# Bond Lending and Bond Returns*

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**Abstract**

Existing literature finds that proxies for bond short selling activity do not contain information about bond returns. We employ a more comprehensive database over a longer sample period and better benchmarking and find that utilization (fraction of inventory lent) predicts returns. Many lending fees are negative or very low, suggesting the bond loans are financing transactions. The bonds with both high lending fees and high utilization, for which lending is likely associated with short sales, have large and highly significant negative excess returns. These results are robust to controlling for bond characteristics and information from the equity lending market.

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## 1 Introduction

Theoretical literature argues that short sale constraints restrict investors' ability to trade based on negative information, resulting in slow incorporation of information into securities' prices and low or negative future returns.[1] Empirical research finds that measures of short selling and stock lending activity including short interest, lending fees, and utilization predict negative abnormal returns, consistent with short sale constraints.[2] To date, studies have focused mainly on equity lending and short sales. However, in a recent paper Asquith, Au, Covert, and Pathak (2013) use proprietary data from a large securities lender to provide a first look at the market for lending and borrowing corporate bonds. Among their many results, and in contrast to both theoretical predictions and the empirical evidence on equity short selling, they find that for bonds utilization and lending fees do not predict abnormal returns. This result is puzzling and worth revisiting. It might arise if the common assumption that securities loans are for the purpose of short selling does not apply to all bond loans so that measures of lending market activity do not capture shorting activity and short sale constraints for all bonds.

Another reason to revisit the previous findings is that there have been potentially important changes to the bond market after the end of the Asquith, Au, Covert, and Pathak (2013) sample period. For example, hedge fund fixed income assets under management more than tripled from 2006 to 2016, suggesting increased demand to short-sell bonds.[3] Mutual fund (including ETF) holdings of corporate and foreign bonds increased from about 7% to almost 18% of the total amount of corporate and foreign bonds held in the U.S. (Adrian, Fleming, Shachar, and Vogt (2017), Figure 7). On the other hand, dealer inventories of corporate bonds declined dramatically from 2008 to 2016 (Adrian, Fleming, Shachar, and Vogt (2017), Figure 8). Mutual funds, ETFs, and dealer inventories are sources of lent bonds, so these changes in holdings suggest the possibility of changes in the supply of bonds available to be borrowed. Activity in single-name CDS also declined following the financial crisis, suggesting that some short positions that otherwise would have been established via CDS might instead be established in the bond market.

Using a more comprehensive data set of bond loans covering a longer time period, together with three extensions of the analysis in Asquith, Au, Covert, and Pathak (2013), we find that measures

[1] See Rubinstein (2004) for a review of the literature.

[2] For example, Figlewski (1981), Desai, Ramesh, Thiagarajan, and Balachandran (2002), Jones and Lamont (2002), Ofek, Richardson, and Whitelaw (2004), Asquith, Pathak, and Ritter (2005), Boehme, Danielsen, and Sorescu (2006), Cohen, Diether, and Malloy (2007), Diether, Lee, and Werner (2009) Boehmer, Huszar, and Jordan (2010), Engelberg, Reed, and Ringgenberg (2012), Drechsler and Drechsler (2016), Muravyev, Pearson, and Pollet (2017b), Engelberg, Reed, and Ringgenberg (2017), and Henderson, Jostova, and Philipov (2017).

[3] The data underlying this claim are available at https://www.barclayhedge.com/research/indices/ghs/mum/Fixed˙Income.html.

of bond lending activity predict negative abnormal returns, consistent with both theory and prior research on equities. First, we find that utilization predicts excess returns of high-yield industrial bonds over a three-month horizon. When we compute abnormal returns relative to rating- and maturity-matched benchmarks the evidence for high-yield bonds becomes stronger, and we also find that utilization predicts three-month excess returns in the full sample of all corporate bonds. When we examine the subset of bonds with both high lending fees and high utilization, which are the bonds for which lending activity is likely to be associated with shorting, the negative abnormal returns are large and also appear at the one-month horizon. The predictability is also found when we control for bond characteristics and information from the equity lending market using Fama-Macbeth regressions.

The bond lending data we use cover the period from July 2006 through March 2015, inclusive, a total of eight and three-quarters years. They are from the Markit Securities Finance database, which Markit indicates covers about 85% of securities lending activity. In contrast, Asquith, Au, Covert, and Pathak (2013) use proprietary data from a single bond lender over the four-year period from January 2004 through December 2007. They assume their lender's share of the bond lending market equals its share of the equity lending market, which Asquith, Au, and Pathak (2006) estimate to be 16.7%. Most of our data are from after the financial crisis, making it likely that our results also apply to the current (post-financial crisis) bond market. During the period of overlap the bond lending fees in our dataset are less than those in the Asquith, Au, Covert, and Pathak (2013) data, suggesting that their data from a single lender might not be fully representative of the bond lending market.

We also make three changes to the Asquith, Au, Covert, and Pathak (2013) methodology. First, the lower trading frequency and liquidity in bonds as compared to equities suggests that the information reflected in short sales will be incorporated into bond prices more slowly than into equity prices. This implies that researchers should examine returns over horizons longer than the one-month horizon used in most empirical research on short selling, so we also examine three month returns.[4] Second, we use refined benchmarks that explicitly account for credit and interest rate risk to provide a more precise view of abnormal returns than aggregate benchmarks that reflect the overall bond market. Third, a large fraction of the bond-date pairs in our data have low, and sometimes even negative lending fees, which is inconsistent with the assumption that all bond loans are for the purpose of short selling. This implies a distinction between bonds lent for short sales

[4] While the results presented in Asquith, Au, Covert, and Pathak (2013) are for a one-month horizon, they briefly indicate that untabulated results for a three-month horizon are similar to the insignificant one-month horizon results they present.

and loans motivated by other purposes such as the desire of bond lenders to obtain funding. As a result, in some analyses we focus on the subset of bonds for which the bond loans are likely to be motivated by short sales.

We begin our analysis by following Asquith, Au, Covert, and Pathak (2013) and examining one-month abnormal returns relative to equal- and issue-size-value-weighted aggregate bond market benchmarks computed using bond prices from the Trade Reporting and Compliance Engine (TRACE). Using our data and their methodology we also find no evidence of abnormal one-month returns. Extending the return horizon to three months, we find that utilization predicts the abnormal returns of high-yield industrial bonds. The evidence for high-yield bonds becomes stronger when we compute abnormal bond returns using benchmarks formed from bonds matched on rating and maturity. When we use the rating and maturity-matched benchmarks we also find that utilization is significantly related to three-month returns in the full sample of all corporate bonds.

We also find that lending fees for many bonds are negative. These negative lending fees at first glance might seem surprising because they imply that the bond lender pays the bond borrower a rebate (interest rate) on the cash collateral held by the lender that is in excess of the short-term interest rate. In the more common situation with a positive lending fee the rebate rate is less than the short term interest rate, with the difference being the lending fee. While negative lending fees are most common during the financial crisis, they also occur at other times. Even when non-negative, many lending fees were low—for example, the 25th percentile of lending fees was below 5 bps per year in almost half of the sample months. Recognizing that for each bond-date the lending fee we have is the value-weighted average of the fees on outstanding loans and that there is considerable variation in the lending fees on individual bond loans (Asquith, Au, Covert, and Pathak 2013), the lending fees that are positive but close to zero suggest that many of the individual bond loans involve negative fees. Negative lending fees likely reflect financing transactions in which bond lenders pay a rebate rate greater than the short-term interest rate to obtain the cash collateral deposited by the bond borrower (see Pierce (2014) and Foley-Fisher, Narajabad, and Verani (2016)).

Because many bond loans appear to be financing transactions, we examine the returns of portfolios that are double-sorted on lending fees and utilization. By focusing on bonds with both high lending fees and utilization we isolate bonds that are not only highly desirable to sell short but also the most short-sale constrained. As expected, we find large negative abnormal returns on the high-lending fee, high-utilization bonds in both the full sample and the subsample of high-yield industrial bonds at horizons of one and three months. Thus, the combination of the three-month horizon, more refined bond market benchmarks, and a focus on the bond loans likely to be associated with short sales provides the strongest evidence of predictability. The point estimates of abnormal returns also are negative for the high-lending fee, high-utilization investment-grade industrial bonds, but not statistically significantly different from zero. We also adjust the abnormal returns for the cost of borrowing the bonds and find that the returns net of lending fees remain large and significantly different from zero in both the full sample and the subsample of high-yield industrial bonds.

The finding that the negative abnormal returns are larger in high-yield industrial bonds than in investment-grade industrial bonds, where the abnormal returns are not significant, is comforting. In the context of structural credit risk models, if activity in the securities lending market predicts stock returns because it reflects private information about underlying firm asset values then it should also predict the returns of high-yield bonds, because they also are exposed to the risk of changes in firm asset values. The lesser ability to predict the returns of investment-grade bonds is unsurprising because investment-grade bonds have limited exposure to changes in firms' underlying asset values.

Fama-MacBeth regressions show that the abnormal returns on the high-utilization, high-lending fee bonds are significantly negative in both the full sample and the subsample of high-yield industrial bonds even when controlling for various bond characteristics. The point estimates of the negative abnormal returns are actually slightly larger when we control for bond characteristics. The result also survives controlling for information from the equity lending market, though in this case the point estimates of the negative abnormal returns are smaller.

The result that the information in the bond lending market is incremental to the information in the equity lending market may suggest that the bond and equity markets are not fully integrated, consistent with Choi and Kim (2017). However, if supply conditions differ in the stock and bond lending markets then it is possible for bond lending market information to be incremental to equity lending market information even if the demands for shorting stocks and bonds are both driven by the same information about underlying firm values.

Finally, we evaluate the role of single-name CDS in the context of bond short sales by investigating the CDS-bond basis. The basis provides a measure of frictions between trading in the bond vs. the CDS market. Thus, it can be used to gain insight into investors' preferred choice of trading venue to exploit private information. We find that the basis is, on average, positive and significant in the portfolio of high lending fee and high utilization high-yield bonds. This, combined with our result that high lending fee and utilization high-yield bonds have negative abnormal returns, suggests that investors express negative opinions in both the CDS and bond lending markets while preferring the CDS market. We also investigate bonds with and without actively traded CDS. These results, though mixed, are generally consistent with the view that private information is reflected in both the bond and CDS markets.

Because our results about the predictability of bond returns are consistent with the existing results for the equity market, we are left with the same puzzle that appears in the literature on equity short sales—it is not clear why measures of lending market activity that are available to sophisticated market participants are such strong predictors of security returns. A developing literature has begun to consider explanations of the persistent predictability (Duffie, Gârleanu, and Pedersen (2002), Drechsler and Drechsler (2016), Hong, Li, Ni, Scheinkman, and Yan (2016), and Engelberg, Reed, and Ringgenberg (2017)). Our reading of the literature is that the issue is not yet resolved. Regardless, given that our results regarding bond lending activity and bond returns are consistent with the existing results for equities, it seems likely that the same mechanisms explain both phenomena.

The next section of the paper describes the data we use, focusing on the lending fee data and its properties, including the fact that many of the lending fees are negative. Section 3 presents the main results regarding abnormal returns to bond portfolios sorted on measures of lending activity. It first reproduces the results showing no evidence of abnormal returns in Asquith, Au, Covert, and Pathak (2013) using our data, and then goes on to provide the new results about abnormal returns. Section 4 examines whether the abnormal returns differ depending on whether CDS are traded on the bonds, and also shows that the information in the bond lending market is incremental to the information in the equity lending market. Section 5 briefly concludes.

## 2 Data and Summary Statistics

The securities lending data come from the Markit Securities Finance database.[5] The database includes daily data on securities lending activity aggregated to the security level (rather than at the loan level), including the quantity on loan, the number of loans, various measures of loan fees, the numbers of active brokers and lending agents, and other fields. Markit obtains the information from more than 100 lending market participants, including beneficial owners, hedge funds, investment banks, lending agents, and prime brokers. Markit indicates that the reporting contributors account for approximately 85% of U.S. securities loans. Our sample begins in July 2006 because the data

[5]We originally licensed the data from Data Explorers, which was acquired by Markit shortly thereafter. We subsequently acquired an updated version of the data from Markit.

coverage expanded significantly around that time and the data are available at daily frequency beginning June 28, 2006. Our sample ends with March 2015.

The market for securities lending and its institutional arrangements are described in other papers, including D'Avolio (2002), Asquith, Au, Covert, and Pathak (2013), and Kolasinski, Reed, and Ringgenberg (2013). It includes three groups of participants: (i) lenders such as insurance companies, pension funds, and mutual funds, who often lend through agent lenders (custodians), (ii) ultimate borrowers, for example hedge funds, proprietary trading desks, and in the case of stocks, option market makers, and (iii) prime brokers. In the typical triparty agreement, for which we have data, hedge funds and other short sellers borrow the securities from their prime brokers, who in turn borrow from the insurance companies, mutual funds, pension funds, and other lenders (Kolasinski, Reed, and Ringgenberg (2013), especially Figure 1). In this process the prime brokers "mark up" the lending fee, that is they borrow from the original lender and then relend to the hedge fund or other short seller at a higher fee.

Lending fees typically are not quoted directly but rather are derived from quoted rebate rates. The bond borrower usually provides cash collateral to the bond lender, and the bond lender pays interest (the rebate rate) on the cash collateral that it holds. The lending fee is the difference between the market short-term interest rate and the rebate rate paid on the cash collateral.[6] During our data period Markit (and previously, Data Explorers) used the Federal Funds Open rate as the short-term interest rate in calculating the lending fee. The rebate rate can be negative when securities are hard to borrow and the lending fee is high. The lending fee can also be negative, which occurs when the rebate rate that the bond lender pays on cash collateral exceeds the short-term interest rate.

We use the fee variable *VWAF All*, which is the value-weighted average fee received by the lenders on all currently outstanding loans reported to the data provider. This is the best populated fee variable in our version of the Markit database. The database also includes the value-weighted average fees received by lenders on loans originated in the previous one, three, seven, and 30 days. The literature that uses lending fees from Data Explorers or Markit (for example, Drechsler and Drechsler (2016) and Engelberg, Reed, and Ringgenberg (2017)) generally uses one of the lender-side fee measures or a similar lender-side fee measure computed from a proprietary database (for example, D'Avolio (2002) and Asquith, Au, Covert, and Pathak (2013)). Our data also include a buy-side variable *SAF* that is the simple average fee paid by the borrowing hedge funds, and

[6] When the security borrower provides Treasury securities as collateral the lending fee is quoted and Markit derives the rebate rate as the difference between the short term interest rate and the lending fee.

includes the prime broker markups. We do not use *SAF* because this variable is much less well populated, being available for less than 1% of the bond-date pairs for which *VWAF All* is available. Also for equities *SAF* is subject to a selection bias in that this field is less likely to be populated when stocks are hard to borrow (Muravyev, Pearson, and Pollet 2017a), and this may also be the case for bonds. Our use of lender-side fees is relevant for one set of results in which we present abnormal returns net of fees, because the lender-side fees we use are lower bounds on the fees that would be paid by a hedge fund or other short seller.

Turning to other data, we calculate bond returns using bond transaction prices from the Enhanced TRACE dataset. Bond characteristics are taken from Mergent FISD. One analysis uses the CDS-bond basis; for this analysis the CDS data used to compute the basis are from Markit. The par-equivalent spread calculation of the CDS-bond basis also uses Constant Maturity Treasury yields from the Federal Reserve.

Table 1 presents various summary statistics describing the bond lending data. The top panel shows the statistics for all bonds, including those issued by financial and utility companies, in each year of the sample period, while the bottom two panels show for each year the statistics for the samples of investment-grade and high-yield industrial bonds that we use in most analyses. In the sample of all bonds, between about 6,400 and 10,000 unique bonds are lent each year.[7] Conditional on being lent, bonds on average were lent between 13 and 19 times each year, and the annual average loan fee varied from 26 bps in 2006 to 9 bps in 2009 and back up to 22.6 bps in 2015. For the years that appear in both our sample and that used in Asquith, Au, Covert, and Pathak (2013), 2006 and 2007, the mean lending fees in our sample, 26 and 16 bps, are less than the mean lending fees for those years reported in Table 4 of Asquith, Au, Covert, and Pathak (2013).

The financial crisis was associated with a noticeable decline in lending activity: the quantity on loan averaged more than 4% of the amount outstanding during 2006, 2007, and 2008, but never exceeded 1.67% of the outstanding amount after 2008. Utilization, defined as the quantity on loan divided by the quantity available to be lent, was between 12.1% and 14.7% up through 2008, but never above 8.67% after 2008. The fact that the proportionate decline in utilization is smaller than the proportionate decline in quantity on loan suggests that bonds were withdrawn from lending programs following the financial crisis, possibly because some lenders terminated their lending programs. The average loan term also declined.

Comparison of the rows showing the numbers of unique investment-grade and high-yield indus-

[7] The table entry indicating that 6,401 bonds were lent in 2006, and all other entries for 2006, reflect only activity starting in July 2006. The entries for 2015 reflect only activity through March of that year.

trial bonds lent reveals that only about 25% (5,071 of 20,352) and 16.5% (3,320 of 20,352) of the lent bonds were issued by investment-grade and high-yield industrial companies, respectively. The various measures of lending activity (quantity on loan as a percentage of outstanding, utilization, and loan tenure) are higher for high-yield industrial bonds than for investment-grade industrial bonds and the full sample during every year. Lending activity in both investment-grade and high-yield industrial bonds also declined after the financial crisis, similar to the sample of all bonds. The proportionate declines in these measures of lending activity were smaller for high-yield industrial bonds than for the investment-grade industrial bonds and the full sample.

Table 1 also shows that the average loan fee for investment-grade industrial bonds was less than that for high-yield industrial bonds in every year. The overall average fee for investment-grade industrial bonds was only 6.16 bps, well below the 30.43 bps overall average loan fee for high-yield industrial bonds. Strikingly, during 2008 the average loan fee for investment-grade industrials was negative, −16.96%. This negative average lending fee indicates that the interest rate that bond lenders were paying on cash collateral deposited with them exceeded the short-term rate. Pierce (2014) discusses how AIG and some other bond lenders used their bond lending programs as a source of financing in order to obtain funds to invest in long-term securities, including subprime residential mortgage-backed securities (RMBS). During the financial crisis, when bond borrowers sought to terminate the bond loans by returning the borrowed bonds and receiving back their cash collateral, AIG and other securities lenders were unwilling to liquidate their securities portfolios to meet their obligations to return cash collateral because doing so would require the recognition of losses (Pierce (2014), p. 28.). AIG and other securities lenders had insufficient other sources of liquidity to return the bond borrowers' collateral, and compensated the bond borrowers by paying high interest rates on the retained collateral.

Figure 1 shows that negative lending fees also occurred outside the financial crisis. The top panel shows the 5th, 10th, 25th, and 50th percentiles of the distribution of loan fees on investment-grade industrial bonds during each month of the sample period, while the lower panel shows the 50th, 75th, 90th, and 95th percentiles. Figure 2 shows the same percentiles of the distributions of loan fees for high-yield industrial bonds. In the top panel of Figure 1, the 25th percentile of the distribution of lending fees was negative from August 2007 through April 2009, the entire financial crisis. With the exception of September 2006 and March 2007 the 10th percentile was negative from the beginning of our sample in July 2006, and remained negative through June 2009. The 5th percentile was negative in September 2006 and remained negative through September 2009, and went as low as −551 basis points in October 2008. Even the 50th percentile was negative during some months.

The top panel of Figure 2 displaying the 5th, 10th, 25th, and 50th percentiles of the distribution of loan fees on high-yield industrial bonds also reveals that lending fees on these bonds were negative at times during the crisis, though for high-yield bonds the lending fees were not consistently negative throughout the entire crisis. The bottom panels of Figures 1 and 2 show that loan fees at the high percentiles became very high during September 2008.

The top panel of Figure 1 also reveals that for investment-grade industrial bonds lending fees on some bonds were sometimes negative even outside of the crisis. For example, the 5th percentile was negative from July through December 2006, February through June 2010, September through December 2010, June and August 2011, and April 2013. It was less than 0.93 bps for half of the months. The 10th percentile was slightly positive (0.77 bps) during September 2006, but negative during the other five months of 2006 and during April 2013, and was less than 4.7 bps during half of the months. The 25th percentile of lending fees was below 5 bps per year in almost half of the sample months. Even the 50th percentile of lending fees was generally low, as it exceeded 10 bps in only three months (March 2007, September 2008, and March 2015) and was negative in April 2013. Recognizing that for each bond-date the lending fee we have is the value-weighted average of the fees on outstanding loans and that there is considerable variation in the fees of individual bond loans (Asquith, Au, Covert, and Pathak 2013), the average lending fees close to zero suggest that many of the bond loans involve negative fees.

The explanation for the often negative lending fees lies in the fact that a bond loan is not just a loan of a bond, collateralized by cash; it is also a loan of cash, collateralized by a bond. A bond loan can occur because a hedge fund wants to borrow the bond to short-sell it, with the hedge fund providing cash collateral. Or a bond loan can be a financing transaction driven by the bond lender's (cash borrower's) desire to obtain access to the cash collateral to use for other purposes, for example to invest in higher-yielding securities (Pierce (2014), Foley-Fisher, Narajabad, and Verani (2016)). In our data a negative lending fee means that the bond lender (cash borrower) is paying a rate in excess of the Federal Funds Open rate on the cash collateral. This was common during the financial crisis, consistent with the funding liquidity difficulties experienced by many financial institutions during the crisis. The low and sometimes negative lending fees outside of the financial crisis suggests that even outside of the crisis period a large fraction of bond loans were financing transactions.

Bond loans that are financing transactions are unlikely to predict negative bond returns. The prevalence of bond loans with rebate rates greater than or only slightly less than Federal Funds

Open rates suggests that a large fraction of the bond loans are such financing transactions. Thus, in many of the analyses below we focus on a subset of the bond loans that are likely to be motivated by investors' desire to short-sell the bonds, those for which both utilization and lending fees are high. The data used in Asquith, Au, Covert, and Pathak (2013) appear to contain fewer financing transactions, as during the period of overlap the lending fees in the Asquith, Au, Covert, and Pathak (2013) data are higher than those in our data.[8]

To study whether measures of lending activity predict bond returns we must calculate a holding period return for each bond and month, which requires prices at the beginning and end of the month. We use "clean" transaction prices and volumes, cleaned as in Dick-Nielsen (2009, 2014), from Enhanced TRACE beginning in July of 2006 and align them with the bond lending data. In early years Enhanced TRACE provides better coverage than TRACE because it includes both disseminated and non-disseminated transactions. However, because our bond lending sample starts after the last major dissemination phase in February 2005, the main advantage of Enhanced TRACE is that it includes unmasked volume which we use to calculate daily bond prices as the trade volume-weighted average prices. Because the differences between TRACE and Enhanced TRACE are minor, we substitute TRACE for the three sample months January-March 2015 for which Enhanced TRACE was not yet available when we assembled the data.

We combine the transaction data with bond characteristics from the Fixed Investment Securities Database (FISD). These data contain, among other characteristics, the coupon rate, frequency, and first interest payment date. From these we can determine the other interest payment dates for each bond and compute accrued interest for each date. The merge removes 4,492,182 unmatched transactions, many of which are not corporate bonds, from the sample. We focus on the transactions in corporate debentures, medium-term notes, retail notes, medium-term zeros, and zero coupon bonds. Floating rate notes, convertible debt, equity-linked notes, bonds denominated in foreign currency, bonds with warrants or sinking fund provisions, and bonds issued as part of a unit deal are eliminated from the sample. This leaves approximately 73 million bond transactions between 2006 and 2015.

Using the remaining transactions, we estimate end-of-month prices for each bond to use in computing holding period returns. The majority of bonds do not trade every day, which complicates the return calculation. We define the end-of-month price for each bond as the trade volume-weighted

[8] For example, for 2006 the 10th and 25th percentiles of the lending fee in the Asquith, Au, Covert, and Pathak (2013)) data are 8-9 and 12-13 bps (see Asquith, Au, Covert, and Pathak (2013), Table 4), while in our data these percentiles are less than or equal to 0.77 and 4.3 basis points for every month between July and December, 2006.

price over all transactions on the last day the bond trades within the final five days of each month.[9] If the bond does not trade within the five-day window we do not calculate a holding period return for that month or the next. For bonds with consecutive end-of-month prices, we calculate the monthly return as

$$R_t = \frac{P_t - P_{t-1} + AI_t + C_{t-1,t}}{P_{t-1} + AI_{t-1}}$$

where $P_t$ and $P_{t-1}$ are clean end-of-month TRACE prices for months $t$ and $t-1$, respectively. Accrued interest between the last coupon payment date prior to time $t$ and the date the monthly bond price was recorded (time $t$) is denoted by $AI_t$. $C_{t-1,t}$ is the total dollar value of coupon payments made over the month.

The final database of bond returns contains 834,524 bond-month returns for 31,642 unique bonds, over 70% of which are corporate debentures, issued by 4,189 issuers. On average, bonds in our sample return 76 bps per month (42 bps median). The difference between the 76 bps mean bond return in our data and the 40 bps mean return reported by Asquith, Au, Covert, and Pathak (2013) is likely due to the differences in the sample period and composition.

# 3 Lending Activity and Bond Returns

We begin by replicating the previous results using our data. Following Asquith, Au, Covert, and Pathak (2013), each month we sort the sample bonds into portfolios using either the average daily utilization or lending fee during the previous month, where utilization is defined as the percent of loanable inventory that is currently on loan. The idea is that utilization and lending fees proxy for short-sale constraints, as bonds for which a large fraction of inventory has already been lent (high utilization) or with high lending fees are more difficult and/or more costly to borrow and short. Therefore their prices might not fully reflect investors' negative information, and the bonds might subsequently have negative returns.

Table 3 Panel A reports the average monthly returns of utilization-sorted quintile portfolios as well as of portfolios formed from bonds with utilization above the $95^{th}$ and $99^{th}$ percentiles. The top third of Panel A reports results for the full sample of all corporate bonds, while the lower two-thirds reports the corresponding average monthly returns for portfolios of investment-grade and high-yield industrial bonds.

Beginning with the results for the full sample, the second column headed "Number Bonds"

[9] See Bessembinder, Kahle, Maxwell, and Xu (2009) for a more detailed discussion of bond holding period returns.

illustrates the superior coverage of the Markit data. Each utilization quintile on average includes 750 lent bonds with returns in TRACE compared to an average of approximately 450 bonds in Asquith, Au, Covert, and Pathak (2013).[10] The third and fifth columns report the average returns for equal-weighted and issue-size value-weighted portfolio returns. Although our average returns are somewhat larger than those reported by Asquith, Au, Covert, and Pathak (2013), the pattern and general message is similar: neither equal- nor value-weighted returns decrease monotonically with utilization. In fact, only the $99^{th}$ percentile portfolios appear to have lower returns than the others. The average returns of the quintile 5 minus quintile 1 long-short portfolio are only $-6$ and $-11$ basis points, respectively, and not statistically significantly different from zero.

Columns 7 through 9 report average excess returns relative to equal- and issue-size value-weighted aggregate TRACE benchmarks, defined as either the equal- or issue-size value-weighted monthly return over all bonds in TRACE for which we can calculate a monthly return. The average excess returns display the same pattern across portfolios as the raw returns, which must be the case because the same benchmarks are used for the different quintile and percentile portfolios. The average excess returns are lesser than the raw returns because the average benchmark return is positive; in fact, consistent with Asquith, Au, Covert, and Pathak (2013) the average excess returns are negative.[11] This should not be surprising because the sorted portfolios are formed from bonds that are lent, some of which are then shorted, while the aggregate TRACE benchmarks include all bonds, including those that are not lent and shorted. In addition, the risk characteristics of the aggregate benchmarks do not match those of the bonds.[12] These results confirm the prior findings that within the universe of lent bonds those with higher utilization do not experience lower returns, except for the $99^{th}$ percentile portfolios.

The lower two-thirds of Panel A present the average returns of the sorted portfolios of investment-grade and high-yield industrial bonds. We focus on industrial bonds (defined as bonds whose issuers are in Mergent industry group 1) because industrial companies are typically less highly regulated than utilities and financial institutions and may provide a setting in which it is more likely to observe informed trading, and we consider investment grade and high-yield bonds separately because

[10] Asquith, Au, Covert, and Pathak (2013) dropped bond loans that could not be matched with trades during the last three days of each month rather than the last five days.

[11] One difference between our results and the corresponding results in Asquith, Au, Covert, and Pathak (2013) is that we find larger negative average returns. High yield bonds are a larger fraction of the lent bonds than of the TRACE benchmark, and high yield bonds performed poorly during the financial crisis, which is in our sample period but not in that used by Asquith, Au, Covert, and Pathak (2013).

[12] Below we benchmark to portfolios of bonds matched on rating and maturity and find that the average excess returns are generally close to zero, consistent with the hypothesis that the rating- and maturity-matched benchmarks better capture the risks of the bonds.

we expect that the results might differ for the two groups. The results for the one-month excess returns of the investment-grade and high-yield industrial bonds are similar to those for the full sample.[13] One-month excess returns are generally slightly negative but not significantly different from zero across all five quintile portfolios, and no pattern exists in either raw or excess quintile portfolio returns to support the hypothesis that more heavily lent bonds earn lower returns. Again, an exception is that the $99^{th}$ percentile portfolios have lower returns than the others.

Table 3 Panel B reports average monthly returns of quintile portfolios sorted on the average daily lending fee during the previous month, as well as the average returns of the $95^{th}$ and $99^{th}$ percentile portfolios. The results for the full sample of all corporate bonds in the top part of the table provide no support for the hypothesis that higher fee bonds are associated with lower future returns. The third and fifth columns contain the averages of monthly returns for the equal- and value-weighted portfolios, respectively, and the seventh and ninth columns contain the average excess returns. The average raw returns are positive for every portfolio, as expected, and the average excess returns are negative for the first four quintile portfolios but positive for the other portfolios. More importantly, the returns do not decrease monotonically with fees. In fact, for both raw and excess returns the equal- and value-weighted returns for the high-fee quintile portfolio are 29 and 33 bps greater than those of the low fee quintile portfolio, and the returns of the $95^{th}$ and $99^{th}$ percentile portfolios are even larger. The results for the investment-grade and high-yield industrial bonds in the bottom two-thirds of Panel B also do not provide any evidence that average returns are decreasing in lending fees.

In summary, we use our lending data in combination with bond transactions from Enhanced TRACE to construct bond portfolios sorted on utilization and lending fees similar to those investigated in Asquith, Au, Covert, and Pathak (2013). Similar to their results, the average returns of portfolios based on one-dimensional sorts provide no evidence that utilization or lending fees predict subsequent bond returns.

## 3.1 Using different benchmarks and examining three-month returns

Having replicated the existing results using our data, we next use different benchmarks and investment horizons. Although measuring excess returns relative to aggregate TRACE benchmarks accounts for overall bond market returns, it does not take account of differences in bond credit quality and maturity, which create differences in credit and interest rate risk, and thus differences in expected returns. The sorted portfolios will likely vary systematically along these dimensions,

[13] Our results are not sensitive to the our decision to focus on Mergent industry group 1. In untablulated results we find that including all industries yields similar results.

which may obscure any relations between utilization and/or lending fees and returns. Evidence that returns differ by credit rating can be seen in the differences between the average returns investment-grade and high-yield bonds reported in Table 3.

We address this issue by sorting the bond-month observations into seven credit rating categories and eight maturity categories, for a total of 56 groups. The seven credit rating categories are AAA-Aa3, A1-A3, Baa1-Baa3, Ba1-Ba3, B1-B3, below B3, and Not Rated (NR). Letting $\tau$ denote the maturity of a bond in years, the eight maturity categories are $0 < \tau \leq 2$, $2 < \tau \leq 4$, $4 < \tau \leq 6$, $6 < \tau \leq 8$, $8 < \tau \leq 10$, $10 < \tau \leq 15$, $15 < \tau \leq 20$, and $\tau > 20$. For each month we construct the returns of equal- and value-weighted indexes from the returns of the bonds in each of the 56 groups.

The fifth through eighth columns of Table 4 present the average one-month excess returns for the utilization and fee-sorted portfolios used in Table 3, except that now the bond excess returns are defined relative to the rating- and maturity-matched benchmarks. Panel A reports results for utilization-sorted quintile and percentile portfolios based on the full sample of corporate bonds, investment-grade industrial bonds, and high-yield industrials in that order. Panel B reports the results for the lending fee-sorted portfolios.

The key message of the results for both the full sample and the investment grade subsample is the same as for the results in Table 3. With the exception of the $99^{th}$ percentile utilization-sorted portfolio constructed in full sample of corporate bonds, the average excess returns are not significantly different from zero. Moreover, the point estimates do not show any relation between utilization or lending fees and future returns. A difference between these excess returns and those in Table 3 is that the average excess returns in Table 4 are much closer to zero, with magnitudes that are typically only a few basis points. This is consistent with the earlier suggestion that the larger negative average excess returns in Table 3 are at least partly due to the fact that the aggregate bond market benchmarks in Table 3 do not adequately capture the risks of the bonds.

The average excess returns of the high-yield bond portfolios reported in the lower parts of Panels A and B are also smaller in magnitude than those in Table 3 once we use benchmarks that better capture differences in credit and interest rate risk. With one exception, the value-weighted return on the $95^{th}$ percentile utilization-sorted portfolio which is significant at the 10% level, these excess returns also are not significantly different from zero. Interestingly, the better benchmarking begins to bear out a pattern in the excess returns of the riskier bonds. Although they are not significant, point estimates appear to decrease consistently as utilization and lending fees increase, and are lowest for the $99^{th}$ percentile portfolios.

The lower liquidity and trading frequency of bonds as compared to equities suggest that bond prices might adjust more gradually to negative information.[14] Accordingly, we extend the return horizon to three months. For each sorted bond portfolio, the 3-month return is the holding period return of a portfolio of bonds rebalanced each month based on average fees or utilization in the previous month. The returns of the 56 equal-weighted and 56 value-weighted rating- and maturity-matched benchmark portfolios are computed similarly. The tenth and twelfth columns of Table 4 report the average equal- and value-weighted three-month excess returns based on the rating- and maturity-matched benchmarks, respectively. For comparison, we include the excess returns relative to the original equal- and value-weighted aggregate TRACE benchmark in the sixth and eight columns, respectively.

Using the aggregate TRACE benchmarks and three-month returns (the sixth through ninth columns of Table 4), the results in both the full sample and the investment-grade subsample are similar to the corresponding results for one-month returns in Table 3. Equal-weighted excess returns are statistically significant and economically large in both Panels A and B, while value-weighted excess returns are insignificant across most portfolios. While the average value-weighted return of the utilization-sorted quintile 5 minus quintile 1 long-short portfolio is marginally significant ($t$-statistic $= -1.90$), this is not corroborated by the equal-weighted return of the same portfolio, so there is at best limited evidence of a relation between utilization and excess returns. The sixth through ninth columns of Panel B provide no evidence of a relation between lending fees and excess returns based on the aggregate TRACE benchmarks. This is also true of the results for the high-yield bonds in the lower part of Panel B.

In contrast, we start to see evidence of a relation between utilization and three-month excess returns for the high-yield bonds even using the aggregate TRACE benchmarks (lower one-third of Panel A, columns 6-9). Here the average equal- and value-weighted returns of the utilization-sorted quintile 5 minus quintile 1 long-short portfolios are $-0.91\%$ ($t$-statistic $= -2.14$) and $-1.42\%$ ($t$-statistic $= -2.69$).

The predictive power of utilization strengthens when we use three-month returns and the credit rating and maturity-matched benchmarks. Columns 10 and 12 of Panel A show the excess returns for utilization-sorted portfolios relative to the maturity- and credit rating-matched TRACE benchmarks. For the full sample of corporate bonds, the point estimates of both equal- and value-weighted

[14] Low trading frequency of bonds relative to equity may limit investors ability to exploit information advantages over a similar horizon to those in equity markets. Aggressive trading in the bond market will likely provide a clearer signal of informed trading leading to a loss of profitable trading opportunities. Such an effect can be understood in the context of Kyle (1985) with limited noise trading.

three-month excess returns decrease monotonically as utilization increases, and the returns are statistically significant for deciles 4 and 5 and for the $95^{th}$ and $99^{th}$-percentile portfolios. The excess returns of the quintile 5 minus quintile 1 long-short portfolio are negative and significant at the 1% level for both equal- and value-weighted portfolios. The same pattern is found in the returns of the high-yield bond portfolios in the lower part of Panel A. For investment grade bonds there is no pattern in the returns of the quintile portfolios, which is perhaps unsurprising. That said, the equal- and value-weighted returns of the $99^{th}$-percentile portfolio of investment grade bonds are negative and large ($-2.37\%$ and $-1.78\%$) and significant.

The results for excess returns of lending fee-sorted portfolios for the 3-month horizon are consistent with those for 1-month excess returns. For the sample of all corporate bonds and the sample of investment-grade bonds, excess returns are mostly insignificant and show no evidence that higher fees predict lower excess returns for equal- or value-weighted portfolios regardless of the benchmark. This holds for the high-yield bonds as well. The main message to take away from Table 4 is that we find strong evidence that utilization predicts returns once we look at three-month returns and benchmark to the returns of portfolios matched on credit risk. This contrasts with the findings in Asquith, Au, Covert, and Pathak (2013), who use only aggregate benchmarks. But even using matched benchmarks and three-month returns, we do not find any evidence that lending fees predict returns. Thus, lending fees and utilization appear to contain important and potentially distinct information about constraints to borrowing corporate debt.

## 3.2 Combining the information in utilization and lending fees

In light of the above results, we now directly examine the extent to which lending fees and utilization capture overlapping information. If the information content of fees and utilization is perfectly correlated, then fees should not vary systematically at different points in the distribution of utilization. That is, all bonds with a low percent of inventory on loan would be lent to borrowers at a similar fee. Moreover, this would hold true for all levels of utilization. To test this hypothesis, we perform sequential sorts. First, we sort bond loans into quintiles based on utilization. Then, within each utilization quintile, we sort bond loans into fee quintiles and report the average loan fee conditional on membership in one of the 25 utilization-fee categories.

Table 5 reports the conditional average fees for utilization and fee categories separately for high-yield and investment-grade bond loans in panel A and B respectively. The results for double sorted fees are striking. In Panel A, the conditional average fee for investment-grade bond loans increases monotonically across all five fee-quintiles. Moreover, the result holds within each utilization quintile, not only for investment-grade but also for high-yield bond loans shown in Panel B. Such uniform, predictable, and pervasive variation in fees at all points in the distribution of utilization provides convincing evidence that fees and utilization measure different dimensions of constraints to borrowing corporate debt.

It is also interesting to note that a large number of investment-grade bond loans are executed with negative fees, which is evidenced by the fact that the average lending fee for loans in the low fee quintile is dominated by negative fee, or so called funding transaction, loans. Although, funding transactions are not as common in high-yield lending, Figure 2 shows that, at times, more than 50% of high-yield loans are funding transactions.

Having established several new results, we move forward under the presumption that both fees and utilization are distinctly related to short sale constraints. We contend that bonds that are more heavily lent at higher cost are those with not only the highest short sale demand but also the highest borrowing constraints. Therefore, jointly conditioning on the information content in fees and utilization will likely isolate overvalued bonds that are borrowed for the purpose of selling short.

Table 6 presents 1- and 3-month excess returns for portfolios that are jointly conditioned on both lending fees and utilization. Each month, we sort bonds into utilization quintiles based on their average utilization over the previous month. Within each utilization quintile, we further divide bonds into quintiles based on their average lending fee in the previous month. As with the univariate sorts, we calculate excess returns by matching each bond with the appropriate rating and maturity matched benchmark prior to the aggregation. Three-month returns follow the same procedure using monthly rebalanced portfolios and benchmark returns. For the remainder of the paper, we focus on excess returns relative to rating and maturity matched benchmark returns.

In this setting, we investigate two predictions that are consistent with informed trading. First, bonds with both high lending fees and utilization are the most heavily short sale constrained, and hence, the most overvalued. Therefore, we expect predictive power to be strongest among this set of bonds. Second, the difference between future excess returns of high- and low-fee quintiles, conditional on utilization, decreases as utilization increases. As previously discussed, expressing negative sentiment is more difficult when lending fees are high. Therefore, we would expect higher fees to predict lower future returns but only when short-sale constraints bind, which is not likely for all bonds. Taking utilization as our second measure of short sale constraints allows us to identify more precisely a set of bonds where constraints are more likely to bind. At high levels of utilization, high-fee bonds are likely the more constrained and will thus predict lower negative returns than less constrained low-fee bonds. The strength of this prediction weakens at lower levels of utilization.

Panel A of Table 6 reports 1- and 3-month excess returns of double-sorted portfolios using all corporate bonds. These results are mixed. There is very little evidence of informed trading at the 1-month horizon, as excess returns are mostly insignificant. Moreover, the difference in excess returns between the high and low fee quintile portfolios appears to decrease as utilization increases; although, the difference is insignificant even for the highest utilization quintile. In contrast, 3-month excess returns are negative and significant for most high-utilization quintiles. Investors in the highest fee and utilization portfolio earn excess returns of 96 bps over the following 3 months from the short-seller's perspective.

Consistent with prior results, there is no evidence of informed trading in investment-grade bonds. Excess returns at both the 1- and 3-month horizon are insignificant across all fee- and utilization-based portfolios. Further, there is no pattern or significance in the spread between high and low fee quintile portfolios over levels of utilization at either horizon.

In contrast, the results for lending of high-yield debt offer convincing evidence that short-sellers are informed. At the 1-month horizon, future excess portfolio returns are decreasing in both fees and utilization. Moreover, the result is strongest at higher levels of utilization where investors in higher fee portfolios earn approximately 40 bps per month on a risk-adjusted basis. The highest excess returns for short-sellers are, as predicted, in the highest fee and utilization portfolio. This portfolio of bonds with arguably the highest demand and strongest constraints for short selling yields excess returns of $-82$ bps per month, which is both statistically and economically significant. Furthermore, the spread between excess returns of high- and low-fee quintile portfolios decreases predictably with short-sale constraints as measured by utilization. The largest difference, in the highest utilization quintile portfolio, is 81 bps and significant at the 5% level.

The results for high-yield strengthen in magnitude and significance when we extend the return horizon to 3-months. Negative and significant excess returns concentrate in high-fee-high-utilization portfolios. Of the 4 portfolios formed from bonds with the highest prior lending fees and utilization, 3 yield statistically significant negative returns at the 5% level. The highest fee and utilization quintile portfolio, where loans are most likely related to short sales, earns a negative 3-month excess return of close to $-3\%$ which is statistically significant at the 1% level. Furthermore, we observe a decreasing pattern in the difference between excess returns of high- and low-fee quintile portfolios as utilization increases ending with a -2.5% difference that is significant at the 1% level.

To summarize, we find compelling evidence that short-sale constraints, measured from the joint distribution of lending fees and utilization, predict negative excess returns in high-yield debt.

This finding is consistent with the hypothesis that short sales in corporate bonds exploit private information, which is similar to findings in the equity market. Not surprisingly, there is no evidence of a similar effect for investment-grade bonds. This likely reflects the limited exposure of investment-grade debt to information regarding firm value along with higher visibility of large investment-grade issuers. At the same time, a larger fraction of investment-grade loans is likely driven by the need to satisfy delivery on repo agreements, which is unrelated to private information.

### 3.3 Profitability of bond shorting

Results presented thus far suggest that bond short sellers are informed. However, there is no direct evidence to show that they profit from this strategy. Therefore, we now examine the impact of fees. For this analysis, we assume that the investment strategy for each bond begins on the last observed trading day of month t-1, ends on the last observed trading day of month t, and is subject to the average borrowing fee over month t-1. As such, we add the average lending fee, paid by the borrower, over the previous month to our existing returns to obtain an estimate of short sale returns net of fees. We roll-over this strategy for 3 consecutive months to yield a 3-month return. This assumes that the lending agreement is renewed each month at the average lending fee over the previous month.

Short sellers profit from the decrease in bond price less accrued interest, coupon payments, and lending fees over the investment horizon. Because our computed bond returns account for coupon payments and accrued interest, simply adding the monthly fee provides an estimate of returns to a long bond investor chosing to lend out their bonds, which is equal to the negative of short-sale profits. An important caveat is that our data provider collects terms from triparty lending agreements in the intermediated securities lending market. These fees represent the cost to prime brokers for borrowing from the bond owner rather than the fee paid by short sellers. As a result, we likely overestimate profits. Unfortunately, this is unavoidable as we do not have access to information on dealer markups.

Finding that investors do not profit significantly from short positions would call into question the conclusion that short sellers are informed. That is, any alleged private information is likely overvalued by short sellers because the broker either observes similar information, or can accurately infer its value from existing lending fees and utilization. In contrast, significant excess returns, particularly for high-fee-high-utilization portfolios, net of fees offers additional support for the argument that short sellers are informed.

Table 7 reports results for portfolio excess returns after accounting for bond-level lending fees.

Similar to the previous tests, we sort bonds into quintile portfolios based on their average utilization and lending fee in the prior month. Panels A, B, and C report excess returns inclusive of lending fees for portfolios formed from all bonds, investment-grade industrials, and high-yield industrials respectively. For the most part, these results parallel those in Table 6. Panel A shows no evidence of informed trading at the 1-month horizon for portfolios constructed from the set of all bonds. However, there is some evidence of short-sale profits for 3-month returns as the highest-fee-highest-utilization quintile portfolio reports significant excess returns of 72 bps. Although, the difference between high and low fee-quintile portfolios, reported in column 12, is insignificant at the highest level of utilization and does not decrease monotonically as utilization increases. Consistent with prior findings, there is no evidence of short-sale profits for investment-grade bonds reported in Panel B.

In contrast, the results for high-yield debt are robust to the inclusion of lending fees. Panel B shows that 1-month excess returns decrease consistently as utilization increases at higher fee quintiles. As expected, accounting for fees reduces the magnitude and significance of excess returns especially for higher fee bond loans. Fees consume approximately 17 bps of the 1-month excess return in the highest-utilization-highest-fee quintile portfolio, which reduces the excess return form 82 bps to 65 bps rendering it significant at the 12% level. However, the difference between high and low fee quintiles, shown in column 6, decreases consistently as utilization increases; the 64 bps difference for high-utilization bonds is significant at the 10% level.

Finally, we find that strong evidence of informed short selling persists after accounting for fees at the 3-month horizon. Three of the four highest fee and utilization quintile portfolios generate significant excess returns after accounting for approximately 24 bps in lending fees. Moreover, short selling the portfolio of highest-fee-highest-utilization bonds returns 2.4% over the next 3 months net of fees. Once again, the difference between high and low fee portfolios decreases as utilization increases ending with a 2.07% spread and that difference is significant at the 1% level. These results confirm that short sale constraints measured jointly by lending fees and utilization predict lower future bond returns, which is consistent with informed short selling.

### 3.4 Controlling for bond characteristics using Fama-MacBeth regressions

Next, we employ an alternative approach to calculating excess returns, which relies on Fama and MacBeth (1973) regressions. Each month, we purge bond-level 3-month holding period returns of cross-sectional variation related to characteristics commonly associated with credit, interest rate, and liquidity risk. We then reevaluate returns to high-utilization and high-fee bonds to ensure that the short sale returns documented above do not rely on our choice of methodology.

In monthly cross-sectional regressions, we use the natural log of time-to-maturity (TTM), coupon rate, and bond rating (Rating) to control for cross-sectional variation in interest rate and credit risk. Our rating variable is the average quantified rating (AAA = 1, AA+ = 2, ...) over Moodys, S&P and Fitch ratings each month, when available. For bonds with missing or NR ratings, the average is taken over the remaining agencies that provide rating information. If ratings from the three major agencies are missing or "NR", then we assign the variable Rating a value of zero and include an indicator variable that equals 1 for bonds that are not rated by any of the 3 major agencies. A similar treatment is commonly used for missing accounting data [see for example Himmelberg, Hubbard, and Palia (1999)].

To capture return differences related to bond liquidity, we include the natural log of amount outstanding the Amihud ratio, and the realized bid-ask spread [see Houweling, Mentink, and Vorst (2005); Dick-Nielsen, Feldhtter, and Lando (2012); Anderson and Stulz (2017)]. We calculate the daily Amihud ratio for each bond as the average absolute return from sequential trades divided by total principal traded in millions,

$$\sum_{t=2}^{N} \frac{1}{N-1} \frac{|(P_t - P_{t-1})/P_{t-1}|}{Q_t},$$

where $P_t$ is the clean price and $Q_t$ is volume. For Amihud, we limit the calculation to institutional-size trades (above $100,000 of principal volume), which reduces noise in the measure. Amihud measures price impact, hence lower values of Amihud indicate higher bond liquidity from more robust market depth. The realized spread is the difference been the average daily customer-initiated sell and buy prices. Customer-initiated buy/sell transactions are identified using the RPT_SIDE_CD and CNTRA_MP_ID tags in Enhanced TRACE (see Dick-Nielsen, 2014; Adrian, Fleming, Shachar, and Vogt, 2016). A lower realized spread is associated with lower transaction costs (bid-ask spread) and higher liquidity. Again, we calculate realized spread from institutional-size trades to minimize noise from small trades.

Finally, we include two indicator variables and their interaction to evaluate the relative difference in returns of bonds in the highest fee and highest utilization quintile. The indicator variable $D_{HighBondUtil}$ equals one for bonds sorted into the top utilization quintile in a given month and zero elsewhere. Similarly, $D_{HighBondFee}$ is an indicator variable that equals one for bonds sorted into the top fee quintiles in a given month and zero elsewhere. The interaction term $D_{HighBondUtil} \times D_{HighBondFee}$ identifies bonds in both the highest utilization and highest fee quintile each month. As such, the coefficient on $D_{HighBondUtil}$ measures the marginal difference in 3-month returns between the average bond in the highest utilization quintile and the average bond in the lower 4 fee and utilization quintiles (our reference case). Similarly, $D_{HighBondFee}$ measures the marginal difference in 3-month returns between the average bond in the highest fee quintile and the average bond in the lower 4 fee and utilization quintiles. The coefficient estimate for the interaction between our indicator variables, which is our outcome of interest, measures the marginal difference in 3-month returns for bonds in both the highest fee and highest utilization quintile relative to the return on the average bond in either the highest fee or highest utilization quintile only. This compares roughly to the excess return for the highest fee/highest utilization quintile portfolio in the sequential double sorts above. The final specification for monthly cross-sectional regressions is shown below:

$$\begin{aligned} R_{i,t} = \alpha &+ \beta_{1,t} D_{HighBondUtil} + \beta_{2,t} D_{HighBondFee} + \beta_{3,t} D_{HighBondUtil} \times D_{HighBondFee} \\ &+ \beta_{4,t} log(TTM) + \beta_{5,t} Coupon + \beta_{6,t} log(AmountOut) + \beta_{7,t} Amihud \\ &+ \beta_{8,t} RealizedSpread + \epsilon_t. \end{aligned} \quad (1)$$

If the joint distribution of lending fees and utilization provides incremental information on short-sale constraints beyond that contained in univariate measures of fees or utilization, we would expect $\beta_{3,t}$ to be negative and significant.

Table 8 reports the time series average of monthly cross-sectional regression parameters from July 2006 to March 2015. Columns 1 and 2 present results for cross-sectional parameters estimated over the full sample of bonds including financial and utility issues. Columns 3 and 4, and 5 and 6, present similar results for parameters estimated from the subsample of investment-grade and high-yield bonds, respectively, issued by industrial companies. Consistent with prior results, $\beta_{3,t}$ is, on average, negative and significant, at 1%, for high-yield but insignificant for investment-grade bonds in both the simple specification (3 & 5) and after controlling for credit, interest rate, and liquidity risk (specifications 4 & 6). Although, the sign is consistently negative across all specifications and subsamples. Within the full sample of bonds, $\beta_{3,t}$ is negative and significant at 10% for the simple specification; after controlling for other effects significance increases to 5%, although the coefficient remains relatively unchanged in terms of magnitude. These results offer additional support for the view that bond short sales are informed while also emphasizing the importance of short sale constraints in the joint distribution of utilization and fees.

Consistent with our prior findings from Table 4, these results suggest that short sale constraints are not fully captured in the univariate distribution of either fees or utilization. Summing the indicator variable $D_{HighBondFee}$ and the interaction term $D_{HighBondUtil} \times D_{HighBondFee}$ yields the marginal difference between high-fee bonds and other bonds in our reference case. These marginal differences in columns 1, 3, and 5 compare roughly to excess returns relative to the TRACE benchmark returns from univariate sorts. Similar to the results in Tables 3, the returns for high-fee bonds do not appear to differ from returns of our benchmark case - bonds in the lower 4 fee or utilization quintiles, as evidenced by an insignificant marginal difference. Marginal differences in columns 2, 4, and 6, with additional controls, are more comparable to excess returns relative to our TRACE rating and maturity matched benchmark returns. Again, the marginal difference is close to zero, which suggests that, on average, returns for high-fee bonds do not differ from returns for the average reference bond after controlling for credit, interest rate, and liquidity risk. A similar result holds for returns on high-utilization bonds. Although in this case, there is some evidence of significant marginal differences within the full sample and for high-yield debt. These results, presented in columns 2 and 6, are consistent with our findings from Table 4. However, the results in columns 1 and 5 are inconsistent with those presented in Table 3, which results from the use of different benchmarks. Recall, our reference case for these regressions is all bonds that do not classify as high-fee or high-utilization each month. In contrast, benchmark returns in Table 3 are derived from all filtered bonds with non-missing returns.

Finally, bonds with longer time to maturity and higher coupon tend to yield higher future returns, especially for investment-grade bonds, which is consistent with their use as a proxy for interest rate risk. Rating, is a positive and significant predictor of high-yield bond returns but does not predict future investment-grade bond returns, which is in line with prior work which shows that credit risk is priced more in high-yield debt [see for example Elton, Gruber, Agrawal, and Mann (2001)]. Amount outstanding does not appear to have predictive power. The sign on both Amihud and Realized spread is consistent with higher expected returns for less liquid bonds. Although, significance is higher for Amihud than for Realized spread. Lastly, controlling for alternative effects increases R squared from approximately 10% to approximately 25%.

# 4 Alternative Markets for Informed Trading

In the previous section we documented a robust link between bond excess returns and short sale constraints as represented in the joint distribution of lending fees and utilization. We now turn our attention to alternative trading venues and investigate whether similar private information is observed in the Credit Default Swap market or the equity market.

## 4.1 Credit Default Swap Market

The credit default swap (CDS) market offers an alternative setting to trade credit risk, and arguably exists to complete the bond market. As a result, investors have the option to express negative opinions through a synthetic short sale, which equates to buying CDS protection on the reference entity, rather than through securities lending. This brings up an obvious question, why would an investor sell a bond short if buying protection is the easier and less costly strategy?

It is important to note that more heavily traded and liquid single-name CDS contracts are not usually a perfect substitute for a bond. The standard contracts provided by the International Swaps and Derivatives Association (ISDA) offer counterparties substantial flexibility to express different dimensions of credit quality as needed. They can be written to cover a particular reference entity (firm) or obligation (bond). However, the most liquid contracts, for which we have pricing information, are written on reference entities with terms standardized under the North American Convention and cover issuer specific credit events rather than the default of a specific bond in the firms capital structure. Therefore, investors seeking to short a specific bond may prefer to trade in the securities lending market.

Privately informed investors will consider the CDS market an attractive alternative to securities lending. As a result, they will likely speculate in both markets, favoring the less costly option. We have shown the traditional securities lending short sale strategy generates higher future excess returns when short-sale constraints are high. However, this is exactly when the CDS may offer a relatively more effective option. Therefore, one may expect trading to shift toward CDS for bonds that are more difficult to short. In this case, the demand for credit protection would cause the price of credit risk to deviate predictably with short-sale constraints across the CDS and cash markets. To test this implication, we investigate the CDS bond basis in the joint distribution of lending fees and utilization.

The CDS-bond basis is the difference between the credit spread quoted in the CDS market and the credit spread quoted in the bond market ($CS_{CDS} - CS_{bond}$). If the CDS and bond are perfect substitutes, absent frictions, the basis is zero. Therefore, the magnitude of the basis measures tension between the two markets and the sign indicates relative value. If trading shifts toward CDS for difficult-to-short bonds, then the demand for credit protection will inflate the CDS spread relative to the bond credit spread, resulting in a positive basis. In terms of the price, the synthetic bond trades at a discount to the cash bond. Hence, a positive and significant CDS-bond basis for high-fee-high-utilization bonds is consistent with the view that investors speculate in both markets and favor the more profitable strategy.

We calculate the basis relative to the CDS par equivalent spread (PES). Houweling and Vorst (2005) show that a reduced form approach is important when comparing credit spreads between the CDS and bond market. For this analysis, we limit our attention to bonds maturing in 4 to 6 years to compare with the most liquid CDS contract maturity of 5 years. Our basis calculation relies on the full term structure of CDS spreads. However, our final point estimate is taken at the 5-year horizon, which increases precision in the basis estimator. The appendix provides further details on the PES calculation.

Table 9 reports the CDS-bond basis for different levels of lending fees and utilization. Following the previous analysis, we sequentially sort bonds into utilization- and then fee-based quintiles. Panel A shows the average basis for investment-grade utilization-fee quintile and Panel B reports the same averages for high-yield. Interestingly, the average investment-grade basis is mostly negative but tends to increase and become positive in the higher utilization- and fee-based portfolios. For the highest-utilization-highest-fee quintile the average basis is 165 bps. This may provide some evidence that privately informed investors prefer to trade CDS for higher credit quality issuers. Perhaps because investment-grade CDS are more liquid and easier to access.[15]

The average basis for high-yield bonds reported in Panel B provides stronger evidence that informed investors also trade CDS. In this case, we observe higher positive basis for lower levels of utilization and lending fees. Again, the basis increases consistently with fees and utilization ending with an average 240 bps spread between the CDS and bond PES for the highest fee and utilization bonds. The large positive basis is consistent with higher demand for credit protection for bonds where short selling is heavily constrained.

Given the evidence that investors also express negative opinions in the CDS market, a skeptic may question whether bond excess returns are in fact related to short sales. That is, if the CDS is the lower cost option, then why would investors short bonds; and if investors do not short bonds, are the previously documented excess returns really related to informed short selling? The simple answer is that these markets are closely linked and will price information similarly. To illustrate, consider a bond with high short-sale demand that is difficult to borrow. In this case, investors can synthetically short the bond by purchasing credit protection. Increased price pressure will drive the CDS spread up relative to the equivalent bond spread and produce a positive basis as reported in Table 9. This has two effects. First, it reduces profits from the CDS strategy because

[15] The CDS market is still more opaque than the bond market, which may be more advantageous for exploiting private information about IG issuers. Also, IG issuers tend to have larger offerings. This could make the standard single-name contract a closer substitute to borrowing the bond.

the synthetic short is executed at a lower price. If the traditional strategy eventually becomes more profitable, trading will shift to the cash market. Second, arbitrage profits increase as the basis widens. In this case, arbitragers short the bond and sell credit protection essentially transferring private information from the CDS to the bond market. Therefore, even if privately informed investors trade exclusively in the CDS market, the information will still be priced in the bond market. Such a mechanism is consistent with the interaction described in Oehmke and Zawadowski (2015).

Our analysis of the CDS bond basis offers some insight into the transfer of private information across these two markets in the presence of varying degrees of frictions against the flow of information. However, in this setting investors always have the option to express views in either the CDS or bond market. An alternative approach is to investigate the extreme form of frictions in which investors are forced to express views through securities lending.

To operationalize this analysis, at the beginning of each month, we differentiate lent bonds issued by companies named as the reference entity on an actively traded single-name CDS contract (HASCDS) from lent bonds issued by companies not named on an actively traded CDS contract (NOCDS).[16] CDS are usually considered easier to trade as they are unfunded instruments with lower search costs that do not trade in fixed net supply. Therefore, investors may prefer to speculate on private information in the CDS market. As a result, it is tempting to claim that short sale returns should be pronounced for NOCDS bonds because investors must express negative opinions through securities lending. Unfortunately, there are several complications to the simple assertion. Mainly, informed trading in the CDS market is also priced in the bond market through the arbitrage link discussed above.[17]

Therefore, we predict that, all else equal, short sale returns for bonds covered by an active CDS are similar to those for bonds not covered by an active CDS. To explore this implication, we return to our utilization and fee based quintile portfolios and reevaluate 3-month excess returns relative to TRACE rating and maturity matched benchmark returns. We partition further each utilization- and fee-sorted portfolio into subsamples of HASCDS and NOCDS bonds each month. For brevity, we condense our results and report average excess returns for two portfolios rather than the original 25. The first combines high-fee and high-utilization bonds; it is composed of bonds categorized into the top 2 utilization and fee quintiles each month. The second is the highest

[16]We define an actively traded CDS contract as a single-name corporate CDS with an active quote in the MARKIT single-name CDS file.

[17]It is also important to note that absent quotes from MARKIT do not imply that CDS on the unnamed company cannot be traded. Standard contracts can be easily implemented once both parties agree on terms. Although, agreeing on terms is likely more difficult for unquoted CDS contracts.

utilization and fee quintile portfolio from the original 25. Table 10 compares average 3-month excess returns to portfolios formed on HASCDS and NOCDS subsamples. We further split the analysis by investment-grade and high-yield industrial issues.

Interestingly, the expected result is observed for only one of our four portfolio comparisons. The highest utilization and fee quintile portfolio, formed from high-yield industrial issues, generates significant negative average excess returns on both HASCDS and NOCDS subsamples, reported in columns 4 and 5 respectively. Furthermore, excess returns to these portfolios are statistically similar in magnitude as shown in column 6. Somewhat surprising is the result for investment-grade issues. Average excess returns to both the combine and extreme portfolios are negative and significant for bonds covered by an actively traded CDS (columns 1 and 4). However, columns 2 and 5 report insignificant portfolio excess returns on the NOCDS subsample where investors are more likely to express negative opinions through securities lending. Though potentially counterintuitive, this result may reflect fundamental differences in the availability of private information between the two subsamples. Literature on credit risk transfer suggests that the separation of control and cash flow rights may lead to lower monitoring of firms with available CDS. Moreover, Parlour and Winton (2013) show that the problem is exacerbated in higher credit quality debt where CDS coverage is more comprehensive. Finally, excess returns to the combine portfolio of high-yield industrial credits is negative and significant on the NOCDS subsample but insignificant on the HASCDS subsample.

## 4.2 Stock Market

Results presented thus far suggest that informed short selling in corporate bonds is more prevalent for high-yield debt. Because high-yield bond returns share characteristics with equity returns, it is natural to ask whether informed debt and equity traders act on similar information. A positive finding here is perhaps anticlimactic as it implies that the results for shorting corporate debt are simply an alternative viewing of the well-established equity short-sale results. However, such a finding would also counter the commonly held belief that debt and equity markets are segmented and raise several interesting questions about cross-market interactions. Alternatively, distinct information trading in each market is equally interesting and arguably increases the importance and contribution of our findings. It implies that bond short sellers accurately process distinct information and its impact on securities' value in a manner that has not yet been documented in the existing literature.

To examine whether the information traded in bond short sales is duplicative of that in equity short sales, we augment the Fama-MacBeth regressions presented in Table 8 with three additional variables that measure equity short sale constraints from information in the joint distribution of equity lending fees and utilization. Recall, for these regressions we sort bonds into quintile portfolios based on bond lending utilization and fees each month and track returns over the next 3-months. These 3-month returns are the dependent variable in monthly cross-sectional regressions. Table 11 records the time series average of monthly regression parameters. Similar to our bond lending variables, $D_{HighEquityUtil}$ and $D_{HighEquityFee}$ is an indicator variable that equals one if the issuers equity is categorized into either the top utilization quintile or top fee quintile, respectively, each month in sequential sorts. Finally, the interaction of $D_{HighEquityUtil} \times D_{HighEquityFee}$ identifies bonds issued by companies with equity in the highest fee quintile within the highest utilization quintile each month.

If the information reflected in bond short sale returns is similar to that exploited by informed equity short sellers, then companies' debt and equity will experience similar short sale pressure. As a result, short sale constraints will correlate across markets and the rank order for equity fees and utilization will mimic the rank order for bond fees and utilization. In this case, we expect equity lending variables to subsume much of the explanatory power of their bond lending counterparts. For this test, we are particularly interested in the interaction terms. If bond short sales reflect similar information to equity short sales, then we expect much of $D_{HighBondUtil} \times D_{HighBondFee}$'s explanatory power to be absorbed by $D_{HighEquityUtil} \times D_{HighEquityFee}$. In contrast, finding that bond lending variables are informative after controlling for equity lending utilization and fees suggests that bond short sales are driven by different information than equity short sales.

Table 11 reports the average regression parameters from monthly cross-sectional regressions. Focusing first on equity lending variables, we find some limited evidence, reported in column 6, that equity lending fees predict negative bond returns for high-yield debt after controlling for other effects. This suggests that, to some extent, equity and debt short sellers trade on similar information specifically related to equity lending fees. Such a result is reassuring as the value of both high-yield debt and equity securities are likely sensitive to the availability of private information if it leads investors to reassess firm value. Similar to bond lending, we find that the predictive power of equity lending variables is limited to high-yield debt. Unreported results show that the total marginal contribution from equity lending fees ($D_{HighEquityFee} + D_{HighEquityUtil} \times D_{HighEquityFee}$) is insignificant. This, along with the insignificant interaction term and coefficient estimate for high equity utilization, suggests that equity lending short sale constraints are, at best, weak proxies for bond short sale constraints.

More importantly, the bond lending fee and utilization interaction term remains negative and significant, on both the full sample and high-yield subsample, after controlling for equity lending fees and utilization. The coefficient estimate of $-0.019$ is almost half of the -0.036 point estimate reported in Table 8, consistent with overlapping information in debt and equity short sales. Taken together, these results provide convincing evidence that bond short sale returns cannot be fully explained by equity short sale constraints. This result is consistent with the view that debt and equity short sellers, at times, exploit distinct information.

# 5 Conclusions

Using a novel dataset of corporate bond loans aggregated over several lenders from 2006 to 2015, we provide new evidence consistent with informed short selling in the corporate debt market. These results are important since an earlier study relying on data from a single lender from 2004 to 2007 concluded there is no evidence of informed short sales in corporte bond markets (see Asquith, Au, Covert, and Pathak (2013)).

A closer look at the data revealed extensive bond lending activity at fees below the federal funds rate. In fact, at different points in time more than half of all bond loans are executed with negative fees. We posit that these low-fee loans are unrelated to informed trading. Rather, they may reflect funding transactions in which the bond owner offers the bond as collateral on a cash loan essentially inverting the securities lending agreement to mimic a collateralized loan. In this case, the bond lender pays the borrower the short term rate plus a premium, which manifests as a negative lending fee. Such a transaction is inconsistent with constraints to short selling related to informed trading.

Following Asquith, Au, Covert, and Pathak (2013), we begin our analysis by sorting loans into bond utilization quintiles (the percent of inventory on loan) as a coarse proxy for lending supply. Next, we propose three fundamental extensions. First, within each utilization sort, we further sort loans into fee based quintiles to better distinguish loans likely associated with informed short selling. Next, we consider longer horizon 3-month short-sale returns. Finally, we calculate excess returns relative to rating and maturity matched benchmarks. In this setting, we hypothesize that bonds with high short sale constraints proxy by lending fees and utilization predict higher short sale returns in the presence of informed trading.

To test this hypothesis, we examine 1- and 3-month excess bond returns. In this first pass, we find significant negative excess returns (positive short sale returns) for portfolios formed from high-fee and high-utilization bonds at both the 1- and 3-month horizon, which is consistent with informed short selling in corporate bonds. Moreover, this result is concentrated in high-yield industrial debt where returns are likely most sensitive to firm-specific private information.

Next, we adjust for lending fees by adding the quoted fee back to the excess return. This accounts for proceeds to the lender (owner) and reduces the magnitude of negative returns to reflect borrowing costs to the short seller. We find that the results are relatively insensitive to borrowing costs. Excess returns remain negative and significant for the highest fee and utilization quintile and the result is stronger at the 3-month horizon.

To ensure that our results do not rely on our choice of methodology, we repeat the tests using Fama-MacBeth regressions. Indicator variables identify bonds in the top fee quintile, top utilization quintile, and intersection of the two. We control for time-to-maturity, coupon, amount outstanding, bond rating, Amihud ratio, and realized spread. Consistent with two-way sorts, we find that bonds in both the top fee and utilization quintile earn significant negative returns relative to other bonds. This provides additional support for the view that bond short sales are informed.

In light of these findings, we turn our attention to the credit default swap market. A common justification for CDS contracts is that they offer an easy and low cost alternative to shorting corporate debt [see for example Oehmke and Zawadowski (2015)]. In this case, one may question why investors short bonds via securities lending. To explore this question, we employ the CDS bond basis as a measure of the relative cost for shorting debt. The CDS bond basis is typically negative, which reflects the lower credit spread (higher price) of the synthetic option relative to the cash market. However, for bonds with high shorting demand and limited lending supply  those in the top fee and utilization quintile portfolio, the basis is positive and, for high-yield, significantly distinguishable from zero. Such a result is consistent with high demand for credit protection for bonds that are difficult or costly to borrow. It suggests that informed traders express opinions through both the CDS and bond market favoring the lower cost option.

Finally, we investigate whether informed corporate debt short sellers trade on similar information to that exploited by equity short sellers. Returning to Fama-MacBeth regressions, we augment the specification to include indicator variables for bonds issued by companies in the top equity lending fee quintile, utilization quintile, and intersection of the two. These results show that equity lending constraints, related to fees, are to some extent correlated with bond lending constraints, suggesting short sellers may act on similar information across markets. However, bonds in the intersection of high bond lending fee and utilization yield significant negative returns after controlling for equity lending constraints. Hence, short sale returns in corporate debt are largely distinct to short sale returns in equity.

In sum, we provide important new results on privately informed trading in corporate bond short sales, which extends the existing literature by Asquith, Au, Covert, and Pathak (2013). Generally, the corporate bond market is dominated by institutional investors lending credence to the notion that bonds are efficiently priced [see for example Chordia, Goyal, Nozawa, Subrahmanyam, and Tong (2017)]. Our findings suggest that bonds can suffer similar price inefficiencies as stocks; potentially encouraging further work in this area. Finally, our results extend the discussion of informed trading in corporate debt from transaction cost estimates [see Edwards, Harris, and Piwowar (2007); Bessembinder, Maxwell, and Venkataraman (2006); Chen, Lesmond, and Wei (2007); Han and Zhou (2014)] and CDS trading [see Acharya and Johnson (2007)] to bond short sales via securities lending.

# Appendix A Bond-CDS Basis

To measure the Bond-CDS basis we employ the Par Equivalent Spread (PES) method developed by JP Morgan. This procedure begins by extracting the term structure of risk-neutral survival probabilities from the current term structure of CDS quotes. Next, the derived term-structure of survival probabilities is shifted by a constant (parallel shift) to match the model and market bond price. Finally, these shifted probabilities are applied to the standard CDS pricing function to obtain the par equivalent CDS spread for the five-year maturity. The estimated bond-CDS basis for bond $j$ on day $t$ is the difference between the quoted CDS spread and PES ($Basis_{j,t} = CDS_{j,t} - PES_{j,t}$). Further details are provided below.

## Appendix A.1 CDS-implied risk neutral survival probabilities

We extract the term structure of risk neutral survival probabilities from the term structure of CDS quotes by iteratively choosing the survival probability ($QSP(t_i)$) such that the "fair CDS spread" matches the quoted CDS spread. This is repeated for each quarterly increment along the (linearly interpolated) CDS term structure at day $t$. Where $i$ ranges from .25 to the longest maturity quoted on day $t$ and $QSP(t_0) = 1$[18]. Following Duffie (1999), the fair CDS spread equates the value of the fixed and default leg of the contract as shown below:

$$
\begin{aligned}
V_{\text{fixed}}(C) &= C \sum_{i=1}^{n} DF(t_i) \times QSP(t_i) \times dt \qquad \text{(A.1)} \\
&\quad + C \sum_{i=1}^{n} DF\left(\frac{t_i + t_{i-t}}{2}\right) \times [QSP(t_{i-1}) - QSP(t_i)] \times \frac{dt}{2} \\
V_{\text{default}} &= (1 - R) \sum_{i=1}^{n} DF\left(\frac{t_i + t_{i-t}}{2}\right) \times [QSP(t_{i-1}) - QSP(t_i)] \qquad \text{(A.2)} \\
V_{\text{premium}}(C_{fair}) &= V_{\text{default}} \qquad \text{(A.3)}
\end{aligned}
$$

In the above equations we assume that default occurs at the midpoint between quarterly CDS premium payments. As such, the second term in the valuation of the premium leg is the total present value of accumulated interest. The discount factor, $DF(t)$, results from the linear interpolated swap curve obtained from the Federal Reserve Board and $dt$ ist he number of years between premium payments and is 0.25 for quarterly payments).

[18]For the basis calculation, we require a spread quote for at least one contract with maturity of five or more years.

## Appendix A.2 Matching to Model Bond Price

The iterative procedure described above yields a vector of estimated quarterly risk-neutral survival probabilities, $\widehat{QSP}$. Next, we adjust these probabilities by a constant to match the model bond price, shown below, and the market price reported in TRACE.

$$V_{bond}(\widehat{QSP}) = \sum_{i=1}^{n} DF(t_i) \times \widehat{QSP}(t_i) \times CP \times dt + \sum_{i=1}^{n} DF(t_i) \times [1 - \widehat{QSP}(t_i)] \times R, \qquad \text{(A.4)}$$

where $CP$ is the bond coupon amount in dollars and $R$ is the expected recovery in default for a given bond. Other notation is described above. The coupon rate, coupon frequency, principal amount, and maturity date are obtained from FISD for each bond. We use the recovery rate supplied by Markit or 40% when the Markit rate is missing. For simplicity, we assume that coupon payments are made at the fraction, implied by the coupon frequency, of a 365 day year. For example, semiannual coupons are paid at day 182.5 and again on day 365.

Using this structure, we adjust $\widehat{QSP}$ by adding a constant $\epsilon$ to the probability of survival at each horizon. The final survival probability term structure ($\widehat{QSP} + \epsilon$) equates the model bond price to that reported in TRACE ($V_{bond}(\widehat{QSP}) + \epsilon) = V_{TRACE}$

## Appendix A.3 Calculate the Par Equivalent Spread

At this point, calculating the par equivalent spread is simply a matter of setting the value of the fixed leg equal to the value of the floating leg of the CDS contract and solving for the fair CDS spread implied by $\widehat{QSP} + \epsilon$:

$$PES = \frac{(1-R)\sum_{i=1}^{n} DF(\frac{t_i + t_{i-1}}{2}) \times [\widehat{QSP}(t_{i-t}) - \widehat{QSP}(t_i)]}{\sum_{i=1}^{n} DF(t_i) \times (\widehat{QSP}(t_i) + \epsilon) \times dt + \sum_{i=1}^{n} DF(\frac{t_i + t_{i-1}}{2}) \times [\widehat{QSP}(t_{i-t}) - \widehat{QSP}(t_i)] \times \frac{dt}{2}}. \qquad \text{(A.5)}$$

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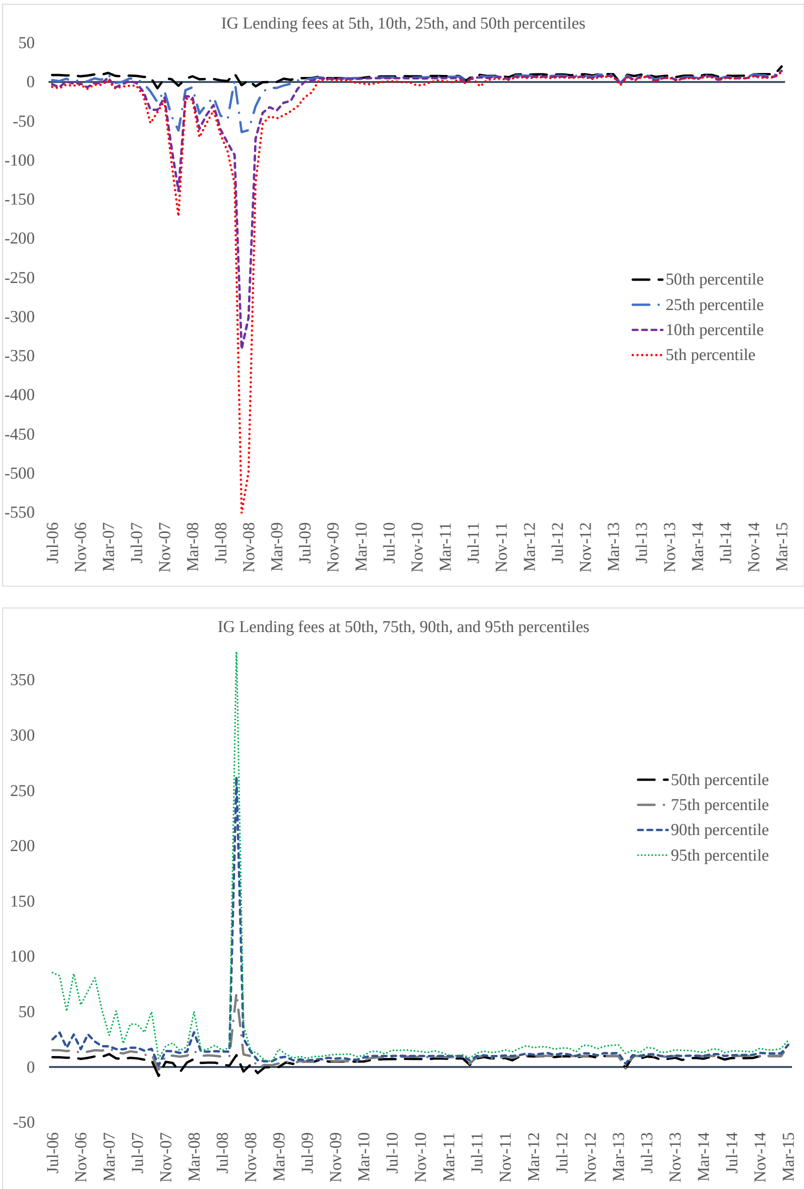
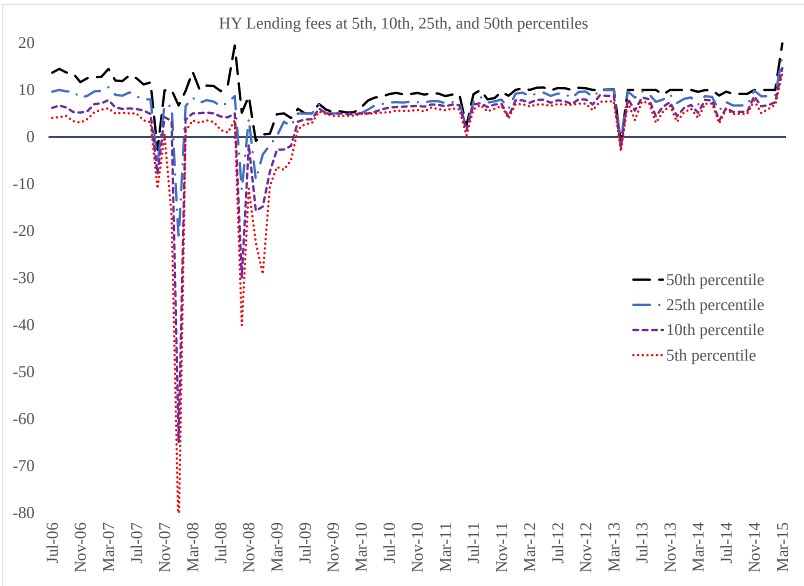
**Figure 1: Investment Grade Corporate Bond Loan Fees**

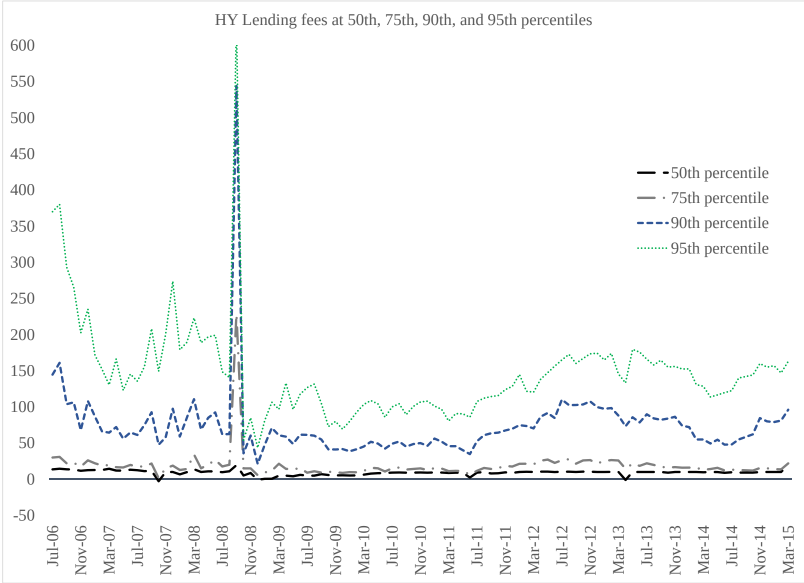
The figure shows the progression of monthly lending fees for investment grade bond loans from July 2006 to March 2015. Each month we compute the $95^{th}$, $90^{th}$, $75^{th}$, $50^{th}$, $25^{th}$, $10^{th}$, and $5^{th}$ percentile of bond lending fees from all open loan positions in the MARKIT Securities Finance file. The time series of low fee percentiles are shown above and the time series of high fee percentiles are shown below.



## Figure 2: High Yield Corporate Bond Loan Fees

The figure shows the progression of monthly lending fees for high yield bond loans from July 2006 to March 2015. Each month we compute the $95^{th}$, $90^{th}$, $75^{th}$, $50^{th}$, $25^{th}$, $10^{th}$, and $5^{th}$ percentile of bond lending fees from all open loan positions in the MARKIT Securities Finance file. The time series of low fee percentiles are shown above and the time series of high fee percentiles are shown below.



## Table 1: Corporate Bond Lending Market Descriptive Statistics

This table describes the sample of corporate bond lending transactions from July, 2006 to March, 2015. The sample comes from the MARKIT Securities Finance files. The table presents descriptive statistics for three samples: "All Bonds," contains the full sample of corporate bond lending transactions including financials and utilities; Investment Grade Industrial contains all investment-grade rated bond loans for industrial issuers (Mergent industry group 1); High yield Industrial containts the sample of bond loans rated as below investment grade for industrial issuers. Each column presents average characteristic for the year given in the column header. The column labelled "All" is the pooled average over all years. Loan fees are in basis points. Quantity on loan is the total principal on loan divided by the total amount outstanding at the time of the loan. Utilization is the percent of available inventory on loan at the time of the loan. Number Brokers is the average number of prime brokers that contribute lending market information. Number Agents is the average number of lending agents that contribute lending market information. Loan Tenure records the average number of days on existing open lending positions.

**Annual Descriptive Statistics**

| Year | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | ALL |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **All Bonds** | | | | | | | | | | | |
| Number of Unique Bonds Lent | 6,401 | 7,886 | 7,323 | 7,392 | 8,222 | 8,746 | 9,357 | 9,886 | 9,914 | 8,058 | 20,352 |
| Average Loans per Bond | 13.23 | 17.08 | 15.25 | 16.81 | 18.52 | 17.08 | 15.56 | 14.04 | 14.49 | 14.82 | 15.83 |
| Loan Fee | 26.01 | 16.17 | 11.35 | 9.01 | 14.06 | 14.24 | 20.01 | 18.83 | 18.30 | 22.60 | 16.38 |
| Quantity on loan (% outstanding) | 4.36 | 4.92 | 4.14 | 1.67 | 1.64 | 1.48 | 1.25 | 1.15 | 1.19 | 1.18 | 2.13 |
| Utilization | 14.71 | 14.49 | 12.10 | 8.11 | 8.67 | 8.53 | 7.94 | 7.63 | 7.57 | 7.81 | 9.44 |
| Number Brokers | 2.45 | 2.86 | 2.70 | 2.90 | 2.86 | 3.15 | 3.03 | 2.96 | 3.06 | 3.09 | 2.95 |
| Number Agents | 3.08 | 3.36 | 3.30 | 3.33 | 3.61 | 3.65 | 3.40 | 3.22 | 3.31 | 3.21 | 3.37 |
| Loan Tenure (days) | 129.11 | 147.72 | 139.48 | 98.42 | 95.65 | 88.68 | 91.12 | 85.82 | 95.01 | 94.08 | 104.45 |
| **Investment Grade Industrial Firm Corporate Bonds** | | | | | | | | | | | |
| Number of Unique Bonds Lent | 1,408 | 1,760 | 1,747 | 1,971 | 2,184 | 2,472 | 2,744 | 3,009 | 3,089 | 2,525 | 5,071 |
| Average Loans per Bond | 13.00 | 17.44 | 14.99 | 16.99 | 19.46 | 18.16 | 15.22 | 15.38 | 16.97 | 17.01 | 16.65 |
| Loan Fee | 12.88 | 5.41 | −16.96 | 0.10 | 6.46 | 7.04 | 10.35 | 9.70 | 10.01 | 13.99 | 6.16 |
| Quantity on loan (% outstanding) | 4.14 | 4.37 | 3.43 | 1.47 | 1.55 | 1.37 | 1.04 | 1.13 | 1.19 | 1.17 | 1.76 |
| Utilization | 10.17 | 9.91 | 7.95 | 4.87 | 5.39 | 5.06 | 4.58 | 5.22 | 5.41 | 5.31 | 5.86 |
| Number Brokers | 2.71 | 3.41 | 3.19 | 3.17 | 3.37 | 3.66 | 3.41 | 3.40 | 3.45 | 3.43 | 3.38 |
| Number Agents | 3.54 | 4.08 | 3.99 | 4.03 | 4.34 | 4.34 | 3.74 | 3.68 | 3.90 | 3.70 | 3.96 |
| Loan Tenure (days) | 119.22 | 133.60 | 117.18 | 76.93 | 81.53 | 73.00 | 72.30 | 67.46 | 79.27 | 75.49 | 83.87 |
| **High Yield Industrial Firm Corporate Bonds** | | | | | | | | | | | |
| Number of Unique Bonds Lent | 1,108 | 1,302 | 1,096 | 1,149 | 1,242 | 1,262 | 1,321 | 1,348 | 1,257 | 1,013 | 3,320 |
| Average Loans per Bond | 23.99 | 35.47 | 35.91 | 31.06 | 28.90 | 25.57 | 29.98 | 22.53 | 23.33 | 25.73 | 28.39 |
| Loan Fee | 46.24 | 35.45 | 36.27 | 18.61 | 22.70 | 24.15 | 34.04 | 32.22 | 29.07 | 36.97 | 30.43 |
| Quantity on loan (% outstanding) | 4.66 | 5.36 | 5.17 | 2.90 | 2.82 | 2.44 | 2.54 | 1.89 | 1.98 | 2.14 | 3.12 |
| Utilization | 19.06 | 20.35 | 19.61 | 13.29 | 14.82 | 14.01 | 15.33 | 12.99 | 13.79 | 15.05 | 15.61 |
| Number Brokers | 2.83 | 3.69 | 3.65 | 3.09 | 3.20 | 3.37 | 3.71 | 3.50 | 3.83 | 3.97 | 3.49 |
| Number Agents | 3.84 | 4.40 | 4.55 | 4.03 | 4.37 | 4.29 | 4.79 | 4.21 | 4.32 | 4.20 | 4.34 |
| Loan Tenure (days) | 91.19 | 101.28 | 90.74 | 73.97 | 71.59 | 76.81 | 82.05 | 79.53 | 80.10 | 76.78 | 82.23 |

## Table 2: Quintile Portfolio Characteristics

This table presents average bond loan characteristics for quintile portfolios formed using bond loan information from MARKITs Securities Finance file between July 2006 and March 2015. Each month bonds are sorted into quintile portfolios based on lending utilization or lending fees in the previous month. We then create monthly time series of portfolio bond-loan characteristics for each portfolio. These are the equal-weighted average characteristic over all loans that define a portfolio in a given month. The table presents the average of these time series for each portfolio and characteristic. The table is split into three panels. Panel A describes quintile portfolios formed from all bond loans including those for financial and utility bonds. Panel B describes quintile portfolios formed from investment grade bonds issued by industrial companies (Mergent industry group 1). Panel C describes quintile portfolios formed from high yield bonds issued by industrial companies (Mergent industry group 1). Each panel follows the same format. Columns 1-5 report the average characteristics for portfolios formed on bond utilization. Columns 6-10 report the average characteristics for portfolios formed on bond lending fees. Time-to-Maturity is the average number of years remaining until bonds in the portfolio mature. Coupon is the average annual interest rate paid to bond holders. Seasoning is the average number of years elapsed since the issuance date. Utilization is the average percent of bond principal in inventory that is on loan. Quantity Lent is the average percent of total issuance outstanding that is on loan. Fees is the average annualized rate, in basis points, paid by the borrower.

**Panel A: Quintile Characteristics, All Corporate Bonds**

| | *Portfolios Sorted on Utilization* | | | | | *Portfolios Sorted on Fees* | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Variable | Low Utilization | 2 | 3 | 4 | High Utilization | Low Fees | 2 | 3 | 4 | High Fees |
| Time-to-Maturity (years) | 7.83 | 8.30 | 9.01 | 8.97 | 8.16 | 9.67 | 9.25 | 8.61 | 7.79 | 6.75 |
| Coupon Rate | 6.05 | 5.90 | 5.85 | 5.89 | 6.45 | 5.86 | 5.83 | 5.88 | 5.97 | 6.60 |
| Seasoning | 5.35 | 4.47 | 3.97 | 3.64 | 3.63 | 4.58 | 3.80 | 3.74 | 4.35 | 4.57 |
| Utilization | 0.23 | 1.42 | 3.98 | 9.13 | 32.17 | 7.57 | 7.65 | 7.26 | 5.85 | 18.12 |
| Quantity Lent (percentage) | 0.17 | 0.51 | 1.36 | 2.89 | 6.92 | 2.72 | 2.37 | 1.99 | 1.42 | 3.30 |
| Fees | 17.10 | 8.53 | 5.30 | 4.77 | 30.92 | −12.47 | 3.15 | 7.82 | 10.10 | 57.55 |

**Panel B: Quintile Characteristics, Investment Grade Industrial Bonds**

| | *Portfolios Sorted on Utilization* | | | | | *Portfolios Sorted on Fees* | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Variable | Low Utilization | 2 | 3 | 4 | High Utilization | Low Fees | 2 | 3 | 4 | High Fees |
| Time-to-Maturity (years) | 8.57 | 9.07 | 10.34 | 10.67 | 10.94 | 11.24 | 10.79 | 10.41 | 9.10 | 8.35 |
| Coupon Rate | 5.81 | 5.59 | 5.50 | 5.41 | 5.38 | 5.77 | 5.53 | 5.41 | 5.44 | 5.52 |
| Seasoning | 5.66 | 4.69 | 4.11 | 3.74 | 3.43 | 4.74 | 3.90 | 3.71 | 4.17 | 4.82 |
| Utilization | 0.21 | 1.18 | 3.05 | 6.57 | 21.20 | 6.81 | 7.03 | 6.41 | 4.85 | 7.37 |
| Quantity Lent (percentage) | 0.15 | 0.45 | 1.14 | 2.36 | 6.14 | 2.62 | 2.48 | 2.11 | 1.41 | 1.74 |
| Fees | 13.15 | 6.90 | 2.84 | 0.88 | 7.82 | −15.97 | 1.23 | 6.62 | 9.15 | 28.57 |

**Panel C: Quintile Characteristics, High Yield Industrial Bonds**

| | *Portfolios Sorted on Utilization* | | | | | *Portfolios Sorted on Fees* | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Variable | Low Utilization | 2 | 3 | 4 | High Utilization | Low Fees | 2 | 3 | 4 | High Fees |
| Time-to-Maturity (years) | 5.56 | 5.23 | 5.43 | 5.38 | 5.43 | 5.73 | 5.65 | 5.18 | 5.06 | 5.36 |
| Coupon Rate | 7.02 | 7.04 | 7.02 | 6.90 | 7.12 | 7.02 | 6.85 | 6.92 | 6.93 | 7.38 |
| Seasoning | 5.21 | 4.78 | 4.35 | 4.20 | 4.57 | 4.14 | 3.93 | 4.24 | 5.09 | 5.61 |
| Utilization | 0.38 | 2.14 | 5.71 | 13.66 | 46.40 | 6.80 | 9.94 | 9.90 | 12.21 | 30.12 |
| Quantity Lent (percentage) | 0.25 | 0.61 | 1.41 | 2.71 | 5.67 | 1.67 | 2.03 | 1.82 | 1.86 | 3.41 |
| Fees | 26.00 | 16.89 | 16.84 | 22.64 | 60.66 | 1.86 | 6.98 | 9.30 | 16.76 | 108.63 |

## Table 3: Monthly returns to bond portfolios

This table compares to Table 9 in Asquith, Au, Covert, and Pathak (2013). It presents raw and excess returns for portfolios formed by bond lending utilization (percent of inventory on loan) and bond lending fees. Each month we sort bonds into quantiles based on average utilization, presented in Panel A, or average lending fees, presented in Panel B, over the previous month. Each panel is split into 3 subpanels which report the monthly average raw and excess returns for portfolios formed from: i) all available bonds including financials and utilities, ii) investment grade industrial bonds, and iii) high yield industrial bonds, in this order. Each panel and subpanel follows the same format. Rows 1-5 present information for quintile portfolios formed on low to high utilization or fees. Rows 6 and 7 present similar information for the $95^{th}$ and $99^{th}$ percentile portfolios respectively. The last row of each subpanel shows the average monthly return difference between the $5^{th}$ and $1^{st}$ quintile portfolios. Column 1 reports the average number of bonds per month, truncated, in each bond portfolio. The average Equal- and value- weighted monthly portfolio returns and associated t-statistics, in parentheses, are reported in each column 2-9. Value weights are a calculated from the last observed price and amount outstanding in the previous month. The monthly return for each bond is $(P_t - P_{t-1} + AI_t + C_{t-1,t})/(P_{t-1} + AI_{t-1})$. Where $P_t$ is the last observed price in the last five days of month t. AI is accrued interest and $C_{t-1,t}$ is any coupon payed over the holding period t-1 to t. The TRACE benchmark return is the equal- or value- weighted monthly return for a portfolio of all corporate bonds that pass our filters with non-missing returns. The excess return is the portfolio return less the equal- or value- weighted TRACE benchmark return each month.

**Panel A: Bond portfolios formed by sorting on *utilization* (percent of inventory on loan)**

| Portfolio | Number Bonds | Equal weighted raw returns | | Value weighted raw returns | | Equal weighted excess returns TRACE benchmark | | Value weighted excess returns TRACE benchmark | |
|---|---|---|---|---|---|---|---|---|---|
| | Mean | Mean | $t-$stat | Mean | $t-$stat | Mean | $t-$stat | Mean | $t-$stat |
| **Results for full sample of corporate bonds** | | | | | | | | | |
| Q1 (lowest) | 750 | 0.68% | 3.97 | 0.66% | 3.61 | −0.18% | −0.73 | −0.20% | −0.90 |
| Q2 | 749 | 0.59% | 3.34 | 0.56% | 2.92 | −0.28% | −1.04 | −0.31% | −1.29 |
| Q3 | 749 | 0.63% | 3.51 | 0.62% | 3.31 | −0.24% | −0.89 | −0.25% | −1.04 |
| Q4 | 749 | 0.64% | 3.48 | 0.61% | 3.24 | −0.23% | −0.82 | −0.26% | −1.04 |
| Q5 (highest) | 748 | 0.63% | 2.41 | 0.55% | 2.29 | −0.24% | −0.86 | −0.32% | −1.28 |
| 95%ile | 182 | 0.64% | 1.65 | 0.55% | 1.46 | −0.23% | −0.65 | −0.31% | −0.91 |
| 99%ile | 37 | 0.29% | 0.58 | 0.27% | 0.53 | −0.58% | −1.25 | −0.60% | −1.30 |
| Q5 - Q1 | | −0.06% | −0.44 | −0.11% | −0.95 | −0.06% | −0.44 | −0.11% | −0.95 |
| **Results for investment grade industrial corporate bonds** | | | | | | | | | |
| Q1 (lowest) | 290 | 0.57% | 4.15 | 0.53% | 3.77 | −0.29% | −1.15 | −0.33% | −1.60 |
| Q2 | 289 | 0.55% | 3.56 | 0.56% | 3.42 | −0.32% | −1.12 | −0.31% | −1.32 |
| Q3 | 289 | 0.56% | 3.52 | 0.57% | 3.36 | −0.30% | −1.06 | −0.30% | −1.24 |
| Q4 | 289 | 0.59% | 3.55 | 0.59% | 3.35 | −0.28% | −0.96 | −0.28% | −1.14 |
| Q5 (highest) | 289 | 0.58% | 3.21 | 0.60% | 3.20 | −0.29% | −1.04 | −0.27% | −1.12 |
| 95%ile | 72 | 0.66% | 2.75 | 0.79% | 2.88 | −0.21% | −0.76 | −0.08% | −0.30 |
| 99%ile | 15 | 0.40% | 0.70 | 0.55% | 0.80 | −0.46% | −0.89 | −0.32% | −0.49 |
| Q5 - Q1 | | 0.00% | 0.03 | 0.06% | 0.91 | 0.00% | 0.03 | 0.06% | 0.91 |
| **Results for high yield industrial corporate bonds** | | | | | | | | | |
| Q1 (lowest) | 142 | 0.96% | 3.05 | 0.98% | 2.87 | 0.09% | 0.30 | 0.11% | 0.36 |
| Q2 | 142 | 0.86% | 2.96 | 0.91% | 2.59 | −0.01% | −0.03 | 0.04% | 0.13 |
| Q3 | 141 | 0.73% | 2.42 | 0.64% | 1.98 | −0.13% | −0.45 | −0.23% | −0.79 |
| Q4 | 141 | 0.65% | 1.71 | 0.63% | 1.62 | −0.22% | −0.67 | −0.23% | −0.70 |
| Q5 (highest) | 141 | 0.70% | 1.54 | 0.66% | 1.42 | −0.17% | −0.41 | −0.21% | −0.51 |
| 95%ile | 35 | 0.58% | 1.15 | 0.51% | 0.95 | −0.28% | −0.61 | −0.36% | −0.75 |
| 99%ile | 7 | 0.19% | 0.25 | −0.08% | −0.10 | −0.68% | −0.94 | −0.95% | −1.26 |
| Q5 - Q1 | | −0.26% | −1.23 | −0.32% | −1.35 | −0.26% | −1.23 | −0.32% | −1.35 |

## Table 3 Continued: Monthly returns to bond portfolios

**Panel B: Bond portfolios formed by sorting on *loan fees***

| Portfolio | Number Bonds | Equal weighted raw returns | | Value weighted raw returns | | Equal weighted excess returns TRACE benchmark | | Value weighted excess returns TRACE benchmark | |
|---|---|---|---|---|---|---|---|---|---|
| | Mean | Mean | $t-$stat | Mean | $t-$stat | Mean | $t-$stat | Mean | $t-$stat |
| **Results for full sample of corporate bonds** | | | | | | | | | |
| Q1 (lowest) | 781 | 0.60% | 3.46 | 0.57% | 3.20 | −0.27% | −0.92 | −0.30% | −1.17 |
| Q2 | 866 | 0.58% | 3.02 | 0.57% | 2.82 | −0.29% | −1.04 | −0.30% | −1.17 |
| Q3 | 635 | 0.52% | 2.90 | 0.46% | 2.42 | −0.35% | −1.31 | −0.40% | −1.70 |
| Q4 | 796 | 0.55% | 3.22 | 0.53% | 3.18 | −0.32% | −1.29 | −0.33% | −1.57 |
| Q5 (highest) | 706 | 0.89% | 3.20 | 0.90% | 3.31 | 0.02% | 0.08 | 0.03% | 0.13 |
| 95%ile | 143 | 1.33% | 2.77 | 1.41% | 2.84 | 0.47% | 1.08 | 0.54% | 1.19 |
| 99%ile | 28 | 1.70% | 2.45 | 1.79% | 2.39 | 0.84% | 1.37 | 0.92% | 1.34 |
| Q5 - Q1 | | 0.29% | 1.48 | 0.33% | 1.69 | 0.29% | 1.48 | 0.33% | 1.69 |
| **Results for investment grade industrial corporate bonds** | | | | | | | | | |
| Q1 (lowest) | 287 | 0.56% | 3.23 | 0.57% | 3.09 | −0.31% | −1.02 | −0.30% | −1.18 |
| Q2 | 289 | 0.59% | 3.31 | 0.60% | 3.20 | −0.28% | −0.93 | −0.27% | −1.07 |
| Q3 | 257 | 0.52% | 3.27 | 0.53% | 3.19 | −0.35% | −1.21 | −0.34% | −1.44 |
| Q4 | 309 | 0.54% | 3.71 | 0.53% | 3.72 | −0.33% | −1.24 | −0.33% | −1.57 |
| Q5 (highest) | 323 | 0.59% | 3.89 | 0.58% | 3.80 | −0.28% | −1.13 | −0.29% | −1.42 |
| 95%ile | 73 | 0.75% | 2.83 | 0.74% | 2.96 | −0.12% | −0.44 | −0.13% | −0.48 |
| 99%ile | 14 | 1.73% | 2.00 | 1.26% | 1.50 | 0.86% | 1.13 | 0.39% | 0.49 |
| Q5 - Q1 | | 0.03% | 0.33 | 0.01% | 0.15 | 0.03% | 0.33 | 0.01% | 0.15 |
| **Results for high yield industrial corporate bonds** | | | | | | | | | |
| Q1 (lowest) | 140 | 0.73% | 2.38 | 0.66% | 2.04 | −0.14% | −0.47 | −0.21% | −0.71 |
| Q2 | 133 | 0.66% | 2.37 | 0.63% | 2.23 | −0.21% | −0.74 | −0.24% | −0.90 |
| Q3 | 139 | 0.71% | 2.40 | 0.62% | 2.02 | −0.16% | −0.59 | −0.25% | −0.92 |
| Q4 | 152 | 0.62% | 1.87 | 0.58% | 1.61 | −0.25% | −0.81 | −0.29% | −0.96 |
| Q5 (highest) | 143 | 1.12% | 2.01 | 1.26% | 1.99 | 0.25% | 0.49 | 0.40% | 0.68 |
| 95%ile | 36 | 1.16% | 1.84 | 1.30% | 1.72 | 0.29% | 0.50 | 0.43% | 0.60 |
| 99%ile | 7 | 0.75% | 0.83 | 0.41% | 0.41 | −0.12% | −0.14 | −0.45% | −0.45 |
| Q5 - Q1 | | 0.39% | 1.22 | 0.60% | 1.47 | 0.39% | 1.21 | 0.60% | 1.47 |

## Table 4: Excess returns to bond portfolios over 1 and 3 month horizons

This table reports average bond portfolio excess returns, relative to maturity and rating based benchmark returns, for both the one-month and three-month horizon. Each month we sort bonds into quantiles base on average utilization, presented in Panel A, or average lending fees, presented in Panel B, over the previous month. Each panel is split into 3 subpanels which report the average excess returns for portfolios formed from: i) all available bonds including financials and utilities, ii) investment grade industrial bonds, and iii) high yield industrial bonds, in this order. Each panel and subpanel follows the same format. Rows 1-5 present information for quintile portfolios formed on low to high utilization or fees. Rows 6 and 7 present similar information for the $95^{th}$ and $99^{th}$ percentile portfolios respectively. The last row of each subpanel shows the average monthly return difference between the $5^{th}$ and $1^{st}$ quintile portfolios. Columns 1-4 present average monthly equal-weighted (columns 1 & 2) and value-weighted (columns 3 & 4) excess returns and associated t-statistics relative to TRACE time-to-maturity and rating matched portfolios. That is, each month we independently sort TRACE bonds into 7 rating categories and 9 time-to-maturity categories: AAA-Aa3, A1-A3, Baa1-Baa3, Ba1-Ba3, B1-B3, B3¡, and NR and 0-2, 2-4, 4-6, 6-8, 8-10, 10-15, 15-20, and 20¡ years. We then create 63 benchmark portfolios series. Each bond-month return is compared to the relevant equal- or value- weighted benchmark portfolio return prior to computing portfolio excess returns. Value-weights are based on the last observed price and amount outstanding in the last 5 days of the formation month. Three month returns cumulate one-month returns following portfolio formation. These weights are constant for 3 months until the portfolio is rebalanced. Columns 5-8 report the average equal- and value- weighted 3-month excess return relative to the 3-month TRACE benchmark return. The TRACE bench mark is the equal- or value- weighted average cumulative 3 month return over all bonds with non-missing returns that pass our filters. TRACE 3-month maturity and rating based benchmarks cumulate the one-month maturity/rating benchmark returns.

**Panel A: Bond portfolios formed by sorting on *utilization* (percent of inventory on loan)**

| Portfolio | Equal weighted 1-month excess returns matched benchmark | | Value weighted 1-month excess returns matched benchmark | | Equal weighted 3-month excess returns TRACE benchmark | | Value weighted 3-month excess returns TRACE benchmark | | Equal weighted 3-month excess returns matched benchmark | | Value weighted 3-month excess returns matched benchmark | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Mean | $t-$stat | Mean | $t-$stat | Mean | $t-$stat | Mean | $t-$stat | Mean | $t-$stat | Mean | $t-$stat |
| **Results for full sample of corporate bonds** | | | | | | | | | | | | |
| Q1 (lowest) | 0.03% | 0.67 | 0.04% | 1.40 | −0.53% | −1.60 | −0.07% | −0.22 | 0.12% | 2.02 | 0.14% | 3.03 |
| Q2 | −0.01% | −0.28 | −0.03% | −0.77 | −0.92% | −2.53 | −0.46% | −1.45 | −0.07% | −1.63 | −0.07% | −1.33 |
| Q3 | 0.01% | 0.16 | 0.02% | 0.39 | −0.85% | −2.34 | −0.40% | −1.29 | −0.09% | −1.38 | −0.08% | −1.38 |
| Q4 | −0.03% | −0.58 | −0.03% | −0.65 | −0.81% | −2.26 | −0.34% | −1.08 | −0.19% | −2.55 | −0.12% | −2.09 |
| Q5 (highest) | −0.16% | −1.11 | −0.12% | −1.25 | −0.71% | −1.98 | −0.48% | −1.56 | −0.45% | −2.56 | −0.35% | −2.95 |
| 95%ile | −0.36% | −1.14 | −0.42% | −1.41 | −0.72% | −1.23 | −0.49% | −0.78 | −1.09% | −2.89 | −1.06% | −3.11 |
| 99%ile | −0.95% | −1.81 | −0.96% | −2.10 | −1.44% | −1.62 | −1.21% | −1.30 | −2.48% | −3.24 | −2.22% | −3.78 |
| Q5 - Q1 | −0.18% | −1.51 | −0.16% | −1.61 | −0.18% | −0.67 | −0.41% | −1.90 | −0.57% | −3.46 | −0.50% | −3.82 |
| **Results for investment grade industrial corporate bonds** | | | | | | | | | | | | |
| Q1 (lowest) | −0.04% | −0.63 | −0.05% | −0.84 | −0.85% | −2.22 | −0.42% | −1.38 | −0.07% | −0.60 | −0.07% | −0.76 |
| Q2 | −0.03% | −0.50 | −0.02% | −0.29 | −1.02% | −2.60 | −0.48% | −1.55 | −0.13% | −1.19 | −0.07% | −0.73 |
| Q3 | −0.03% | −0.47 | −0.02% | −0.32 | −0.99% | −2.42 | −0.46% | −1.40 | −0.11% | −0.97 | −0.07% | −0.71 |
| Q4 | −0.01% | −0.09 | −0.00% | −0.03 | −0.96% | −2.33 | −0.45% | −1.35 | −0.11% | −1.08 | −0.10% | −1.02 |
| Q5 (highest) | −0.05% | −0.75 | −0.02% | −0.38 | −0.94% | −2.39 | −0.35% | −1.06 | −0.15% | −1.29 | −0.05% | −0.51 |
| 95%ile | −0.07% | −0.51 | −0.00% | −0.02 | −0.91% | −2.62 | −0.09% | −0.24 | −0.32% | −1.41 | −0.14% | −0.62 |
| 99%ile | −0.53% | −1.14 | −0.51% | −0.92 | −2.50% | −2.61 | −1.46% | −1.12 | −2.37% | −2.76 | −1.78% | −2.09 |
| Q5 - Q1 | −0.01% | −0.23 | 0.03% | 0.63 | −0.09% | −0.77 | 0.07% | 0.57 | −0.08% | −1.06 | 0.02% | 0.29 |
| **Results for high yield industrial corporate bonds** | | | | | | | | | | | | |
| Q1 (lowest) | 0.01% | 0.07 | 0.05% | 0.33 | 0.65% | 1.19 | 1.35% | 2.11 | 0.28% | 1.21 | 0.41% | 1.73 |
| Q2 | 0.04% | 0.31 | 0.08% | 0.50 | 0.07% | 0.16 | 0.62% | 1.03 | 0.09% | 0.46 | 0.12% | 0.49 |
| Q3 | −0.17% | −0.74 | −0.24% | −1.07 | −0.34% | −0.82 | 0.07% | 0.16 | −0.42% | −1.55 | −0.46% | −1.90 |
| Q4 | −0.31% | −1.07 | −0.31% | −1.11 | −0.25% | −0.44 | 0.24% | 0.36 | −0.57% | −1.54 | −0.49% | −1.39 |
| Q5 (highest) | −0.41% | −1.05 | −0.46% | −1.19 | −0.26% | −0.35 | −0.07% | −0.09 | −1.02% | −2.22 | −1.15% | −2.56 |
| 95%ile | −0.57% | −1.40 | −0.67% | −1.83 | −0.73% | −0.86 | −0.41% | −0.45 | −1.58% | −2.74 | −1.60% | −3.41 |
| 99%ile | −1.33% | −1.37 | −1.60% | −1.52 | −0.92% | −0.60 | −1.39% | −0.92 | −2.48% | −1.62 | −3.41% | −2.51 |
| Q5 - Q1 | −0.42% | −1.48 | −0.51% | −1.53 | −0.91% | −2.14 | −1.42% | −2.69 | −1.30% | −3.13 | −1.56% | −3.44 |

## Table 4 Continued: Excess returns to bond portfolios over 1 and 3 month horizons

**Panel B: Bond portfolios formed by sorting on *loan fees***

| Portfolio | Equal weighted 1-month excess returns matched benchmark | | Value weighted 1-month excess returns matched benchmark | | Equal weighted 3-month excess returns TRACE benchmark | | Value weighted 3-month excess returns TRACE benchmark | | Equal weighted 3-month excess returns matched benchmark | | Value weighted 3-month excess returns matched benchmark | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Mean | $t$−stat | Mean | $t$−stat | Mean | $t$−stat | Mean | $t$−stat | Mean | $t$−stat | Mean | $t$−stat |
| **Results for full sample of corporate bonds** | | | | | | | | | | | | |
| Q1 (lowest) | −0.03% | −0.73 | −0.02% | −0.45 | −0.88% | −2.17 | −0.45% | −1.31 | −0.12% | −2.42 | −0.07% | −1.40 |
| Q2 | −0.05% | −1.05 | −0.04% | −0.76 | −0.86% | −2.43 | −0.43% | −1.44 | −0.21% | −2.90 | −0.19% | −3.05 |
| Q3 | −0.00% | −0.03 | −0.03% | −0.82 | −1.09% | −2.94 | −0.67% | −2.11 | −0.10% | −1.17 | −0.10% | −1.41 |
| Q4 | −0.05% | −0.69 | −0.04% | −0.71 | −0.96% | −2.81 | −0.52% | −1.80 | −0.15% | −1.85 | −0.11% | −1.74 |
| Q5 (highest) | −0.03% | −0.21 | 0.00% | 0.04 | 0.10% | 0.22 | 0.64% | 1.29 | −0.05% | −0.32 | 0.03% | 0.22 |
| 95%ile | −0.13% | −0.35 | −0.02% | −0.08 | 1.49% | 1.61 | 2.30% | 2.24 | −0.13% | −0.28 | 0.20% | 0.62 |
| 99%ile | 0.12% | 0.24 | 0.25% | 0.53 | 3.54% | 2.45 | 4.13% | 2.66 | 0.92% | 0.87 | 1.03% | 1.34 |
| Q5 - Q1 | −0.00% | −0.03 | 0.02% | 0.17 | 0.97% | 2.07 | 1.09% | 2.19 | 0.07% | 0.41 | 0.10% | 0.69 |
| **Results for investment grade industrial corporate bonds** | | | | | | | | | | | | |
| Q1 (lowest) | −0.03% | −0.48 | −0.02% | −0.34 | −0.98% | −2.33 | −0.47% | −1.36 | −0.12% | −1.06 | −0.10% | −0.94 |
| Q2 | −0.02% | −0.23 | −0.01% | −0.11 | −0.98% | −2.41 | −0.47% | −1.43 | −0.07% | −0.63 | −0.06% | −0.60 |
| Q3 | −0.02% | −0.35 | −0.01% | −0.19 | −1.11% | −2.71 | −0.57% | −1.74 | −0.10% | −0.89 | −0.05% | −0.57 |
| Q4 | −0.03% | −0.51 | −0.02% | −0.37 | −0.95% | −2.31 | −0.44% | −1.37 | −0.11% | −1.02 | −0.07% | −0.76 |
| Q5 (highest) | −0.04% | −0.59 | −0.03% | −0.45 | −0.82% | −2.20 | −0.26% | −0.85 | −0.13% | −1.09 | −0.05% | −0.50 |
| 95%ile | −0.08% | −0.56 | −0.04% | −0.25 | −0.36% | −0.81 | 0.29% | 0.64 | −0.22% | −0.64 | 0.05% | 0.17 |
| 99%ile | 0.15% | 0.22 | −0.27% | −0.42 | 2.06% | 1.16 | 1.89% | 1.12 | 0.28% | 0.18 | 0.03% | 0.03 |
| Q5 - Q1 | −0.01% | −0.10 | −0.01% | −0.14 | 0.16% | 0.97 | 0.21% | 1.28 | −0.02% | −0.19 | 0.05% | 0.57 |
| **Results for high yield industrial corporate bonds** | | | | | | | | | | | | |
| Q1 (lowest) | −0.05% | −0.35 | −0.10% | −0.71 | −0.35% | −0.87 | 0.03% | 0.08 | −0.22% | −1.05 | −0.26% | −1.47 |
| Q2 | −0.15% | −0.78 | −0.14% | −0.83 | −0.48% | −1.20 | −0.13% | −0.34 | −0.38% | −1.62 | −0.36% | −1.64 |
| Q3 | −0.17% | −0.82 | −0.23% | −1.12 | −0.41% | −1.08 | −0.15% | −0.38 | −0.40% | −1.48 | −0.53% | −1.90 |
| Q4 | −0.28% | −1.12 | −0.32% | −1.10 | −0.26% | −0.55 | 0.21% | 0.36 | −0.46% | −1.56 | −0.45% | −1.47 |
| Q5 (highest) | −0.22% | −0.51 | −0.10% | −0.24 | 1.16% | 1.02 | 1.99% | 1.39 | −0.31% | −0.54 | −0.02% | −0.04 |
| 95%ile | −0.27% | −0.56 | −0.16% | −0.31 | 1.41% | 1.17 | 2.11% | 1.39 | −0.51% | −0.63 | −0.19% | −0.26 |
| 99%ile | −0.80% | −0.98 | −1.01% | −1.15 | 3.56% | 1.92 | 3.04% | 1.59 | 1.14% | 0.68 | −0.02% | −0.02 |
| Q5 - Q1 | −0.17% | −0.46 | −0.00% | −0.01 | 1.50% | 1.73 | 1.96% | 1.70 | −0.08% | −0.16 | 0.24% | 0.41 |

## Table 5: Lending Market Fees

This table presents average lending fees, in basis points, for 25 bond portfolios from July 2006 to March 2015. Lending fees come from MARKITs Securities Finance files and are the value-weighted average fee across all open loans for each bond. Each month bonds are sequentially sorted into quintiles based on average utilization in the prior month and then into quintiles based on average lending fees in the prior month. From these sorts, we create monthly time series of portfolio lending fees by averaging fees over bonds in each portfolio. The table records the average of monthly portfolio lending fees for each of the utilization/fee based portfolios. Utilization is the percent of bond principal in inventory on loan and fee is the annual lending rate. Panels report average lending fees for portfolios formed from different subsamples of the lending data. Portfolios in Panel A are formed from all bond loans including those for bonds issued by financial and utility companies. Portfolios in Panel B are formed from loans of investment grade bonds issued by industrial companies (Mergent industry group 1). Portfolios in Panel C are formed from loans of high yield bonds issued by industrial companies (Mergent industry group 1). Each panel follows the same format. Rows 1-5 define the utilization sort and columns 1-5 define the lending fee sort. For example, row 2 of column 3 in panel A reports an average lending fee for the third fee-based portfolio within the second utilization quintile of 8.24 basis points. The last row in each panel reports the difference in average lending fees between the highest and lows utilization portfolio. Similarly, the last column of each panel reports the difference in average lending fees between the highest and lowest fee-based portfolios.

**Panel A: Lending Fees (Basis Points), Full Sample**

| | | Portfolios Sorted on Lending Fees | | | | | |
|---|---|---|---|---|---|---|---|
| | | Low Fees | Fees 2 | Fees 3 | Fees 4 | High Fees | (5)−(1) |
| Portfolios Sorted by Utilization | Low Utilization | −1.76 | 7.88 | 9.74 | 11.68 | 47.56 | 49.32 |
| | Utilization 2 | −5.53 | 5.91 | 8.24 | 9.58 | 25.34 | 30.84 |
| | Utilization 3 | −14.54 | 1.33 | 6.27 | 8.91 | 26.39 | 40.93 |
| | Utilization 4 | −19.95 | −2.74 | 3.64 | 8.59 | 31.86 | 51.81 |
| | High Utilization | −13.83 | 0.38 | 7.62 | 17.71 | 131.82 | 145.65 |
| | (5)−(1) | −12.07 | −7.50 | −2.12 | 6.02 | 84.26 | |

**Panel B: Lending Fees (Basis Points), Investment Grade Industrial Bonds**

| | | Portfolios Sorted on Lending Fees | | | | | |
|---|---|---|---|---|---|---|---|
| | | Low Fees | Fees 2 | Fees 3 | Fees 4 | High Fees | (5)−(1) |
| Portfolios Sorted by Utilization | Low Utilization | −0.50 | 7.64 | 9.35 | 11.10 | 32.09 | 32.59 |
| | Utilization 2 | −8.32 | 5.44 | 7.89 | 9.27 | 20.13 | 28.45 |
| | Utilization 3 | −17.66 | −0.52 | 5.14 | 8.36 | 18.41 | 36.07 |
| | Utilization 4 | −21.60 | −4.09 | 2.65 | 7.23 | 19.40 | 41.00 |
| | High Utilization | −19.67 | −4.64 | 2.28 | 7.61 | 52.10 | 71.78 |
| | (5)−(1) | −19.17 | −12.27 | −7.07 | −3.49 | 20.02 | |

**Panel C: Lending Fees (Basis Points), High Yield Industrial Bonds**

| | | Portfolios Sorted on Lending Fees | | | | | |
|---|---|---|---|---|---|---|---|
| | | Low Fees | Fees 2 | Fees 3 | Fees 4 | High Fees | (5)−(1) |
| Portfolios Sorted by Utilization | Low Utilization | 1.08 | 7.91 | 9.28 | 11.85 | 99.28 | 98.20 |
| | Utilization 2 | 2.27 | 6.55 | 8.32 | 10.42 | 41.00 | 38.73 |
| | Utilization 3 | 1.78 | 6.36 | 8.22 | 10.81 | 49.97 | 48.18 |
| | Utilization 4 | 2.70 | 6.81 | 8.72 | 13.58 | 79.45 | 76.74 |
| | High Utilization | 6.14 | 13.70 | 33.80 | 80.41 | 250.94 | 244.80 |
| | (5)−(1) | 5.06 | 5.79 | 24.53 | 68.56 | 151.66 | |

## Table 6: Returns to portfolios sorted on utilization and fees

This table presents the average monthly and three-month excess returns, in percentage points, to bond portfolios sequentially sorted on average utilization then by average fees in the formation month (month prior to rebalancing) from July 2006 to March 2015. The monthly excess return is the total return to the bond minus the equal-weighted average return over all bonds in the TRACE credit rating and maturity matched benchmark each month. The 3-month excess bond return is the cumulative monthly return less the cumulative credit rating and maturity matched benchmark return. The portfolio excess return is the equal-weighted average excess return over bonds in the portfolio for the 1- and 3- month horizon. Panels A, B, and C report the average monthly and 3-month portfolio excess returns for the 25 utilization/fee based portfolios formed from different subsamples of the lending data. Portfolios in Panel A are formed from all bond loans including those for bonds issued by financial and utility companies. Portfolios in Panel B are formed from loans of investment grade bonds issued by industrial companies (Mergent industry group 1). Portfolios in Panel C are formed from loans of high yield bonds issued by industrial companies (Mergent industry group 1). Each panel follows the same format. Row headers define the utilization sort and column headers define the fee sort. For example, row 2 of column 1 reports the average 1-month excess return for the lowest fee-based portfolio within the second utilization quintile. Utilization is the percent of bond principal in inventory on loan and fee is the annual lending rate. Columns 1-5 and 7-11 report average monthly and 3-month portfolio excess returns respectively. Columns 6 and 12 report the difference in monthly and 3-month excess returns, respectively, between the highest lowest fee-based portfolios with each utilization quintile. T-statistics are reported in parentheses.

**Panel A: All Corporate Bonds**

| | | 1 month excess returns | | | | | | 3 month excess returns | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | **Portfolios Sorted on Lending Fees** | | | | | | **Portfolios Sorted on Lending Fees** | | | | | |
| | | Low Fees | Fees 2 | Fees 3 | Fees 4 | High Fees | (5)−(1) | Low Fees | Fees 2 | Fees 3 | Fees 4 | High Fees | (5)−(1) |
| **Portfolios Sorted on Utilization** | Low Utilization | 0.00 | 0.02 | 0.02 | −0.10 | 0.04 | 0.04 | −0.08 | 0.01 | 0.01 | 0.06 | 0.13 | 0.20 |
| | | (0.03) | (0.26) | (0.22) | (−0.71) | (0.51) | (0.74) | (−0.73) | (0.13) | (0.09) | (0.34) | (0.82) | (1.24) |
| | Utilization 2 | −0.03 | −0.06 | −0.02 | −0.01 | 0.27 | 0.30 | −0.07 | −0.16 | −0.11 | −0.13 | 0.58 | 0.65 |
| | | (−0.75) | (−1.19) | (−0.38) | (−0.21) | (2.87) | (4.14) | (−1.35) | (−1.71) | (−1.12) | (−1.49) | (2.62) | (2.05) |
| | Utilization 3 | −0.02 | −0.02 | −0.04 | 0.01 | −0.04 | −0.01 | −0.15 | −0.20 | −0.11 | −0.08 | 0.16 | 0.30 |
| | | (0.58) | (−0.51) | (−0.52) | (0.24) | (−0.22) | (−0.17) | (−2.07) | (−2.51) | (−1.02) | (−0.84) | (0.84) | (1.65) |
| | Utilization 4 | −0.01 | −0.00 | −0.07 | −0.10 | −0.03 | −0.02 | −0.11 | −0.19 | −0.30 | −0.27 | −0.22 | −0.10 |
| | | (−0.24) | (−0.05) | (−1.23) | (−1.30) | (−0.14) | (−0.12) | (−1.87) | (−2.31) | (−2.99) | (−2.35) | (−1.04) | (−0.52) |
| | High Utilization | −0.01 | −0.10 | −0.03 | −0.07 | −0.33 | −0.32 | −0.19 | −0.14 | −0.29 | −0.24 | −0.96 | −0.76 |
| | | (−0.19) | (−1.73) | (−0.48) | (−0.63) | (−1.17) | (−1.36) | (−2.12) | (−1.34) | (−2.54) | (−1.60) | (−2.78) | (−2.38) |

## Table 6 Continued: Returns to portfolios sorted on utilization and fees

**Panel B: Investment Grade Industrial Firms Corporate Bonds**

| | | 1 month excess returns | | | | | | 3 month excess returns | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Portfolios Sorted on Lending Fees | | | | | | Portfolios Sorted on Lending Fees | | | | | |
| | | Low Fees | Fees 2 | Fees 3 | Fees 4 | High Fees | (5)−(1) | Low Fees | Fees 2 | Fees 3 | Fees 4 | High Fees | (5)−(1) |
| **Portfolios Sorted on Utilization** | Low Utilization | −0.06 | −0.06 | 0.04 | 0.06 | −0.06 | 0.00 | −0.21 | −0.07 | 0.06 | −0.12 | −0.07 | 0.14 |
| | | (−0.73) | (−0.72) | (0.39) | (0.42) | (−1.03) | (−0.09) | (−1.71) | (−0.56) | (0.43) | (−0.51) | (−0.72) | (1.51) |
| | Utilization 2 | −0.04 | −0.04 | −0.00 | −0.07 | 0.05 | 0.08 | −0.09 | −0.17 | −0.19 | −0.21 | 0.05 | 0.14 |
| | | (−0.54) | (−0.54) | (−0.04) | (−0.83) | (0.53) | (1.18) | (−0.83) | (−1.29) | (−1.66) | (−1.82) | (0.24) | (1.02) |
| | Utilization 3 | −0.07 | −0.01 | −0.06 | −0.04 | −0.10 | −0.03 | −0.07 | −0.09 | −0.18 | −0.12 | −0.16 | −0.09 |
| | | (−0.93) | (−0.13) | (−0.84) | (−0.58) | (−1.04) | (−0.36) | (−0.60) | (−0.74) | (−1.38) | (−0.98) | (−0.71) | (−0.63) |
| | Utilization 4 | −0.01 | −0.02 | 0.05 | −0.04 | 0.02 | 0.03 | −0.13 | −0.13 | −0.00 | −0.09 | −0.07 | 0.06 |
| | | (−0.17) | (−0.19) | (0.84) | (−0.62) | (0.20) | (0.22) | (−1.21) | (−1.05) | (−0.04) | (−0.89) | (−0.57) | (0.32) |
| | High Utilization | −0.06 | −0.04 | 0.02 | 0.06 | −0.13 | −0.08 | −0.25 | −0.12 | 0.10 | −0.01 | −0.24 | 0.01 |
| | | (−0.68) | (−0.56) | (0.27) | (0.69) | (−1.20) | (−0.73) | (−1.72) | (−0.82) | (0.69) | (−0.11) | (−1.27) | (0.07) |

**Panel C: High Yield Industrial Firms Corporate Bonds**

| | | 1 month excess returns | | | | | | 3 month excess returns | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Portfolios Sorted on Lending Fees | | | | | | Portfolios Sorted on Lending Fees | | | | | |
| | | Low Fees | Fees 2 | Fees 3 | Fees 4 | High Fees | (5)−(1) | Low Fees | Fees 2 | Fees 3 | Fees 4 | High Fees | (5)−(1) |
| **Portfolios Sorted on Utilization** | Low Utilization | −0.04 | 0.01 | 0.00 | −0.42 | 0.36 | 0.40 | 0.54 | 0.19 | 0.04 | −0.58 | 0.95 | 0.41 |
| | | (−0.21) | (0.06) | (0.00) | (−1.21) | (0.97) | (2.22) | (1.27) | (0.42) | (0.07) | (−1.69) | (1.37) | (0.99) |
| | Utilization 2 | −0.04 | −0.04 | −0.13 | −0.01 | 0.41 | 0.45 | −0.21 | −0.16 | −0.39 | 0.28 | 1.55 | 1.76 |
| | | (−0.25) | (−0.19) | (−0.98) | (−0.04) | (1.10) | (3.23) | (−0.68) | (−0.52) | (−1.20) | (0.59) | (1.91) | (1.86) |
| | Utilization 3 | 0.03 | −0.18 | −0.22 | −0.07 | −0.34 | −0.38 | −0.26 | −0.45 | −0.68 | −0.75 | 0.14 | 0.40 |
| | | (0.20) | (−0.95) | (−0.98) | (−0.27) | (−0.59) | (−1.36) | (−0.87) | (−1.66) | (−2.02) | (−1.80) | (0.18) | (0.64) |
| | Utilization 4 | −0.12 | −0.15 | −0.39 | −0.40 | −0.34 | −0.22 | −0.21 | −0.33 | −0.71 | −0.75 | −0.21 | 0.00 |
| | | (−0.69) | (−0.88) | (−0.96) | (−1.29) | (−0.79) | (−0.78) | (−0.70) | (−1.31) | (−1.40) | (−1.87) | (−0.28) | (0.00) |
| | High Utilization | −0.01 | −0.13 | −0.39 | −0.56 | −0.82 | −0.81 | −0.35 | −0.89 | −0.76 | −1.66 | −2.92 | −2.57 |
| | | (−0.07) | (−0.83) | (−1.24) | (−1.18) | (−1.95) | (−2.27) | (−1.09) | (−2.40) | (−1.78) | (−2.44) | (−3.80) | (−3.22) |

## Table 7: Fee-adjusted returns to portfolios sorted on utilization and fees

This table presents the average monthly and three-month excess returns adjusted for lending fees, in percentage points, to bond portfolios sequentially sorted on average utilization then by average fees in the formation month (month prior to rebalancing) from July 2006 to March 2015. In this case, bond-level returns are adjusted to include1 month or 3 months of fees paid by the borrower. As such, fee-adjusted returns are from the perspective of the bond owner/lender. The monthly excess return is the fee-adjusted bond return minus the equal-weighted average return over all bonds in the TRACE credit rating and maturity matched benchmark each month. The 3-month excess bond return is the cumulative fee-adjusted monthly return less the cumulative credit rating and maturity matched benchmark return. The portfolio excess return is the equal-weighted average excess return over bonds in the portfolio for the 1- and 3- month horizon. Panels A, B, and C report the average monthly and 3-month portfolio excess returns for the 25 utilization/fee based portfolios formed from different subsamples of the lending data. Portfolios in Panel A are formed from all bond loans including those for bonds issued by financial and utility companies. Portfolios in Panel B are formed from loans of investment grade bonds issued by industrial companies (Mergent industry group 1). Portfolios in Panel C are formed from loans of high yield bonds issued by industrial companies (Mergent industry group 1). Each panel follows the same format. Row headers define the utilization sort and column headers define the fee sort. For example, row 2 of column 1 reports the average 1-month excess return for the lowest fee-based portfolio within the second utilization quintile. Utilization is the percent of bond principal in inventory on loan and fee is the annual lending rate. Columns 1-5 and 7-11 report average monthly and 3-month portfolio excess returns respectively. Columns 6 and 12 report the difference in monthly and 3-month excess returns, respectively, between the highest lowest fee-based portfolios with each utilization quintile. T-statistics are reported in parentheses.

**Panel A: All Corporate Bonds**

| | | 1 month excess returns | | | | | | 3 month excess returns | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Portfolios Sorted on Lending Fees | | | | | | Portfolios Sorted on Lending Fees | | | | | |
| | | Low Fees | Fees 2 | Fees 3 | Fees 4 | High Fees | (5)−(1) | Low Fees | Fees 2 | Fees 3 | Fees 4 | High Fees | (5)−(1) |
| **Portfolios Sorted on Utilization** | Low Utilization | 0.00 | 0.02 | 0.03 | −0.09 | 0.07 | 0.07 | −0.07 | 0.04 | 0.03 | 0.09 | 0.21 | 0.28 |
| | | (0.07) | (0.37) | (0.33) | (−0.64) | (0.90) | (1.19) | (−0.66) | (0.30) | (0.40) | (0.52) | (1.96) | (1.75) |
| | Utilization 2 | −0.03 | −0.06 | −0.02 | −0.00 | 0.31 | 0.33 | −0.08 | −0.14 | −0.09 | −0.11 | 0.68 | 0.76 |
| | | (−0.80) | (−1.09) | (−0.26) | (−0.06) | (3.22) | (4.29) | (−1.46) | (−1.54) | (−0.91) | (−1.21) | (3.07) | (2.11) |
| | Utilization 3 | −0.03 | −0.02 | −0.03 | 0.02 | −0.00 | 0.03 | −0.18 | −0.19 | −0.10 | −0.06 | 0.26 | 0.44 |
| | | (−0.83) | (−0.45) | (−0.44) | (0.39) | (−0.01) | (0.34) | (−3.50) | (−2.41) | (−0.86) | (−0.60) | (1.41) | (1.83) |
| | Utilization 4 | −0.03 | −0.00 | −0.07 | −0.09 | 0.02 | 0.04 | −0.16 | −0.20 | −0.29 | −0.25 | −0.10 | 0.06 |
| | | (−0.63) | (−0.07) | (−1.17) | (−1.21) | (0.09) | (0.28) | (−2.56) | (−2.36) | (−2.88) | (−2.15) | (−0.45) | (0.28) |
| | High Utilization | −0.03 | −0.10 | −0.03 | −0.06 | −0.25 | −0.22 | −0.25 | −0.15 | −0.28 | −0.21 | −0.72 | −0.47 |
| | | (−0.53) | (−1.79) | (−0.45) | (−0.56) | (−0.88) | (−0.89) | (−2.60) | (−1.47) | (−2.50) | (−1.43) | (−2.10) | (−1.42) |

## Table 7 Continued: Returns to portfolios sorted on utilization and fees

**Panel B: Investment Grade Industrial Firms Corporate Bonds**

| | | **1 month excess returns** | | | | | | **3 month excess returns** | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | **Portfolios Sorted on Lending Fees** | | | | | | **Portfolios Sorted on Lending Fees** | | | | | |
| | | Low Fees | Fees 2 | Fees 3 | Fees 4 | High Fees | (5)−(1) | Low Fees | Fees 2 | Fees 3 | Fees 4 | High Fees | (5)−(1) |
| **Portfolios Sorted on Utilization** | Low Utilization | −0.06 | −0.05 | 0.05 | 0.07 | −0.04 | 0.01 | −0.20 | −0.05 | 0.08 | −0.10 | −0.02 | 0.18 |
| | | (−0.69) | (−0.64) | (0.47) | (0.49) | (−0.69) | (0.22) | (−1.65) | (−0.41) | (0.61) | (−0.40) | (−0.16) | (1.97) |
| | Utilization 2 | −0.04 | −0.03 | 0.00 | −0.06 | 0.07 | 0.11 | −0.10 | −0.15 | −0.17 | −0.19 | 0.10 | 0.20 |
| | | (−0.59) | (−0.47) | (0.06) | (−0.73) | (0.75) | (1.42) | (−0.96) | (−1.18) | (−1.49) | (−1.63) | (0.52) | (1.42) |
| | Utilization 3 | −0.08 | −0.01 | −0.06 | −0.03 | −0.08 | −0.01 | −0.10 | −0.09 | −0.16 | −0.10 | −0.10 | 0.01 |
| | | (−1.10) | (−0.13) | (−0.78) | (−0.47) | (−0.82) | (−0.06) | (−0.95) | (−0.75) | (−1.27) | (−0.81) | (−0.44) | (0.04) |
| | Utilization 4 | −0.03 | −0.02 | 0.05 | −0.03 | 0.04 | 0.07 | −0.19 | −0.14 | 0.00 | −0.07 | −0.01 | 0.18 |
| | | (−0.47) | (−0.24) | (0.88) | (−0.52) | (0.43) | (0.50) | (−1.69) | (−1.15) | (0.02) | (−0.71) | (−0.10) | (0.85) |
| | High Utilization | −0.07 | −0.05 | 0.02 | 0.06 | −0.10 | −0.02 | −0.31 | −0.13 | 0.10 | 0.00 | −0.13 | 0.17 |
| | | (−0.91) | (−0.62) | (0.28) | (0.76) | (−0.87) | (−0.19) | (−2.10) | (−0.94) | (0.72) | (0.02) | (−0.71) | (0.98) |

**Panel C: High Yield Industrial Firms Corporate Bonds**

| | | **1 month excess returns** | | | | | | **3 month excess returns** | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | **Portfolios Sorted on Lending Fees** | | | | | | **Portfolios Sorted on Lending Fees** | | | | | |
| | | Low Fees | Fees 2 | Fees 3 | Fees 4 | High Fees | (5)−(1) | Low Fees | Fees 2 | Fees 3 | Fees 4 | High Fees | (5)−(1) |
| **Portfolios Sorted on Utilization** | Low Utilization | −0.04 | 0.02 | 0.01 | −0.41 | 0.43 | 0.47 | 0.54 | 0.21 | 0.06 | −0.55 | 1.14 | 0.60 |
| | | (−0.20) | (0.09) | (0.02) | (−1.18) | (1.18) | (2.45) | (1.29) | (0.46) | (0.11) | (−1.60) | (1.66) | (1.35) |
| | Utilization 2 | −0.04 | −0.03 | −0.13 | 0.00 | 0.47 | 0.51 | −0.21 | −0.15 | −0.37 | 0.31 | 1.73 | 1.94 |
| | | (−0.24) | (−0.16) | (−0.93) | (0.00) | (1.28) | (3.44) | (−0.66) | (−0.47) | (−1.14) | (0.65) | (2.14) | (1.35) |
| | Utilization 3 | 0.04 | −0.18 | −0.21 | −0.06 | −0.28 | −0.32 | −0.25 | −0.44 | −0.66 | −0.73 | 0.31 | 0.56 |
| | | (0.21) | (−0.93) | (−0.95) | (−0.23) | (−0.49) | (−1.06) | (−0.85) | (−1.60) | (−1.96) | (−1.73) | (0.39) | (0.84) |
| | Utilization 4 | −0.12 | −0.15 | −0.38 | −0.38 | −0.25 | −0.13 | −0.20 | −0.32 | −0.68 | −0.71 | 0.03 | 0.24 |
| | | (−0.68) | (−0.85) | (−0.94) | (−1.25) | (−0.58) | (−0.44) | (−0.68) | (−1.24) | (−1.36) | (−1.78) | (0.05) | (0.35) |
| | High Utilization | −0.01 | −0.12 | −0.37 | −0.51 | −0.65 | −0.64 | −0.34 | −0.86 | −0.71 | −1.51 | −2.40 | −2.07 |
| | | (−0.05) | (−0.78) | (−1.19) | (−1.08) | (−1.55) | (−1.71) | (−1.05) | (−2.34) | (−1.67) | (−2.25) | (−3.13) | (−2.45) |

## Table 8: Cross-Sectional Regressions of Future Returns

The table reports results for monthly Fama-MacBeth regressions of 3-month future bond returns from July 2006 to March 2015. In each sample month, we calculate the holding period return over the subsequent 3-months for each bond in the sample. These 3-month future returns are the dependent variable in each of our monthly cross-sectional regressions. The interaction between two dummy variables $D_{HighBondUtil} \times D_{HighBondFee}$ yields the coefficient of interest on the right hand side. This coefficient represents the marginal difference in 3-month future returns (predictive power) between bonds in the top quintile of both lending fees and utilization relative to returns of bonds in only one of the two top quintiles. The indicator variable $D_{HighBondUtil}$ equals one for bonds in the highest utilization quintile and zero elsewhere. The indicator variable $D_{HighBondFee}$ equals one for bonds in the highest bond loan fee quintile and zero elsewhere. Therefore, the interaction identifies bonds in both the highest fee and highest utilization quintile each month, which compares to our (5,5) portfolio in sequential double sorts. Specification 1, 3, and 5 estimates the difference in 3-month future returns for all bonds - including financials and utilities, investment grade industrials, and high yield industrials, respectively. Columns 2, 4, and 6 present similar results after controlling for bond and bond loan characteristics. Characteristics include: the log of years remaining to maturity ($log(TTM)$); the coupon rate in percentage points (*Coupon*); the log of the principal amount outstanding in thousands (*log*(*AmountOut*)); the average quantified credit rating (NR or missing = 0, AAA = 1, AA+ = 2 ) over ratings from Moodys, S&P and Fitch (Rating); an indicator variable that equals one if the Rating variable is set to zero (Not Rated); the Amihud illiquidity ratio (*AmihudRatio*) ; and the realized spread (*RealizedSpread*). Daily Amihud is the average of absolute returns between sequential trades normalized by trade size in millions. Daily realized spread is the difference between the average customer sell price and the average customer buy price each day. Monthly Amihud and realized spread are the median of daily measures. Each month, we estimate cross-sectional regression parameters. The table reports the time-series average of these parameter estimates and the $t$-statistics in parentheses.

| | **Full Sample, All Bonds** | | **Investment Grade, Industrial Bonds** | | **High Yield, Industrial Bonds** | |
|---|---|---|---|---|---|---|
| Variable | (1) | (2) | (3) | (4) | (5) | (6) |
| $D_{HighBondUtil}$ | −0.001 | −0.001 | −0.001 | −0.001 | −0.005 | −0.001 |
| | (−0.71) | (−0.29) | (−1.09) | (−1.33) | (−0.76) | (−0.39) |
| $D_{HighBondFee}$ | 0.013 | 0.012 | 0.003 | 0.003 | 0.021 | 0.026 |
| | (3.06) | (2.95) | (2.46) | (2.80) | (2.62) | (2.71) |
| $D_{HighBondUtil} \times D_{HighBondFee}$ | −0.015 | −0.011 | −0.008 | −0.006 | −0.033 | −0.036 |
| | (−1.90) | (−2.12) | (−1.11) | (−1.17) | (−3.79) | (−3.56) |
| log(TTM) | | 0.004 | | 0.005 | | 0.001 |
| | | (2.12) | | (2.23) | | (0.33) |
| Coupon | | 0.001 | | 0.002 | | 0.002 |
| | | (1.35) | | (2.06) | | (1.34) |
| log(Amount Out) | | 0.001 | | −0.001 | | 0.001 |
| | | (−0.49) | | (−0.85) | | (0.39) |
| Rating | | 0.003 | | 0.002 | | 0.005 |
| | | (0.95) | | (0.99) | | (2.22) |
| Not Rated | | 0.010 | | 0.002 | | 0.008 |
| | | (1.44) | | (0.87) | | (1.59) |
| Amihud Ratio | | 0.204 | | 0.136 | | 0.190 |
| | | (3.15) | | (3.41) | | (1.59) |
| Realized Spread | | −0.016 | | −0.002 | | −0.021 |
| | | (−1.57) | | (−0.35) | | (−1.13) |
| Constant | 0.008 | −0.008 | 0.007 | 0.024 | 0.013 | −0.029 |
| | (2.93) | (−0.48) | (3.20) | (1.60) | (2.74) | (−0.99) |
| R2 | 0.083 | 0.268 | 0.076 | 0.331 | 0.127 | 0.249 |

## Table 9: CDS Bond Basis

This table presents the average CDS bond basis for portfolios formed from bonds issued by industrial companies (Mergeant industry group 1). Each month bonds are sequentially sorted in to quintile portfolios based on average utilization in the previous month and then by average lending fees in the previous month. Taking the equal-weighted average CDS bond basis over all bonds in a portfolio yields 25 monthly time series. The table reports the average of each times series. The basis is calculated as the difference between the 5-year CDS spread and the 5 year par equivalent spread (PES). The PES is derived from a parallel shift in the term structure of survival probabilities bootstrapped from the term structure of CDS spreads as discussed in Appendix A. For this calculation, we limit our attention to bonds maturing in 4 to 6 years in order to more accurately compare the PES and CDS spread. Monthly PES are obtained using the last reported price in TRACE over the final 5 days of each month. Panel A shows the average CDS bond basis for portfolios formed from investment grade bonds and Panel B show similar averages formed from high yield bonds. Each panel follows the same format. Row headers define the utilization sort and column headers, for columns 1-5, define the fee sort. For example, row 2 of column 1 reports the average CDS bond basis for the lowest fee-based portfolio within the second utilization quintile. The last row and second to last column of each panel reports the average basis over portfolios formed from univariate sorts on fees and utilization respectively. The last column of each panel shows the difference in basis between the highest and lowest fee-based portfolio for each utilization quintile. *t*-statistics are reported in parentheses.

**Panel A: Average Basis (Percentage), Investment Grade Bonds**

| | | Portfolios Sorted on Lending Fees | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Low Fees | Fees 2 | Fees 3 | Fees 4 | High Fees | Unconditional Utilization | (5)−(1) |
| **Portfolios Sorted on Utilization** | Low Utilization | −0.55 | −0.57 | −0.53 | −0.47 | −0.59 | −0.54 | −0.04 |
| | | (−2.25) | (−2.85) | (−2.38) | (−2.45) | (−2.66) | (−3.38) | (−0.21) |
| | Utilization 2 | −0.49 | −0.63 | −0.55 | −0.53 | −0.53 | −0.55 | −0.04 |
| | | (−2.55) | (−3.49) | (−2.88) | (−2.53) | (−2.30) | (−3.37) | (−0.14) |
| | Utilization 3 | −0.40 | −0.26 | −0.26 | −0.24 | −0.28 | −0.29 | 0.12 |
| | | (−1.34) | (−1.16) | (−1.22) | (−1.37) | (−1.18) | (−0.56) | (0.31) |
| | Utilization 4 | −0.32 | −0.42 | −0.43 | −0.22 | −0.04 | −0.29 | 0.28 |
| | | (−1.05) | (−1.56) | (−1.67) | (−0.85) | (−0.12) | (−0.63) | (0.56) |
| | High Utilization | −0.42 | −0.44 | −0.36 | 0.06 | 0.40 | −0.15 | 0.82 |
| | | (−1.36) | (−1.19) | (−1.02) | (0.18) | (1.39) | (−0.42) | (1.21) |
| | Unconditional Fees | −0.44 | −0.46 | −0.43 | −0.28 | −0.21 | | |
| | | (−2.75) | (−2.19) | (−1.97) | (−1.41) | (−1.06) | | |

**Panel B: Average Basis (Percentage), High Yield Bonds**

| | | Portfolios Sorted on Lending Fees | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Low Fees | Fees 2 | Fees 3 | Fees 4 | High Fees | Unconditional Utilization | (5)−(1) |
| **Portfolios Sorted on Utilization** | Low Utilization | −1.40 | −0.67 | −0.88 | −1.32 | −0.88 | −1.06 | 0.52 |
| | | (−2.03) | (−1.45) | (−1.57) | (−2.28) | (−1.98) | (−2.81) | (0.72) |
| | Utilization 2 | −1.02 | −0.71 | −0.75 | −0.85 | −0.98 | −0.83 | 0.04 |
| | | (−1.97) | (−1.08) | (−1.83) | (−1.95) | (−2.03) | (−1.85) | (0.13) |
| | Utilization 3 | −1.46 | −1.63 | −1.55 | −1.94 | −0.91 | −1.65 | 0.55 |
| | | (−2.82) | (−2.90) | (−2.17) | (−3.33) | (−1.39) | (−2.97) | (0.85) |
| | Utilization 4 | −1.64 | −1.25 | −1.29 | −1.19 | −1.08 | −1.34 | 0.56 |
| | | (−3.57) | (−2.93) | (−2.15) | (−2.45) | (−0.27) | (−2.73) | (1.15) |
| | High Utilization | −1.00 | −0.98 | −0.61 | 0.49 | 0.55 | −0.53 | 1.55 |
| | | (−1.39) | (−1.51) | (−0.25) | (1.56) | (1.73) | (−0.93) | (2.92) |
| | Unconditional Fees | −1.30 | −1.04 | −1.02 | −0.96 | −0.66 | | |
| | | (−2.35) | (−2.93) | (−2.85) | (−2.31) | (−1.48) | | |

## Table 10: Excess Returns To Bonds By CDS Coverage

This table presents average 3-month excess returns for portfolios formed from bonds issued by industrial companies (Mergent industry group 1) that have actively traded CDS vs. those that do not. For each subsample in each month, we form bond portfolios by sequentially sorting bonds into quintiles based on average lending utilization and then average lending fee in the formation month (month prior to construction). We then track the portfolio for 3 months. The 3-month portfolio excess return is the equal-weighted average excess return, relative to TRACE maturity and rating matched benchmark returns, over all bonds in the portfolio each month. This yields a monthly time series of 3-month future excess bond returns for each portfolio; the table records these time series averages. Columns 1 and 2 report average portfolio 3-month excess returns for portfolios formed from high fee and high utilization bonds for bond issuers with actively traded CDS and those without, respectively. In this case, we define high fee and high utilization bonds to be those in the highest 2 fee quintiles within the top 2 utilization quintiles. That is, these portfolios combine bonds from the 4 portfolios of the lower right corner in sequential double sorts. The difference in excess returns between bond portfolios of bonds with actively traded CDS and those without is reported in column 3. Columns 4 and 5 report average portfolio 3-month excess returns for portfolios formed from bonds in the highest fee quintile within the top utilization quintile for issuers with actively traded CDS and those without, respectively. This is the average excess return from our (5,5) portfolio in sequential double sorts. Row 1 reports results for investment grade bond portfolios and row 3 reports results for high yield bond portfolios; t-statistics are reported in parentheses.

| | **High Utilization & Fee Bonds** | | | **Highest Utilization & Fee Bonds** | | |
|---|---|---|---|---|---|---|
| | HASCDS (1) | NOCDS (2) | Difference (2) − (1) | HASCDS (1) | NOCDS (2) | Difference (2) − (1) |
| Investment Grade | −1.82% | 0.04% | 1.86% | −2.02% | −0.17% | 1.85% |
| | (−2.07) | (0.11) | (1.95) | (−2.06) | (−0.32) | (2.22) |
| High Yield | −1.39% | −2.70% | 1.30% | −2.45% | −3.05% | −0.60% |
| | (−1.28) | (−3.07) | (−2.01) | (−2.37) | (−3.06) | (−0.71) |

## Table 11: Cross-Sectional Regressions of Future Returns

The table reports results for monthly Fama-MacBeth regressions of 3-month future bond returns from July 2006 to March 2015. In each sample month, we calculate the holding period return over the subsequent 3-months for each bond in the sample. These 3-month future returns are the dependent variable in each of our monthly cross-sectional regressions. The interaction between two dummy variables $D_{HighBondUtil} \times D_{HighBondFee}$ yields the coefficient of interest on the right hand side. This coefficient represents the marginal difference in 3-month future returns (predictive power) between bonds in the top quintile of both lending fees and utilization relative to returns of bonds in only one of the two top quintiles. The indicator variable $D_{HighBondUtil}$ equals one for bonds in the highest utilization quintile and zero elsewhere. The indicator variable $D_{HighBondFee}$ equals one for bonds in the highest bond loan fee quintile and zero elsewhere. Therefore, the interaction identifies bonds in both the highest fee and highest utilization quintile each month, which compares to our (5,5) portfolio in sequential double sorts. Specification 1, 3, and 5 estimates the difference in 3-month future returns for all bonds - including financials and utilities, investment grade industrials, and high yield industrials, respectively. Columns 2, 4, and 6 present similar results after controlling for bond, bond lending, and equity lending characteristics. For equity lending characteristics, $D_{HighEquityUtil}$ equals one for bonds issued by companies with equity lending utilization in the top quintile and zero elsewhere; $D_{HighEquityFee}$ equals one for bonds issued by companies with equity lending fees in the top quintile and zero elsewhere; $D_{HighEquityUtil} \times D_{HighEquityFee}$ is the interaction between the two. Other characteristic variables are described in the caption of Table 8. Each month, we estimate cross-sectional regression parameters. The table reports the time-series average of these parameter estimates and the $t$-statistics in parentheses.

| | **Full Sample, All Bonds** | | **Investment Grade, Industrial Bonds** | | **High Yield, Industrial Bonds** | |
|---|---|---|---|---|---|---|
| Variable | (1) | (2) | (3) | (4) | (5) | (6) |
| $D_{HighBondUtil}$ | 0.000 | −0.001 | 0.000 | −0.001 | −0.001 | −0.006 |
| | (0.07) | (−0.47) | (0.24) | (−0.70) | (−0.36) | (−1.98) |
| $D_{HighBondFee}$ | 0.004 | 0.004 | −0.000 | −0.000 | 0.013 | 0.006 |
| | (2.88) | (2.29) | (−0.36) | (−0.20) | (2.53) | (1.99) |
| $D_{HighBondUtil} \times D_{HighBondFee}$ | −0.006 | −0.007 | −0.001 | −0.000 | −0.023 | −0.019 |
| | (−2.43) | (−2.27) | (−0.94) | (−0.32) | (−3.19) | (−2.93) |
| $D_{HighEquityUtil}$ | −0.001 | −0.005 | −0.000 | −0.000 | −0.004 | −0.001 |
| | (−0.23) | (−1.07) | (−0.08) | (−0.02) | (−0.98) | (−0.32) |
| $D_{HighEquityFee}$ | 0.005 | 0.002 | 0.002 | 0.001 | −0.008 | −0.015 |
| | (2.86) | (1.51) | (2.01) | (1.22) | (−1.25) | (−2.18) |
| $D_{HighEquityUtil} \times D_{HighEquityFee}$ | −0.003 | −0.004 | −0.001 | −0.001 | 0.008 | 0.015 |
| | (−0.57) | (−0.65) | (−0.44) | (−0.35) | (1.08) | (1.40) |
| log(TTM) | | 0.005 | | 0.006 | | 0.005 |
| | | (2.51) | | (2.54) | | (1.24) |
| Coupon | | 0.001 | | 0.001 | | 0.002 |
| | | (2.62) | | (0.88) | | (3.26) |
| log(Amount Out) | | −0.001 | | 0.000 | | −0.004 |
| | | (−0.50) | | (1.41) | | (−2.43) |
| Rating | | 0.002 | | 0.001 | | 0.004 |
| | | (2.26) | | (0.90) | | (1.58) |
| Not Rated | | 0.009 | | 0.003 | | 0.010 |
| | | (1.36) | | (0.46) | | (1.66) |
| Amihud Ratio | | 0.049 | | 0.045 | | 0.143 |
| | | (1.06) | | (1.90) | | (1.65) |
| Realized Spread | | 0.001 | | −0.005 | | 0.015 |
| | | (0.02) | | (−1.03) | | (0.43) |
| Constant | 0.009 | −0.05 | 0.009 | −0.006 | 0.015 | 0.11 |
| | (2.89) | (−0.30) | (2.78) | (−0.47) | (2.22) | (0.55) |
| R2 | 0.094 | 0.262 | 0.050 | 0.330 | 0.129 | 0.286 |