate paid by a firm on existing securities. Panel (b) shows the gaps for maturity-matched interest rate

Figure 3: The Cost of Capital

(a) Interest Rates



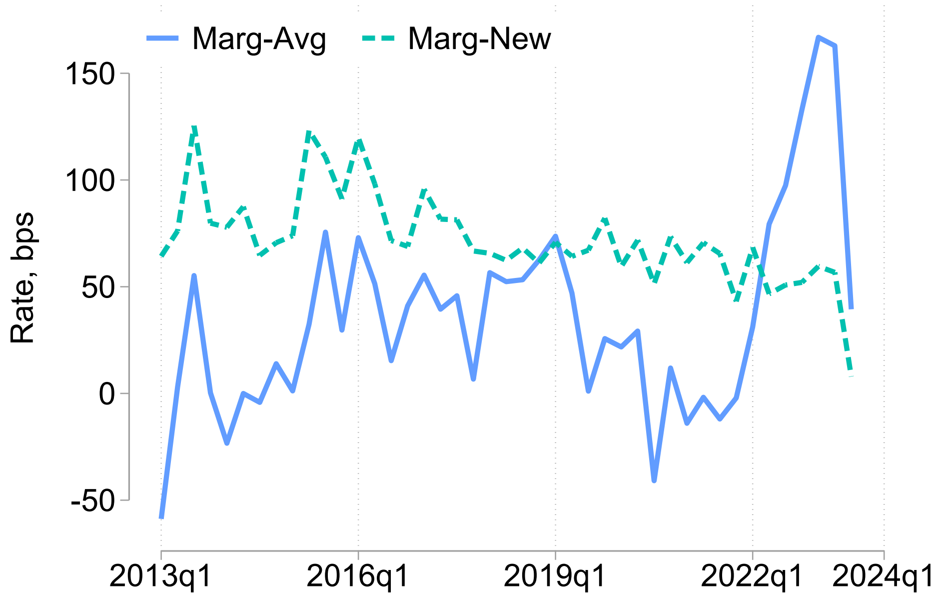
(b) Interest Rate Spreads



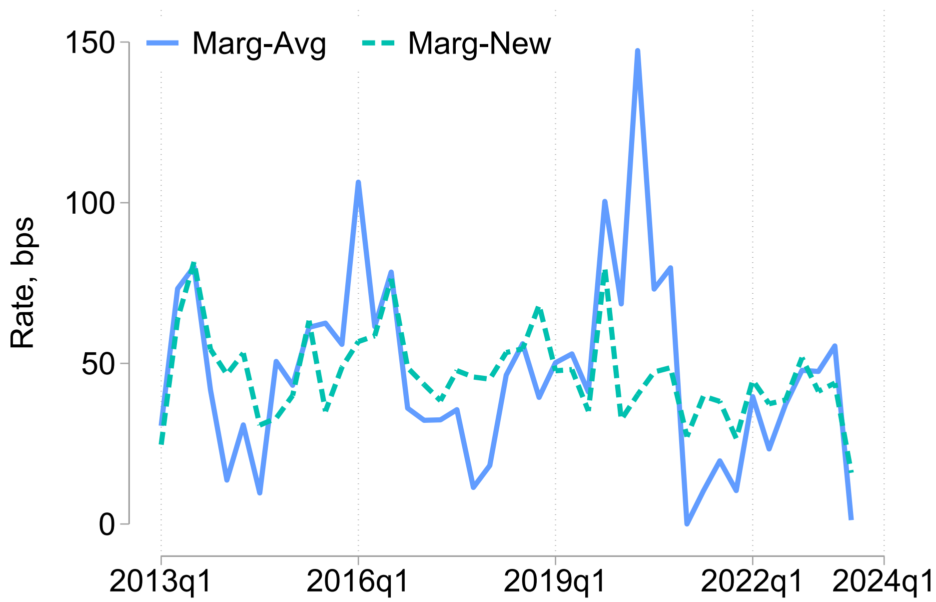
spreads, which helps control for interest rate level effects. We find a similar picture for the Marginal Rate Gap^{new}, but a higher Marginal Rate Gap^{avg}.

Figure 4: Marginal Rate Gaps

(a) Interest Rates



(b) Interest Rate Spreads



4 Variance Decompositions

We now specify a statistical model that allows us to perform a variance decomposition of interest rates. This helps us quantify how much of the dispersion in interest rate is due to within-firm dispersion versus other factors, such as aggregate time variation of certain security characteristics. Let $r_{t,f,a,s}$ be the interest rate of firm f at quarter t for security type a, and security s. We can decompose this rate into a time-average component γ_t, a time-firm component $\beta_{t,f}$, a time-firm-type component $\alpha_{t,f,a}$ and a residual $\varepsilon_{t,f,a,s}$. We consider different definitions of type: maturity bins, amount binds, and/or the type of security (bond vs. loan). We decompose the variance by taking averages in an iterative manner following Daruich and Kozlowski (2023), such that:

$$r_{t,f,a,s} = \gamma_t + \beta_{t,f} + \alpha_{t,f,a} + \varepsilon_{t,f,a,s}$$

4.1 Interest Rate

Table 3 presents the results of the variance decomposition for different types of models. In the first row, we consider only time and time-firm effects. The second row considers all set of controls, which also include time-firm-type, time-firm-type-maturity and time-firm-type-maturity-amount effects. The following rows include each of these additional factors individually. The Table shows that, regardless of the specification, about 25% of the total variance in interest rates is accounted for by within-firm dispersion. Variation across time accounts for 19% of total variance, while dispersion across firms accounts for 57%. Security type within a firm-quarter only accounts for 1.23% of the variation, while other characteristics explain less than 1% (maturity and amount).[9]

Table 3: Variance Decomposition

	Time	Firm	Security Type	Maturity	Amount	Residual
(1)	39.15	41.74				19.11
(2)	39.15	41.74	.84			18.27
(3)	39.15	41.74		.18		18.93
(4)	39.15	41.74			.65	18.46
(5)	39.15	41.74	.84	.08	.12	18.07
	N Firms	158454				
	N Securities	395798				

Notes: Each cell presents the share of the total variance explained by each component. By construction, each row adds up to 100% of the total variance.

[9]The order in which we place the controls can potentially matter for the results. For example, if you have two controls that are exactly equal, by construction the control you put second will explain 0% of the variance. Nevertheless, we corroborated that regardless of the ordering, security type, matturity, and amount have a very small explanatory power.

4.2 Credit Spreads

Table 4 repeats the exercise for maturity-matched credit spreads as opposed to interest rate levels. The contribution of the time average is lower at 4.5%, as most of this aggregate time variation arises from interest rate level effects. Across-firm variation now explains close to 70% of total variation, while the contribution of other observable factors is still very small. This leaves about a quarter of variation unexplained at the within-firm-quarter level, a very similar share to that obtained using interest rates instead of spreads.

Table 4: Variance Decomposition Interest Rate Spread

	Time	Firm	Security Type	Maturity	Amount	Residual
(1)	5.36	67.48				27.38
(2)	5.36	67.48	.4			26.99
(3)	5.36	67.48		.71		26.67
(4)	5.36	67.48			.41	26.98
(5)	5.36	67.48	.4	.83	.14	26.02
	N Firms	158302				
	N Securities	395029				

Notes: Each cell presents the share of the total variance explained by each component. By construction, each row adds up to 100% of the total variance.

4.3 Small vs Large Issuers

There is significant variation in the number of securities that firms issue per quarter, as shown in Section 2, which can play an important role in driving the importance of within-firm dispersion for the variance of interest rates. Larger firms tend to issue more securities, as well as more varied types of securities, which tends to raise this within-firm dispersion component. On the other hand, larger firms tend to be more transparent due to reporting requirements, which could contribute to interest rate compression and a reduction in the importance of this component. A priori, it is not clear whether the within-firm dispersion component should increase or fall depending on the share of large firms in our sample.

Table 5 repeats the interest rate variance decomposition exercise for subsets of firms that have more than two, four, six, and eight issuances in at least a quarter.[10] The share of within-firm dispersion seems to increase as we restrict the sample to firms that issue larger numbers of securities, suggesting that the "variety" effect dominates.

[10]Results are similar if we look at firms that have more than two, four, six, and eight issuances on average across quarters.

Table 5: Variance Decomposition by Issuances

Num Securities	Time	Firm	Security Type	Maturity	Amount	Residual
2+	40.08	32.01	1.46	.26	.18	26
4+	45.1	23.54	1.71	.63	.24	28.78
6+	48.5	20.83	1.75	.71	.19	28.02
8+	50.73	19.45	1.74	.79	.11	27.18
N Firms	21095					
N Securities	139591					

Notes: Each cell presents the share of the total variance explained by each component. By construction, each row adds up to 100% of the total variance.

4.4 The Role of Security Type for Large Issuers

The previous subsections suggest that the security type (whether the credit facility is a loan or a bond) explains an extremely small share of total variation of interest rates. This could be, however, a direct consequence of the fact that our sample includes many more loans than bonds: bonds are just over 3% of all the issuances in our sample. To account for this imbalance, we repeat the baseline decomposition for a sub-sample of firms-quarters in which firms have both loans and bonds. Table 6 presents the results, showing that over 50% of the variation is coming from within-firm dispersion, even after controlling by firm, security type, maturity and amount. This result is not surprising in light of Table 5, which suggests that the within-firm variation becomes more important for larger issuers. These larger issuers are also more likely to be issuing bonds. In this case both the security type, maturity, and amount explain over 10% of the variation. In this exercise, the order in which we place the security characteristic matters for share of the variance explained by each factor. Therefore, this experiment cannot help us understand which of the three characteristics is more important. In the next we estimate an alternative specification in order to study how interest rates vary across security types, maturity, and amount.

Table 6: Variance Decomposition on firms with loans and bonds

	Time	Firm	Security Type	Maturity	Amount	Residual
(1)	32.36	18.23				49.41
(2)	32.36	18.23	5.76			43.66
(3)	32.36	18.23		4.91		44.5
(4)	32.36	18.23			4.35	45.06
(5)	32.36	18.23	5.76	1.03	.53	42.1
	N Firms	1701				
	N Securities	936773				

Notes: Each cell presents the share of the total variance explained by each component. By construction, each row adds up to 100% of the total variance.

5 The Bond-Loan Spread

Motivated by our previous findings, that security type and other characteristics can contribute to explaining variation of interest rates within a firm and a quarter, we set up a formal specification in order to study how interest rates vary across security types. We estimate the following panel regression:

$$y_{f,t,s} = \alpha_{f,t} + \sum_{i=l,b} \gamma_i \mathbb{I}(\text{security type}_{f,t,s} = i) + \Gamma X_{f,t,s} + \varepsilon_{f,t,s} \quad (1)$$

where $y_{f,t,s}$ is the interest rate paid by firm f in quarter of origination t on security s, regressed on the security type (bond or loan). $\alpha_{f,t}$ is a firm-quarter interacted fixed effect, and we include other controls $X_{f,t,s}$ (e.g. the maturity and amount borrowed of the security). The main coefficient of interest are γ_l and γ_b, which capture the differences in interest rate due to the security type.

Table 7 shows the main empirical estimates. Our benchmark specification in column (1) contains firm-quarter fixed effects, maturity, and the size of the credit facility. Contrary to what is commonly assumed in the literature, our results show that loans have a significantly lower interest rate than bonds—an average discount of 161 bps in our baseline specification.

Next, we want to control for the default probability of the firm. Since the default probability is measured at the firm level, we can no longer include the firm-quarter interacted fixed effect. Instead, we include firm and quarter fixed effects separately (i.e, not interacted). Column (2) shows that the loan-bond spread is the same if we include firm and time fixed effects separately. Next, column (3) controls for the default probability and shows that the coefficient on loans reduces by 18 basis points. The results are consistent with the baseline and show that loans are between 144 bps cheaper than bonds—keeping all other variables constant. The estimated coefficient on default is of 202: an increase of one standard deviation in the probability of default (9.29%) implies an increase in the interest rate of about 1,876 basis points.

Column (4) controls for the loss given default (LGD). We observe LGD data for loans from the Y-14 database. For bonds we use the estimates in Moody's Investors Service (2015) which estimate the expected loss given default for different class of bonds (it varies from 47% for senior secured bonds up to 75% for junior bonds). For each bond we assign the expected LGD corresponding to each bond class. Controlling for LGD reduces the bond-loan spread by about 42 bps, but bonds remain 118 bps more expensive than loans.

The results in column (3) and column (4) suggest that a fraction of the loan-bond spread documented in columns (1) and (2) can be attributed to either variation in the default probability and/or variation in the loss given default between bonds and loans. Nevertheless, column (5) shows that there is a large and significant bond-loan spread even after controlling for both the default probability and the loss given default.

Table 7: The Bond-Loan Spread

	(1)	(2)	(3)	(4)	(5)
Maturity	0.60***	0.31***	0.31***	1.02***	0.35***
	(0.07)	(0.05)	(0.06)	(0.08)	(0.06)
Amount	-0.01***	-0.02***	-0.02***	-0.00	-0.01***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Loan	-152.37***	-154.85***	-135.10***	-106.08***	-123.61***
	(3.54)	(2.75)	(2.72)	(3.89)	(2.84)
Default Probability			206.31***		193.33***
			(7.26)		(7.72)
Loss Given Default				0.45***	0.34***
				(0.04)	(0.02)
Constant	495.40***	508.77***	495.71***	446.62***	477.65***
	(3.52)	(2.81)	(2.81)	(4.24)	(3.18)
Observations	139591	295234	200353	93699	177690
Adjusted R^2	0.801	0.712	0.727	0.817	0.730
Firm-Time FE	Yes	No	No	Yes	No
Firm FE	No	Yes	Yes	No	Yes
Time FE	No	Yes	Yes	No	Yes

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

5.1 The default elasticity of the bond-loan spread

We evaluate in more detail how the bond-loan spread varies with the probability of default of the firm. First, we repeat the estimation, but only on the subsets of firms with the lowest and highest deciles of default probability. Table 8 shows that firms in the bottom decile of the default probability, meaning they are less likely to default, have loans that cost 37 bps less than bonds all else equal. In the top decile, on the other hand, loans are 247 bps cheaper than bonds. This suggests that not only there is a significant difference in pricing between bonds and loans, but that this difference widens as firms become riskier.

Table 8: The Default Elasticity of Bond-Loan Spreads

	(1)	(2)	(3)
Maturity	0.31***	3.55***	-0.01
	(0.06)	(0.17)	(0.15)
Amount	-0.02***	-0.01*	-0.03**
	(0.00)	(0.00)	(0.01)
Loan	-135.10***	-28.06***	-259.53***
	(2.72)	(7.04)	(10.55)
Default Probability	206.31***		
	(7.26)		
Constant	495.71***	316.71***	602.39***
	(2.81)	(6.59)	(10.59)
Observations	200353	12013	36335
Adjusted R^2	0.727	0.811	0.752
Firm-Time FE	No	Yes	Yes
Firm FE	Yes	No	No
Time FE	Yes	No	No
Prob. Default	Cont.	Below p10	Above p90

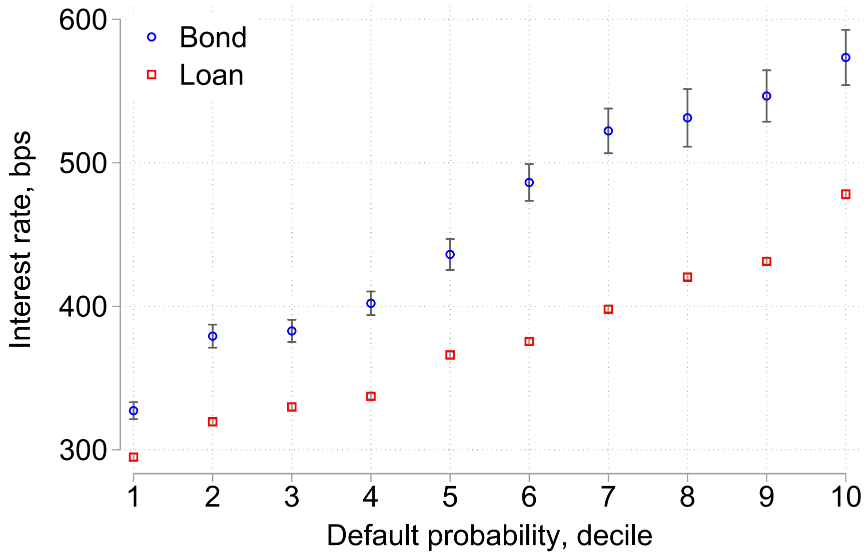
Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

We take this analysis further by formally estimating the bond-loan spread for each decile of the default probability. Specifically, we estimate

$$y_{f,t,s} = \alpha + \sum_{i=1}^{10} \beta_i \mathbb{I}(\mathrm{q}_{f,t} = i)\mathrm{maturity}_{f,t,s} + \sum_{i=1}^{10} \delta_i \mathbb{I}(\mathrm{q}_{f,t} = i)\mathrm{amount}_{f,t,s} \qquad (2)$$
$$+ \sum_{i=1}^{10} \sum_{j=1}^{2} \gamma_{i,j} \mathbb{I}(\mathrm{q}_{f,t} = i)\mathbb{I}(\mathrm{s.t.}_{f,t} = j) + \varepsilon_{f,t,s}$$

where $q_{f,t}$ is the decile of the default probability distribution. Figure 5 shows for each decile the value of $\alpha + \gamma_{i,j}$ for both bonds and loans. This corresponds to the interest rate that firms pay for bonds and loans grouped by a firm's default probability. Similar to the result in Table 8, firms with lower default probability pay relatively similar rates for bonds and loans. The slope of this relationship, however, is much steeper for bonds than for loans. This implies that as a firm becomes more likely to default, the spread between bonds and loans increases.

Figure 5: The Default Elasticity of the bond-loan spreads



Notes: The Figure shows for each decile the value of $\alpha + \gamma_{i,j}$ for for each decile, both for bonds and loans, together with a one standard-error confidence interval.

5.2 Robustness

We now briefly discuss the robustness of the previous result, while Appendix A provides additional estimates.

Loan types: credit lines and syndicated loans. Our baseline analysis pools together all loans when comparing them to bond securities. There are, however, many different types of bank loans as discussed in section 2. We repeat our analysis by separately treating credit lines from term loans, and syndicated from non-syndicated loans.

Credit lines are a type of loan where the lender defines a borrowing limit (the so-called committed exposure) that can be fully or partially utilized by the borrower, potentially several times (depending on whether it is a revolving or non-revolving line of credit). We run our benchmark regressions with an indicator function, $\mathbb{I}(\text{st}_{f,t,s} = i)$, that now distinguishes between term loans, credit lines, and bonds. Columns (2) and (5) of Table 9 shows both term loans as well as credit lines are cheaper than bonds (the base category). Moreover, credit lines are cheaper than term loans. Our dataset also gives us information on whether a loan facility is part of a syndicated loan or shared credit facility. As before, we split all loan facilities into two types: syndicated and non-syndicated. Columns (3) and (6) of Table 9 again show that loans are cheaper than bonds, and that syndicated loans tend to be cheaper than non-syndicated ones.

Table 9: The Bond-Loan Spread: Credit Lines and Syndicated Loans

	(1)	(2)	(3)	(4)	(5)	(6)
Loan	-160.65***			-144.18***		
	(3.57)			(2.76)		
Term Loan		-154.97***			-137.49***	
		(3.56)			(2.76)	
Credit Line		-168.98***			-154.28***	
		(3.58)			(2.77)	
Non-syndicated			-146.71***			-129.04***
			(3.60)			(2.82)
Syndicated			-171.67***			-154.19***
			(3.57)			(2.75)
Constant	477.50***	478.33***	475.89***	475.71***	476.61***	469.21***
	(3.56)	(3.54)	(3.52)	(2.85)	(2.84)	(2.83)
Maturity	0.96***	0.98***	0.93***	0.51***	0.52***	0.50***
	(0.07)	(0.07)	(0.07)	(0.06)	(0.06)	(0.06)
Amount	-0.01***	-0.01***	-0.01***	-0.01***	-0.01***	-0.01***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Default Probability				202.69***	202.59***	203.71***
				(7.03)	(6.99)	(7.06)
Observations	139144	139144	139144	199760	199760	199760
Adjusted R^2	0.744	0.745	0.746	0.649	0.652	0.652
Firm-Time FE	Yes	Yes	Yes	No	No	No
Firm FE	No	No	No	Yes	Yes	Yes
Time FE	No	No	No	Yes	Yes	Yes

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Bond types The final database has 12,418 unique bonds after all the cleaning described in Appendix A.2. We also run our benchmark regressions distinguishing bonds of different types. Now, $\mathbb{I}(\text{st}_{f,t,s} = i)$ indicates loan, bond, and special type of bond. For brevity, we report only the coefficients of $\mathbb{I}(\text{st}_{f,t,s} = i)$ for both loans and the type of bond. The results are summarized in Table 10. First we look at callable bonds, i.e. bonds in which the borrower has the option to prepay or redeem before the maturity date. Most of our bonds (93%) are callable, and the results are thus very similar to the benchmark, with loans being about 114 bps cheaper than regular bonds, and callable bonds being about 5 bps more expensive than regular ones. Second, we distinguish putable bonds, where the holder can demand early repayment (24 unique bonds), and asset-backed bonds (33 unique bonds), again with similar results for the loan coefficient.

We also observe that a large number of bonds (8,937 bonds) have covenants, but discriminating them yields results that are very similar to those of the benchmark regressions, with covenants generating slightly higher bond-loan spreads.[11] Finally, we also distinguish 144A bonds, which can only be held by qualified institutional buyers, and find that they are more expensive than regular bonds (93 bps), with the bond-loan spread being slightly smaller (88 bps).

Table 10: Bond types

Bond Type	N	β Loan	β Bond
Callable	12656	-143.13	-8.73
		(10.5)	(10.57)
Putable	27	-135.13	-9.01
		(2.73)	(44.92)
Asset Backed	33	-135.14	-30.44
		(2.73)	(34.97)
Covenants	9693	-158.35	-31.19
		(4.45)	(4.58)
Rule 144a	3953	-101.86	103.44
		(2.83)	(4.02)
Total	13520		

Security Size. Even though we explicitly control for facility size in our baseline regression, the summary statistics in section 2 raise the possibility that we may simply comparing large bonds to small loans, and that bonds are therefore more expensive simply because they are so much larger in terms of size. To try to account for this, we run our benchmark regression with firm-time fixed effects on different facility size bins. In each of our bins, we condition on the security being a different size. Table 11 reports the results, with each column corresponding to our baseline regression specification for a different size bin. We also report the number of loans and bonds in each size bin. We find a statistically significant bond-loan spread for all bins except for the two smallest ones, $1-5 M and $5-10 M.

5.3 Quantity of Issuances

Moving from prices to quantities, we estimate a specification similar to that of 1, but using facility size as the dependent variable, and including the interest rate as a control. We regresss the log size of the facility on the interest rate, maturity, LGD, and an indicator for whether the security is a loan or a bond. Table 12 shows the results for variations on this base specification.

[11] We only observe a flag for having covenants, but we do not actually observe the covenant description.

Table 11: The Bond-Loan Spread: Similar Sized Security Bins

	(1)	(2)	(3)	(4)	(5)	(6)
Maturity	-2.05***	0.08	0.46**	0.65**	4.57***	5.77***
	(0.12)	(0.41)	(0.20)	(0.26)	(0.41)	(0.13)
Loan	-4.90	-79.94	-236.18***	-357.38***	-139.38***	-107.90***
	(37.51)	(61.79)	(29.37)	(51.84)	(13.73)	(25.90)
Constant	377.18***	414.62***	569.81***	673.22***	392.98***	309.74***
	(37.04)	(61.36)	(29.46)	(51.80)	(8.77)	(2.04)
Observations	40940	9172	31282	4112	3310	5207
Adjusted R^2	0.837	0.860	0.888	0.931	0.797	0.790
Firm-Time FE	Yes	Yes	Yes	Yes	Yes	Yes
N Loans	40384	9050	31188	4077	1669	79
N Bonds	556	122	94	35	1641	5128
Amount Bin	1-5	5-10	10-50	50-100	100-500	500up

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

First, we look only at origination amounts, collapsing loans by bank-quarter to compare all lending from the same bank. We find that bonds are substantially larger than loans, about 19 log points with firm-time fixed effects, and 16 log points for firm and time fixed effects.

5.4 Which firms issue bonds?

To formally analyze the determinants of bond issuance, we estimate a linear probability model where the dependent variable is equal to 100 if the firm issues bonds, and the regressors are different types of firm characteristics.[12] Table 13 shows that bond issuers tend to be larger (have more assets), and have higher leverage ratios, and lower shares of tangible assets.

6 Conclusions

We build a new security-level database of US companies issuing both corporate bonds and bank loans. We show that bank loans are significantly less expensive than corporate bonds, and this bond-loan spread is greater for companies with higher default probabilities. We build a dynamic corporate finance model. Firms can issue both secured (loans) and unsecured (bonds) debt. Secured debt is subject to a collateral constraint, but firms can also issue unsecured debt once the collateral constraint becomes binding. As a result, there is equilibrium default in both secured and unsecured debt. We find that around 25% of the bond-loan spread can be explained by the unsecured nature of corporate bonds.

[12] Results are robust to alternative model such as logit ones.

Table 12: Bond-Loan Differences in Quantity Origination

	(1)	(2)	(3)	(4)
Maturity	0.0231	0.0239	0.0666***	0.0670***
	(0.047)	(0.047)	(0.013)	(0.012)
Interest Rate	-0.0159***	-0.0160***	-0.0091***	-0.0092***
	(0.002)	(0.002)	(0.001)	(0.001)
Loan	-19.7216***	-19.1114***	-16.6490***	-16.3122***
	(1.047)	(1.275)	(0.697)	(0.782)
Loss Given Default		0.0080		0.0048
		(0.009)		(0.004)
Default Probability			1.5871***	1.5908***
			(0.592)	(0.592)
Constant	48.9180***	48.1500***	39.7616***	39.2987***
	(1.439)	(1.632)	(0.830)	(0.949)
Observations	61313	61313	154640	154640
Adjusted R^2	0.115	0.115	0.113	0.113
Firm-Time FE	Yes	Yes	No	No
Firm FE	No	No	Yes	Yes
Time FE	No	No	Yes	Yes

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

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Gurkaynak, R. S., Sack, B., and Wright, J. H. (2007). The u.s. treasury yield curve: 1961 to the present. *Journal of Monetary Economics*, 54(8):2291–2304.

Moody's Investors Service (2015). Annual Default Study: Corporate Default and Recovery Rates, 1920-2014. Working paper.

Table 13: Probability of Issuing Bonds

	(1)	(2)
Assets	4.74***	4.32***
	(0.02)	(0.02)
Leverage	5.75***	6.24***
	(0.15)	(0.25)
Tangible / Total Assets	-2.91***	-4.01***
	(0.18)	(0.23)
Constant	-79.91***	-71.68***
	(0.46)	(0.51)
Observations	634671	628388
Adjusted R^2	0.263	0.340
Time FE	Yes	No
Time-NAICS FE	No	Yes

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Online Appendix

A Empirical Appendix

A.1 Data: Y14

This section explains the sample selection of the Y-14 data, the construction of the variables used in the empirical analysis.

Sample Selection Our sample selection criteria follow standard practice in the literature. We exclude all firm-quarters for which:

(i) Loans not in the U.S. (Field 6 Country is not U.S.)

(ii) Industry is financial or public administration (Field 8 IndustryCode is 52 or 92)

(iii) Committed Exposure is negative or zero (Field 24 CommittedExposure ≤ 0)

(iv) Utilized Exposure is negative (Field 25 UtilizedExposure < 0)

(v) Utilized exposure is higher than committed (Field 25 UtilizedExposure > Field 24 CommittedExposure)

(vi) The date is after the maturity date (Field 0 D_DT, the date of observation, is after Field 19 MaturityDate)

(vii) The date is before the origination date (Field 0 D_DT is before Field 18 OriginationDate)

(viii) The loan is classified as municipal or foreign (Field 26 LineReportedOnFRY9C loan type is not 3, 4, 8, 9, or 10[13].)

Construction of variables We construct the key variables employed in the empirical analysis as follows. In the Y-14 we have two levels of analysis: security level and firm level. Therefore, we have two sets of variables The variables from collateral share up to probability of default are calculated at the security-quarter level. Starting at probability of default and going until

[13] 3 - Loans to finance agricultural production and other loans to farmers, 4 - Commercial and industrial loans to U.S. addresses, 8 - All other loans, excluding consumer loans, 9 - All other leases, excluding consumer leases, 10 - Loans secured by owner-occupied nonfarm nonresidential properties originated in domestic offices

coverage, the variables are calculated at the firm-quarter level. Variables at the security-quarter level:

(i) Collateral Share: ratio of loan collateral over amount utilized on the loan for loans with first or second lien. We cap collateral share at 1.

(ii) Maturity: The difference between maturity and origination dates (Field 19 MaturityDate - Field 18 OriginationDate).

(iii) Amount: The utilized exposure on a loan (Field 25 UtilizedExposure).

(iv) Default probability: We define the default probability at the firm-quarter level. For each firm-quarter, we take the median of the PD of all loans in that quarter (Field 88 ProbabilityOfDefault).

(v) Collateral share: The collateral market value divided by the utilized exposure of the loan. We cap the collateral share at 1 (Field 93 CollateralMarketValue divided by Field 25 UtilizedExposure).

(vi) Loan type: We use the credit facility type to create broad categories of revolving credit lines and term loans (Field 20 FacilityType - credit lines defined as 1-6, term loans defined as 7-13).

(vii) Syndicated loans: We use a participation flag to define if a loan is syndicated or not (Field 34 ParticipationFlag - 1 is not syndicated, 2-5 syndicated).

(viii) Interest rate: The interest rate on a loan (Field 38 InterestRate).

(ix) Interest rate spread: We calculate the interest rate spread using the nominal yields from Gurkaynak et al. (2007). For each loan, we calculate the maturity remaining to the nearest year, and subtract from the interest rate the nominal treasury yield with maturity equal to maturity remaining. (Field 38 InterestRate, nominal interest yields from the Board of Governors). We follow the same process for both loans and bonds, using (Issue coupon) as the initial interest rate for bonds.

(x) Lien Position: The possible lien positions of loans are first lien senior, second lien, senior unsecured, and contractually subordinated (Field 35 LienPosition).

Variables at the firm-quarter level:

(i) Probability of default: the median of a firm across observations (i.e., across different securities from potentially different banks) in a quarter.

(ii) Expected loss: We multiply PD and LGD together to calculate expected loss (Field 88 ProbabilityOfDefault * Field 89 LGD).

(iii) Total Assets: We use the log of total assets (Field 70 TotalAssetsCurrent).

(iv) ROA: We calculate return on assets as the net income divided by the total assets (Field 59 NetIncomeCurrent / Field 70 TotalAssetsCurrent).

(v) Leverage: We define leverage as total liabilities divided by total assets (Field 80 TotalLiabilities / Field 70 TotalAssetsCurrent).

(vi) Liquidity Ratio: We define the liquidity ratio as the difference between current assets and current liabilities divided by total assets ((Field 66 CurrentAssetsCurrent - Field 76 CurrentLiabilitiesCurrent) / Field 70 TotalAssetsCurrent).

(vii) Tangible / Total Assets: We define this as the ratio of tangible assets and total assets (Field 68 TangibleAssets / Field 70 TotalAssetsCurrent) .

(viii) Long Share of Debt: We define the long share of debt as the total observed amount utilized by a firm for both bonds and loans, with maturity of over a year, divided by the total observed borrowing.

(ix) Loan Share: We define the loan share as the total utilized value of loans divided by the total observed utilized value of loans and bonds. For firms with no bonds, the loan share will be $= 1$.

(x) Coverage: We define the coverage as the total utilized value of loans and bonds divided by a firm's total liabilities.

A.2 Data: FISD

This section explains the sample selection of the FISD data, the construction of the variables used in the empirical analysis.

Sample Selection Our sample selection criteria follow standard practice in the literature. Our final sample is 2013Q1 - 2022Q3, but we view the FISD bonds only at origination. Because of this, we start the "sample" – the bonds that we are viewing at origination – in 1990q1. Thus if a bond has a maturity of 20 years and originates in 2000q1, we will have this bond in our sample from 2013q1-2020q1. We exclude all firm-quarters for which:

(i) Industry is financial or public administration (Issuer NAICS_Code is 52 or 92)

(ii) Bond issuer or issue not in US (Issuer or Issue Country_Domicile not USA)

(iii) Issuer or issue industry was government (Issue industry_group is 4)

(iv) Currency is not USD (Currency not either USD or missing)

(v) Bond is not a corporate bond (Bond_type not CCOV, CCPI, CDEB, CLOC, CMTN, CMTZ, CP, CPAS, CPIK, CS, CUIT, CZ, RNT, UCID, or USBN)

(vi) Bond is not convertible (convertible not yes)

Further, we download data from Bloomberg on bonds that have been called, and the date they were called. We merge that data to FISD using the nine digit security level cusip, and drop bond observations that are in or after the quarter the bond was called.

Construction of variables We construct the key variables employed in the empirical analysis as follows.

(i) Maturity: Difference between maturity and origination dates (Issue Maturity - Issue Offering_date).

(ii) Amount: The offering amount of the loan (Issue Offering_amt).

(iii) Collateral share: We set it equal to zero.

(iv) Bond type: We have flags for a number of bond types. Specifically, if a bond is convertible, putable, callable, asset backed, rule 144a, or if it has a covenant (Issue convertible, putable, announced_call asset_backed, rule_144a, and covenants respectively).

(v) Interest rate: Issue coupon (Issue coupon_type) .

(vi) Lien position: The seniority level for bonds contain the following possibilities: none, junior, junior subordinate, subordinate, unsecured, senior, and senior secured. (Issue security_level).

A.3 Firm-level data

This section explains how we create the final firm identifier, how we assign bonds and loans to this firm, and the calculation of the calibration targets. The Y-14's main firm identification variable is the tax identification number (TIN). To begin, we define a firm by grouping TINs. For any loans that are missing TINs, we define the firm by grouping loans that share an ObligorName, ZipCode, and IndustryCode. In order to merge the Y-14 and FISD, we use S&P's Business Entity Cross Reference Service (BECRS). The BECRS contains CUSIP level information, and contains the ultimate parent of each CUSIP. We create an ultimate id for a firm that contains the ultimate parent, and every CUSIP of that firm or their subsidiaries. Then, we merge the BECRS ultimate id to the Y-14 using the 6-digit firm CUSIP. After merging the BECRS to the Y-14, we carry forward the ultimate id by firm for any missing ultimate ids. To settle any within firm-quarter discrepancies (A Y-14 firm, as defined by TIN, with multiple CUSIPs in the same quarter, that point to different ultimate parents in the BECRS), we assign the ultimate id with the most observations in a firm-quarter to all observations in that firm-quarter. The FISD uses the firm CUSIP identifier, so we can simply merge with the BECRS.

A.4 Interest Rate Spread

Results are very similar if we use interest rate spreads with respect to the risk-free rate as the dependent variable, instead of the level of the interest rate. We use nominal yield data from Gurkaynak et al. (2007) to calculate the interest rate spread.[14] We define the interest rate spread as the security's interest rate less the nominal yield with maturity equal to the maturity left on the security.[15] Table A1 shows that the results are robust to consider the interest rate spread with respect to the risk-free rate instead of the interest rate level.

A.5 Seniority of securities

Initially, we include all types of seniority in our sample. Next, we run our benchmark regressions on a subset of our original sample containing only loans that are first-lien senior

[14] Data available from the Federal Reserve Board here

[15] For demand loans and credit lines without a well-defined maturity date, we use the 30 year nominal yield

Table A1: Interest Rate Spread

	(1)	(2)	(3)	(4)	(5)
Maturity	-4.90***	-5.81***	-4.26***	-3.21***	-4.06***
	(0.10)	(0.06)	(0.07)	(0.10)	(0.07)
Amount	-0.01***	-0.02***	-0.02***	-0.01***	-0.02***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Loan	-128.26***	-136.61***	-118.27***	-91.97***	-108.22***
	(3.31)	(2.48)	(2.55)	(3.69)	(2.68)
Default Probability			186.82***		174.56***
			(6.81)		(7.28)
Loss Given Default				0.47***	0.38***
				(0.03)	(0.02)
Constant	324.43***	354.53***	316.81***	263.32***	296.24***
	(3.33)	(2.54)	(2.63)	(4.10)	(3.04)
Observations	139164	294517	199937	93453	177315
Adjusted R^2	0.706	0.601	0.564	0.713	0.573
Firm-Time FE	Yes	No	No	Yes	No
Firm FE	No	Yes	Yes	No	Yes
Time FE	No	Yes	Yes	No	Yes

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

and bonds that are senior. Our results are provided in Table A2, and are largely unchanged from the benchmark results.

A.6 Credit lines and syndicated loans

Table A3 describes the main variables used in the analysis, but split out between term loans and credit lines, and then split out by syndication status.

A.7 Firms with Loans and Bonds

In this section, we run our benchmark regressions on a sample that contains only firm-quarters in which a firm has both loans and bonds. First, in Table A4 we use only firms that originate both a loan and a bond in a given quarter. Our estimates of the Bond-Loan spread are very similar to the benchmark. Next, in Table A5 we keep only firms that have one security originated in a quarter, but have both bonds or loans in that quarter. Again, the results are largely unchanged.

Table A2: The Bond-Loan Spread: First-Lien Senior Loans and Senior Bonds

	(1)	(2)	(3)	(4)	(5)
Maturity	1.11***	0.37***	0.46***	1.66***	0.49***
	(0.08)	(0.05)	(0.06)	(0.09)	(0.07)
Amount	-0.01***	-0.02***	-0.02***	-0.00	-0.02***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Loan	-143.14***	-134.64***	-115.34***	-84.95***	-96.90***
	(4.71)	(3.33)	(3.28)	(5.43)	(3.55)
Default Probability			200.63***		187.40***
			(8.03)		(8.42)
Loss Given Default				0.63***	0.53***
				(0.05)	(0.03)
Constant	496.38***	497.08***	484.64***	429.06***	453.16***
	(4.54)	(3.35)	(3.31)	(5.75)	(3.97)
Observations	95842	221312	148560	65942	133869
Adjusted R^2	0.805	0.713	0.726	0.819	0.733
Firm-Time FE	Yes	No	No	Yes	No
Firm FE	No	Yes	Yes	No	Yes
Time FE	No	Yes	Yes	No	Yes

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

A.8 All Securities – Not At Origination

Finally, we provide the results from our full sample. The main difference here is that we keep all observations of loans and bonds, regardless of if they were originated in that quarter. This means that we have older loans and bonds that are still in circulation. Using this “full” sample, we find an even larger bond-loan spread, in part due to the existence of older bonds with higher interest rates.

Table A3: Summary Statistics by Security, With Robustness

	mean	sd	p10	p50	p90
Bond					
Maturity (yrs)	11.81	9.96	4.05	8.54	30.04
Amount (mil$)	698.71	718.49	122.57	500.00	1,350.00
Interest Rate (bps)	432.20	180.43	219.15	412.50	683.40
Interest Rate Spread (bps)	216.34	167.39	60.77	157.40	473.43
Loss Given Default	61.23	5.47	47.20	62.60	62.60
Term Loan					
Maturity (yrs)	6.48	5.62	1.00	5.00	10.18
Amount (mil$)	10.41	50.21	1.09	2.59	22.50
Interest Rate (bps)	369.60	152.07	190.45	353.00	572.60
Interest Rate Spread (bps)	184.10	129.70	30.29	177.41	341.26
Loss Given Default	33.60	16.16	13.36	33.00	50.00
Credit Line					
Maturity (yrs)	6.15	9.01	0.77	3.00	30.00
Amount (mil$)	10.33	23.54	0.45	2.98	26.73
Interest Rate (bps)	363.50	167.26	170.00	335.00	600.00
Interest Rate Spread (bps)	198.79	145.00	19.55	196.41	383.64
Loss Given Default	29.95	17.46	8.00	30.00	50.00
Non-syndicated Loans					
Maturity (yrs)	6.82	8.07	0.87	4.98	20.01
Amount (mil$)	6.51	32.45	0.66	2.09	13.34
Interest Rate (bps)	367.68	152.44	189.50	350.00	573.00
Interest Rate Spread (bps)	192.52	134.56	26.33	190.78	358.48
Loss Given Default	31.38	16.98	8.00	31.00	50.00
Syndicated Loans					
Maturity (yrs)	4.50	3.48	1.54	4.99	5.17
Amount (mil$)	24.70	58.24	1.70	12.96	52.25
Interest Rate (bps)	363.31	182.77	163.00	325.00	630.00
Interest Rate Spread (bps)	185.11	146.66	23.42	158.64	389.41
Loss Given Default	34.39	16.00	12.00	35.00	50.50

Table A4: The Bond-Loan Spread: Firms That Originate Both a Loan and Bond

	(1)	(2)	(3)	(4)	(5)
Maturity	2.74***	2.67***	2.96***	3.43***	3.15***
	(0.16)	(0.15)	(0.15)	(0.16)	(0.15)
Amount	-0.02***	-0.01***	-0.01***	-0.01***	-0.01***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Loan	-140.24***	-136.40***	-113.47***	-91.01***	-102.08***
	(3.64)	(3.54)	(3.52)	(4.65)	(4.36)
Default Probability			166.38***		163.99***
			(38.98)		(40.84)
Loss Given Default				0.41***	0.10
				(0.11)	(0.10)
Constant	419.90***	416.61***	397.05***	365.19***	386.78***
	(3.63)	(3.64)	(3.60)	(7.56)	(6.95)
Observations	16633	16633	14069	12452	12116
Adjusted R^2	0.610	0.557	0.573	0.640	0.575
Firm-Time FE	Yes	No	No	Yes	No
Firm FE	No	Yes	Yes	No	Yes
Time FE	No	Yes	Yes	No	Yes

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A5: The Bond-Loan Spread: Firms That Have b>0 in a Given Quarter

	(1)	(2)	(3)	(4)	(5)
Maturity	5.92***	5.79***	5.98***	6.12***	6.03***
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
Amount	-0.05***	-0.05***	-0.05***	-0.05***	-0.05***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Loan	-196.00***	-198.92***	-182.51***	-166.60***	-169.06***
	(0.69)	(0.67)	(0.69)	(0.86)	(0.85)
Default Probability			106.73***		96.50***
			(3.01)		(3.08)
Loss Given Default				0.33***	0.32***
				(0.02)	(0.02)
Constant	477.69***	481.18***	466.32***	446.74***	444.32***
	(0.74)	(0.73)	(0.76)	(1.31)	(1.32)
Observations	936773	936773	850162	818114	772842
Adjusted R^2	0.527	0.481	0.475	0.532	0.475
Firm-Time FE	Yes	No	No	Yes	No
Firm FE	No	Yes	Yes	No	Yes
Time FE	No	Yes	Yes	No	Yes

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A6: The Bond-Loan Spread not at Origination

	(1)	(2)	(3)	(4)	(5)
Maturity	3.91***	3.08***	3.32***	4.21***	3.33***
	(0.02)	(0.01)	(0.01)	(0.02)	(0.01)
Amount	-0.06***	-0.07***	-0.06***	-0.06***	-0.06***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Loan	-216.46***	-227.80***	-208.76***	-176.25***	-192.26***
	(0.74)	(0.69)	(0.73)	(0.81)	(0.76)
Default Probability			92.70***		88.78***
			(0.95)		(0.96)
Loss Given Default				0.69***	0.49***
				(0.01)	(0.01)
Constant	534.20***	564.01***	543.49***	476.39***	512.43***
	(0.77)	(0.73)	(0.78)	(0.97)	(0.88)
Observations	3174611	6152203	4816877	2520016	4597834
Adjusted R^2	0.623	0.648	0.634	0.629	0.640
Firm-Time FE	Yes	No	No	Yes	No
Firm FE	No	Yes	Yes	No	Yes
Time FE	No	Yes	Yes	No	Yes

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

A.9 Maturity and Amount bins

Maturity Buckets	$x < 3$
	$3 \geq x < 5$
	$5 \geq x < 7$
	$7 \geq x < 9$
	$9 \geq x < 11$
	$11 \geq x < 29$
	$29 \geq x < 31$
	$31 \geq x$
Amount Buckets	$0 \geq x < 5$
	$5 \geq x < 10$
	$10 \geq x < 50$
	$50 \geq x < 100$
	$100 \geq x < 500$
	$500 \geq x$