Corporate Bond Inventories and Liquidity Risk Pricing

Effects on Expected Corporate Bond Return

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Abstract:

This paper studies the pricing of liquidity risk in the cross section of corporate bonds for the period of October 2004 to December 2020 following the method presented by Lin et al. (2011). Furthermore, it examines the relationship between liquidity pricing and inventory cycles. No significant results for general pricing of liquidity risk are found for the full sample period, however significant pricing is found after the financial crisis. Market-wide liquidity is priced to a lesser extent as peak inventory grows. We find no significant relationship between a proxy for individual liquidity and inventory cycles.

Keywords:

Liquidity Pricing, Corporate Bonds, Inventory cycles

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1. Introduction

Since the conclusion of the financial crisis an increase in regulatory interventions has made bond inventory provisioning more costly and attention is therefore now directed to how post-crisis regulations have affected dealer behavior. This is especially important because corporate bonds are traded over the counter (OTC), and trades are thus heavily dependent on dealer willingness to intermediate (Duffie et al, 2005). With increased bond inventory provision costs, the level of inventory absorbed onto the balance sheet and the willingness to make market should be affected. Waibel (2021) finds that imposed regulations have resulted in constrained dealers reducing market-making in high inventory bonds and selling balance sheet concentrated bonds. The reduced market-making hence is coupled with a reversal in position. As inventory becomes positive or negative, i.e., points of continued - customer selling or customer buying, there are stages throughout this cycle where positions are reversed, and market-making is reduced. Inventory risk is managed by lowering ask prices as dealer inventory reaches a positive peak and increasing bid prices as dealer inventory reach a negative peak (Amihud and Mendelson, 1980). Corporate bonds are expected to become more illiquid as reduced market-making and lower potential transactions, and consequently have a potential effect on liquidity risk pricing in corporate bonds.

The body of literature concentrating on liquidity risk pricing in corporate bond returns is substantial. Studies suggest that liquidity risk, i.e., the risk that the bond's return responds to improvements or deteriorations of aggregate liquidity in the market, is priced in the cross-section of corporate bonds (E.g., Lin et al, 2010; Bao et al, 2011; Bongaerts et al, 2017). However, the majority of such studies examine relatively short periods of time, up until the financial crisis. Furthermore, evidence of dealer inventory impact on liquidity risk pricing in corporate bonds returns remains limited. An interesting route for research is to increase the understanding of how liquidity pricing changes based on the level of intermediation dealers chose to provide, identified through the dealer inventory cycle, and if post financial crises regulations have affected this relationship.

This paper examines market-wide liquidity risk pricing in the cross-section of U.S. corporate bond returns and investigates possible variations throughout the inventory cycles, i.e., when absolute dealer inventory is high respectively low. This is accomplished by replicating and extending upon the study of *Liquidity risk and expected corporate bond returns* by Lin et al. (2010), with U.S. market data from 2004 to 2020. Dealer inventory cycles are obtained in accordance with Anands et al. (2020) and acquired through Waibel (2021). As regulations have had a potential effect on dealer behavior, in terms of how much inventory they choose to absorb and market-making activity, this paper also investigates possible variations of liquidity risk pricing through inventory cycles, by testing the potential relationship across regulatory periods.

The purpose of this paper is to further the understanding of liquidity risk pricing in the cross-section of corporate bonds and how it is affected by dealer intermediation activities. The contribution is firstly made by providing an updated outlook on Lin et al. (2011) and its replicability with new data and a more complete data set from TRACE, with regards to if liquidity risk is priced in the cross-section of corporate bond returns. Information on dealer inventory cycles on individual corporate bond levels allows us to disentangle the potential impact of variations in dealer inventory on liquidity risk pricing in corporate bond excess returns. Presented studies show evidence towards the notion that dealer intermediation and thereby the inventory dealers absorb have been affected by regulations directed by the Basel accords and the Volcker rule. This additionally presents an opportunity to establish the potential impact of regulatory metrics on liquidity pricing in the cross-section of corporate bond excess returns, through the perspective of dealer inventory levels and dealer intermediation willingness.

The aim of the paper is henceforth to answer the following:

Is liquidity risk priced in the cross-section of corporate bond excess returns? How do variations in dealer inventory affect the pricing, and can discrepancies between regulatory periods be identified?

The employed method follows Lin et al. (2011) with some modifications. Utilizing the Amihud (2002) bond market liquidity factor, Lin et al. (2011) provide a method that tests if the liquidity measure is priced in the cross-section of expected corporate bond excess returns and a portfolio sorting methodology that we modify for the inclusion of inventory cycles. The transaction data sample is used for the study, covering the period Oct 2004 to Dec 2020, where transaction data from the Trade Reporting and Compliance Engine (TRACE) is used.

To begin, we build the aggregate market-wide liquidity measure, following Amihud (2002), a prominent measure of liquidity in the literature. Through the regression method by Fama and MacBeth (1973), the effect of liquidity risk in expected corporate bond excess returns is tested.

The linear factor model is employed to assess the importance of liquidity risk relative to the effect of other common risk factors as established by Fama and French (1992;1993), liquidity, and bond characteristics on expected corporate bond returns. The empirical evidence derived from this study finds no support for the pricing of liquidity risk in expected corporate bond returns when investigating the full sample period. However, after making a time-based split in the data, with a Pre-Crisis/Crisis period and a Post Crisis period, we find evidence for a significant positive relation between expected corporate bond returns and liquidity beta in the cross-sectional regression. Note that, the pre-Crisis/Crisis timeframe overlaps with Lin et al. (2011). The evidence from the Post Crisis cross-sectional regression strongly suggests that liquidity risk is priced in corporate bond returns.

Further, a portfolio-based approach dating back to Black, Jensen, and Scholes (1972) is used, where portfolios are based on the pre-ranking of absolute peak dealer inventory for individual bonds in a cycle, on a monthly basis. The test between high and low portfolio liquidity betas finds evidence supporting the notion that market liquidity risk is priced to a lesser degree when peak inventory is high, and dealers are constrained. This difference shows to be statistically significant.

In addition, the bond market liquidity factor is substituted, and the portfolio sorts are replicated using a bond-specific liquidity proxy. Contrasting the market-wide liquidity pricing against the bond specific-liquidity pricing, we find no significant differences between the portfolios where dealers are most constrained compared to portfolios where the dealers are least constrained. These differences are not significant for the entire sample and no clear relationship can be established.

Lastly, the portfolio sorting is again replicated with respect to different regulatory periods where literature has found support for impact on dealer behavior and market-making. Here the previously established relationships, i.e., for both bond market liquidity and bond-specific liquidity, still find support. Bond-market liquidity is priced to a higher extent when peak inventory is low and bond-specific liquidity is priced to a higher extent when dealer peak inventory is high. This stands for the Post-Crisis, and Leverage Ratio periods, but not during the Crisis, where the relationships find no significant support.

The remaining parts of the paper proceed as follows: Section 2; discusses the relevant literature; Section 3; describes the data and presents the methodology; Section 4; presents and discusses the empirical results, and Section 5; concludes the paper.

2. Literature Review

The literature regarding liquidity in publicly traded assets is prevalent and covered through different studies. Acharya & Pedersen (2005) summed up that investors should care about the liquidity of the market, concluding that the required return of a security is affected by the liquidity in the market.

Lin et al. (2011) finds significant evidence for liquidity risk being priced in the cross-section of corporate bond excess returns, using the liquidity measures of Amihud (2002) and Pastor and Stambaugh (2003). For the period 1994 to 2009, they show support for a positive relationship between liquidity risk and expected corporate bond returns, managing to apprehend the possible effects of default information "embedded" in the variables. Bao et al. (2011) also verifies these findings, by computing their own illiquidity measure that explains individual bond yield spreads significantly both in the time-series and cross-section of corporate bonds. In addition, Bongaerts et al. (2017), find support for the notion that equity market liquidity risk, following Amihud (2002) as well as Pastor and Stambaugh (2003), and corporate bond liquidity as defined by Roll (1984), is priced in the corporate bond returns. This was done using the model by Archya and Pedersen (2005), for the sample period 2003-2006.

Bessembinder et al. (2018), finds evidence that liquidity provision is evolving away from the commitment of bank-affiliated dealer capital to absorb customer imbalances and that post-crisis banking regulations are probable contributors. Bao et al. (2018) further suggest that bond illiquidity grows as the Volcker rule influenced dealers to decrease market-making activities during times of market stress. Being the main liquidity providers in the market, others have not counterbalanced this decreased activity. Waibel (2021) additionally finds that constrained dealers intentionally reduce market-making in high inventory bonds, selling them on a net basis. This is a result of the increasingly binding constraints as required by the Basel accords, increasing risk-taking of dealers as of the resulting changes in balance sheet size.

Related to dealer behavior, Anand et al. (2020) finds that there is a subset of funds that supply liquidity through periods of prolonged customer selling when dealer inventories are large and dealer liquidity demands are high. Whilst most funds demand liquidity, the subset keeps supplying, alleviating market fragility risk. The literature suggests support of a connection between dealer behavior, in form of market-making willingness and inventory absorption to post-crisis regulations, affecting liquidity. Our intended contribution, in terms of literature, is to display if liquidity risk pricing in expected corporate bond returns varies with dealer inventory levels. Specifically, how liquidity risk pricing differs when inventory levels become large, and dealers become constrained, demanding liquidity. We want to further this by presenting if this relationship has changed with the introduction of post-crisis regulations, as liquidity provisioning costs have increased. Hence, the aim is to provide a more direct link between liquidity risk pricing and dealer inventory levels.

3. Data & Methodology

In the third section of the paper, firstly, the data and its construction will be presented, followed by an outline of the dealer inventory cycle. Afterward, the framework used to compute the measure of the Amihud (2002) market-wide liquidity risk factor in the corporate bond market is presented. Lastly, a presentation of the empirical methodology used in the analysis of liquidity risk linkage to the excess return of corporate bonds and dealer inventory will be provided.

3.1 Data

The primary data source used in this paper is the Trade Reporting and Compliance Engine (TRACE) issued by Financial Industry Regulatory Authority (FINRA), obtained through Wharton Research Data Services (WRDS). Data regarding corporate bond transactions are obtained from TRACE. Contained in each transaction is information with reference to bond-specific trade price, traded volume as well as trade time. This data is used in the computation of the Amihud liquidity risk factor as specified in Section 3.3. The collection of end-of-month transaction prices allows for the calculation of monthly returns used as the dependent variable in the empirical methodology. The transaction data from TRACE is paired with bond-specific characteristics, i.e., issue size, coupon, bond rating, offering date, and maturity date, from the Mergent Fixed Income Securities Database (FISD), acquired through the Swedish House of Finance (SHOF). As TRACE initial launch did not include all corporate bonds the sample period has been limited to the period after the Phase III expansion on October 1st, 2004. The sample period therefore covers the period from October 1, 2004, to December 31, 2020.

In accordance with Lin et al. (2010), the sample is restricted to returns with a track record of 15 or more months. Unregular coupons (Incl. variable/floating rate), if any, unidentified bond ratings, and bonds without any reported maturity, are excluded from the sample. Because of low liquidity and high risk of pricing errors in short maturity corporate bonds, bonds with a maturity of less than a year are also excluded. Further, the following bond types: convertibles, puttable, callable, sinking fund, and exchangeable types, are all excluded. The intention is to exclude the effects of all embedded options. Bonds that are classified as part of the 144A bond group are excluded, as they can only be traded by specific certified traders. Ratings are collected in accordance with Moody's and S&P's ratings. Moody's are primarily used and if not available S&P ratings are used. Additional cleaning of the TRACE data was done in accordance with Dick-Nielsen (2014), correcting for duplicates and known errors. This should reduce the sample by roughly 35%. The final Sample includes 9561 Corporate bonds: 202 Aaa bonds, 2224 Aa bonds, 3865 A bonds, 1736 Baa bonds and 1534 speculative bonds.

The collection of monthly common factors of Fama and French for the sample period is made from WRDS. Specifically, this regards the factors SMB, small minus big; HML, standing for high minus low; MKT, The excess return on the market. Also, data were derived for the default premium (DEF), defined as the difference between the monthly returns of long-term investment grade bonds in the sample and ten-year government bond returns. The term premium (TERM) is defined as the difference between ten-year government bond returns and the one-month T-bill rate. The monthly returns of long-term government bonds and the one-month T-bill are acquired from the Center for Research in Security Prices (CRSP) and the Federal Reserve Board (FRB).

3.2 Dealer Inventory

The dealer behavior in this paper is proxied by inventory cycles. The inventory cycles utilized in the subsequent analysis are acquired through the work of Waibel (2021), following the methods of Anand et al. (2020).

Using TRACE bond trading data on a trade price, trade size, and identification of dealer's trades with customers, it is possible to measure the inventory position of market intermediaries for a specific corporate bond and compute its cumulative inventory.

The cumulative inventory is the signed aggregate dollar inventory for a corporate bond based on all dealer trades with customers. For each bond trading day, the cycle shows how dealers assume large inventory positions through customer trades only, in both positive and negative directions. Cumulative inventory, for each bond and day, is derived using customer trades from the introduction of the cycle, given that the cycle inception is less than 3 months ago. If the introduction of the cycle is more than 3 months from the calculated date, the inventory is constructed on customer imbalance over a rolling past 3-month period. This is done to avoid the compounding of large reporting errors. In addition, a 3-month period allows for gradual development and unraveling of inventory, as the corporate bond market is illiquid. The cycle begins when the cumulative inventory of all dealers' changes from zero and ends when it resumes at zero. At zero, selling and buying behavior are essentially offset by each other. When cumulative inventory drifts from (reverts to) zero it is specified as the loading (unloading) phase. A positive(negative) inventory cycle is a cycle where cumulative inventory is positive(negative), i.e., dealers are buying more than selling (buying less than selling). The number of calendar days in an inventory cycle constitutes the cycle length. The sample period for this set of data is Oct 2004 to Mar 2018. Also, note that cycles are restricted to a minimum of $10 million and a cycle length of at least 5 calendar days. A volume-weighted average price of trades is used in order to calculate the bond return between two trading days.

The inventory cycles are further converted to the bond-year-month level for the purpose of the paper, where the year-month in a given year is observed. For cases where several cycles were observed in a bond per month, the cycles that dominated in terms of length in a given month were chosen.

Furthermore, peak inventory is derived from each cycle. It is the largest cumulative inventory, in par value terms, during the cycle. When peak inventory is high (low) in absolute terms, the difference in aggregate selling and buying is large (small). Hence, when the peak inventory of a bond is high relative to other bonds in the same month it indicates that the bond is a balance sheet intensive bond at that period of time and therefore a high inventory bond.

3.3 Liquidity Factor

We estimate the liquidity measure employed by Amihud (2002). Using the Amihud illiquidity measure we look at the price impact of trades. If little price impact is present for a large, traded volume, liquidity is high and vice versa for large price impacts of small volume trades. The measure is defined as:

$$ILLIQ_{it} = \frac{1}{Days_{it}} \sum_{j=1}^{Days_{it}} \frac{|r_{i,j,t}|}{Vol_{i,j,t}} \tag{1}$$

Where $r_{i,j,t}$ is the return for bond *i* on day j of month t, $Vol_{i,j,t}$ is the dollar volume, $Days_{it}$ is the number of days that we have transaction data on for bond *i* in month *t*. $ILLIQ_{it}$ is the period average of the ratio of absolute stock return to its dollar volume traded. The measured is averaged across months for each individual bond. Amihud (2002), explains that the measure can be interpreted as a daily price reaction associated with one dollar of trading volume and hence an approximate measure of price impact.

Market-wide liquidity $ILLIQ_{Mt}$ is then obtained by the aggregation of individual illiquidity measures month by month, for the sample:

$$ILLIQ_{Mt} = \frac{1}{N_t} \sum_{i=1}^{N_t} ILLIQ_{it} \tag{2}$$

Where N_t is the amount of bonds included in month t. The individual bond ILLIQ is winsorized at 1% each month, preventing outliers from impacting the results. The reasoning behind this is that the Amihud measure is sensitive and becomes less accurate when not using microstructure data, however, this allows for broader analysis (Amihud and Noh, 2017). Monthly differences are scaled by the ratio of capitalization of bonds, by month t:

$$\Delta ILLIQ_{Mt} = (M_t/M_1)(ILLIQ_{Mt} - ILLIQ_{Mt-1}) \tag{3}$$

Where M_t refers to the market capitalization of all bonds included in month t and M_1 refers to the market capitalization of all bonds in the first month of the sample.
Liquidity Innovations are obtained from the following time-series regression:

$$\Delta ILLIQ_{Mt} = \alpha_0 + \phi_1 \Delta ILLIQ_{Mt-1} + \phi_2 (M_t/M_1)(ILLIQ_{Mt-1}) + \varepsilon_t + \theta_1 \varepsilon_{t-1} + \theta_2 \varepsilon_{t-2} \tag{4}$$

Following Lin et al. (2011) the innovation series ε_t is converted by adding a negative sign, which results in the Amihud measure $(-\varepsilon_t)$. This measure is further standardized by normalizing its standard deviation to 1. This innovation is what is used as the measure for bond market liquidity and henceforth will be referred to as the Amihud liquidity factor.

Figure 1

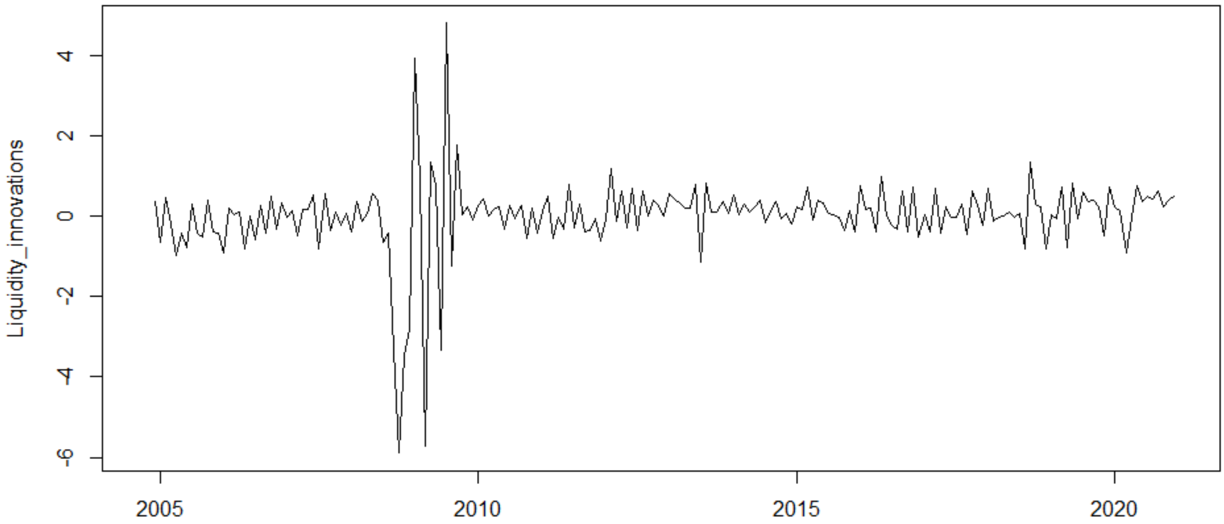

Fig. 1. Plots the Amihud liquidity innovations over the sample period from October 2004 to December 2020.

3.4 Statistical Model

3.4.1 Regressions

In order to recognize if liquidity risk is priced into corporate bond excess returns, we examine variations in corporate bond excess returns following fluctuations in market risk factors and liquidity risk. Specifically, this examination makes use of common risk factors in corporate bond literature and the measure of liquidity risk by Amihud (2002) as specified in Section 3.3. Default- and term premia are factors shown to be significant for corporate bonds by Fama and French (1993). common risk factors employed in this paper, follow Fama and French (1993), extended by Elton et al. (2001), where default- and term premia are complemented by the Fama-French three common factors (Fama and French, 1992), as the factors have been shown to explain corporate bond returns. Inclusion of the Fama-French factors is based on the premise that corporate bonds and stocks may share similar variations in returns, as they are both “claims on the value of the same underlying” (Elton et al, 2001). Also, there is an evident relationship between the expected default loss and equity price. As equity value increases, there is a decrease in risk of default, hence affecting the returns of corporate bonds. The incorporation of the five factors and liquidity risk in a linear factor model for corporate bond pricing is made.

To examine if liquidity risk is priced with time and in the cross-section of corporate bond excess returns, the following linear model is adopted:

$$r_{it} - r_{ft} = \alpha_i + \beta_{iMKT} MKT_t + \beta_{iSMB} SMB_t + \beta_{iHML} HML_t + \beta_{iDEF} DEF_t + \beta_{iTERM} TERM_t + \beta_{iL} L_t + \varepsilon_{it} \tag{5}$$

This is consistent with the regression model used by Lin et al. (2011). Above, MKT_t is the excess return of the stock market, SMB_t being the size factor, HML_t representing the book-to-market factor, DEF_t being the default premium and $TERM_t$ standing for the term premium, and lastly L_t being the added liquidity factor. All else constant, the coefficient of the liquidity factor, β_{iL}, captures the sensitivity of bond returns to fluctuations in market-wide liquidity. $\boldsymbol{r_{ft}}$ represents the return of the one-month T-bill.

Following Lin et al. (2011), a time-series regression is employed, based on the model presented in Eq.5, where betas are estimated over the whole sample period, allowing for an indication of how corporate bond returns covary with factors over time. To understand if an observable market-premium for the liquidity risk factor can be seen in the cross-section of corporate bond excess returns, a cross-sectional regression test of individual bonds, as outlined by Fama and MacBeth (1973) is further employed. This is done with respect to the linear factor model in Eq.5 over the whole sample period, i.e., Oct 2004 to Dec 2020. Betas are initially derived from a time-series estimate, for a rolling 60-month window for each bond. Bonds are only included if they have transactions for at least 15 of the previous 60 months. The beta estimates are then used in a cross-sectional regression for the following month, as an independent variable, allowing for analysis of the pricing of risk. Both independent and dependent variables are winsorized at the 1% level, to minimize the impact of outliers.

In equilibrium, the bond expected excess return is connected factor loadings cross-sectionally:

$$r_{it} - r_{ft} = \gamma_0 + \gamma_1 \beta_{iMKT} + \gamma_2 \beta_{iSMB} + \gamma_3 \beta_{iHML} + \gamma_4 \beta_{iDEF} + \gamma_5 \beta_{iTERM} + \gamma_6 \beta_{iL} + u_{it} \tag{6}$$

The estimated slope coefficient γ_6 captures if there is any observable market-premium for liquidity risk in the cross-section, henceforth explaining if there is a pricing of liquidity risk. Accordingly, a significantly positive γ_6 can be interpreted as support for the notion that liquidity risk is priced into the excess returns of corporate bonds. The pricing would mean that corporate bond excess returns should increase as market-wide liquidity risk rises.

To add a dimension of comparison to Lin et al. (2011), a time-based split is added. Beyond the analysis of the full sample, a Fama and MacBeth regression is additionally made for the timeframe that overlaps with the paper of Lin et al. (2011), i.e., Oct 2004 to March 2009, respectively the data that we extend the study with, i.e., March 2009 to Dec 2020. Also, the split approximately splits the data into a Pre-Crisis/Crisis period and a Post-Crisis period.

Following the model adopted above, issue size, coupon rate, age, and ratings are further included as explanatory variables in the cross-sectional regression of Fama and MacBeth (1973). The inclusion of bond-specific characteristics together with the common factors is done to test the robustness of the liquidity beta in the cross-section of expected corporate bond excess returns. The relative importance of the liquidity risk betas can be accessed in a more robust manner and uncertainty with regards to the accuracy of the liquidity risk measure can be resolved. Past studies reveal that bond-specific characteristics show explanatory power for cross-sectional variations in bond returns (Green and Odegaard, (1997); Chordia and Subrahmanyam (1998); Houweling et al. (2005); Bao et al. (2011)), hence their consideration in this study.

This analysis is again done in accordance with Fama and MacBeth (1973), where betas are derived from a time-series estimate for a rolling past 60-month window and used in a cross-sectional regression for the following month, allowing for an analysis on pricing of risk.

The model in Eq.6 is hence adopted as:

$$r_{it} - r_{ft} = \gamma_0 + \gamma_1 \beta_{iMKT} + \gamma_2 \beta_{iSMB} + \gamma_3 \beta_{iHML} + \gamma_4 \beta_{iDEF} + \gamma_5 \beta_{iTERM} + \gamma_6 \beta_{iL} + CPNR_i + CREDIT_i + AGE_i + SIZE_i + u_{it} \quad (7)$$

Where CPNR is the coupon rate, CREDIT stands for the credit rating, AGE is the age of the bond and SIZE represents the issue size, all for individual bonds i.

3.4.2 Portfolio sorts

Market-wide liquidity

While the preceding linear model allows for pricing of risk in the cross-section of corporate bonds, it does not factor in if the pricing of liquidity risk differs through inventory cycles. It would be beneficial to understand if liquidity risk is priced to a different degree as dealers reduce intermediation and start to unload, particularly as absolute peak inventory is high respectively low, and dealers become constrained respectively unconstrained.

Bonds are sorted into ten portfolios each month, with an equal number of bonds in each portfolio, based on pre-ranking of absolute peak inventory. Time-series estimates of betas are calculated over rolling past 60-month periods for each individual bond, in line with Eq.5. Liquidity betas are estimated using the Amihud bond market liquidity factor. Equal-weighted mean pre-ranking liquidity beta, default, and term- premiums are calculated for each ex-post dealer peak inventory portfolio. In addition, mean excess return (in percentage), issue size, coupon rate, and rating, is calculated for each ex-post dealer peak inventory portfolio. With the excess return, we refer to the average monthly return of the individual both less the one-month T-bill rate. Moreover, differences in average liquidity beta (Diff) between the high and low dealer peak inventory portfolio and the corresponding t-statistic are reported. Note that this analysis is done for the period Oct 2004 to Mar 2018, due to the sample period of the dealer inventory cycles.

The purpose of the above portfolio sorts is to investigate the role of liquidity beta in the cross-section of corporate bonds returns when absolute dealer peak inventory levels are high respectively low, as these are stages where dealers are expected to be constrained respectively relaxed.

Furthermore, different regulatory periods are expected to have affected the bonds inventory provisioning costs over time. Naturally, this change has suggested a difference in behavior of dealers in terms of market-making willingness and inventory absorption. The previous portfolio sorting analysis is replicated, with the addition of a time-based split. The four regulatory periods are defined as October 2004-June 2007 for the Pre-Crisis Period, July 2007 to April 2009 for the Crisis Period, May 2009 to December 2014 for the Post-Crisis

Period and 2015 forward for the Leverage Ratio Period. The first two periods, Pre-Crisis and Crisis, are defined in accordance with Bessembinder et al. (2018). Du et al. (2018) is followed in the definition of the Post-Crisis and Leverage-Ratio periods, heeding to the establishment of specific regulations. The period split allows for further analysis into how liquidity risk pricing in the cross-section of corporate bonds, by ranking of peak inventory, possibly has evolved through the regulatory periods.

Individual bond liquidity

The portfolio sort with betas including the Amihud liquidity measure is complemented by betas based on individual bond liquidity. The portfolio sorting methodology for market-wide liquidity presented in *Market-wide Liquidity* is replicated, however, instead of using the market-wide liquidity risk measure presented in Eq.4, we instead use the Amihud ILLIQ Eq.1 as a bond-specific liquidity proxy. This measure is not standardized which means it cannot be directly compared to the market wide measure. This test permits us to identify if there are any potential differences in bond-specific and market-wide liquidity, concerning liquidity risk pricing in the cross-section of corporate bonds, by the ranking of dealer peak inventory.

4. Results and Empirical Analysis

In this section of the paper, we examine liquidity risk pricing in the cross-section of corporate bond excess returns and investigate if the pricing of risk differs throughout the dealer inventory cycles. This analysis is divided into three parts. First of all, we examine if liquidity risk is priced in the cross-section of corporate bond excess returns using the method presented by Fama and MacBeth (1973). Next, we test if the pricing of risk differs through the dealer inventory cycles, by the ranking of peak inventory. We implement a portfolio sorting analysis, where 10 liquidity beta portfolios are created based on the ranking of absolute dealer peak inventory for the corporate bonds. Looking at the difference between portfolios, we gain an understanding of possible variations in liquidity pricing. This is done on a market-wide and bond-specific liquidity basis. To further nuance the portfolio analysis. Lastly, we repeat the portfolio sorting analysis, but introduce a time-based split, by different regulatory periods, analyzing is, if possible, whether variations of liquidity pricing in the dealer inventory cycles have changed over time.

4.1 Liquidity pricing in the cross-section of corporate bonds

Table 1

Time-series regression estimates of individual bond betas

Table 1 presents summary statistics of a time-series regression on the full samples, i.e., Oct 2004 to Dec 2020, as well as the time period that overlap with Lin et al. (2011) and the extension period, where betas are estimated following the model in Eq.5:

$$r_{it} - r_{ft} = \alpha_i + \beta_{iMKT} MKT_t + \beta_{iSMB} SMB_t + \beta_{iHML} HML_t + \beta_{iDEF} DEF_t + \beta_{iTERM} TERM_t + \beta_{iL} L_t + \varepsilon_{it}$$

Where L_t is the Amihud bond-market liquidity factor. The return dependent variable is the return of an individual bond, r_{it}, less the one-month T-bill rate, r_{ft}, in month *t*. The return dependent variable is based on the cross-sectional distribution of mean excess returns for every bond in the sample, in percentage terms. Individual bonds mean and median t-values of betas estimates are presented together with the aggregate t-statistic, T for the entire sample. Panel A represents the full sample, Panel B represents Oct 2004 to March 2009, and Panel C represents April 2009 to Dec 2020. Note that ratings are measured on a nominal scale, where AAA is equal to 0 and B3 and below are equal to 15.

Table 1

Panel A

Variable	Mean	Maximum	Minimum	Standard deviation	T	Mean t	Median t
Return	0.5538	82.3377	−51.8835	3.714	97.8		
B_MKT	0.0173	2.9678	−2.066	0.2443	6.5451	0.1534	0.056
B_SMB	0.0353	3.2855	−3.4586	0.3306	9.8427	0.1046	0.0894
B_HML	0.0167	0.0065	−2.8706	0.2959	5.2018	0.0677	0.0784
B_DEF	0.7295	9.3485	−5.3627	0.9804	68.689	2.4086	1.8497
B_TERM	0.5422	7.1475	−2.5274	0.6504	76.961	2.709	2.07
B_L	0.0841	13.6366	−7.9858	0.8924	8.7055	0.1914	0.1436
Adj.R-Squared	0.2475	0.9526	−0.6731	0.24			

Panel B

Variable	Mean	Maximum	Minimum	Standard deviation	T	Mean t	Median t
Return	0.2024	82.3377	-51.8835	4.99	12.985		
B_MKT	0.0173	2.9678	−2.066	0.2443	6.5451	0.15343	0.05598
B_SMB	0.0353	3.2855	−3.4586	0.3306	9.8427	0.1046	0.0894
B_HML	0.0167	2.9161	−2.8706	0.2959	5.2018	0.0677	0.0784
B_DEF	0.7295	9.3485	−5.3627	0.9804	68.689	2.4086	1.8497
B_TERM	0.5422	7.1475	−2.5274	0.6504	76.961	2.709	2.07
B_L	0.0842	12.6366	−7.9858	0.8924	8.7055	0.1914	0.1436
Adj.R-Squared	0.24753	0.9526	-0.6731	0.301			

Panel C

Variable	Mean	Maximum	Minimum	Standard deviation	T	Mean t	Median t
Return	0.6288	37.7038	−26.7241	2.3900	145.17		
B_MKT	−0.01271	1.5613	−1.6643	0.1643	−5.8195	−0.0983	−0.1167
B_SMB	−0.0024	1.7177	−1.6598	0.1903	−0.93479	−0.0704	−0.00783
B_HML	0.0164	2.7509	−2.5126	0.2286	5.3854	0.0925	0.0427
B_DEF	0.7681	6.324	−2.6105	0.8605	67.16	2.773	2.336
B_TERM	0.5935	4.7716	−2.4559	0.5875	76.008	3.213	2.623
B_L	0.0556	17.122	−7.885	0.8953	4.6729	0.0955	0.1202
Adj.R-Squared	0.2781	0.946	−0.5819	0.2300			

For Panel A in the above table full sample beta estimates are documented, when including the Amihud bond market liquidity factor. For the default and term premia, average beta values of 0,73 and 0,54 are reported, which are greater relative to the smaller average beta value of the common factors by Fama and French, some of which displayed negative beta averages. By contrast to the default and term premium, the liquidity beta has a mean average of 0,08. All variables show significant betas in aggregate, at a 1% level. On average term factor is significant at the 5% level and default at the 10% level.

Table 2 Asset pricing of individual bonds

The table presents the results of cross-sectional regression tests on individual bonds, by employing the methodology of Fama & Macbeth (1973) in line with Eq.6. For each bond, betas are estimated over rolling past 60-month periods. Bonds are only included if it has been traded in at least 15 months of the 60-month window of the rolling beta regression. The intention of the regression is to assess if liquidity risk is priced into corporate bond excess returns for the sample period Oct 2004 to Dec 2020. The dependent variable is the monthly return less the one-month T-bill rate, and β_{MKT} β_{SMB} β_{HML} β_{DEF} β_{TERM}, are betas of the common factors used. As part of the beta estimation, the Amihud corporate bond liquidity factor, β_L as presented in Section 3.3., is used. Further, all independent variables are normalized by their respective cross-sectional standard deviation every month. Therefore, the coefficient is understood as the premium per unit standard deviation of the respective variable. [Bond characteristics, i.e., coupon rate, age, issue size, and ratings are included for robustness concerning the liquidity factors]. Note that the t-value is presented in parentheses.

Table 2

Liquidity Measure	*Intercept*	*B_MKT*	*B_SMB*	*B_HML*	*B_DEF*	*B_TERM*	*B_L*	*Rating*	*Issue size*	*Coupon*	*Age*	Adj. R-Squared
Amihud	0.266***	0.146*	0.097	−0.043	0.139	0.025	0.002					0.261
	(8.19)	(1.85)	(1.32)	(−0.57)	(0.91)	(0.24)	(0.02)					
	0.078*	0.093	0.069	−0.05	0.054	0.083	−0.017	0.003	0.004	0.03***	$-5.60 * 10^{-8}$**	0.262
	(1.76)	(1.19)	(1.00)	(−0.70)	(0.36)	(0.83)	(−0.21)	(0.38)	(1.35)	(4.32)	(−2.32)	

Significance levels: *** $p < 0.01$. ** $p < 0.05$. * $p < 0.1$

Based on time-series estimates from Eq. 5, Table 2 displays the results of the cross-sectional regressions tests, with the inclusions of the Amihud bond-market liquidity factors. Row 1 reports results showing the significance of the MKT beta coefficient at a 10% level, with a reported t-value of 1,85. The coefficient of the liquidity beta displays a t-value of 0,02 and shows no significance. We cannot therefore conclude if liquidity risk has a positive effect on expected corporate bond returns.

With regards to how liquidity fares against the common factors and the inclusion of bond characteristics in the cross-section of expected corporate bond returns, characteristics are shown to be insignificant, except for coupon rate and age, which are found to be significant at a 1% and 5% level. The coefficient of the liquidity beta drops in t-value to -0,21 and remains insignificant after controlling for the effects of bond characteristics. In contrast to Lin et al. (2011), no evidence of liquidity risk being priced in the cross-section of corporate bond returns is found.

Table 3 Asset pricing of individual bonds (Pre and Post crisis)

The table presents the results of cross-sectional regression tests on individual bonds, by employing the methodology of Fama & Macbeth (1973) in line with Eq.6. For each bond, betas are estimated over rolling past 60-month periods. The intention of the regression is to assess if liquidity risk is priced into corporate bond excess returns. Panel A displays the results for the sample period Oct 2004 to March 2009, and Panel B displays the results from March 2009 to Dec 2020. The dependent variable is the monthly return less the one-month T-bill rate, and β_{MKT} β_{SMB} β_{HML} β_{DEF} β_{TERM}, are betas of the common factors used. As part of the beta estimation, the Amihud corporate bond liquidity factor, β_L as presented in Section 3.3., is used. Further, all independent variables are normalized by their respective cross-sectional standard deviation for every month. The coefficients are therefore understood as the premium per unit standard deviation of the respective variable. Note that t-values are presented in parentheses.

Table 3

Panel A

Liquidity Measure	*Intercept*	*B_MKT*	*B_SMB*	*B_HML*	*B_DEF*	*B_TERM*	*B_L*	*Rating*	*Issue size*	*Coupon*	*Age*	Adj. R-Squared
Amihud	0.045	−0.335	−0.607**	−0.319	−0.427	0.262	−0.249					0.476
	(0.57)	(−1.56)	(2.45)	(−1.18)	(−0.89)	(0.72)	(−0.78)					
	0.173*	−0.404*	0.549**	−0.29	−0.484	0.301	−0.287	−0.049*	0.006	0.021	$2.65 * 10^{-8}$***	0.476
	(1.99)	(−1.84)	(2.27)	(−1.05)	(−0.99)	(0.80)	(−0.92)	(−2.8)	(0.79)	(1.56)	(0.36)	

Significance levels: *** p < 0.01. ** p < 0.05. * p < 0.1

Panel B

Liquidity Measure	*Intercept*	*B_MKT*	*B_SMB*	*B_HML*	*B_DEF*	*B_TERM*	*B_L*	*Rating*	*Issue size*	*Coupon*	*Age*	Adj. R-Squared
Amihud	0.284***	0.197***	−0.044	0.004	0.215*	0.003	0.08***					0.187
	(12.75)	(4.35)	(−1.08)	(0.12)	(1.94)	(0.056)	(2.7)					
	0.033	0.15***	−0.081	−0.018	0.127	0.069	0.061***	0.012*	0.004*	0.036***	$7.27 * 10^{-8}$***	0.195
	(0.7)	(2.96)	(−1.57)	(−0.45)	(1.07)	(1.06)	(1.85)	(1.71)	(1.7)	(5.02)	(−3.15)	

Significance levels: *** p < 0.01. ** p < 0.05. * p < 0.1

Based on time-series estimates from Eq. 5, Table 3 displays the results of the cross-sectional regressions tests, with the inclusions of the Amihud bond-market liquidity factors, for two different time periods. Panel A documents result from the Pre-Crisis and Crisis periods, overlapping with Lin et al. (2011), whilst Panel B documents result from the extending data, i.e., the Post-Crisis Period.

Looking at Panel A, no significant results can be identified, except for SMB at a 5% level. Besides, the term premium, all beta coefficients show negative averages, with a mean t-value of -0.78 for the coefficient of the Amihud market liquidity beta. When introducing the bond characteristics, no major difference is identified, except for SMB, MKT and rating showing significance on at least a 10 % level

By contrast the results of Panel B show significant support for bond liquidity to be priced in the cross-section of expected corporate bond returns. The beta coefficient for market-wide liquidity is significantly positive at the 1% level, with a mean coefficient of 0.08. The significance remains at the 1% level after the inclusion of bond characteristics for robustness, dropping to a mean coefficient estimate of 0.061. All characteristics are significant in the cross-section of expected corporate bond returns on at least a 10% level.

Regarding the liquidity beta coefficient estimate in Row 1 in Panel A, a one standard deviation over the cross-sectional mean of the liquidity beta is linked with a rise in the excess return by 8 points every month. A rise of 8 points per month makes up around 3% of the monthly standard deviation of the corporate bond excess return.

Panel A and Panel B provide different results that oppose and support liquidity risk pricing. This can be further compared to the full sample in Table 2. Based on the period post-crisis, evidence shows liquidity risk being a determinant of expected corporate bond return. This could possibly suggest that the 2004 to 2009 period in the sample, including the financial crisis, is what distorts the data and makes the results in Table 2 insignificant. It could possibly also suggest that the positive significant results of Lin et al. (2011) are strongly influenced by the earlier parts of the sample, ranging from 1994 to 2004.

4.2 Liquidity risk pricing variations through dealer inventory cycles

In this section investigate variations in liquidity risk pricing through dealer inventory cycles, by testing the difference in liquidity betas when peak inventory is high respectively low.

Table 4

Bonds are sorted into ten portfolios each month, each with an equal number of bonds, by the pre-ranking of associated absolute peak dealer inventory. The sample period is from Oct 2004 to Mar 2018. Liquidity betas are estimated over rolling past 60-month periods for each individual bond along with DEF, TERM, and other betas in the time-series regression. Liquidity betas are estimated using the Amihud bond-market liquidity factor. Average pre-ranking DEF, TERM and liquidity betas are calculated for each dealer peak inventory portfolio. In addition, issue size, coupon rate and ratings are calculated for every ex-post dealer inventory portfolio. Return is again average monthly returns (in %) of individual bonds less the one-month T-bill rate. Differences in Liquidity betas (Diff) between the high and low dealer inventory portfolios and the corresponding t-statistics are reported.

Table 4

Variable	**Low**	2	3	4	5	6	7	8	9	**High**	**Diff**	**t**	
B_DEF	0.44	0.56	0.66	0.7	0.76	0.77	0.84	0.86	0.96	0.98			
B_TERM	0.44	0.58	0.71	0.75	0.79	0.78	0.82	0.84	0.91	0.94			
B_L	0.12	0.14	0.14	0.16	0.14	0.09	0.07	0.02	−0.002	−0.02	0.14	9.01	***
Rating	6.88	7.17	7.52	7.43	7.35	7.23	7.02	6.87	6.74	5.91			
Size (M)	0.20	0.20	0.30	0.30	0.40	0.50	0.60	0.80	10	20			
Coupon	7.80	7.58	7.37	7.13	6.76	6.4	6.06	5.79	5.59	5.16			

Table 4 reports results of the portfolio sort by ranking of absolute peak dealer inventory as presented by Anand et al. (2020). The results display a pattern where market-wide liquidity risk is priced to a lower extent as peak inventory grows larger and dealers become constrained. The difference between the high and low portfolio is significant at a 1% level. When dealer peak inventories are closer to zero and thus dealers are not constrained the market liquidity significantly affect excess bond returns. When dealer peak inventories are higher, and dealers constrained the bond excess return does not depend on the market liquidity.

Table 5

Bonds are sorted into ten portfolios each month, each with an equal number of bonds, by the pre-ranking of associated absolute peak dealer inventory. The sample period is from Oct 2004 to Mar 2018. Liquidity betas are estimated over rolling past 60-month periods for each individual bond along with DEF, TERM and other betas in the time-series regression. Liquidity betas are estimated using the Amihud bond-specific liquidity proxy, as presented in Eq.1. Average pre-ranking DEF, TERM, and liquidity betas are calculated for each dealer peak inventory portfolio. Liquidity Betas are presented in thousands (000) In addition, issue size, coupon rate and ratings are calculated for every ex-post dealer inventory portfolio. Return is again average monthly returns (in %) of individual bonds less the one-month T-bill rate. Differences in Liquidity betas (Diff) between the high and low dealer inventory portfolios and the corresponding t-statistics are reported.

Table 5

Variable	**Low**	2	3	4	5	6	7	8	9	**High**	**Diff**	**t**
B_DEF	0.63	0.65	0.7	0.74	0.78	0.8	0.84	0.86	0.94	0.96		
B_TERM	0.6	0.67	0.74	0.77	0.8	0.8	0.83	0.86	0.91	0.94		
B_L	88.44	60.47	43.29	29.65	55.61	30.15	26.03	5.2	95.22	130.34	41.90	0.56
Rating	6.88	7.17	7.52	7.43	7.35	7.23	7.02	6.87	6.74	5.91		
Size (M)	0.19	0.22	0.26	0.31	0.38	0.48	0.61	0.75	1	1.6		
Coupon	7.8	7.58	7.37	7.13	6.76	6.4	6.06	5.79	5.59	5.16		

There is no significant difference in betas of the individual bond liquidity when comparing the high and low peak inventory portfolios. Due to no clear pattern being present a relationship cannot be established between the peak inventory of a current inventory cycle and the individual bond liquidity bond betas.

4.3 Regulation impact on liquidity risk pricing through the inventory cycles

We investigate how liquidity risk pricing through inventory cycles changes with different regulatory periods. The analysis in Section 4.2 is repeated for all four regulatory periods.

Table 6

Bonds are sorted into ten portfolios each month, each with an equal number of bonds, by the pre-ranking of associated absolute peak dealer inventory. This is done for the four regulatory periods. Panel A concerns the sample period Oct 2004 to June 2007, representing the Pre-Crisis period. Panel B concerns the sample period July 2007 to April 2009, representing the Crisis period. Panel C concerns the sample period May 2009 to Dec 2014, representing the Post Crisis period. Panel D concerns the sample period Jan 2015 to Mar 2018, representing the Leverage Ratio period. Liquidity betas are estimated over rolling past 60-month periods for each individual bond along with DEF, TERM, and other betas in the time-series regression. Liquidity betas are estimated using the Amihud bond-market liquidity factor. Average pre-ranking DEF, TERM and liquidity betas are calculated for each dealer peak inventory portfolio. In addition, issue size, coupon rate and ratings are calculated for every ex-post dealer inventory portfolio. Differences in Liquidity betas (Diff) between the high and low dealer inventory portfolios and the corresponding t-statistics are reported.

Table 6

Panel A

Variable	Low	2	3	4	5	6	7	8	9	High	Diff	t
B_DEF	0.92	0.94	0.96	0.89	0.9	0.92	1.08	1.08	1.17	1.2		
B_TERM	0.61	0.69	0.75	0.72	0.7	0.73	0.86	0.83	0.95	0.96		
B_L	0.02	−0.04	−0.08	−0.07	−0.03	0.01	0.05	−0.08	0.04	−0.01	0.03	0.38
Rating	7.51	7.2	7,00	6.83	6.86	7.07	7.19	7.3	7.1	6.91		
Size (M)	0.2	0.2	0.2	0.28	0.3	0.32	0.4	0.43	0.54	0.87		
Coupon	7.62	7.4	7.26	7.15	6.8	6.79	6.85	6.61	6.37	6,00		

Panel B

Variable	Low	2	3	4	5	6	7	8	9	High	Diff	t
B_DEF	0.46	0.54	0.69	0.65	0.73	0.81	0.85	0.96	1.01	1.03		
B_TERM	0.47	0.53	0.7	0.68	0.74	0.76	0.78	0.91	0.9	0.96		
B_L	0.01	0.04	0.15	0.16	0.12	0.02	0.03	0.06	0.04	0.04	-0.03	-0.58
Rating	6.99	6.96	7.28	6.69	6.57	6.8	6.74	6.68	6.57	6.08		
Size (M)	0.02	0.17	0.2	0.24	0.3	0.32	0.4	0.44	0.57	0.96		
Coupon	7.91	7.62	7.35	6.99	6.75	6.61	6.57	6.5	6.33	6.09		

Panel C

Variable	Low	2	3	4	5	6	7	8	9	High	Diff	t
B_DEF	0.29	0.41	0.54	0.63	0.71	0.71	0.79	0.77	0.91	0.83		
B_TERM	0.31	0.44	0.63	0.71	0.77	0.76	0.8	0.81	0.9	0.9		
B_L	0.18	0.21	0.2	0.22	0.22	0.17	0.14	0.09	0.03	−0.02	0.2	11.67
Rating	7.08	7.39	7.74	7.7	7.81	7.68	7.48	7.11	6.94	0.001		
Size (M)	0.2	0.23	0.3	0.21	0.4	0.45	0.6	0.76	1	1.8		
Coupon	7.8	7.6	7.43	7.23	6.97	6.69	6.37	6.06	5.82	5.09		

Panel D

Variable	Low	2	3	4	5	6	7	8	9	High	Diff	t
B_DEF	0.46	0.64	0.8	0.75	0.81	0.78	0.81	0.86	0.92	1.07		
B_TERM	0.53	0.74	0.81	0.85	0.88	0.85	0.86	0.87	0.91	0.99		
B_L	0.15	0.17	0.12	0.16	0.12	0.04	0.002	−0.06	−0.09	−0.05	0.2	9.1
Rating	6.4	6.95	7.55	7.64	7.26	6.82	6.34	6.34	6.3	6.11		
Size (M)	0.2	0.25	0.3	0.37	0.5	0.71	0.9	1.2	1	1.76		
Coupon	7.8	7.57	7.33	7.04	6.39	5.62	4.79	4.38	5.19	4.03		

There are no significant differences in liquidity betas for the Pre-Crises and Crises periods. The pattern of Table 4 establishes itself in the Post-Crises period and in the Leverage Ratio period. Both periods show a difference in liquidity betas to be significant at the 1% level, suggesting that bond returns depend on market liquidity only when dealers are not constrained.

Table 7

Bonds are sorted into ten portfolios each month, each with an equal number of bonds, by the pre-ranking of associated absolute peak dealer inventory. This is done for the four regulatory periods presented in Table 6. Panel A concerns the sample period Oct 2004 to June 2007, representing the Pre-Crisis period. Panel B concerns the sample period July 2007 to April 2009, representing the Crisis period. Panel C concerns the sample period May 2009 to Dec 2014, representing the Post Crisis period. Panel D concerns the sample period Jan 2015 to Mar 2018, representing the Leverage Ratio period. Liquidity betas are estimated over rolling past 60-month periods for each individual bond along with DEF, TERM and other betas in the time-series regression. Liquidity betas are estimated using the Amihud bond-specific liquidity proxy, as presented in Eq.1. Average pre-ranking DEF, TERM, and liquidity betas are calculated for each dealer peak inventory portfolio. Liquidity betas are displayed in thousands (000). In addition, issue size, coupon rate, and ratings are calculated for every ex-post dealer inventory portfolio. Differences in Liquidity betas (Diff) between the high and low dealer inventory portfolios and the corresponding t-statistics are reported.

Table 7

Panel A

Variable	Low	2	3	4	5	6	7	8	9	High	Diff	t
B_DEF	0.84	0.86	0.88	0.86	0.79	0.78	0.88	0.86	0.85	0.87		
B_TERM	0.66	0.7	0.76	0.75	0.68	0.69	0.8	0.8	0.85	0.87		
B_L	32.88	10.41	47.45	−30	25.51	56.58	96.5	−69.9	−0.093	−1087.49	-1120.37	-5.65
Rating	7.51	7.2	7,00	6.83	6.86	7.07	7.19	7.3	7.1	6.91		
Size (M)	0.17	0.2	0.25	0.28	0.28	0.32	0.35	0.43	0.54	0.88		
Coupon	7.62	7.4	7.26	7.15	6.8	6.79	6.85	6.61	6.37	6,00		

Panel B

Variable	Low	2	3	4	5	6	7	8	9	High	Diff	t
B_DEF	0.81	0.64	0.74	0.67	0.76	0.82	0.86	0.95	1	1.03		
B_TERM	0.73	0.63	0.72	0.68	0.75	0.78	0.8	0.91	0.89	9.6		
B_L	38.46	34.13	43.84	41.53	48.68	33.85	94.53	26.89	29.59	106.82	68.36	0.78
Rating	6.99	6.96	7.28	6.69	6.57	6.8	6.74	6.68	6.57	6.08		
Size (M)	0.015	0.17	0.22	0.24	0.29	0.32	0.4	0.44	0.57	0.96		
Coupon	7.91	7.62	7.35	6.99	6.75	6.61	6.57	6.5	6.33	6.09		

Panel C

Variable	Low	2	3	4	5	6	7	8	9	High	Diff	t
B_DEF	0.52	0.57	0.64	0.7	0.76	0.79	0.84	0.81	0.94	0.85		
B_TERM	0.48	0.55	0.67	0.74	0.77	0.79	0.82	0.82	0.93	0.91		
B_L	110.98	89.01	58.55	47.27	49.8	43.27	−4.36	37.72	224.51	370.57	259.59	2.08
Rating	7.08	7.39	7.74	7.7	7.81	7.68	7.48	7.11	6.94	0.001		
Size (M)	0.19	0.23	0.26	0.21	0.37	0.45	0.59	0.77	1.15	1.88		
Coupon	7.8	7.6	7.43	7.23	6.97	6.69	6.37	6.06	5.82	5.09		

Panel D

Variable	Low	2	3	4	5	6	7	8	9	High	Diff	t
B_DEF	0.61	0.69	0.71	0.77	0.83	0.8	0.82	0.89	0.95	1.09		
B_TERM	0.7	0.83	0.84	0.88	0.89	0.87	0.87	0.88	9.3	1.01		
B_L	101.42	51.93	19.76	22.77	78.92	−0.58	9.79	−21.07	−20.14	282.86	181.44	2.37
Rating	6.4	6.95	7.55	7.64	7.26	6.82	6.34	6.34	6.3	6.11		
Size (M)	0.23	0.25	0.31	0.37	0.51	0.71	0.91	1.12	1.36	1.76		
Coupon	7.8	7.57	7.33	7.04	6.39	5.62	4.79	4.38	5.19	4.03		

Table 7 shows how individual bond liquidity pricing changes over the four-time periods. In the Pre-Crisis period, we find significant pricing of individual bond liquidity at 1% where dealers are more relaxed. In the crisis period, there is no significant difference between the high and low portfolios. In the post crisis and leverage ratio periods, there is a difference between the low and high portfolios significant at the 5% level. As with the whole sample period the results broken down by time period does not show any clear patterns.

5. Conclusion

In this paper, we provide evidence that suggests that liquidity risk in the corporate bond market is not priced to the extent that is proposed by Lin et al. (2011). We use the Amihud measure as a proxy for market-wide liquidity factor combined with bond characteristics to test robustness. By looking at the time period from October 2004 to December 2020 we find no significant pricing of liquidity risk in the cross-section of corporate bond returns. This is especially the case for the period of our sample that overlaps with the period in the aforementioned paper from October 2004 to March 2009. We do find significant pricing in the post-crisis period, April 2009 to December 2020, suggesting that the effects of the financial crisis might influence the results for the comparatively short period of overlap.

Using the peak inventory value calculated by Waibel (2021) we show that there is a significant difference in the pricing of liquidity risk between bonds where dealers are constrained compared to those where the dealers are not constrained. Market-wide liquidity is priced to a lower extent (higher extent) in bonds when dealers are constrained (not constrained). Conversely, using a proxy for individual bond liquidity we find no significant relationship. This paper does not find a difference between the low peak inventory and high peak inventory with a statistically significant difference and the results does not present a clear relationship. The measure is not an ideal proxy for individual bond liquidity; another proxy would ideally be used to determine the effect.

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