Does Stock Liquidity Affect Corporate Debt Maturity Structure?*

Joseph M. Marks
Northeastern University
D'Amore-McKim School of Business
360 Huntington Ave., Boston, MA, 02115, USA
Email: j.marks@northeastern.edu

Chenguang Shang
Bentley University
175 Forest St. Waltham, MA 02452, USA
Tel: 781-891-3416
Email: cshang@bentley.edu

January 2019

Abstract

We show an inverse relation between the use of short-term debt and stock market liquidity. This finding is robust to alternative measures of the key variables and various identification strategies. Additionally, we document that the impact of stock liquidity on debt maturity is stronger when the information environment is opaque and when default risk is high. We also provide evidence that firms with liquid stock tend to issue longer-term bonds and enjoy lower bond yield spreads. Overall, our results suggest that stock market liquidity alleviates agency problems faced by creditors and thus reduces the necessity of monitoring through short-term debt.

JEL Classification: G12; G14; G32

Keywords: Debt maturity structure; stock liquidity; agency problems

* We thank Kershen Huang, Kristina Minnick, Nagpurnanand Prabhala, Kartik Raman, Ari Yezegel, and seminar and conference participants at Bentley University, the University of Massachusetts Boston, and the 2017 Southern Finance Association (SFA) Annual Meetings for helpful comments. The usual disclaimer applies.

1. Introduction

As a liquid stock market allows investors to trade quickly and at low transaction costs, an important literature points out that stock market liquidity can play a governance role through enhanced information production and informed trading (Holmstrom and Tirole, 1993; Easley and O'Hara, 2004; Chordia, Roll, and Subrahmanyam, 2008), easier and cheaper exit for large shareholders (Maug, 1998; Admati and Pfleiderer, 2009; Edmans, 2009; Edmans and Manso, 2011), and increased threat of takeover (Kyle and Vila, 1991). Based on this view, an emerging line of research provides evidence that stock market trading activity indeed influences the management, which in turn affects managerial decisions, corporate policies, and financial outcomes (Fang, Noe, and Tice, 2009; Bharath, Jayaraman, and Nagar, 2013; Edmans, Fang, and Zur, 2013; Fang, Tian, and Tice, 2014; Chang, Chen, and Zolotoy, 2017; Brogaard, Li, and Xia, 2017; among others). While prior studies primarily focus on the disciplinary effect that addresses manager-shareholder agency conflicts, little is known about the implications of stock market liquidity on other stakeholders of the firm, such as creditors. The main objective of this study is to examine whether stock market liquidity impacts creditors' perceptions of agency problems through the lens of the maturity structure of corporate debt.

In a lending relationship, creditors may be subject to several well-documented agency issues (Fama and Miller, 1972; Jensen and Meckling, 1976; Murphy, 1985; Jensen, 1986). One of the concerns is that self-interested managers may have objectives that deviate from value-maximization and choose to pursue private benefits at the cost of stakeholders by making value-destroying decisions. This self-serving behavior could increase the borrowing firms' default risk. In addition, managers may possess private information that is either not accessible to capital providers or is costly for them to gather. The information asymmetry may allow managers to withhold unfavorable information from outside investors, giving rise to adverse selection problems. Furthermore, due to their different payoff structures, shareholders may have incentives to expropriate the wealth of creditors by substituting into riskier investments. Prior studies have proposed that optimally determining the debt maturity structure of the firm can offer a solution to these agency problems (Eastbrook, 1984; Rajan and Winton, 1995; Stulz, 1990). Because short-term debt needs to be rolled over frequently, lenders can use it as a powerful device to monitor the decisions made by the borrower at the time of renegotiation. The regular renewal of short-term debt provides creditors with improved access to information and imposes significant restrictions on managerial discretion, and thus mitigates agency costs.

In this paper, we find strong evidence that the use of short-term debt is negatively associated with stock liquidity. In other words, *ceteris paribus*, firms with more liquid (illiquid) stock have a lower (higher) proportion of short-term debt in their debt maturity structure. Our interpretation of this finding is that stock liquidity, through its governance function, disciplines the management and helps alleviate the agency problems faced by creditors, making it less necessary for lenders to monitor the borrower with short-term debt. Our results are robust to controlling for a battery of variables that are commonly considered to be determinants of debt maturity structure, various fixed effects, and alternative measures of debt maturity and stock liquidity. To address potential endogeneity concerns, we employ a 2SLS approach and a difference-in-difference approach using the 2001 decimalization event as a quasi-natural experiment. The results of these additional analyses indicate that the documented negative relation between the use of short-term debt and stock liquidity appears to be causal.

To better understand the mitigating effect of stock market liquidity on agency costs, we investigate the heterogeneity of the association between corporate debt maturity structure and stock liquidity in the context of information opacity and default risk. As agency problems are more likely to arise in opaque information environments and during financial distress (Eisdorfer, 2008; Ortiz-Molina and Penas, 2008), we expect the relation between debt maturity and stock liquidity to be stronger for firms with higher information opacity and greater default risk. Subsample tests support our predictions.

In addition, we explore the implications of stock market liquidity on creditors using a sample of corporate bond issues. We show that, consistent with the main results that are based on balance sheet data, firms with illiquid stock are more inclined to issue short-term debt. Finally, we provide evidence that stock liquidity is an important determinant of the pricing of new bond issues. Specifically, creditors charge lower premiums on corporate bonds issued by firms with higher stock liquidity. These results further demonstrate the impact of stock market liquidity on the perceived level of agency problems faced by creditors.

This study makes several important contributions. First, we extend the literature that studies the determinants of debt maturity structure. Related research indicates that the choice of debt maturity is made based on various firm characteristics and stakeholder incentives (Myers, 1977; Barclay and Smith, 1995; Rajan and Winton, 1995; Guedes and Opler, 1996; Stohs and Mauer, 1996; Johnson, 2003; Datta, Iskandar-Datta, and Raman, 2005; Brockman, Martin, and Unlu, 2010; among others). Our paper shows that stock market liquidity is another important consideration in the corporate debt maturity structure, and highlights the key role played by short-term debt in alleviating the agency problems arising from an illiquid stock market. Secondly, we add to the young but quickly growing line of research that examines the effect of stock market liquidity on financial outcomes and corporate policies (Fang, Noe, and Tice, 2009; Lipson and Mortal, 2009; Jayaraman and Milbourn, 2011; Bharath, Jayaraman, and Nagar, 2013; Edmans, Fang, and Zur, 2013; Fang, Tian, and Tice, 2014; Chang, Chen, and Zolotoy, 2017; Brogaard, Li, and Xia, 2017). While prior studies primarily addressed different means by which stock liquidity could mitigate manager-shareholder conflicts, our paper inserts creditors into the discussion, and demonstrates that the governance through stock market liquidity can alleviate agency problems that are related to debtholders. Thirdly, this study contributes to the recent literature focused on the substitution between different forms of corporate governance. For instance, Ferreira, Ferreira, and Raposo (2011) report that stock price informativeness and board monitoring are mutual substitutes. Guo, Lach, and Mobbs (2015) find evidence supporting the notion that firms treat internal and external governance as substitutes. Our empirical results complement this literature by showing that stock market liquidity may substitute for short-term debt as an alternative monitoring mechanism.

The remainder of our paper proceeds as follows. We review related literature and develop our hypotheses in Section 2. Section 3 describes our sample selection process and summarizes the descriptive statistics. In section 4, we discuss the research design and report our empirical results. Section 5 concludes.

2. Related Literature and Hypothesis Development

Over the last several decades, a large volume of research has focused on understanding the determinants and implications of corporate debt maturity. The (mis)alignment of interests between different groups of stakeholders has been shown to be an important factor that determines corporate debt maturity structure. Several influential papers suggest that short-term debt is an effective monitoring device that can exert restrictions on managerial discretion and thereby mitigate agency problems (Barnea, Haugen, and Senbet, 1980; Rajan and Winton, 1995; Leland and Toft, 1996; Stulz, 2000). Recent empirical findings support this view. For example, Graham, Li, and Qiu (2008) discover that banks substantially shorten loan maturity for firms that previously engaged in financial misreporting, consistent with the idea that lenders rely on short-term debt to mitigate risks associated with the borrower. Brockman, Martin, and Unlu (2010) find a positive association between risk-taking incentives in CEO compensation portfolios and the use of short-term debt. Their results suggest that short-term debt helps mitigate agency cost of debt arising from managers' risk preferences. Fu and Tang (2016) show that firms with more short-term debt are less likely to engage in acquisitions, and when they do, they tend to make smaller deals, take more time to complete the deal, and are less likely to use cash. In a related study, Dang, Lee, Liu, and Zeng (2018) argue that short-term debt can play a monitoring role over managers and constrain bad news hoarding behavior. The authors report a negative relation between the firm's use of short-term debt and stock price crash risk.

Our paper extends this debt maturity literature by identifying stock market liquidity as another dimension affecting the use of short-term debt. There are at least two reasons that one may expect corporate debt maturity structure to be influenced by the level of stock liquidity. First, because of the lower transaction costs, higher stock liquidity encourages informed investors to impound private information into the stock price, making the prices of liquid stocks more informative and reflective of fundamental values (Holmstrom and Tirole, 1993; Subrahmanyam and Titman, 2001; Easley and O'Hara, 2004; Chordia, Roll, and Subrahmanyam, 2008). As informative stock prices mitigate information asymmetry faced by outside investors, it is less costly for creditors to gather information and to interpret managerial actions when the borrower's equity is liquid. The improvement in the information environment may thus reduce the need for the lender to subject the borrower to frequent debt market scrutiny.

Secondly, via several different mechanisms, stock market liquidity provides governance that could benefit creditors. One channel is that higher stock liquidity could encourage blockholders to monitor due to easier accumulations of shares and increases in the value of interventions (Kahn and Winton, 1998; Maug, 1998). Even if blockholders choose not to actively monitor via their "voice," they can still discipline the management through potential exit, as a liquid stock market allows large shareholders to easily sell their shares upon receiving negative information (Maug, 1998; Admati and Pfleiderer, 2009; Edmans, 2009; Edmans and Manso, 2011). The price pressure generated by the exit of large shareholders may present a significant threat to managers' personal wealth, especially when their compensation packages are directly tied to stock performance. Additionally, as pointed out by Kyle and Vila (1991), a liquid stock market can facilitate block acquisitions and make it easier for corporate buyers to form toeholds in target firms. The increased likelihood of hostile takeovers in case of poor performance may motivate the manager to take actions to avoid becoming a potential target.

The intensified monitoring by blockholders, potential price pressure from large shareholders' exit, and hostile takeover threats could serve as an effective disciplinary function that promotes value-enhancing decisions and prevent managers from pursuing private benefits at the cost of stakeholders. Consistent with this view, Fang, Noe, and Tice (2009) find that stock liquidity is positively associated with firm value. Importantly, several recent studies document that monitoring through stock market liquidity could potentially pressure managers to focus on short-term performance and to behave in a risk-averse fashion. Fang, Tian, and Tice (2014), for example, show that an increase in stock liquidity reduces future innovation productivity, and identify managers' fears of hostile takeover attempts and non-dedicated institutional investors' exit as the contributing factor. In a similar vein, Brogaard, Li, and Xia (2017) show that stock liquidity significantly lowers firms' default risk through stock price informational efficiency and corporate governance by blockholders. These findings imply that creditors may be beneficiaries of stock market liquidity, and are directly relevant to the issue of interest in this study.

Since stock liquidity may reduce the information asymmetry faced by lenders and steer managers towards safer and value-enhancing projects, it is plausible that actions taken by firms with high stock liquidity may be more aligned with the interest of creditors, which should lower agency costs and result in less reliance on short-term debt in firms' debt maturity structure. Based on the discussion above, we expect an inverse relation between the use of short-term debt and stock market liquidity. This is the main hypothesis that we propose and empirically test in this study.

***H**: Firms with high stock liquidity are associated with a lower proportion of short-term debt in their debt maturity structure.*

3. Sample Selection and Descriptive Statistics

To construct our sample, we identify firms covered by both Compustat and CRSP from 1985 to 2015.[1] We exclude the following observations from the sample: financial firms (SIC from 6000 to 6999), firms with non-positive total assets or sales, firms that are not traded on NYSE, AMEX, or NASDAQ, firms with share codes other than 10 and 11, firms with fewer than 50 daily stock price records during a fiscal year, and firms without sufficient data to calculate the control variables described below.[2] Additionally, following the convention in the debt maturity structure literature (Johnson, 2003; Datta, Iskandar-Datta, and Raman, 2005; Brockman, Martin, and Unlu, 2010), we omit firms with short-term debt to total debt ratios that are less than 0% or greater than 100%. Our final sample consists of 74,898 firm-year observations with 11,043 unique firms.

3.1. Liquidity Measures

We use the Amihud (2002) illiquidity measure as the primary measure of liquidity in this study. This measure is widely employed in the microstructure literature and has been demonstrated to be an appropriate proxy for stock illiquidity. For example, Goyenko, Holden, and Trzcinka (2009) document

[1] The sample period starts in 1985 because it is the first year for which credit rating data, one of our control variables, is available.
[2] Further restricting the sample to the industrial sector only (SIC from 2000 to 5999) yields similar results.

that among twelve proxies that use daily data, the Amihud illiquidity measure most accurately captures price impact. Hasbrouck (2009) shows that, compared to other daily proxies, the Amihud illiquidity measure is the one most strongly correlated with a TAQ-based price impact coefficient. Fong, Holden, and Trzcinka (2017) suggests that the Amihud illiquidity measure is the best daily cost-per-dollar-volume proxy. We calculate the Amihud illiquidity measure as the daily ratio of the absolute value of the stock return to dollar volume, averaged over firm *i*'s fiscal year *t*:

$$Amihud\ Illiquidity_{i,t} = \frac{1}{D_{i,t}} \times \sum_{d=1}^{D} \frac{|Ret_{i,d}|}{Dollar\ Volume_{i,d}}, \tag{1}$$

Where *Ret* and *Dollar Volume* are the return and dollar volume of firm *i* on day *d*, respectively, and *D* is the total number of trading days during firm *i*'s fiscal year *t*.

Since the distribution of the Amihud illiquidity measure is highly skewed, we follow Edmans, Fang, and Zur (2013)'s approach to modify the Amihud illiquidity measure by taking the natural logarithm of (Amihud Illiquidity plus one). We refer to this modified measure as Illiq in the rest of the paper. To examine the robustness of the relation between corporate debt maturity structure and stock liquidity, we employ alternative liquidity measures including the lagged value of Illiq, the cost-per-price measure developed by Fong, Holden, and Trzcinka (2017) (FHT hereafter), the Gibbs measure developed by Hasbrouck (2009), bid-ask spread, and share turnover. We describe these alternative liquidity measures in detail in Section 4.2.

3.2. Debt Maturity Measures

Following prior literature (Barclay and Smith, 1995; Johnson, 2003; Datta, Iskandar-Datta, and Raman, 2005; Brockman, Martin, and Unlu, 2010), we use the fraction of debt due within three years (ST3) as our main proxy for short-term debt. This variable is calculated as the ratio of debt in current liabilities plus debt maturing in two and three years to total debt. We also employ a number of alternative measures of debt maturity structure, namely the fraction of debt due within one year (STNP, ST1), two years (ST2), four years (ST4), and five years (ST5), to check the robustness of our main results and to mitigate the concern that the use of ST3 may be based on an arbitrary cutoff point.[3]

3.3. Control Variables

We include the following control variables that are commonly used in the debt maturity structure literature: firm size (Size), firm size squared (Size Squared), leverage (Leverage), market-to-book (MB), abnormal earnings (AbEarn), asset maturity (ATM), asset volatility (ATV), research and development expenses (R&D), missing R&D dummy (Miss R&D), bond rating dummy (Rated), and term structure of interest rate (Term Structure). Detailed variable definitions are included in the Appendix.

3.4. Summary Statistics

Table 1 reports summary statistics for the variables used in this study. The mean of our main short-term debt measure, ST3, is 51.52%, similar to the mean value of 55% reported in Johnson (2003). The mean and median of our primary explanatory variable, Illiq, are 0.6626 and 0.0738 respectively. It is worth noting that a higher value of this Illiq indicates that the stock of the firm is more *illiquid*. The summary statistics for the rest of the variables reported in Table 1 are comparable to those documented in previous research. All continuous variables are winsorized at the 1st and 99th percentile to reduce the impact of outliers.

<Table 1 about here>

We present the correlation between stock liquidity and the main short-term debt measure, ST3, as well as alternative shot-term debt measures, STNP, ST1, ST2, ST4, and ST5, in Table 2. The Illiq variable is strongly and positively correlated with all the short-term debt variables (Panel A), suggesting that firms with less liquid equity have more short-term debt in their debt maturity structure. This finding is consistent with our prediction of a negative relation between stock liquidity and firms' use of short-term debt. We further split the sample into quartiles based on the Illiq measure, with the first Illiq quartile containing the most liquid stocks and the fourth Illiq quartile containing the least liquid stocks (Panel B).

[3] STNP is the fraction of debt maturing in one year relative to total debt, net of the current portion of long-term debt. As a result, this measure is not affected by maturing long-term debt.

It is evident that the proportion of short-term debt monotonically decreases in stock liquidity. The mean (median) of our main short-term variable, ST3, is 69.65% (79.24%) in the least liquid stock quartile and 33.54% (25.92%) in the most liquid stock quartile. This pattern is depicted graphically in Figure 1.

<Table 2 about here>

<Figure 1 about here>

4. Research Design and Empirical Results

4.1. Baseline Estimation

In this section, we investigate the empirical relation between corporate debt maturity structure and stock liquidity in a multivariate setting. The following specification is our baseline estimation:

$$ST3_{i,t} = \alpha + \beta Illiq_{i,t} + \gamma X_{i,t} + \varepsilon_{i,t}, \tag{2}$$

where *ST3* is the short-term debt measure, *Illiq* is the primary variable of interest, and *X* includes all the control variables described in Section 3.3.

Table 3 reports the baseline estimation results. Column 1 of Table 3 shows that when including a full set of control variables but without fixed effects, the Illiq variable is significantly and positively associated with the proportion of short-term debt on the firm's balance sheet. This result confirms the univariate finding in Table 2 that firms with more liquid equity use less short-term debt in their debt maturity structure. In addition to including all the control variables, Columns 2, 3, and 4 introduce year, industry, and year and industry fixed effects, respectively. Industry classification is based on two-digit SIC codes. The coefficient estimate associated with Illiq varies little and remains strongly significant after controlling for these fixed effects. Using the point estimate from Column 4 to gauge economic significance, a one standard deviation increase in Illiq is associated with a 2.6% increase in the fraction of debt maturing in three years (ST3), controlling for the other variables as well as year and industry fixed effects. Considering that the sample mean of ST3 is 51.52%, this represents a relative increase in the use of short-term debt by approximately 5%. Finally, to further control for omitted firm specific characteristics not captured by the control variables, we include firm fixed effects in Column 5. The coefficient estimate on Illiq in Column 5 is nearly unchanged and remains significant at the 1% level.

These baseline estimation results are consistent with our hypothesis that firms with higher stock market liquidity are associated with less short-term debt in their debt maturity structure.

<Table 3 about here>

The coefficient estimates on the control variables in Table 3 are intuitive and are generally consistent with those reported in previous studies. Firm size is negatively associated with the use of short-term debt. Given that firm size may be used as a proxy for credit quality (Diamond, 1991; Johnson, 2003), it may be easier for larger firms with high credit quality to obtain longer-term debt. The coefficient estimate on firm size squared is significant and positive, suggesting a non-monotonic relation between firm size and debt maturity (Diamond, 1991; Stohs and Mauer, 1996). Leverage is negatively related to short-term debt, as highly levered firms may be more concerned about refinancing risk. Consistent with Myers (1977), firms with greater growth opportunities as measured by the market-to-book ratio are more likely to use short-term debt to mitigate the underinvestment problem. The coefficient estimate on abnormal earnings is negatively associated with short-term debt usage, which may be a reflection of higher quality firms being more capable of accessing long-term debt. We find a negative relation between asset maturity and short-term debt, which is in line with the prediction that firms match debt maturity with asset maturity (Stohs and Mauer, 1996). The theoretical relation between asset volatility and debt maturity is ambiguous. On one hand, firms with high asset volatility may tend to issue more short-term debt in order to rebalance their capital structure when necessary (Ju and Ou-Yang, 2006). On the other hand, these firms may prefer to use longer-term debt to avoid refinancing and liquidity risk (Kane, Marcus, and McDonald, 1985). The coefficient estimate on the asset volatility variable in our study appears to be sensitive to the types of fixed effects used in the regressions. We document a positive association between R&D expenditure and the use of short-term debt, as firms with high R&D intensity tend to be risky, and it may be difficult for such firms to obtain long-term financing. Similar to Dang and Phan (2016), we include a missing R&D dummy variable to account for the fact that many firms do not explicitly report R&D expenses. This variable generally carries a positive sign. As expected, firms with a long-term credit rating (Rated) have significantly more long-term debt in their debt maturity structure

(Datta, Iskandar-Datta, and Raman, 2005). While Barclay and Smith (1995) suggest a negative relation between the use of short-term debt and the regulation dummy, after including all the control variables in the regressions, we find some evidence of a positive relation between the two variables.[4] The coefficient estimate on term structure is generally not significant.

4.2. Robustness

While the results in Table 3 confirm our hypothesis that firms with high (low) stock liquidity have less (more) short-term debt in their debt maturity structure, in this section we conduct a number of additional analyses to test the robustness of this finding. In Table 4, we re-run the baseline estimation using alternative short-term debt measures (STNP, ST1, ST2, ST4, and ST5) as the dependent variable while maintaining Illiq as the primary independent variable and including all control variables as well as year and industry fixed effects. We find that the documented association between firms' debt maturity structure and stock market liquidity is not sensitive to the use of alternative debt maturity measures, as the positive coefficient estimate on Illiq remains significant at the 1% level across all specifications.

<Table 4 about here>

Next, to address the concern that our finding may depend on the use of Illiq as the measure of stock liquidity, we employ several other proxies for stock liquidity studied in the microstructure literature. Specifically, in Table 5, we use the lagged value of Illiq, FHT, the Gibbs estimator, bid-ask spread, and share turnover as alternative stock liquidity measures.

FHT is developed by Fong, Holden, and Trzcinka (2017) and is defined as

$$FHT_{i,t} = 2\sigma N^{-1}\left(\frac{1+z}{2}\right), \tag{3}$$

where σ is the standard deviation of non-zero returns for firm *i* over year *t*, $N^{1}()$ is the inverse function of the cumulative normal distribution, and *z* is the proportion of zero return days relative to the number of total trading days for firm *i* over year *t*. Fong, Holden, and Trzcinka (2017) show that this measure is highly correlated with cost-per-price benchmarks calculated using intraday data. The FHT variable is used

[4] In untabulated results we find that, consistent with Barclay and Smith (1995), the regulation dummy is negatively correlated with the use of short-term debt when the control variables are excluded.

as a stock liquidity measure in recent studies such as Marshall, Nguyen, and Visaltanachoti (2012), Edmans, Fang, and Zur (2013), and Schestag, Schuster, and Uhrig-Homburg (2016).

We also use the Gibbs sampler proposed in Hasbrouck (2009). This approach is an updated estimate of the Roll (1984) measure of trading cost that focuses on the negative serial covariance in daily returns induced by the bid-ask spread.[5] Using a validation sample of transaction level data, Hasbrouck (2009) shows that the Gibbs estimator based on daily data is a good proxy for the effective cost of trade. Since the Gibbs measure is calculated based on calendar year, we use the lagged Gibbs measure in our analysis to ensure that the debt maturity structure decisions do not lead the stock liquidity measure. Another popular measure used to proxy for liquidity and trading cost is the bid-ask spread. Using CRSP data, we follow Chung and Zhang (2014) and measure the bid-ask spread as the difference between daily closing ask and bid quotes divided by the midpoint of the quote, averaged over the firm's fiscal year. The share turnover measure is calculated as the ratio of daily share volume to shares outstanding, averaged over firm *i*'s fiscal year *t*. Unlike the other stock liquidity variables used in this study for which a higher value signals greater *illiquidity*, a higher value of share turnover is associated with higher *liquidity*.

Table 5 Panel A and Panel B display the summary statistics of the alternative liquidity measures and their correlations with the main liquidity measure, Illiq. The number of observations for each measure varies depending on data availability. The mean and median of the alternative measures reported in Panel A are similar to those documented in prior studies (Hasbrouck, 2009; Lipson and Mortel, 2009; Edmans, Fang, and Zur, 2013; Chung and Zhang, 2014). Panel B shows that these alternative measures are significantly, but not perfectly, correlated with our main explanatory variable, Illiq. The imperfect correlation among the various liquidity variables implies that they are meaningful alternative measures for the purpose of checking the robustness of our results.

<Table 5 about here>

[5] We thank Joel Hasbrouck for making the Gibbs measure available at http://people.stern.nyu.edu/jhasbrou/Research/GibbsEstimates2006/Liquidity%20estimates%202006.htm. Since this data is available until 2005, our sample also stops in 2005 when using the Gibbs measure as the alternative liquidity measure.

Table 6 reports the baseline regression results when using alternative liquidity measures as the primary independent variable. After including all the control variables as well as year and industry fixed effects, the inverse relation between stock liquidity and the proportion of short-term debt persists as evidenced by the positive and highly significant coefficient estimates on all of the alternative stock liquidity measures (with the exception of turnover, which is significantly negative because of the direct relation between it and liquidity). Taken together, the results in Tables 3, 4, and 6 demonstrate that the strong negative association between stock liquidity and short-term debt usage is not sensitive to the inclusion of a large set of control variables as well as various fixed effects, nor does it depend on the particular manner in which we measure short-term debt and stock liquidity.

<Table 6 about here>

4.3. Endogeneity

While the OLS regression results support our hypothesis that stock market liquidity imposes governance that benefits creditors and reduces the need for short-term debt monitoring, the relation between corporate debt maturity structure and stock market liquidity documented in our study could potentially be endogenous. It is possible that there is some unobserved variable not captured by our specification that drives both the use of short-term debt and stock liquidity. Reverse causality between debt maturity and stock liquidity is another concern: it may be that market participants have a preference to trade the stock of firms with longer debt maturity, which may in turn result in higher stock liquidity. These endogeneity issues are addressed using a two stage least squares (2SLS) approach in Section 4.3.1. and a difference-in-difference approach in Section 4.3.2.

4.3.1. 2SLS

To address the potentially endogenous relation between debt maturity structure and stock liquidity, we use an approach similar to that adopted by Fang, Noe, and Tice (2009) and Jayaraman and Milbourn (2011). Specifically, we treat Illiq as endogenous and use two instrumental variables (IVs) to predict stock liquidity in the first stage regression. The two IVs employed in the analysis are the lagged value of the Illiq variable and the industry median of the Illiq variable in a given year. These two IVs are expected to be significantly correlated with a firm's stock liquidity but uncorrelated with the error term in Equation (2). As pointed out by Fang, Noe, and Tice (2009) and Jayaraman and Milbourn (2011), the use of lagged liquidity as an exogenous variable helps mitigate the concern that an unobservable variable in fiscal year *t* is correlated with both stock liquidity and the use of short-term debt at time *t*. In addition, the portion of firm i's liquidity that is related to the liquidity of its industry is less likely to be correlated with unobservable variables that may affect the outcome variable (the use of short-term debt). Therefore, lagged liquidity and industry median liquidity satisfy both the relevance and exclusion requirements for valid instruments, which is why both have been successfully employed in this role in the previously mentioned studies. The first and second stage regressions (Equation 4 and Equation 5, respectively) associated with 2SLS estimation are formally expressed as follows:

$$Pred.Illiq_{i,t} = \alpha_1 + \beta_1 X_{i,t} + \gamma_1 Instruments_{i,t} + \varepsilon_{1_{i,t}}, \quad (4)$$

$$ST3_{i,t} = \alpha_2 + \beta_2 Pred.Illiq_{i,t} + \gamma_2 X_{i,t} + \varepsilon_{2_{i,t}}, \quad (5)$$

where the vector *X* contains the full set of control variables as in Equation (2), and *Instruments* represents the lagged value of Illiq and the industry median Illiq in a given year. Year and industry fixed effects are included in both the first and second stage regressions.

<Table 7 about here>

Table 7 Column 1 reports the first stage regression result (Equation 4). The first stage regression indicates that, as expected, both IVs are significantly and positively associated with the endogenous Illiq variable. The Kleibergen-Paap rk Wald F statistic is very large, suggesting that our IVs are relevant and are not weak. In the second stage regression using our main debt maturity measure ST3 as the dependent variable (Column 2), the coefficient estimate on the predicted value of Illiq is positive and significant at the 1% level, which confirms our baseline estimation result of the negative effect of stock liquidity on the proportion of short-term debt in firms' debt maturity structure. The estimate of the Hansen J statistic further supports the validity of the IVs employed in this analysis as its *p*-value indicates that we cannot reject the null hypothesis of non-overidentification. Column 3 to Column 7 report the second stage

regression results with the main dependent variable (ST3) replaced by STNP, ST1, ST2, ST4, and ST5. We obtain very similar results using these alternative short-term debt measures.[6] Overall, the 2SLS analysis yields results that are consistent with our baseline OLS results and partially address endogeneity.

4.3.2. Difference-in-Difference

As discussed previously, the relation between debt maturity and stock liquidity may be subject to reverse causality concerns. To further establish causality, we adopt a Difference-in-Difference (DiD) approach in this section. Similar to prior studies (Fang, Noe, and Tice, 2009; Edmans, Fang, and Zur, 2013; Fang, Tian, and Tice, 2014; Chang, Chen, and Zolotoy, 2017; Brogaard, Li, and Xia, 2017), we identify the exogenous tick-size decimalization event in 2001 as a quasi-natural experiment that alters stocks' liquidity. The New York Stock Exchange (NYSE) and American Stock Exchange (AMEX) changed the minimal tick size from 1/16th of a dollar to 1 cent on January 29th, 2001, while NASDAQ converted all stocks to a decimal price form on April 9th, 2001.[7] Decimalization has been shown to increase stock liquidity as the effective bid-ask spreads are on average significantly narrower following the event, which substantially reduces trading costs and encourages trading activity (Bessembinder, 2003; Furfine 2003). This quasi-natural experiment provides an ideal setting to address the potential reverse causality issue because it is an event that exogenously affects stock market liquidity but is highly unlikely to have been caused by firms' debt maturity structure decisions.

Our goal is to examine the impact of changes in stock market liquidity facilitated by the decimalization event on corporate debt maturity structure. We focus on the fiscal year before (t-1) and the fiscal year after (t+1) decimalization in the DiD approach.[8] A short window is adopted for this analysis in order to avoid possible confounding events (unobserved variables) that may result from a longer time period and to better establish causality. As the DiD estimation critically relies on the parallel trends assumption (Lemmon and Roberts, 2010), we form two groups of firms (treatment group and control

[6] The results in Table 7 are also not sensitive to the choice of stock liquidity measure.
[7] A small number of stocks were part of a pilot program prior to the conversion of all stocks to decimal prices. For instance, decimalization was introduced to 158 out of 3,525 stocks during the period between August 2000 and January 2001 (Fang, Noe, and Tice, 2009).
[8] The year of decimalization is excluded.

group) that appear to be very similar *pre*-decimalization, but experienced different change in stock liquidity around the decimalization event. If firms in the two groups develop different patterns in terms of short-term debt usage in the *post*-decimalization period, we can then conclude that any difference in the trends of firms' debt maturity structure between the two groups after decimalization is caused by the shock to stock liquidity.

Following Fang, Tian, and Tice (2014) and Brogaard, Li, and Xia (2017), we first construct a sample of treatment and control firms using a propensity score matching approach. Stocks are sorted into terciles based on the percentage change in Illiq around decimalization so that the bottom (top) tercile contains stocks that experienced the largest (smallest) increase in stock liquidity.[9] Accordingly, we label firms in the bottom (top) tercile treatment (control) firms. Firms in the middle tercile are excluded from the analysis. To facilitate propensity score matching, we estimate a probit model where the dependent variable is a dummy variable, Treat, that is equal to one if the firm belongs to the treatment group and zero if the firm belongs to the control group. The probit estimation includes all independent variables from Equation (2), measured in the year prior to decimalization, as well as industry fixed effects. The probit estimation is reported in Column 1 of Table 8 Panel A. The pseudo R-squared is 24.7% and the *p*-value from the χ^2 test is well below 0.0001, indicating that the model is well specified and explains a meaningful portion of variation in the dependent variable.

We then match firms in the treatment and control groups based on predicted probabilities (propensity scores) calculated from the probit estimation in Column 1. Each treatment firm is matched to a control firm with the closest propensity score that is within 0.01. This propensity score matching procedure yields 226 pairs of treatment and control firms around the decimalization event. Using the propensity score matched sample, we repeat the probit model to predict whether a firm is classified as a

[9] We construct the treatment and control groups based on the *percentage* change in Illiq, instead of the *level* change in Illiq, around decimalization because the percentage change in firms' stock liquidity better captures the relative magnitude of the stock liquidity shock.

treatment firm and report the result in Column 2 of Table 8 Panel A.[10] Notably, none of the independent variables in Column 2 is statistically significant, and the pseudo R-squared declines sharply to 3.9% with the *p*-value from the χ^2 test being 0.9999. This result indicates that there is no significant difference in firm characteristics between the treatment and control groups prior to decimalization.

Next, we compare the estimated propensity scores between treatment firms and the matched control firms. As is shown in Table 8 Panel B, the two groups of firms exhibit little differences in propensity scores. The mean and median of the differences in propensity scores between the treatment group and the control group are 0.55% and 0.62%, respectively.

As another diagnostic test, in Table 8 Panel C, we perform univariate comparisons in firm characteristics in the year preceding decimalization. *t*-tests show no significant differences in the characteristics between the firms that belong to the treatment group and firms that belong to the control group. In particular, treatment firms and control firms in the matched sample have similar levels of stock liquidity prior to decimalization, even though their stock liquidity was affected differently by decimalization. Overall, the diagnostic tests documented in Panel A, B, and C suggest that, in the propensity score matched sample, the parallel trends assumption is valid and the treatment and control groups contain firms that are essentially identical before decimalization. As a result, we expect the changes in firms' debt maturity structure around decimalization, if any, to be caused by the exogenous shock to stock liquidity.

Having established a treatment group and a control group that look very similar pre-decimalization, we next turn to examining changes in debt maturity structure that may have occurred around the decimalization event. Table 8 Panel D reports the mean value of each of the short-term debt measures before and after decimalization for the treatment and control groups. The DiD estimator is calculated as the difference between the change in short-term debt around decimalization (After – Before) for the control group and the change in short-term debt around decimalization (After – Before) for the

[10] Because several two-digit SIC industries contain only treatment or control firms, the probit estimation predicts success or failure perfectly for observations in these industries. As a result, nine observations are dropped from the probit estimation based on the propensity score matched sample reported in Column 2 of Table 8 Panel A.

treatment group. The change in the usage of short-term debt following decimalization is markedly different for firms in the treatment group relative to those in the control group. Around decimalization, the proportion of debt maturing within three years declined from 48.20% to 45.04% for firms in the treatment group, but increased from 48.12% to 53.04% for the control group, yielding an 8.08% net difference. The results using the alternative short-term debt measures (STNP, ST1, ST2, ST4, and ST5) show the same pattern, and in all cases the difference-in-difference is statistically significant.

We further explore the effect of decimalization on debt maturity in a DiD regression setting. The specification adopted for this analysis is as follows:

$$ST3_{i,t} = \alpha + \beta Treat_i + \gamma After_t + \theta Treat_i * After_t + \delta X_{i,t} + \varepsilon_{i,t}, \tag{6}$$

where *Treat* is a dummy variable that is equal to one if the firm belongs to the treatment group and zero otherwise, *After* is a dummy variable that is equal to one for the fiscal year following decimalization and zero for the fiscal year prior to decimalization, and *X* is the full set of control variables used in Table 3. Industry fixed effects (based on two-digit SIC codes) are included. Standard errors are clustered at the firm level. The coefficient estimate of interest is θ, which captures the differential impact of the positive shock to stock liquidity on firms in the treatment group after decimalization.

<Table 8 about here>

Table 8 Panel E presents the DiD regression results with the main dependent variable ST3 as well as the alternative measures of short-term debt usage reported in Table 4. The significant and negative estimates of θ indicate that an increase in stock liquidity following decimalization leads to a greater reduction in the proportion of short-term debt in firms' debt maturity structure for firms in the treatment group relative to firms in the control group. Using the main short-term debt proxy ST3 as an example, the coefficient estimate on *Treat*After* of -0.0718 means that one year after decimalization, the proportion of debt maturing within three years fell by 7.18% more for treatment firms than for control firms. This finding is consistent across all specifications using alternative measures of short-term debt. Collectively,

the results from the DiD analysis further alleviate our concerns related to endogeneity and suggest a causal relation between stock market liquidity and corporate debt maturity structure.

4.3. The Heterogeneous Effect of Stock Liquidity

Our analyses thus far document an inverse relation between the use of short-term debt and stock liquidity. Our interpretation is that stock liquidity serves as a form of monitoring (Holmstrom and Tirole, 1993; Admati and Pfleiderer, 2009; Edmans, 2009; Edmans and Manso, 2011) that can mitigate agency problems faced by creditors, which in turn reduces the need for short-term debt as a disciplinary device. We argue that, if creditors indeed benefit from stock market monitoring, then the influence of stock liquidity on debt maturity should vary with the severity of agency problems to which creditors are subject. We test this proposition by conducting subsample analysis based on firms' information asymmetry and default risk, as agency problems are likely to exacerbate when borrowers operate in opaque information environments or are financially distressed.

4.3.1. Information Opacity

We first examine whether the effect of stock liquidity on debt maturity is amplified for firms operating in opaque environments. Information asymmetry could impede creditors' abilities to assess borrowers' risk factors and thus force them to take disciplinary actions (e.g., the use of short-term debt). If higher stock market liquidity enhances the informativeness of firms' stock prices, reduces information asymmetry, and lowers creditors' information acquisition cost, the effect should be more pronounced in informationally opaque environments.

We employ two proxies that are widely used in the literature for information opacity. The first measure is financial analyst forecast accuracy, which is calculated as the absolute difference between the consensus annual earnings per share forecast and the actual earnings per share, divided by the stock price at the beginning of the fiscal year. Similar to Platikanova and Mattei (2016), we use forecasts made in the same month as the fiscal year end. This variable is then multipled by -1 so that higher values represent higher levels of forecast accuracy. Our second measure of firms' information transparency is the readability of firms' annual reports. Financial statements are a primary source of information for market participants. Therefore, the complexity of the language used in these documents may significantly affect the amount of information conveyed to investors. The readability of firms' annual reports is measured by the size of 10-K files (Loughran and McDonald, 2014), where files with larger sizes are deemed to be less readable.[11] Both analyst forecast accuracy and 10-K readability have been shown to convey important information to creditors (Mansi, Maxwell, and Miller, 2011; Ertugrul, Lei, Qiu, and Wan, 2017). For both measures, we create dummy variables for low information opacity (High Accuracy and High Readability) and high information opacity (Low Accuracy and Low Readability). High (Low) Accuracy is a dummy variable equal to one if the firm's financial analyst forecast accuracy measure is above (below) the sample median and zero otherwise. High (Low) Readability is a dummy variable equal to one if the firm's 10-K file size is below (above) the sample median and zero otherwise. We then interact stock liquidity with these information opacity dummy variables to re-estimate debt maturity structure. The specification is formally expressed as follows:

$$ST3_{i,t} = \alpha + \beta Illiq_{i,t} \times Low\ Opacity_{i,t} + \gamma Illiq_{i,t} \times High\ Opacity_{i,t} + \theta X_{i,t} + \varepsilon_{i,t}, \qquad (7)$$

where *Low Opacity* represents low information opacity environments where analyst forecast accuracy is high and 10-K reports are more readable, *High Opacity* represents high information opacity environments where analyst forecast accuracy is low and 10-K reports are less readable, and *X* includes the full set of control variables from the baseline estimation in Table 3. Year and industry fixed effects are included. The key coefficient estimates in this subsample analysis are the interaction terms between Illiq and the indicators of firms' information opacity.

In Columns 1 and 2 of Table 9, we show that in opaque information environments (Low Accuracy and Low Readability), the positive relation between the use of short-term debt and stock illiquidity persists and remains statistically significant. On the other hand, the coefficient estimates on the interactions between stock illiquidity and the low opacity measures (High Accuracy and High Readability) are either insignificant or are much smaller in magnitude. The last row of the table provides *p*-values

[11] We thank Tim Loughran and Bill McDonald for generously sharing their financial disclosure readability data at https://sraf.nd.edu/textual-analysis/resources/#LM_10X_Summaries.

associated with an F-test that coefficient estimates for the interaction terms across the high and low opacity environments are equal. The *p*-values suggest that the effect of stock liquidity on debt maturity structure is significantly stronger in the informationally opaque subsample. This result confirms the notion that stock market liquidity is particularly valuable in addressing agency issues when information is less accessible to creditors.

<Table 9 about here>

4.3.2. Default Risk

Shareholders of financially distressed firms may have incentives to invest in risk-increasing yet value-reducing projects, because they enjoy the upside payoffs while creditors bear the downside costs (Galai and Masulis, 1976; Jensen and Meckling, 1976; Eisdorfer, 2008). Consequently, creditors are especially concerned with agency problems when borrowers are in poor financial condition and therefore asset substitution problems are more likely. As the monitoring through stock market liquidity motivates the manager to invest in value-enhancing and less risky projects (Fang, Noe, and Tice, 2009; Fang, Tian, and Tice, 2014; Brogaard, Li, and Xia, 2017), we predict that the effect of stock liquidity on the use of short-term debt is stronger when the borrower is subject to higher default risk.

To empirically test this proposition, we split the sample into high and low default risk subsamples based on the interest coverage ratio and Altman's (1968) Z-Score, with lower values of the interest coverage ratio and Altman's Z-Score indicating a higher likelihood of default.[12] Similar to the subsample analysis based on information environments, we create dummy variables for firms facing higher default risk (Low Interest Coverage and Low Z-Score) and firms facing lower default risk (High Interest Coverage and High Z-Score). High (Low) Interest Coverage is a dummy variable equal to one if the interest coverage ratio is above (below) the sample median and zero otherwise. High (Low) Z-Score is a dummy variable equal to one if the Z-Score is above (below) the sample median and zero otherwise. As

[12] Similar to Sufi (2009), Campello, Lin, Ma, and Zou (2011), and Shenoy and Williams (2017), we use a modified Altman's Z-Score which excludes the ratio of market value of equity to book value of debt in the calculation.

before, we interact stock liquidity with these dummy variables to re-estimate the proportion of short-term debt in firms' debt maturity structure. We employ the following specification for the purpose of this test:

$$ST3_{i,t} = \alpha + \beta Illiq_{i,t} \times Low\ Default_{i,t} + \gamma Illiq_{i,t} \times High\ Default_{i,t} + \theta X_{i,t} + \varepsilon_{i,t}, \quad (8)$$

where *Low Default* represents firms that are financially healthy, characterized by a relatively high interest coverage ratio or Z-Score, *High Default* represents financially distressed firms that have a relatively low interest coverage ratio or Z-Score, and *X* includes the full set of control variables from the baseline estimation in Table 3. Year and industry fixed effects are included. The interaction terms between *Illiq* and the indicators of default risk are the main focus of this analysis.

As reported in Columns 3 and 4 in Table 9, the subsample results based on firms' default risk are consistent with our prediction. Specifically, in Column 3 we show that, while the negative effect of stock liquidity on the use of short-term debt is statistically significant in both subsamples, the coefficient estimate for the high default risk group (Low Interest Coverage) is significantly larger than that for the low default risk group. Similarly, in Column 4 where Z-Score is used as the measure of default risk, we find that the impact of stock market liquidity on debt maturity is stronger in the low Z-Score subsample compared to the high Z-Score subsample, and the difference in the effect of stock liquidity between the two groups is statistically meaningful as indicated by the p-value from F-test.

Taken together, the evidence presented in Table 9 shows that the effect of stock market liquidity on corporate debt maturity structure is heterogeneous; it is stronger in situations where information is opaque and the borrower is more likely to default. In other words, the substitution effect between stock market governance through stock liquidity and debt market monitoring through the use of short-term debt is more relevant when creditors are subject to higher levels of agency problems.

4.4. Evidence from Bond Issues

In this section, we further examine the impact of stock market liquidity on corporate debt maturity structure by employing a sample of corporate bond issues. The analysis based on new bond issues serves two purposes. First, the Securities Data Company (SDC) new bond issue data allows us to directly observe debt contract characteristics, such as the maturity and pricing of bonds issued, as a function of the issuer's stock market liquidity. Specifically, if consistent with our predictions, stock market liquidity effectively mitigates lenders' concerns with regards to information asymmetry and/or agency problems related to shareholder incentives, the reduced agency cost of debt should be reflected by longer maturity of new issues and lower cost of borrowing, all else equal. Secondly, using new issue data, we are able to adopt an incremental approach (Guedes and Opler, 1996; Denis and Mihov, 2003; Brockman, Martin, and Unlu, 2010) to analyze the empirical relation between corporate debt maturity structure and stock liquidity. Because firms tend not to frequently adjust their capital structure (Leary and Roberts, 2005), the incremental approach helps rule out the concern that our short-term debt measures from the balance sheet may simply reflect the proportion of long-term debt that is maturing (i.e., firms' debt maturity structure may be a result of past decisions).[13]

To facilitate this new bond issue analysis, we merge the sample used in the main analyses with new corporate bond issue data from SDC. Observations with missing values on proceeds, maturity, and yield spread are excluded. The final corporate bond issue sample consists of 5,804 non-convertible corporate bonds issued by 892 unique firms over the period from 1985 to 2015.

In Column 1 – Column 3 of Table 10 Panel A, we report bond issue level evidence on the relation between debt maturity structure and stock market liquidity. Similar to Brockman, Martin, and Unlu (2010), we also construct a consolidated firm level sample where the bond maturity is measured as either the equal-weighted (EW) maturity for firms with multiple issues in a given year (Column 4) or the proceeds-weighted (PW) maturity for firms with multiple issues in a given year (Column 5). The firm level control variables used in this analysis are the same as those used in the baseline estimation in Table 3, all measured at the end of the fiscal year prior to the year in which bonds were issued. Bond issue level control variables employed in Column 3 include issue size, yield spread, a dummy variable indicating whether a bond is callable, a dummy variable indicating whether a bond is a senior bond, and the S&P rating of a bond issue. Year and industry fixed effects are included in all regressions.

[13] One of our alternative balance sheet measures of short-term debt, STNP, also helps mitigate this concern, as it does not include the proportion of long-term debt that is coming due.

We first show that, at the issue level, there is strong evidence that firms with higher (lower) stock liquidity tend to issue bonds with longer (shorter) maturity. The coefficient estimate on the lagged value of the Illiq variable is consistently negative and statistically significant at the 1% level with the inclusion or exclusion of firm level and issue level control variables. This finding is consistent with our main result obtained using balance sheet data, suggesting that stock liquidity has important implications for creditors' perceived risks of borrowers and therefore affects debt contracting terms such as the maturity of new bond issues. It is worth noting that the addition of bond issue control variables substantially increases the adjusted R-squared, indicating that several bond issue characteristics capture a large amount of variation in the maturity structure of corporate bonds.

We then turn to the firm level bond issue analysis where multiple bond issues by the same firm in the same year are aggregated into one observation. The dependent variable in Column 4 (Column 5) is the equal-weighted (proceeds-weighted) maturity of bonds issued by the firm in a given year. We find that the inverse relation between the use of short-term debt and stock liquidity persists and remains statistically significant. Overall, the new issue analysis reported in Panel A of Table 10 provides further support to our hypothesis and eliminates the concern that, when using balance sheet data, the short-term debt measures may be affected by the maturing portion of long-term debt.

Finally, we analyze the impact of stock liquidity on the pricing of new bond issues. If, as we propose in this study, stock liquidity indeed benefits creditors through reduced information asymmetry and better aligns the interests of shareholders and debtholders, we expect a negative association between the cost of new bond issues and issuers' stock market liquidity. The empirical specification is similar to that used in recent studies (e.g., Hasan, Hoi, Wu, and Zhang, 2017), which is formally expressed as follows:

$$Spread_{i,t} = \alpha + \beta Illiq_{i,t-1} + \gamma X_{i,t-1} + \theta Z_{i,t} + \varepsilon_{i,t}, \tag{9}$$

where *Spread* is the yield spread on a corporate bond issue, which is defined as the natural logarithm of the difference between the yield to maturity of a corporate bond and the yield to maturity of a treasury bond with similar maturity, *Illiq* is the main stock liquidity measure used throughout the paper, *X* captures a vector of firm characteristics that have been employed in the literature as determinants of cost of debt including firm size, market-to-book, leverage, PPE, Z-Score, profitability, cash holding, earnings volatility, and sales growth rate, and Z represents bond issue characteristics that are likely to affect bond pricing. All firm level independent variables are measured at the fiscal year end prior to the bond issuance. Year and industry fixed effects are included in all regressions.

The empirical results on the relation between bond pricing and stock liquidity are reported in Table 10 Panel B. While Column 1 uses stock liquidity as the only firm level explanatory variable in the regression, Column 2 includes firm level control variables, and Column 3 further adds the bond issue level control variables. We find that the coefficient estimate on the lagged liquidity measure, Lag Illiq, is consistently positive and statistically significant at the 1% level, which suggests that corporate bonds issued by firms with higher (lower) stock market liquidity are relatively less (more) costly. This positive relation between the cost of bond issues and issuers' stock illiquidity is consistent with our prediction that creditors view stock market liquidity as a risk-reducing mechanism. The coefficient estimates on the control variables are intuitive and consistent with the findings in prior research such as Hasan, Hoi, Wu, and Zhang (2017). Moreover, the addition of control variables leads to large increases in the adjusted R-squared from Column 1 to Column 3, suggesting that the firm and bond issue characteristics are relevant control variables to be included in the specifications.

Overall, the analyses based on new bond issues as reported in Table 10 demonstrate that firms with more liquid stock tend to issue longer-term bonds and are subject to lower borrowing costs. These findings confirm the hypothesis that stock market liquidity plays an important role in alleviating agency problems faced by creditors and thus helps reduce agency cost of debt.

5. Conclusions

Does stock market liquidity matter to non-shareholder stakeholders such as creditors? In this study, we address this question by empirically examining the relation between corporate debt maturity structure and stock market liquidity. We find strong evidence that the proportion of short-term debt in firms' debt maturity structure is negatively associated with stock liquidity. In other words, all else equal, firms with higher stock liquidity tend to use less short-term debt. This finding is consistent with the idea that stock market liquidity is beneficial to creditors because it reduces the information asymmetry they face when lending, and motivates managers to take value-enhancing actions that are more in line with creditors' interests. Supporting our argument, we demonstrate that the effect of stock liquidity on debt maturity is more pronounced for firms whose creditors are more vulnerable to agency problems, namely those that lend to firms operating in opaque information environments and firms that are financially distressed. Using new issue data, we further show that when issuing debt, firms with higher stock liquidity issue bonds with longer maturity and enjoy lower bond yields. The results from analyzing new bond issue data confirm our hypothesis regarding the implications of stock market liquidity on firms' creditors.

Taken together, the evidence presented in this paper suggests that the monitoring function of stock market liquidity helps mitigate the severity of agency problems faced by creditors. Therefore, there is less need for debt market monitoring through the use of short-term debt. Our results and their interpretation are consistent with the recent literature that highlights the disciplinary function of stock market liquidity, and extend this literature by showing that stock market liquidity positively impacts non-shareholder stakeholders such as debtholders, and can serve as a substitute for debt market monitoring.

References:

Admati, Anat R., and Paul Pfleiderer, 2009, The "Wall Street walk" and shareholder activism: Exit as a form of voice, *The Review of Financial Studies* 22, 2645-2685.

Altman, Edward I., 1968, Financial ratios, discriminant analysis and the prediction of corporate bankruptcy, *The Journal of Finance* 23, 589-609.

Amihud, Yakov, 2002, Illiquidity and stock returns: Cross-section and time-series effects, *Journal of Financial Markets* 5, 31-56.

Barclay, Michael J., and Clifford W. Smith, 1995, The maturity structure of corporate debt, *The Journal of Finance* 50, 609-631.

Barnea, Amir, Robert A. Haugen, and Lemma W. Senbet, 1980, A rationale for debt maturity structure and call provisions in the agency theoretic framework, *The Journal of Finance* 35, 1223-1234.

Bessembinder, Hendrik, 2003, Trade execution costs and market quality after decimalization, *The Journal of Financial and Quantitative Analysis* 38, 747-777.

Bharath, Sreedhar T., Sudarshan Jayaraman, and Venky Nagar, 2013, Exit as governance: An empirical analysis, *The Journal of Finance* 68, 2515-2547.

Brockman, Paul, Xiumin Martin, and Emre Unlu, 2010, Executive compensation and the maturity structure of corporate debt, *The Journal of Finance* 65, 1123-1161.

Brogaard, Jonathan, Dan Li, and Ying Xia, 2017, Stock liquidity and default risk, *Journal of Financial Economics* 124, 486-502.

Campello, Murillo, Chen Lin, Yue Ma, and Hong Zou, 2011, The real and financial implications of corporate hedging, *The Journal of Finance* 66, 1615-1647.

Chang, Xin, Yangyang Chen, and Leon Zolotoy, 2017, Stock liquidity and stock price crash risk, *Journal of Financial and Quantitative Analysis* 52, 1605-1637.

Chordia, Tarun, Richard Roll, and Avanidhar Subrahmanyam, 2008, Liquidity and market efficiency, *Journal of Financial Economics* 87, 249-268.

Chung, Kee H., and Hao Zhang, 2014, A simple approximation of intraday spreads using daily data, *Journal of Financial Markets* 17, 94-120.

Dang, Viet Anh, Edward Lee, Yangke Liu, and Cheng Zeng, 2018, Corporate debt maturity and stock price crash risk, *European Financial Management* 24, 451-484.

Dang, Viet A., and Hieu V. Phan, 2016, CEO inside debt and corporate debt maturity structure, *Journal of Banking & Finance* 70, 38-54.

Datta, Sudip, Mai Iskandar-Datta, and Kartik Raman, 2005, Managerial stock ownership and the maturity structure of corporate debt, *The Journal of Finance* 60, 2333-2350.

Denis, David J., and Vassil T. Mihov, 2003, The choice among bank debt, non-bank private debt, and public debt: Evidence from new corporate borrowings, *Journal of Financial Economics* 70, 3-28.

Diamond, Douglas W., 1991, Debt maturity structure and liquidity risk, *The Quarterly Journal of Economics* 106, 709-737.

Easley, David, and Maureen O'Hara, 2004, Information and the cost of capital, *The Journal of Finance* 59, 1553-1583.

Easterbrook, Frank H, 1984, Two agency-cost explanations of dividends, *The American Economic Review* 74, 650-659.

Edmans, Alex, 2009, Blockholder trading, market efficiency, and managerial myopia, *The Journal of Finance* 64, 2481-2513.

Edmans, Alex, Vivian W. Fang, and Emanuel Zur, 2013, The effect of liquidity on governance, *The Review of Financial Studies* 26, 1443-1482.

Edmans, Alex, and Gustavo Manso, 2011, Governance through trading and intervention: A theory of multiple blockholders, *The Review of Financial Studies* 24, 2395-2428.

Eisdorfer, Assaf, 2008, Empirical evidence of risk shifting in financially distressed firms, *The Journal of Finance* 63, 609-637.

Ertugrul, Mine, Jin Lei, Jiaping Qiu, and Chi Wan, 2017, Annual report readability, tone ambiguity, and the cost of borrowing, *Journal of Financial and Quantitative Analysis* 52, 811-836.

Fama, Eugene F, and Merton H Miller, 1972, *The theory of finance* (Holt Rinehart & Winston, New York, NY).

Fang, Vivian W., Thomas H. Noe, and Sheri Tice, 2009, Stock market liquidity and firm value, *Journal of Financial Economics* 94, 150-169.

Fang, Vivian W., Xuan Tian, and Sheri Tice, 2014, Does stock liquidity enhance or impede firm innovation?, *The Journal of Finance* 69, 2085-2125.

Ferreira, Daniel, Miguel A. Ferreira, and Clara C. Raposo, 2011, Board structure and price informativeness, *Journal of Financial Economics* 99, 523-545.

Fong, Kingsley Y. L., Craig W. Holden, and Charles A. Trzcinka, 2017, What are the best liquidity proxies for global research?, *Review of Finance* 21, 1355-1401.

Fu, Xudong, and Tian Tang, 2016, Corporate debt maturity and acquisition decisions, *Financial Management* 45, 737-768.

Furfine, Craig, 2003, Decimalization and market liquidity, *Economic Perspectives* 27, 2-12.

Galai, Dan, and Ronald W. Masulis, 1976, The option pricing model and the risk factor of stock, *Journal of Financial Economics* 3, 53-81.

Goyenko, Ruslan Y., Craig W. Holden, and Charles A. Trzcinka, 2009, Do liquidity measures measure liquidity?, *Journal of Financial Economics* 92, 153-181.

Graham, John R., Si Li, and Jiaping Qiu, 2008, Corporate misreporting and bank loan contracting, *Journal of Financial Economics* 89, 44-61.

Guedes, Jose, and Tim Opler, 1996, The determinants of the maturity of corporate debt issues, *The Journal of Finance* 51, 1809-1833.

Guo, Lixiong, Patrick Lach, and Shawn Mobbs, 2015, Tradeoffs between internal and external governance: Evidence from exogenous regulatory shocks, *Financial Management* 44, 81-114.

Hasan, Iftekhar, Chun Keung Hoi, Qiang Wu, and Hao Zhang, 2017, Social capital and debt contracting: Evidence from bank loans and public bonds, *Journal of Financial and Quantitative Analysis* 52, 1017-1047.

Hasbrouck, Joel, 2009, Trading costs and returns for us equities: Estimating effective costs from daily data, *The Journal of Finance* 64, 1445-1477.

Holmström, Bengt, and Jean Tirole, 1993, Market liquidity and performance monitoring, *Journal of Political Economy* 101, 678-709.

Jayaraman, Sudarshan, and Todd T Milbourn, 2011, The role of stock liquidity in executive compensation, *The Accounting Review* 87, 537-563.

Jensen, Michael C., 1986, Agency costs of free cash flow, corporate finance, and takeovers, *The American Economic Review* 76, 323-329.

Jensen, Michael C., and William H. Meckling, 1976, Theory of the firm: Managerial behavior, agency costs and ownership structure, *Journal of Financial Economics* 3, 305-360.

Johnson, Shane A., 2003, Debt maturity and the effects of growth opportunities and liquidity risk on leverage, *The Review of Financial Studies* 16, 209-236.

Ju, Nengjiu, and Hui Ou-Yang, 2006, Capital structure, debt maturity, and stochastic interest rates, *The Journal of Business* 79, 2469-2502.

Kahn, Charles, and Andrew Winton, 1998, Ownership structure, speculation, and shareholder intervention, *The Journal of Finance* 53, 99-129.

Kane, Alex, Alan J. Marcus, and Robert L. McDonald, 1985, Debt policy and the rate of return premium to leverage, *The Journal of Financial and Quantitative Analysis* 20, 479-499.

Kyle, Albert S., and Jean-Luc Vila, 1991, Noise trading and takeovers, *The RAND Journal of Economics* 22, 54-71.

Leary, Mark T., and Michael R. Roberts, 2005, Do firms rebalance their capital structures?, *The Journal of Finance* 60, 2575-2619.

Leland, Hayne E., and Klaus Bjerre Toft, 1996, Optimal capital structure, endogenous bankruptcy, and the term structure of credit spreads, *The Journal of Finance* 51, 987-1019.

Lemmon, Michael, and Michael R. Roberts, 2010, The response of corporate financing and investment to changes in the supply of credit, *The Journal of Financial and Quantitative Analysis* 45, 555-587.

Lipson, Marc L., and Sandra Mortal, 2009, Liquidity and capital structure, *Journal of Financial Markets*

12, 611-644.

Loughran, Tim, and Bill McDonald, 2014, Measuring readability in financial disclosures, *The Journal of Finance* 69, 1643-1671.

Mansi, Sattar A., William F. Maxwell, and Darius P. Miller, 2011, Analyst forecast characteristics and the cost of debt, *Review of Accounting Studies* 16, 116-142.

Marshall, Ben R., Nhut H. Nguyen, and Nuttawat Visaltanachoti, 2012, Commodity liquidity measurement and transaction costs, *The Review of Financial Studies* 25, 599-638.

Maug, Ernst, 1998, Large shareholders as monitors: Is there a trade-off between liquidity and control?, *The Journal of Finance* 53, 65-98.

Murphy, Kevin J., 1985, Corporate performance and managerial remuneration: An empirical analysis, *Journal of Accounting and Economics* 7, 11-42.

Myers, Stewart C., 1977, Determinants of corporate borrowing, *Journal of Financial Economics* 5, 147-175.

Ortiz-Molina, Hernán, and María Fabiana Penas, 2008, Lending to small businesses: The role of loan maturity in addressing information problems, *Small Business Economics* 30, 361-383.

Platikanova, Petya, and Marco Maria Mattei, 2016, Firm geographic dispersion and financial analysts' forecasts, *Journal of Banking & Finance* 64, 71-89.

Rajan, Raghuram, and Andrew Winton, 1995, Covenants and collateral as incentives to monitor, *The Journal of Finance* 50, 1113-1146.

Roll, Richard, 1984, A simple implicit measure of the effective bid-ask spread in an efficient market, *The Journal of Finance* 39, 1127-1139.

Schestag, Raphael, Philipp Schuster, and Marliese Uhrig-Homburg, 2016, Measuring liquidity in bond markets, *The Review of Financial Studies* 29, 1170-1219.

Shenoy, Jaideep, and Ryan Williams, 2017, Trade credit and the joint effects of supplier and customer financial characteristics, *Journal of Financial Intermediation* 29, 68-80.

Stohs, Mark Hoven, and David C. Mauer, 1996, The determinants of corporate debt maturity structure, *The Journal of Business* 69, 279-312.

Stulz, René M., 1990, Managerial discretion and optimal financing policies, *Journal of Financial Economics* 26, 3-27.

Subrahmanyam, Avanidhar, and Sheridan Titman, 2001, Feedback from stock prices to cash flows, *The Journal of Finance* 56, 2389-2413.

Sufi, Amir, 2009, Bank lines of credit in corporate finance: An empirical analysis, *The Review of Financial Studies* 22, 1057-1088.

Appendix. Variable Definitions

Variable	Definition
Debt Maturity Measures	
STNP	The ratio of debt in current liabilities without the current proportion of long-term debt (*np*) to total debt (*dlc* + *dltt*).
ST1	The ratio of debt in current liabilities (*dlc*) to total debt (*dlc* + *dltt*).
ST2	The ratio of debt in current liabilities (*dlc*) plus debt maturing in two years (*dd2*) to total debt (*dlc* + *dltt*).
ST3	The ratio of debt in current liabilities (*dlc*) plus debt maturing in two and three years *(dd2 + dd3)* to total debt (*dlc* + *dltt*).
ST4	The ratio of debt in current liabilities (*dlc*) plus debt maturing in two, three, and four years (*dd2* + *dd3* + *dd4*) to total debt (*dlc* + *dltt*).
ST5	The ratio of debt in current liabilities (*dlc*) plus debt maturing in two, three, four, and five years (*dd2* + *dd3* + *dd4* + *dd5*) to total debt (*dlc* + *dltt*).
Stock Liquidity Measures	
Illiq	The natural logarithm of Amihud illiquidity plus one, where Amihud illiquidity is calculated as the daily ratio of the absolute value of stock return to dollar volume, averaged over firm *i*'s fiscal year *t.*
FHT	The calculation of FHT follows Fong, Holden, and Trzcinka (2017).
Gibbs	The calculation of Gibbs follows Hasbrouck (2009). Data is downloaded from Prof. Hasbrouck's website.
Bid-Ask Spread	The difference between daily closing ask and bid quotes divided by the midpoint of the quote, averaged over the firm's fiscal year (Chung and Zhang, 2014).
Turnover	The ratio of daily volume to shares outstanding, averaged over firm *i*'s fiscal year *t.*
Control Variables	
Size	The natural logarithm of book value of total assets (*at*).
Leverage	The ratio of total debt (*dlc* + *dltt*) to book value of total assets (*at*).
MB	The ratio of the market value of assets (*csho∗prcc_f*+*at*–*ceq*) to the book value of total assets (*at*).
AbEarn	The ratio of the difference between the income before extraordinary items, adjusted for common stock equivalents (*ibadj*) in year *t* and *t* − 1, to the market value of equity (*prcc_f∗cshpri*).
ATM	Property, plant, and equipment over depreciation (*ppegt*/*dp*) times the proportion of property, plant, and equipment in total assets (*ppegt*/*at*), plus the ratio of current assets to the cost of goods sold (*act*/*cogs*) times the proportion of current assets in total assets (*act*/*at*).
ATV	The standard deviation of daily stock returns during the fiscal year times the market value of equity (*csho∗prcc_f*), divided by the market value of assets (*csho∗prcc_f*+*at*–*ceq*).
R&D	The ratio of research and development expense (*xrd*) to total assets (*at*). R&D is assigned a value of zero if *xrd* is missing.
Miss R&D	Dummy variable equal to one if R&D expenses are missing and zero otherwise.
Rated	Dummy variable equal to one if the firm has an S&P long-term credit rating (*splticrm)* and zero otherwise.
Reg Dummy	Dummy variable equal to one if the firm is in a regulated industry, as indicated by an SIC code between 4900 and 4939.
Term Structure	The difference between the yield on 10-year government bonds and the yield on 6-month government bonds.

Additional Analysis Variables	
Treat	Dummy variable equal to one if the firm's stock belongs to the bottom tercile of the percentage change in the Illiq variable (stocks that experienced the largest increase in liquidity) around decimalization and zero if the firm's stock belongs to the top tercile of the percentage change in the Illiq variable (stocks that experienced the smallest increase in liquidity) around decimalization.
After	After is a dummy variable equal to one for the year following decimalization and zero for the year prior to decimalization.
Accuracy	The absolute difference between the mean earnings per share forecast and the actual earnings per share, divided by the stock price at the beginning of the fiscal year. The variable is multiplied by -1 so that higher values indicate more accuracy.
Readability	The size of the 10-K document file. Data is downloaded from https://sraf.nd.edu/textual-analysis/resources/#LM_10X_Summaries.
Interest Coverage	The ratio of EBIT (*ebit*) to interest expenses (*xint*).
Z-Score	3.3 times the ratio of EBIT (*ebit*) to the book value of total assets (*at*) plus the ratio of total sales (*revt*) to the book value of total assets (*at*) plus 1.4 times the ratio of retained earnings (*re*) to the book value of total assets (*at*) plus 1.2 times the ratio of working capital (*act – lct*) to the book value of total assets (*at*).
Yield Spread	The natural logarithm of the difference between the yield to maturity of a corporate bond and the yield to maturity of a treasury bond with similar maturity.
Bond Maturity	The natural logarithm of the number of years to maturity of a corporate bond.
ROA	The ratio of operating income before depreciation (*oibdp*) to the book value of total assets (*at*).
Cash	The ratio of cash and short-term investment (*che*) to the book value of total assets (*at*).
Earnings Volatility	The standard deviation of the ratio of income before extraordinary items (*ib*) to the book value of total assets (*at*) in the previous 3 years.
Sales Growth	The growth rate of sales (*sale*).
Issue Size	The natural logarithm of proceeds from a bond issue.
Maturity	The natural logarithm of the number of years to maturity of a bond issue.
Callable	Dummy variable equal to one if a bond is callable and zero otherwise.
Senior	Dummy variable equal to one if a bond is a senior bond and zero otherwise.
SP Rating	A categorical variable capturing the bond issue's rating from S&P at the time of offering. This variable takes a value between 0 (not rated) and 21 (AAA rating).

Table 1: Summary Statistics

This table reports summary statistics for the key variables used in this study. Detailed variable definitions are provided in the Appendix.

	N	Mean	Median	25th Percentile	75th Percentile	STD
Illiq	74,898	0.6626	0.0738	0.0043	0.8582	1.0980
STNP	74,898	0.1513	0.0000	0.0000	0.1475	0.2862
ST1	74,898	0.2885	0.1405	0.0349	0.4372	0.3309
ST2	74,898	0.4118	0.2940	0.1020	0.7282	0.3557
ST3	74,898	0.5152	0.4593	0.1935	0.9174	0.3568
ST4	74,898	0.6036	0.6184	0.3013	0.9911	0.3437
ST5	74,898	0.6887	0.7790	0.4280	1.0000	0.3186
Size	74,898	5.4931	5.4359	3.8492	7.0991	2.2349
Size Squared	74,898	35.1697	29.5485	14.8161	50.3977	25.7483
Leverage	74,898	0.2807	0.2583	0.1209	0.3961	0.2040
MB	74,898	1.7756	1.3606	1.0778	1.9477	1.2786
AbEarn	74,898	-0.0346	0.0051	-0.0374	0.0292	0.3634
ATM	74,898	10.5188	6.8799	3.3003	13.6353	10.7685
ATV	74,898	0.0208	0.0162	0.0099	0.0270	0.0156
R&D	74,898	0.0338	0.0000	0.0000	0.0304	0.0761
Miss R&D	74,898	0.4544	0.0000	0.0000	1.0000	0.4979
Rated	74,898	0.3061	0.0000	0.0000	1.0000	0.4609
Reg Dummy	74,898	0.0485	0.0000	0.0000	0.0000	0.2148
Term Structure	74,898	1.5472	1.5992	0.7273	2.4290	0.9834

Table 2: Short-Term Debt and Stock Liquidity

This table reports the univariate relation between the different short-term debt measures and our main stock liquidity measure, Illiq. Panel A displays the correlation among the variables, and Panel B shows the mean and median of short-term debt measures in each Illiq quartile. Detailed variable definitions are provided in the Appendix. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Panel A: Correlation Table

	Illiq	STNP	ST1	ST2	ST3	ST4	ST5
Illiq	1.0000						
STNP	0.2025***	1.0000					
ST1	0.2646***	0.7313***	1.0000				
ST2	0.3098***	0.5703***	0.8469***	1.0000			
ST3	0.3141***	0.4714***	0.7287***	0.8815***	1.0000		
ST4	0.2960***	0.4001***	0.6336***	0.7785***	0.8949***	1.0000	
ST5	0.2617***	0.3349***	0.5393***	0.6698***	0.7774***	0.8768***	1.0000

Panel B: Short-Term Debt by Illiquidity Quartiles

	STNP	ST1	ST2	ST3	ST4	ST5
			1st Quartile (Most Liquid)			
Mean	0.0887	0.1692	0.2478	0.3354	0.4339	0.5468
Median	0.0000	0.0737	0.1580	0.2592	0.3757	0.5139
			2nd Quartile			
Mean	0.1111	0.2358	0.3460	0.4496	0.5460	0.6445
Median	0.0000	0.0965	0.2102	0.3503	0.5091	0.7007
			3rd Quartile			
Mean	0.1618	0.3229	0.4646	0.5794	0.6654	0.7387
Median	0.0000	0.1720	0.3715	0.5744	0.7396	0.8700
			4th Quartile (Least Liquid)			
Mean	0.2436	0.4261	0.5887	0.6965	0.7689	0.8246
Median	0.0000	0.3124	0.6005	0.7924	0.9044	0.9729

Table 3: Baseline Estimation

This table reports the estimates of OLS regressions of the main short-term debt measure (ST3) on stock liquidity and the control variables. Different fixed effects are included in Column 1 – Column 5. Industry fixed effects are based on two-digit SIC codes. Standard errors are clustered at the firm level. *p*-values are displayed in the parentheses. Detailed variable definitions are provided in the Appendix. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

	(1) ST3	(2) ST3	(3) ST3	(4) ST3	(5) ST3
Illiq	0.0296***	0.0251***	0.0282***	0.0237***	0.0237***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Size	-0.0819***	-0.1052***	-0.0840***	-0.1068***	-0.0732***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Size Squared	0.0043***	0.0054***	0.0045***	0.0056***	0.0015**
	(0.00)	(0.00)	(0.00)	(0.00)	(0.03)
Leverage	-0.3719***	-0.3850***	-0.3588***	-0.3707***	-0.3454***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
MB	0.0067***	0.0084***	0.0065***	0.0085***	0.0055***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
AbEarn	-0.0508***	-0.0460***	-0.0505***	-0.0457***	-0.0329***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
ATM	-0.0032***	-0.0031***	-0.0024***	-0.0024***	-0.0007**
	(0.00)	(0.00)	(0.00)	(0.00)	(0.02)
ATV	1.0780***	-0.1642	1.0533***	-0.1664	-0.9541***
	(0.00)	(0.29)	(0.00)	(0.28)	(0.00)
R&D	0.2535***	0.2277***	0.2312***	0.2048***	0.1228**
	(0.00)	(0.00)	(0.00)	(0.00)	(0.01)
Miss R&D	0.0134***	0.0130***	0.0146***	0.0144***	-0.0105
	(0.00)	(0.00)	(0.00)	(0.01)	(0.24)
Rated	-0.1519***	-0.1465***	-0.1503***	-0.1458***	-0.1224***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Reg Dummy	0.0067	0.0104	0.0358*	0.0412**	-0.0876
	(0.48)	(0.28)	(0.05)	(0.03)	(0.41)
Term Structure	0.0019	0.0001	0.0020*	0.0003	0.0018
	(0.11)	(0.98)	(0.09)	(0.95)	(0.72)
Constant	0.9241***	0.9564***	0.9367***	0.9664***	0.8926***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Year FE	No	Yes	No	Yes	Yes
Industry FE	No	No	Yes	Yes	No
Firm FE	No	No	No	No	Yes
No. of Obs.	74,898	74,898	74,898	74,898	74,898
Adj. R-Squared	0.343	0.355	0.351	0.363	0.545

Table 4: Alternative Measures of Short-Term Debt

This table reports the estimates of OLS regressions of alternative short-term debt measures on stock liquidity and the control variables. Year and industry fixed effects are included in all regressions. Industry fixed effects are based on two-digit SIC codes. Standard errors are clustered at the firm level. *p*-values are displayed in the parentheses. Detailed variable definitions are provided in the Appendix. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

	(1) STNP	(2) ST1	(3) ST2	(4) ST4	(5) ST5
Illiq	0.0169***	0.0210***	0.0262***	0.0188***	0.0134***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Size	-0.0791***	-0.1057***	-0.1140***	-0.0884***	-0.0625***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Size Squared	0.0055***	0.0063***	0.0063***	0.0044***	0.0028***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Leverage	-0.1127***	-0.3307***	-0.3852***	-0.3169***	-0.2277***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
MB	0.0075***	0.0119***	0.0109***	0.0055***	0.0050***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
AbEarn	-0.0367***	-0.0696***	-0.0617***	-0.0356***	-0.0284***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
ATM	-0.0012***	-0.0018***	-0.0021***	-0.0026***	-0.0028***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
ATV	-0.3813**	0.6057***	0.3314**	-0.2677*	-0.1027
	(0.04)	(0.00)	(0.04)	(0.06)	(0.45)
R&D	-0.0626*	0.2566***	0.2553***	0.1399***	0.0546**
	(0.07)	(0.00)	(0.00)	(0.00)	(0.03)
Miss R&D	-0.0056	-0.0010	0.0090*	0.0164***	0.0157***
	(0.31)	(0.86)	(0.09)	(0.00)	(0.00)
Rated	-0.0349***	-0.0551***	-0.1025***	-0.1706***	-0.1834***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Reg Dummy	0.0653***	0.0792***	0.0587***	0.0243	0.0025
	(0.00)	(0.00)	(0.00)	(0.26)	(0.92)
Term Structure	0.0002	-0.0038	-0.0037	-0.0020	0.0018
	(0.96)	(0.43)	(0.46)	(0.66)	(0.67)
Constant	0.4974***	0.6981***	0.8803***	0.9971***	0.9463***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Year FE	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes
No. of Obs.	74,898	74,898	74,898	74,898	74,898
Adj. R-Squared	0.120	0.278	0.346	0.351	0.330

Table 5: Alternative Stock Liquidity Measures

This table reports the summary statistics of alternative stock liquidity measures (Panel A) and the correlation between the main liquidity measure used in this study, Illiq, and the alternative liquidity measures (Panel B). Detailed variable definitions are provided in the Appendix. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Panel A: Summary Statistics of Alternative Stock Liquidity Measures

	N	Mean	Median	25th Percentile	75th Percentile	STD
Lag Illiq	71,242	0.6208	0.0749	0.0046	0.7944	1.0319
FHT	74,883	0.0276	0.0092	0.0020	0.0285	0.0527
Lag Gibbs	46,167	0.0130	0.0072	0.0037	0.0169	0.0143
Bid-Ask Spread	62,327	0.0312	0.0166	0.0032	0.0411	0.0413
Turnover	74,898	0.0056	0.0036	0.0017	0.0072	0.0059

Panel B: Correlation among Stock Liquidity Measures

	Illiq	Lag Illiq	FHT	Lag Gibbs	Bid-Ask Spread	Turnover
Illiq	1.0000					
Lag Illiq	0.8762***	1.0000				
FHT	0.7722***	0.6625***	1.0000			
Lag Gibbs	0.8203***	0.8746***	0.7530***	1.0000		
Bid-Ask Spread	0.8700***	0.7506***	0.8641***	0.8055***	1.0000	
Turnover	-0.3201***	-0.2572***	-0.2055***	-0.1877***	-0.2997***	1.0000

Table 6: Regressions Using Alternative Measures of Stock Liquidity

This table reports the estimates of OLS regressions of the main short-term debt measure (ST3) on alternative stock liquidity measures and the control variables. Year and industry fixed effects are included in all regressions. Industry fixed effects are based on two-digit SIC codes. Standard errors are clustered at the firm level. *p*-values are displayed in the parentheses. Detailed variable definitions are provided in the Appendix. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

	(1) ST3	(2) ST3	(3) ST3	(4) ST3	(5) ST3
Lag Illiq	0.0139***				
	(0.00)				
FHT		0.2273***			
		(0.00)			
Lag Gibbs			1.2863***		
			(0.00)		
Bid-Ask Spread				0.4933***	
				(0.00)	
Turnover					-1.5109***
					(0.00)
Size	-0.1204***	-0.1193***	-0.1341***	-0.1273***	-0.1271***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Size Squared	0.0065***	0.0063***	0.0084***	0.0067***	0.0069***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Leverage	-0.3525***	-0.3594***	-0.3553***	-0.4049***	-0.3480***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
MB	0.0053***	0.0044***	0.0070***	0.0082***	0.0036**
	(0.00)	(0.01)	(0.00)	(0.00)	(0.03)
AbEarn	-0.0476***	-0.0459***	-0.0502***	-0.0457***	-0.0475***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
ATM	-0.0024***	-0.0023***	-0.0030***	-0.0023***	-0.0023***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
ATV	-0.2454	-0.0695	-0.5788***	-0.6110***	0.2088
	(0.13)	(0.65)	(0.01)	(0.00)	(0.19)
R&D	0.2083***	0.1840***	0.1848***	0.1800***	0.1806***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Miss R&D	0.0160***	0.0146***	0.0139**	0.0160***	0.0145***
	(0.00)	(0.00)	(0.03)	(0.00)	(0.01)
Rated	-0.1468***	-0.1473***	-0.1514***	-0.1529***	-0.1468***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Reg Dummy	0.0449**	0.0412**	0.0308	0.0584***	0.0393**
	(0.02)	(0.03)	(0.11)	(0.00)	(0.04)
Term Structure	0.0006	0.0005	-0.0002	0.0018	0.0003
	(0.90)	(0.92)	(0.98)	(0.76)	(0.94)
Constant	1.0111***	1.0177***	1.0822***	1.0309***	1.0456***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Year FE	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes
No. of Obs.	71,242	74,883	46,167	62,327	74,898
Adj. R-Squared	0.354	0.361	0.348	0.362	0.361

Table 7: 2SLS

This table reports the estimates of 2SLS regressions. Illiq is treated as the endogenous variable, and the lagged value of Illiq and the industry median Illiq are used as instrumental variables to predict Illiq in Column 1. The result of the second stage using ST3 as the dependent variable is reported in Column 2. The second stage results using alternative short-term debt measures as the dependent variable are reported in Column 3 – Column 7. Year and industry fixed effects are included in all regressions. Industry fixed effects are based on two-digit SIC codes. Standard errors are clustered at the firm level. *p*-values are displayed in parentheses. Detailed variable definitions are provided in the Appendix. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	First Stage	Second Stage	Second Stage (Alternative ST Measures)				
	Illiq	ST3	STNP	ST1	ST2	ST4	ST5
Illiq		0.0202***	0.0098**	0.0108***	0.0202***	0.0161***	0.0129***
		(0.00)	(0.02)	(0.01)	(0.00)	(0.00)	(0.00)
Size	-0.4052***	-0.1120***	-0.0864***	-0.1179***	-0.1221***	-0.0914***	-0.0628***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Size Squared	0.0257***	0.0060***	0.0059***	0.0071***	0.0069***	0.0046***	0.0029***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Leverage	0.3684***	-0.3601***	-0.1096***	-0.3188***	-0.3740***	-0.3046***	-0.2205***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
MB	-0.1147***	0.0076***	0.0072***	0.0102***	0.0096***	0.0049***	0.0047***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.01)	(0.01)
AbEarn	-0.0749***	-0.0461***	-0.0367***	-0.0701***	-0.0620***	-0.0357***	-0.0285***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
ATM	0.0001	-0.0024***	-0.0012***	-0.0018***	-0.0021***	-0.0026***	-0.0028***
	(0.81)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
ATV	2.0733***	-0.2842*	-0.4179**	0.5234***	0.2257	-0.3206**	-0.1517
	(0.00)	(0.08)	(0.03)	(0.00)	(0.19)	(0.04)	(0.29)
R&D	-0.1281***	0.2110***	-0.0591*	0.2571***	0.2606***	0.1420***	0.0605**
	(0.00)	(0.00)	(0.10)	(0.00)	(0.00)	(0.00)	(0.02)
Miss R&D	0.0002	0.0160***	-0.0051	0.0008	0.0109**	0.0173***	0.0173***
	(0.97)	(0.00)	(0.37)	(0.89)	(0.05)	(0.00)	(0.00)
Rated	-0.0217***	-0.1464***	-0.0352***	-0.0565***	-0.1042***	-0.1709***	-0.1821***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Reg Dummy	-0.0382**	0.0457**	0.0635***	0.0787***	0.0605***	0.0300	0.0101
	(0.04)	(0.02)	(0.00)	(0.00)	(0.00)	(0.18)	(0.68)
Term Structure	-0.0167	0.0010	0.0004	-0.0029	-0.0034	-0.0018	0.0022
	(0.15)	(0.85)	(0.93)	(0.55)	(0.51)	(0.70)	(0.61)
IVs							
Lag Illiq	0.6915***						
	(0.00)						
Med. Illiq	0.1308***						
	(0.00)						
Constant	1.5957***	0.9767***	0.5203***	0.7371***	0.9060***	1.0006***	0.9379***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Kleibergen-Paap rk Wald F statistic	7,990.548						
Hansen J (*p*-value)		0.565	0.809	0.375	0.366	0.317	0.464
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
No. of Obs.	71,242	71,242	71,242	71,242	71,242	71,242	71,242
Adj. R-Squared	0.797	0.356	0.120	0.272	0.339	0.345	0.326

Table 8: Decimalization as a Quasi-Natural Experiment

This table reports a difference-in-difference (DiD) analysis of the effect of stock liquidity on short-term debt using the 2001 decimalization event as a quasi-natural experiment. This analysis is based on a treatment group and a control group of firms identified using propensity score matching. The treatment (control) group contains firms that experienced the largest (smallest) increase in stock liquidity around decimalization. Panel A reports estimates of a probit regression that predicts whether a firm belongs to the treatment group using a sample without propensity score matching (Column 1) and a sample with propensity score matching (Column 2). Panel B reports the statistical distributions of the estimated propensity scores. Panel C reports the variable means for the treatment group and control group prior to decimalization as well as the differences in means of each of the variables, based on the propensity score matched sample. Panel D reports the means of each of the short-term debt measures before and after decimalization for the treatment group and the control group as well as the DiD univariate results, based on the propensity score matched sample. Panel E reports the estimates of DiD regressions based on the propensity score matched sample. Treat is a dummy variable equal to one if a firm belongs to the treatment group and zero otherwise. After is a dummy variable equal to one for the fiscal year following decimalization and zero for the fiscal year prior to decimalization. Industry fixed effects are included in all regressions. Industry fixed effects are based on two-digit SIC codes. Standard errors are clustered at the firm level. *p*-values are displayed in the parentheses. Detailed variable definitions are provided in the Appendix. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Panel A: Probit Regressions without and with Propensity Score Matching

	(1) Full Sample	(2) Propensity Score Matched
	Treat	Treat
Illiq	0.1100	-0.0968
	(0.34)	(0.54)
Size	0.9190***	-0.0912
	(0.00)	(0.76)
Size Squared	-0.0592***	0.0041
	(0.00)	(0.85)
Leverage	-0.3180	-0.2146
	(0.34)	(0.62)
MB	0.1714***	-0.0747
	(0.00)	(0.13)
AbEarn	0.7266***	0.1394
	(0.00)	(0.54)
ATM	0.0220***	-0.0031
	(0.00)	(0.74)
ATV	-20.9997***	-0.9955
	(0.00)	(0.87)
R&D	-1.4320	-0.7062
	(0.24)	(0.61)
Miss R&D	-0.1126	-0.0874
	(0.39)	(0.61)
Rated	-0.2577*	0.1478
	(0.06)	(0.45)
Reg Dummy	0.6394	-0.7151
	(0.10)	(0.18)
Term Structure	-0.2926	-0.2239
	(0.12)	(0.34)
Constant	-2.8891***	1.1392
	(0.00)	(0.39)
Industry FE	Yes	Yes
No. of Obs.	942	443
Pseudo R-Squared	0.247	0.039

Panel B: Propensity Score Distribution

	N	Mean	Median	25th Percentile	75th Percentile	STD
Control	226	0.5203	0.5414	0.3921	0.6630	0.2019
Treat	226	0.5150	0.5389	0.3885	0.6531	0.1989
Difference	226	0.0055	0.0062	0.0013	0.0088	0.0036

Panel C: Differences in Variable Means Pre-Decimalization

	Control #	Control Mean	Treat #	Treat Mean	Difference in Mean	Mean Difference *p*-value
Illiq	226	0.4024	226	0.3434	0.0590	0.3749
Size	226	6.1542	226	6.3292	-0.1750	0.2959
Size Squared	226	41.1782	226	43.0457	-1.8674	0.3874
Leverage	226	0.3170	226	0.3126	0.0044	0.8125
MB	226	1.8168	226	1.6742	0.1426	0.3193
AbEarn	226	-0.0734	226	-0.0347	-0.0387	0.2521
ATM	226	9.1543	226	8.9964	0.1579	0.8387
ATV	226	0.0238	226	0.0223	0.0015	0.3502
R&D	226	0.0265	226	0.0228	0.0037	0.4852
Miss R&D	226	0.4779	226	0.4558	0.0221	0.6382
Rated	226	0.4115	226	0.4469	-0.0354	0.4482
Reg Dummy	226	0.0310	226	0.0177	0.0133	0.3609
Term Structure	226	0.0403	226	0.0163	0.0240	0.3772

Panel D: Changes in the Use of Short-Term Debt around Decimalization

	Control		Treat			
	Before	After	Before	After	DiD	DiD *p*-value
STNP	0.1205	0.1465	0.1485	0.1076	0.0669	0.0014
ST1	0.2026	0.2639	0.2379	0.2218	0.0774	0.0046
ST2	0.3455	0.4117	0.3525	0.3450	0.0736	0.0232
ST3	0.4812	0.5304	0.4820	0.4504	0.0808	0.0150
ST4	0.5636	0.6373	0.5684	0.5544	0.0877	0.0041
ST5	0.6525	0.7223	0.6650	0.6185	0.1162	0.0001

Panel E: DiD Regressions

	(1)	(2)	(3)	(4)	(5)	(6)
		Alternative ST Measures				
	ST3	STNP	ST1	ST2	ST4	ST5
Treat	0.0159	0.0414*	0.0507**	0.0265	0.0148	0.0223
	(0.58)	(0.08)	(0.04)	(0.34)	(0.60)	(0.41)
After	0.2034**	0.1063	0.1293	0.1690*	0.2311**	0.2250**
	(0.02)	(0.14)	(0.11)	(0.07)	(0.01)	(0.01)
Treat*After	-0.0718**	-0.0749***	-0.0854***	-0.0660*	-0.0755**	-0.1110***
	(0.04)	(0.00)	(0.00)	(0.05)	(0.02)	(0.00)
Size	-0.1704***	-0.0829*	-0.1740***	-0.2257***	-0.1276***	-0.0509
	(0.00)	(0.06)	(0.00)	(0.00)	(0.00)	(0.15)
Size Squared	0.0101***	0.0059*	0.0108***	0.0144***	0.0073***	0.0019
	(0.00)	(0.05)	(0.00)	(0.00)	(0.01)	(0.47)
Leverage	-0.2621***	-0.1458*	-0.2721***	-0.2205***	-0.1847**	-0.1089
	(0.00)	(0.05)	(0.00)	(0.01)	(0.01)	(0.14)
MB	-0.0013	0.0098	0.0168	0.0097	-0.0087	-0.0016
	(0.91)	(0.51)	(0.19)	(0.44)	(0.44)	(0.88)
AbEarn	-0.0114	-0.0110	-0.0240	-0.0051	0.0049	-0.0027
	(0.47)	(0.51)	(0.21)	(0.77)	(0.78)	(0.86)
ATM	-0.0041**	-0.0010	-0.0028**	-0.0029*	-0.0058***	-0.0070***
	(0.02)	(0.41)	(0.04)	(0.08)	(0.00)	(0.00)
ATV	-2.9121**	-1.4019	-2.1949	-2.3092	-1.9481	-1.1447
	(0.03)	(0.34)	(0.12)	(0.10)	(0.13)	(0.33)
R&D	0.2278	0.0315	0.4571*	0.4413	0.1712	0.1622
	(0.41)	(0.92)	(0.10)	(0.13)	(0.53)	(0.57)
Miss R&D	0.0163	-0.0225	-0.0084	-0.0112	0.0049	0.0309
	(0.60)	(0.43)	(0.77)	(0.73)	(0.88)	(0.28)
Rated	-0.2267***	-0.0836***	-0.0756**	-0.1681***	-0.2242***	-0.2107***
	(0.00)	(0.01)	(0.03)	(0.00)	(0.00)	(0.00)
Reg Dummy	0.0215	0.0165	0.0238	0.0392	-0.0055	-0.0412
	(0.80)	(0.65)	(0.62)	(0.55)	(0.95)	(0.67)
Term Structure	-0.0608*	-0.0287	-0.0239	-0.0396	-0.0611*	-0.0563*
	(0.06)	(0.27)	(0.41)	(0.25)	(0.07)	(0.09)
Constant	1.4448***	0.4441***	0.9430***	1.3229***	1.3846***	1.1531***
	(0.00)	(0.01)	(0.00)	(0.00)	(0.00)	(0.00)
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
No. of Obs.	904	904	904	904	904	904
Adj. R-Squared	0.293	0.132	0.216	0.264	0.272	0.241

Table 9: The Heterogeneous Effect of Stock Liquidity

This table examines the heterogeneous effect of stock liquidity on short-term debt usage conditional on different levels of information opacity and default risk. The focus of this table is on the interaction terms between the stock liquidity measure, Illiq, and the indicators of information opacity and default risk. The proxies for information opacity are analyst forecast accuracy and financial statement readability. High (Low) Accuracy is a dummy variable equal to one if the analyst forecast accuracy is above (below) the sample median and zero otherwise. High (Low) Readability is a dummy variable equal to one if the size of the firm's 10-K file is below (above) the sample median and zero otherwise. The proxies for default risk are the interest coverage ratio and Altman's Z-Score. High (Low) Interest Coverage is a dummy variable equal to one if the interest coverage ratio is above (below) the sample median and zero otherwise. High (Low) Z-Score is a dummy variable equal to one if the Z-Score is above (below) the sample median and zero otherwise. Year and industry fixed effects are included in all regressions. Industry fixed effects are based on two-digit SIC codes. Standard errors are clustered at the firm level. *p*-values are displayed in the parentheses. The same set of control variables from the baseline estimation are included in all regressions but are not reported for brevity. The *p*-values calculated from F-test of differences in estimated coefficients (high vs. low information uncertainty, and high vs. low default risk) are reported at the bottom of the table. Detailed variable definitions are provided in the Appendix. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

	(1)	(2)	(3)	(4)
	Information Opacity		Default Risk	
	ST3	ST3	ST3	ST3
Illiq * High Accuracy	-0.0157			
	(0.10)			
Illiq * Low Accuracy	0.0225***			
	(0.00)			
Illiq * High Readability		0.0115***		
		(0.01)		
Illiq * Low Readability		0.0349***		
		(0.00)		
Illiq * High Interest Coverage			0.0077**	
			(0.02)	
Illiq * Low Interest Coverage			0.0272***	
			(0.00)	
Illiq * High Z-Score				0.0186***
				(0.00)
Illiq * Low Z-Score				0.0271***
				(0.00)
Controls	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
No. of Obs.	37,613	31,017	71,400	74,075
Adj. R-Squared	0.306	0.384	0.354	0.361
Different (*p*-value)?	0.000	0.000	0.000	0.001

Table 10: Evidence from Bond Issues

This table reports the effect of stock liquidity in the context of corporate bond issues. Panel A reports the effect of stock liquidity on the maturity of bond issues. Panel B reports the effect of stock liquidity on bond yield spreads. Year and industry fixed effects are included in all regressions. Industry fixed effects are based on two-digit SIC codes. Standard errors are clustered at the firm level. *p*-values are displayed in the parentheses. Detailed variable definitions are provided in the Appendix. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Panel A: The Effect of Stock Liquidity on Bond Maturity

	(1)	(2)	(3)	(4)	(5)
	Issue Level			Firm Level	
	Maturity	Maturity	Maturity	Maturity (EW)	Maturity (PW)
Lag Illiq	-0.6049***	-0.6137***	-0.7642***	-0.3341**	-0.3414**
	(0.00)	(0.01)	(0.00)	(0.02)	(0.02)
Lag Size		0.0962	0.1253	0.0810	0.0890
		(0.32)	(0.20)	(0.40)	(0.36)
Lag Size Squared		-0.0076	-0.0095*	-0.0048	-0.0051
		(0.14)	(0.07)	(0.38)	(0.35)
Lag Leverage		-0.2451**	-0.1819*	-0.3682***	-0.3521***
		(0.02)	(0.09)	(0.00)	(0.00)
Lag MB		-0.0271	0.0006	-0.0215	-0.0222
		(0.15)	(0.97)	(0.33)	(0.31)
Lag AbEarn		0.2547**	0.3943***	0.1553	0.1788*
		(0.04)	(0.00)	(0.14)	(0.09)
Lag ATM		0.0045**	0.0054***	0.0030*	0.0030*
		(0.01)	(0.00)	(0.09)	(0.08)
Lag ATV		-0.3263	-1.9914	-2.9098	-2.7104
		(0.92)	(0.51)	(0.30)	(0.33)
Lag R&D		1.1109**	-0.4636	0.8734	0.9288
		(0.05)	(0.37)	(0.21)	(0.18)
Lag Miss R&D		0.0609	0.0374	0.0509	0.0517
		(0.17)	(0.32)	(0.22)	(0.22)
Lag Rated		0.0479	0.0821*	0.0748*	0.0777*
		(0.29)	(0.06)	(0.09)	(0.08)
Lag Reg Dummy		-0.0878	0.0132	-0.0541	-0.0828
		(0.40)	(0.91)	(0.52)	(0.29)
Lag Term Structure		0.0906	0.1107**	0.0863	0.0813
		(0.13)	(0.03)	(0.16)	(0.19)
Issue Size			0.0666***		
			(0.00)		
Yield Spread			0.6501***		
			(0.00)		
Callable			0.1124***		
			(0.00)		
Senior			-0.0864		
			(0.14)		
SP Rating			0.1165***		
			(0.00)		
Constant	2.8059***	1.9546***	-3.1957***	1.9632***	1.9336***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Year FE	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes
No. of Obs.	5,720	5,333	5,333	2,831	2,831
Adj. R-Squared	0.061	0.069	0.234	0.107	0.114

Panel B: The Effect of Stock Liquidity on Bond Yields

	(1) Yield Spread	(2) Yield Spread	(3) Yield Spread
Lag Illiq	3.8317***	1.3833***	0.7151***
	(0.00)	(0.00)	(0.00)
Lag Size		-0.1811***	-0.0608***
		(0.00)	(0.00)
Lag MB		-0.1869***	-0.0787***
		(0.00)	(0.00)
Lag Leverage		1.1593***	0.2775***
		(0.00)	(0.00)
Lag PPE		-0.1054	-0.0071
		(0.32)	(0.92)
Lag Z-Score		-0.0359	-0.0046
		(0.13)	(0.80)
Lag ROA		-1.3814***	-0.5016**
		(0.00)	(0.04)
Lag Cash		0.6795***	0.6095***
		(0.00)	(0.00)
Lag Earnings Volatility		3.6131***	1.8731***
		(0.00)	(0.00)
Lag Sales Growth		0.2166***	0.0419
		(0.00)	(0.28)
Issue Size			0.0304***
			(0.01)
Maturity			0.2230***
			(0.00)
Callable			0.0259
			(0.25)
Senior			-0.0802**
			(0.03)
SP Rating			-0.1237***
			(0.00)
Constant	4.2536***	6.3705***	6.2867***
	(0.00)	(0.00)	(0.00)
Year FE	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes
No. of Obs.	5,720	5,267	5,267
Adj. R-Squared	0.376	0.579	0.739

Figure 1. Short-Term Debt and Illiquidity Quartiles

This graph plots the mean (in blue) and median (in red) of the proportion of debt maturing in 3 years (ST3) by illiquidity quartiles.