Internet Appendix for
The Term Structure of Bond Liquidity

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Internet Appendix 1 – Proof of Propositions 2 and 3

Proposition 2

The fact that seller-initiated turnover is 0 for $T < \tau$ with $\tau > 0$ follows directly from equation (A-2) as $p(\tau) \times (1 - s(\tau)) < 1$. The fact that secondary-market turnover is larger for $T < T_{\text{lim}}$ than for $T > T_{\text{lim}}$ if $\tau < T_{\text{lim}}$ is a direct consequence of the clientele effect.

Since dealers in aggregate do not hold any inventory, secondary-market trading volume can be calculated as twice the trading volume initiated by customers who sell their bond position prematurely. To calculate turnover, we divide by the total outstanding volume of all bonds with the respective maturity:

$$\text{(IA-1)} \qquad \text{turnover}(T) = \frac{2 \times \mathbb{1}_{\{T>\tau\}} \times \int_{T}^{T_{\max}} \frac{1}{T_{\text{init}}} \times \sum_{i=H,L} y_i\,(T, T_{\text{init}}) \times \lambda_i \, dT_{\text{init}}}{\int_{T}^{T_{\max}} \frac{1}{T_{\text{init}}} \, dT_{\text{init}}},$$

where in the numerator and the denominator, we integrate over all bonds with initial maturity T_{init} and remaining maturity T that are held by both investor types. $y_i(T, T_{\text{init}})$ denotes the fraction of bonds with remaining maturity T and initial maturity T_{init} held in the portfolios of type-i investors (see equations (A-38) and (A-39) in Appendix A.3 in the paper). This fraction is multiplied with the rate at which preference shocks arrive. The denominator gives the total volume of all bonds with remaining maturity T and initial maturity T_{init} between T and $T_{\max}$. The entire fraction is multiplied by $\mathbb{1}_{\{T>\tau\}}$, since investors who experience a preference shock only sell bonds with maturity $T > \tau$.

As elaborated in the main text, the second part of Proposition 2 also directly follows from the clientele effect. □

Proposition 3

illiq$^{\text{ask}}(T)$ is monotonically increasing in T: To formalize this requirement, we calculate the first derivative with respect to T of illiq$^{\text{ask}}(T)$ and show that it is greater than or equal to 0, i.e.,

$$\text{(IA-2)} \qquad \frac{\partial \text{illiq}^{\text{ask}}(T)}{\partial T} = \frac{\ln(p(T))}{T^2} - \frac{\frac{\partial p(T)}{\partial T}}{T \times p(T)} \geq 0.$$

(i) For $T \leq \min(\tau, T_{\text{lim}})$, plugging in prices $p(T)$ from equation (A-8) into (IA-2) and multiplying with T^2 leads to the condition

$$\text{(IA-3)} \quad b \times T + \frac{b \times e^{b \times T} \times T \times (b - \lambda_H)}{-b \times e^{b \times T} + e^{T \times \lambda_H} \times \lambda_H} + \ln\left(\frac{b \times e^{-T \times \lambda_H} - e^{-b \times T} \times \lambda_H}{b - \lambda_H}\right) \geq 0.$$

(IA-3) trivially holds for $T = 0$. Moreover, for the first derivative with respect to T of the left-hand side of (IA-3) it holds

$$\text{(IA-4)} \qquad \frac{b \times e^{T \times (b + \lambda_H)} \times T \times (b - \lambda_H)^2 \lambda_H}{\left(b \times e^{b \times T} - e^{T \times \lambda_H} \times \lambda_H\right)^2} \geq 0$$

such that (IA-3) is true for all T.

(ii) For T with $\tau < T \leq T_{\text{lim}}$, multiplying (IA-2) by T and exploiting the relation $\frac{\frac{\partial p(T)}{\partial T}}{p(T)} = -\lambda_H \times s(T)$ from (A-10) as well as $-\frac{\ln(p(T))}{T} = \text{illiq}^{\text{ask}}(T)$ yields

$$\text{(IA-5)} \qquad \text{illiq}^{\text{ask}}(T) \leq \lambda_H \times s(T).$$

$\lambda_H \times s$ is the liquidity premium for the extreme case that bid-ask spreads s remain constant and investors are forced to sell immediately after a preference shock (see equation (A-10)). In the general case, however, investors have the option to wait until maturity and for $\frac{\partial s(T)}{\partial T} > 0$ bid-ask spreads even decrease over the bond's lifetime. Hence, $\lambda_H \times s(T)$ is an upper bound for illiq$^{\text{ask}}(T)$.

(iii) For T with $\tau < T_{\text{lim}} < T$, multiplying again (IA-2) by T and exploiting the relation $\frac{\frac{\partial p(T)}{\partial T}}{p(T)} = -\lambda_L \times \frac{s(T)+\Delta_L(T_{\text{lim}})}{1+\Delta_L(T_{\text{lim}})}$ from (A-12) yields

(IA-6)
$$\text{illiq}^{\text{ask}}(T) \;\; \leq \;\; \lambda_L \times \frac{s(T)+\Delta_L(T_{\text{lim}})}{1+\Delta_L(T_{\text{lim}})}.$$

$p^{\text{forced}}(T) = e^{-T\times \text{illiq}^{\text{forced}}}$ with $\text{illiq}^{\text{forced}} = \lambda_L \times \frac{s+\Delta_L(T_{\text{lim}})}{1+\Delta_L(T_{\text{lim}})}$ solves the indifference condition

(IA-7)
$$\frac{\lambda_L \times e^{\lambda_L \times T}}{p^{\text{forced}}(T)\times e^{\lambda_L\times T}-1} \times \int_0^T p^{\text{forced}}(x) \times (1-s) \times e^{-\lambda_L \times (T-x)}\, dx \overset{!}{=} \Delta_L(T_{\text{lim}}).$$

Therefore, $\text{illiq}^{\text{forced}}$ can be interpreted as the liquidity premium low-risk investors would demand for an artificial bond with the following characteristics: (a) only low-risk investors are allowed to invest in this bond, (b) the bond has constant bid-ask spreads s, (c) investors are forced to sell immediately after a preference shock (see also (A-11)). As high-risk investors are not excluded, bid-ask spreads $s(T)$ can only decrease when the bond ages, and investors have the option to wait until maturity, $\lambda_L \times \frac{s(T)+\Delta_L(T_{\text{lim}})}{1+\Delta_L(T_{\text{lim}})}$ is again an upper bound for $\text{illiq}^{\text{ask}}(T)$.

The reasoning for (iii) also applies for our case (v), i.e., $T_{\text{lim}} \leq \tau < T$.

(iv) For the last case of T with $T_{\text{lim}} < T \leq \tau$, we exploit that $p(T)$ is continuously differentiable at $T = \tau$ (which can be shown using (A-14) and (A-15) for $p(T)$ as well as (A-2) solved for $s(\tau)$). If $p(T)$ is continuously differentiable at τ, $\frac{\partial \text{illiq}^{\text{ask}}(T)}{\partial T}$ is continuous at τ (see (IA-2)). Since we have already shown that $\frac{\partial \text{illiq}^{\text{ask}}(T)}{\partial T}$ is larger than or equal to 0 for T with $T_{\text{lim}} \leq \tau < T$ (case (v)), $\frac{\partial \text{illiq}^{\text{ask}}(T)}{\partial T} \geq 0$ then also holds for $T = \tau$. To show that $\frac{\partial \text{illiq}^{\text{ask}}(T)}{\partial T} \geq 0$ for any T with $T_{\text{lim}} < T \leq \tau$, we introduce an artificial bid-ask spread function $\hat{s}(T) \leq s(T)$ such that the corresponding $\hat{\tau}$ that solves equation (A-2) equals T. Now, we can again exploit case (v) with the artificial bid-ask spread function $\hat{s}(T)$, i.e., $\frac{\partial \text{illiq}^{\text{ask}}(T)}{\partial T} \geq 0$ for T with $T_{\text{lim}} \leq \hat{\tau} < T$. As prices do not depend on bid-ask spreads when investors wait when experiencing a preference shock (see also equation (2)), it holds that $p(T) = \hat{p}(T)$ for $T \leq \hat{\tau} < \tau$. Applying the same continuity argument as above for $\frac{\partial \widehat{\text{illiq}^{\text{ask}}(T)}}{\partial T}$ then proves the assertion for all $T (= \hat{\tau})$ with $T_{\text{lim}} < T \leq \tau$. □

$\text{illiq}^{\text{ask}}(T)$ goes to 0 for $T \to 0$: Applying l'Hôpital's rule and using (A-8) for $p(T)$ directly leads to $\lim_{T\to 0} \text{illiq}^{\text{ask}}(T) = \lim_{T \to 0} \frac{-\ln(p(T))}{T} = 0$. □

$\text{illiq}^{\text{ask}}(T)$ flattens at T_{lim}: We prove condition (4) separately for $T_{\text{lim}} < \tau$, $T_{\text{lim}} = \tau$, and $T_{\text{lim}} > \tau$. For $T_{\text{lim}} < \tau$, using (A-8) and (A-14) for $p(T)$, (4) transforms to the condition

(IA-8)

$$\frac{b \times e^{b \times T_{\text{lim}}} \left(b \times \left(e^{T_{\text{lim}} \times \lambda_L} - e^{T_{\text{lim}} \times \lambda_H}\right) - e^{T_{\text{lim}} \times \lambda_L} \lambda_H + e^{b \times T_{\text{lim}}} (\lambda_H - \lambda_L) + e^{T_{\text{lim}} \times \lambda_H} \lambda_L\right)}{\left(e^{b \times T_{\text{lim}}} - e^{T_{\text{lim}} \times \lambda_L}\right) \times T_{\text{lim}} \times \left(b \times e^{b \times T_{\text{lim}}} - e^{T_{\text{lim}} \times \lambda_H} \lambda_H\right)} \quad > \quad 0.$$

Exploiting that the denominator of (IA-8) is positive and using substitutions $b = \lambda_L - c1$ and $\lambda_H = \lambda_L + c2$ with $c1, c2 > 0$ and $c1 < \lambda_L$, (IA-8) simplifies to

(IA-9)
$$e^{T_{\text{lim}} \times c2} \times c1 + e^{-T_{\text{lim}} \times c1} \times c2 - c1 - c2 \quad > \quad 0.$$

We show that this condition holds by verifying that the left-hand side of (IA-9) equals 0 for $T_{\text{lim}} \to 0$, and its first derivative is strictly positive for $T_{\text{lim}} > 0$.

For $T_{\text{lim}} = \tau$, exactly the same line of arguments as for $T_{\text{lim}} < \tau$, but using (A-15) instead of (A-14), proves the assertion.

For $T_{\text{lim}} > \tau$, using (A-8) and (A-10), condition (4) evaluates to

(IA-10)
$$\lambda_H \times s(T_{\text{lim}}) \quad > \quad \lambda_L \times \frac{s(T_{\text{lim}}) + \Delta_L(T_{\text{lim}})}{1 + \Delta_L(T_{\text{lim}})},$$

which always holds due to the clientele effect. To see why, note that due to the clientele effect (see equation (A-16)), high-risk investors are not willing to invest in long-term bonds.

Thus, for a fixed T, the price $p(T)$ is lower if T_{lim} is below T than when T_{lim} is above T. From that, it directly follows that the integrand when rewriting (A-10) for $\tau < T \leq T_{\text{lim}}$ as $p(T) = e^{-\int_{\tau}^{T} \lambda_H \times s(x)\, dx} \times p(\tau)$ is larger than the integrand when rewriting (A-12) for $\tau < T_{\text{lim}} < T$ as $p(T) = e^{-\int_{T_{\text{lim}}}^{T} \lambda_L \times \frac{s(x)+\Delta_L(T_{\text{lim}})}{1+\Delta_L(T_{\text{lim}})}\, dx} \times p(T_{\text{lim}})$, which directly implies (IA-10). □

$\text{illiq}^{\text{bid}}(T)$ is decreasing in T at the short end: We use (3) and (A-8) to calculate

(IA-11)

$$\frac{\partial \text{illiq}^{\text{bid}}(T)}{\partial T} = \frac{T \times \left(b + \frac{b \times e^{b \times T} \times (b - \lambda_H)}{e^{T \times \lambda_H} \times \lambda_H - b \times e^{b \times T}} + \frac{\frac{\partial s(T)}{\partial T}}{1 - s(T)}\right) + \ln\left(\frac{(1 - s(T)) \times \left(b \times e^{-T \times \lambda_H} - e^{-b \times T} \times \lambda_H\right)}{b - \lambda_H}\right)}{T^2}.$$

Plugging in $T = 0$, the numerator of (IA-11) evaluates to $\ln(1 - s(0))$, which is strictly negative for $s(0) > 0$. Hence, $\lim_{T \to 0} \frac{\partial \text{illiq}^{\text{bid}}(T)}{\partial T} = -\infty$. □

Spillover effect: To prove the spillover effect, we proceed in two steps. First, we show that the effect holds for a fixed T_{lim}. Second, we verify that the effect persists when T_{lim} adapts to the new parameter set. For $T > T_{\text{lim}}$, we can exploit that bond prices $p(T)$ in (A-12), (A-14), and (A-15) decrease if $\Delta_L(T_{\text{lim}})$ increases. Additionally, they also decrease if $p(T_{\text{lim}})$ (for $\tau < T_{\text{lim}} < T$) or $p(\tau)$ (for $T_{\text{lim}} \leq \tau < T$) decreases. Since bond prices and liquidity premia are inversely related, the spillover effect for a fixed T_{lim} directly follows as $p(T_{\text{lim}})$ and $p(\tau)$ decrease and $\Delta_L(T_{\text{lim}})$ increases if λ_H increases. For the second part of the argument, note that T_{lim} is lower (higher) due to lower (higher) bond prices and low-risk investors who now can hold more (less) bonds for given wealth inflows w_L. However, if the change in T_{lim} were to fully compensate the price effect shown for a fixed T_{lim}, it follows that prices above T_{lim} would be unchanged. Then, the wealth of low-risk investors would suffice to buy exactly the same amount of bonds as before and, thus, T_{lim} also would remain unchanged. Thus, there could not be any compensation due to a different T_{lim}, contradicting the initial assumption.

To see that a reverse spillover does not hold, note that bond prices $p(T)$ for $T \leq T_{\text{lim}}$ in (A-8) and (A-10) are not affected by changes in λ_L. Thus, liquidity premia for maturities below the minimum of the new and the old T_{lim} remain unchanged. Note, however, that T_{lim} changes when λ_L changes, and therefore premia between the old and the new T_{lim} are affected by a different λ_L. $\square$

Internet Appendix 2 – Verification of Assumptions on Investor Behavior

In this section, we check the assumptions from Appendix A.1 in the paper: First, for $T > \tau$, it is always optimal to immediately sell the bond if an investor experiences a preference shock. Second, no investor has an incentive to sell bonds prematurely without having experienced a preference shock.

Bonds are sold immediately after a preference shock if $T > \tau$: We define the utility of an investor she receives from selling a T-year bond d time periods after she experienced a preference shock:

$$f(d) \quad = \quad (1 - s(T-d)) \times p(T-d) \times e^{-b \times d}. \tag{IA-12}$$

Bonds are always sold immediately, iff $\frac{\partial f(d)}{\partial d} < 0$. For $\tau < T \leq T_{\text{lim}}$, by plugging in prices $p(T)$ from (A-10), it can be shown that this condition holds iff

$$\left.\frac{\partial s(t)}{\partial t}\right|_{t=T-d} \quad < \quad (1 - s(T-d)) \times (b - \lambda_H \times s(T-d)), \tag{IA-13}$$

i.e., if bid-ask spreads do not grow with maturity "too strongly". For constant bid-ask spreads $s(T) = s$, (IA-13) always holds since $\frac{\partial s(T)}{\partial T} = 0$, $s < 1$, and $b - \lambda_H \times s > 0$. The latter condition holds as inserting $b - \lambda_H \times s \leq 0$ into equation (A-2) leads to a contradiction (i.e., τ would not exist). Condition (IA-13) also ensures that equation (A-2) cannot have more than one solution for τ.

For the other two relevant cases $T_{\text{lim}} \leq \tau < T$ and $\tau < T_{\text{lim}} < T$, $\frac{\partial f(d)}{\partial d} < 0$ also holds when (IA-13) applies. This follows directly from the clientele effect since $p(T)$ decreases more slowly for increasing T when $T > T_{\text{lim}}$ than when $T \leq T_{\text{lim}}$ (low-risk investors demand lower compensation for holding longer term bonds compared to high-risk investors). Thus, the incentive to wait in the case of a preference shock is reduced, compared to $T \leq T_{\text{lim}}$ (since gains from increasing prices when the maturity decreases are smaller).

It is never optimal to sell bonds without preference shock: High-risk investors are indifferent between all bonds with maturities between 0 and T_{lim}. Hence, selling one bond with $T \in (0, T_{\text{lim}}]$, paying the bid-ask spread $s(T)$, and buying another bond with $T_{\text{new}} \in (0, T_{\text{lim}}]$ cannot be optimal. Using the same argument, low-risk investors can never have an incentive to sell bonds with maturity $T \geq T_{\text{lim}}$. For them, selling bonds with $T < T_{\text{lim}}$ without a preference shock can only be optimal if the marginal utility through the early reinvestment in a bond with maturity $T_{\text{new}} \in (T_{\text{lim}}, T_{\max}]$ plus the proceeds from selling the bond with maturity $T \in (0, T_{\text{lim}})$ is higher than the marginal utility from the later reinvestment (at maturity of the respective bond) plus the proceeds from the maturing bond if no preference shock occurs, or the proceeds from the optimal decision given that a preference shock occurs:

$$
\text{(IA-14)} \quad (\Delta_L(T_{\text{lim}}) + 1) \times p(T) \times (1 - s(T)) > \text{prob}(\tilde{T}_L > T) \times (\Delta_L(T_{\text{lim}}) + 1)
+ \int_0^{T-\min(T,\tau)} \underbrace{\lambda_L \times e^{-\lambda_L \times y}}_{\text{density function of the preference shock time}} \times (1 - s(T-y)) \times p(T-y)\, dy
+ \int_{T-\min(T,\tau)}^{T} \lambda_L \times e^{-\lambda_L \times y} \times e^{-b \times (T-y)}\, dy.
$$

Note that in deriving (IA-14), we exploit the fact that marginal utility does not depend on the invested amount (see equation (A-4)), i.e., the optimal investment of an amount z for a low-risk investor leads to an expected utility of $(1 + \Delta_L(T_{\text{lim}})) \times z$. Rearranging equation (IA-14) shows that low-risk investors have no incentive to sell bonds without having experienced a preference shock iff

$$\text{(IA-15)} \qquad (1 + \Delta_L(T_{\text{lim}})) \times e^{-T\times\lambda_L} + \frac{e^{-T\times\lambda_L}\left(-1+e^{(-b+\lambda_L)\times\min(T,\tau)}\right)\times\lambda_L}{-b+\lambda_L}$$
$$+ \int_{\min(T,\tau)}^{T} e^{(-T+x)\times\lambda_L} \times \lambda_L \times p(x) \times (1 - s(x))\, dx - (1 + \Delta_L(T_{\text{lim}})) \times p(T) \times (1 - s(T)) > 0.$$

Condition (IA-15) holds for $T \leq \tau$ since for $T < \tau$, a sell is not optimal even in the case of a preference shock. As b is an upper bound for the ask liquidity premium of an arbitrary maturity (and thus the maximum return a selling investor could gain from her new bonds), the incentive to sell is lower when no preference shock occurs. For constant bid-ask spreads $s(T) = s$, it can also never be optimal to sell prematurely for $\tau \leq T < T_{\text{lim}}$, as the relative wealth gain $-\frac{\frac{\partial p(T)}{\partial T}}{p(T)}$ is higher than for $T > T_{\text{lim}}$. Since we have already shown that it is never optimal to sell prematurely for $T \leq \tau$ and $T \geq T_{\text{lim}}$, it can also not be optimal to sell during the time of highest wealth gains. In the most general case with increasing bid-ask spreads $s(T)$ and for $T \in (\tau, T_{\text{lim}})$, (IA-15) has to be verified by plugging in prices $p(T)$ from Appendix A.2.

Internet Appendix 3 – Calculation of Liquidity Premia

As discussed in the main text, we compute liquidity premia with two completely independent approaches. First, we compute the liquidity premium as the difference between the observed bond yield and the yield of a theoretical bond with identical promised cash flows, but which is only subject to credit risk. This approach is in line with, e.g., Longstaff (2005), and does not depend on a specific proxy for bond illiquidity (as any regression approach must). In the first step, we determine a credit-risky zero (coupon) curve with which we discount the promised payments of the bond. We collect a time series of daily CDS mid quotes of all available maturities for each bond issuer from Markit, and derive a full term structure by interpolating between the available maturities. Since the shortest available maturity for CDS quotes is 6 months, we extrapolate the term structure of CDS premia at the very short end. We then bootstrap a credit-risky zero curve using Treasury par yields, accounting for different day count conventions and payment frequencies of CDS and Treasury markets. In the second step, we calculate the liquidity premium as the difference between the observed bond yield (again differentiating between customer buys and customer sells) and the hypothetical yield of the bond that is only subject to credit risk. We denote the resulting liquidity premium by $\text{illiq}_{\text{diff}}^{\text{ask/bid}}(T)$, which we calculate for each trade in our sample and which we winsorize at the 1% and 99% level. We also use the derived theoretical risk-free bond price, instead of the reported transaction price, to calculate the bond's duration since we do not want duration (our right hand side variable) to be affected by construction by the liquidity premium (our left hand side variable).

In our second approach, we follow Dick-Nielsen et al. (2012) and identify the liquidity component in bond yields by regressing monthly bond yield spreads on a liquidity measure. We calculate the Amihud (2002) liquidity measure, imputed roundtrip costs as in Feldhütter (2012), and their intra-month standard deviations. We winsorize all measures at the 1% and 99% quantile, transform them to a standard deviation of 1, and take the equal-weighted average $lm_{j,t}$ as our aggregated measure of illiquidity for bond j in month t (for details, we refer to the appendix of Dick-Nielsen et al. (2012)).[1] In the second step, we compute the bond's yield spread $\text{ys}_{j,t}$ as the difference between the observed yield and the yield of a risk-free bond with identical promised cash flows (where all payments are discounted at the Treasury curve) and again winsorize yield spreads at the 1% and 99% level. If the observed yield belongs to a transaction marked as a customer buy (sell) in TRACE, we denote it by $\text{ys}_{j,t}^{\text{ask}}(T)$ ($\text{ys}_{j,t}^{\text{bid}}(T)$). We then compute the average over all ob-

[1] In contrast to Dick-Nielsen et al. (2012), who demean each measure, the individual measures are strictly positive in our analysis. The reason is that a perfectly liquid bond should have a liquidity measure of 0, not a large negative value, for our subsequent regressions to be meaningful.

served trades for this bond at the bid or ask side on the last day of the month (we only use the last day to reduce endogeneity of the liquidity proxy). To identify the liquidity component in bond yield spreads separately for bid and ask yields and for different maturities, we use dummy variables for the side of a trade ($\mathbb{1}_{\text{ask}}$ and $\mathbb{1}_{\text{bid}}$) and for monthly duration buckets, i.e., $\mathbb{1}_{\{T_m \leq T < T_m + \frac{1}{12}\}}$. We then run the following regression model, pooled across all bonds j and months t:

(IA-16)

$$\begin{aligned}
\text{ys}_{j,t}^{\text{ask/bid}}(T) = \alpha \quad & + \sum_{T_m \in \{\frac{1}{12}, \frac{2}{12}, \ldots, 30\}} \beta_{T_m}^{\text{ask}} \mathbb{1}_{\text{ask}} \times \mathbb{1}_{\{T_m \leq T < T_m + \frac{1}{12}\}} \times lm_{j,t} \\
& + \sum_{T_m \in \{\frac{1}{12}, \frac{2}{12}, \ldots, 30\}} \beta_{T_m}^{\text{bid}} \mathbb{1}_{\text{bid}} \times \mathbb{1}_{\{T_m \leq T < T_m + \frac{1}{12}\}} \times lm_{j,t} \\
& + \sum_{T_m \in \{\frac{1}{12}, \frac{2}{12}, \ldots, 30\}} \gamma_{T_m} \mathbb{1}_{\{T_m \leq T < T_m + \frac{1}{12}\}} \times \text{CDS}_{j,t} + \delta \text{CONTROLS}_{j,t} + \varepsilon_{j,t}.
\end{aligned}$$

where T is the bond's duration in years, $lm_{j,t}$ is as described above, $\text{CDS}_{j,t}$ is the 5-year CDS Markit mid quote[2] for issuer of bond j for month t, and $\text{CONTROLS}_{j,t}$ include the month-end numerical rating of the bond (where AAA (D) corresponds to a rating of 1 (22)), bond age in years, and the logarithm of the outstanding amount of the bond. Table B1 shows the number of observations for this regression in the last column. The impact of the control variables is as expected: CDS premia affect bond yield spreads positively and significantly for each duration bucket, with higher coefficient estimates for bonds with higher duration. Rating and age also have a positive (0.09 and 0.03, respectively) and significant impact, outstanding amount has a negative (-0.05) and significant impact. Finally, we can compute an average liquidity component for each duration bucket $[T_m, T_m +$

[2]Biswas et al. (2015) show that transaction costs for 5-year CDS, the most liquid maturity, are unrelated to the maturity of the bond on which the CDS are written. Using 5-year CDS thus minimizes any potential impact of CDS illiquidity, and does not introduce a maturity-dependent bias in the bond liquidity component.

$\frac{1}{12}$) in the bond yield as

$$\text{illiq}_{\text{reg}}^{\text{ask/bid}}(T_m) = \widehat{\beta_{T_m}^{\text{ask/bid}}} \times lm_{\text{Mean}}(T_m), \tag{IA-17}$$

where $\widehat{\beta_{T_m}^{\text{ask/bid}}}$ is the estimate from equation (IA-16) and $lm_{\text{Mean}}(T_m)$ is the mean across all observations $lm_{j,t}$ that fall in the corresponding duration bucket.[3]

Internet Appendix 4 – Bid-Ask Spreads

Our model predictions for the long end of the term structure of liquidity premia depend on the shape of the term structure of bid-ask spreads. Therefore, we calibrate a parametric form for $s(T)$ with three parameters $s_1^{\text{bid-ask}}$, $s_2^{\text{bid-ask}}$, and $s_3^{\text{bid-ask}}$ to our data set. Using nonlinear least squares, we minimize the sum of squared errors in the following equation:

$$s(T_{j,t}) = s_1^{\text{bid-ask}} + s_2^{\text{bid-ask}} \times \left(1 - e^{-s_3^{\text{bid-ask}} \times T_{j,t}}\right) + \epsilon_{j,t}, \tag{IA-18}$$

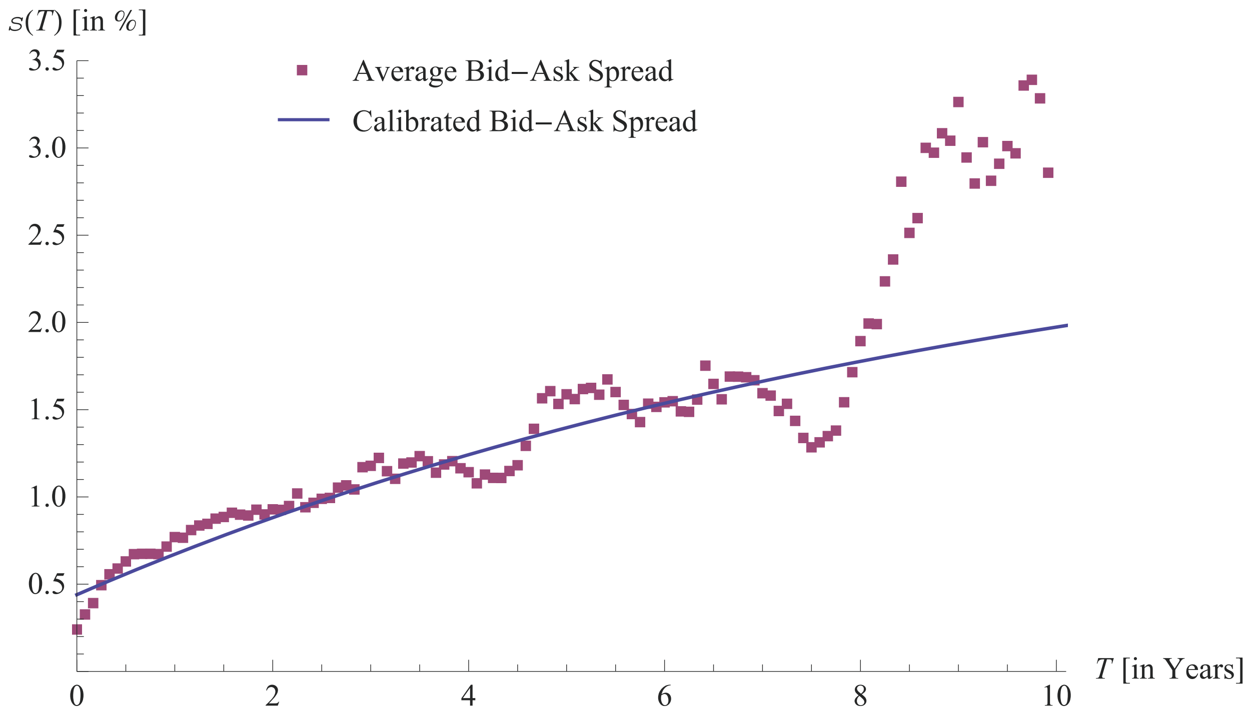
where bid-ask spreads $s(T_{j,t})$ are calculated for each bond j with duration $T_{j,t}$ on days t with trades on both sides as the difference between the average bid and ask transaction price. We winsorize bid-ask spreads at the 1% and 99% quantile. Figure IA1 presents the calibrated function $s(T)$ together with average bid-ask spreads for monthly duration buckets.

Figure IA1 shows two important properties of bid-ask spreads. First, bid-ask spreads are small but distinctly positive even for securities with very short maturities, which corresponds to a fixed component of transaction costs. Second, bid-ask spreads increase in ma-

[3] We choose this specification of $\text{illiq}_{\text{reg}}^{\text{ask/bid}}$ to be consistent with Dick-Nielsen et al. (2012). As a robustness check, we additionally include the intercept from the first-stage regression and the effect of age, and find that our hypotheses are also confirmed for this extended specification.

Figure IA1: **Empirical Term Structure of Bid-Ask Spreads**

Figure IA1 presents the average term structure of proportional bid-ask spreads (squares) together with the calibrated bid-ask spread function $s(T) = 0.0044 + 0.0241\left(1 - e^{-0.1014T}\right)$ (solid line). Bid-ask spreads are computed for each bond on days with trades on both sides as the difference between the average bid and ask transaction price. The depicted average spread is computed as the mean spread across all bonds of a given duration. The sample period is from Oct. 1, 2004 to Sept. 30, 2012.



turity. We therefore expect the term structure of liquidity premia to behave as described in Section IV in the paper.

Internet Appendix 5 – Robustness Checks

Swap Rates as Risk-Free Interest Rates

Table IA1 shows the results when we re-estimate equation (5) using swap rates as the risk-free reference curve to calculate liquidity premia.

Table IA1 shows that our estimation results are mostly unaffected by the use of swap rates as risk-free rates. For ask liquidity premia, the estimates for the slope at the short end are positive in all and significant in 6 out of 10 specifications of the exogenous breakpoint. The significantly positive estimates for the long end are consistently below those for the short end and the difference is significant in 5 out of the 10 cases. For both endogenous breakpoint specifications, the slope is significantly positive at the short end and significantly flatter but still (significantly) positive at the long end. For bid liquidity premia, the slope at the short end is always negative and significant in 8 out of 10 exogenous breakpoint specifications. The slope at the long end is now positive and significant in all cases, but, compared to the short end, quantitatively small. The difference between long- and short-term premia is always positive and significant in 9 out of 10 the cases. The results for the endogenously estimated breakpoint are again the same: significantly negative slopes at the short end and small but significantly positive slopes at the long end.

In Table IA2, we present the results for the spillover analysis using swap rates as the risk-free reference curve.

Table IA2 confirms the results from Section V.E in the paper: No individual coefficient estimate of $\beta_{i,\text{long}}$ is significant. Even though we can now reject the joint hypotheses that both coefficients $\beta_{1,\text{long}}$ and $\beta_{2,\text{long}}$ are equal to 0 in some specifications, the corresponding estimates are negative. This does not indicate a spillover. In contrast, 10 out of 20 estimates for $\beta_{i,\text{short}}$ are positive and significant, and we can reject the joint hypothesis that both coefficient estimates $\beta_{1,\text{short}}$ and $\beta_{2,\text{short}}$ are equal to 0 in 6 out of 10 cases, and that they sum up to 0 in 7 out of 10 cases.

Our main conclusions remain unaffected: ask liquidity premia increase more strongly for shorter maturities, bid liquidity premia exhibit an inverse shape at the short end and are flat or increase slightly for longer maturities, and liquidity shocks spill over from the short end to the long end of the term structure only.

Analysis of AAA Bonds

In our second robustness check, we analyze whether our results are sensitive to how we adjust the observed yield spreads for credit risk. To do so, we concentrate on those bonds which are least likely to be affected by credit risk: Bonds with a AAA rating by at least two rating agencies on the observation date. We also drop all transactions which occurred after Mar. 31, 2007 since a AAA rating might not be indicative of negligible credit risk during the financial crisis. General Electric bonds, e.g., exhibited increasing yields long before the downgrade from AAA to AA+ by Standard&Poor's on Mar. 12, 2009. For the calculation of $\text{illiq}_{\text{diff}}^{\text{ask/bid}}$, we interpret the difference between the bond's yield minus a theoretical yield calculated by discounting the bond's cash flows with the Treasury curve as a pure liquidity premium. Since all bonds exhibit a AAA rating, we exclude rating as a control variable. For $\text{illiq}_{\text{reg}}^{\text{ask/bid}}$, we also exclude CDS quotes in the first-step regression in equation (IA-16).[4] We explore the relation between liquidity premia and maturity for AAA rated bonds in Table IA3.

Table IA3 shows that our results are, if anything, stronger for the AAA sample than for the entire sample. For ask liquidity premia, the estimates for β_1^{ask} are always positive and significant in 9 out of 10 (2 out of 2) exogenous (endogenous) breakpoint specifications. The slope at the long end is significantly positive and significantly flatter than at the short end in 11 out of the in total 12 specifications, respectively. Bid liquidity premia exhibit always negative (always positive) estimates for the slope at the short (long) end, which are significant in 10 (12) out of the in total 12 cases. The difference between the long and the short end is significant in 11 out of the 12 cases.

[4]In an alternative robustness check, we use agency bonds instead of AAA rated bonds. The results are virtually the same.

Table IA1: **Regression of Swap-Implied Ask and Bid Liquidity Premia on Duration**

Table IA1 presents the regression of swap-implied ask and bid liquidity premia (in percentage points) on the bond's duration and control variables for different breakpoints that separate the short end from longer maturities of the liquidity term structure:

$$\begin{aligned}\text{illiq}^{\text{ask}}_{\text{diff/reg}}(T) &= \alpha^{\text{ask}} + \beta_1^{\text{ask}}\mathbb{1}_{\{T\leq\theta\}} \times (T-\theta) + \beta_2^{\text{ask}}\mathbb{1}_{\{T>\theta\}} \times (T-\theta) + \gamma^{\text{ask}}\text{CONTROLS} + \varepsilon,\\ \text{illiq}^{\text{bid}}_{\text{diff/reg}}(T) &= \alpha^{\text{bid}} + \beta_1^{\text{bid}}\mathbb{1}_{\{T\leq\theta\}} \times (T-\theta) + \beta_2^{\text{bid}}\mathbb{1}_{\{T>\theta\}} \times (T-\theta) + \gamma^{\text{bid}}\text{CONTROLS} + \varepsilon.\end{aligned}$$

In Panel A (panel regression), the liquidity premium $\text{illiq}^{\text{ask/bid}}_{\text{diff}}$ is determined for each bond and each trade as the difference of the bond yield and a theoretical credit adjusted yield calculated by discounting the bond's cash flows with a bootstrapped discount curve computed from swap rates and a CDS curve. In Panel B (cross-sectional regression), the average liquidity premium $\text{illiq}^{\text{ask/bid}}_{\text{reg}}$ for each monthly duration bucket is determined as in Dick-Nielsen et al. (2012) as the proportion of the yield spread (in excess of the swap curve) explained by the liquidity measure lm in a linear regression, where lm is the equal-weighted average of the Amihud (2002) liquidity measure, imputed roundtrip costs as in Feldhütter (2012), and the standard deviations of these measures (for details, see the Internet Appendix 3). The explanatory variable is the duration T (in years) minus the breakpoint θ for $T \leq \theta$ and $T > \theta$. In Panel A, we additionally include the control variables AGE in years, the average numerical rating (RATING), and the logarithm of the outstanding amount (ln(AMT)) and use firm and month fixed effects. The breakpoints θ equal 3 months, 6 months, 1 year, 2 years, and 3 years and we estimate an endogenous breakpoint θ^*. In Panel A, we present standard errors clustered at the firm level in parentheses. In Panel B, we use White (1982) standard errors. The sample period is from Oct. 1, 2004 to Sept. 30, 2012. * and ** indicate significance at the 5% and 1% levels, respectively.

	Ask						Bid					
	$\theta = 0.25$	$\theta = 0.5$	$\theta = 1$	$\theta = 2$	$\theta = 3$	$\theta^* = 2.3103$	$\theta = 0.25$	$\theta = 0.5$	$\theta = 1$	$\theta = 2$	$\theta = 3$	$\theta^* = 0.6553$
	Panel A: Liquidity Premium $illiq^{ask/bid}_{diff}$											
$\mathbb{1}_{\{T\leq\theta\}} \times (T-\theta)$	1.1274	0.8630	0.6589**	0.3906**	0.2622**	0.3398**	−10.4996**	−3.1447**	−0.9406**	−0.2653**	−0.1229**	−1.9929**
	(1.3854)	(0.5602)	(0.2252)	(0.1038)	(0.0569)	(0.0848)	(0.6294)	(0.2641)	(0.1126)	(0.0528)	(0.0334)	(0.1841)
$\mathbb{1}_{\{T>\theta\}} \times (T-\theta)$	0.1034**	0.1019**	0.0958**	0.0825**	0.0743**	0.0796**	0.0314**	0.0371**	0.0437**	0.0512**	0.0573**	0.0398**
	(0.0120)	(0.0124)	(0.0131)	(0.0155)	(0.0177)	(0.0162)	(0.0108)	(0.0105)	(0.0103)	(0.0111)	(0.0122)	(0.0104)
	Controls											
AGE [in years]	−0.0001	0.0006	0.0035	0.0083	0.0098	0.0091	0.0307**	0.0284**	0.0257**	0.0235**	0.0231**	0.0273**
	(0.0078)	(0.0080)	(0.0083)	(0.0092)	(0.0097)	(0.0095)	(0.0060)	(0.0057)	(0.0054)	(0.0051)	(0.0051)	(0.0055)
RATING	−0.0091	−0.0078	−0.0043	0.0012	0.0012	0.0014	0.1627**	0.1617**	0.1626**	0.1637**	0.1644**	0.1615**
	(0.0497)	(0.0494)	(0.0491)	(0.0482)	(0.0481)	(0.0482)	(0.0545)	(0.0540)	(0.0537)	(0.0538)	(0.0540)	(0.0539)
ln(AMT)	0.0682*	0.0681*	0.0684*	0.0679*	0.0633*	0.0668*	−0.0420	−0.0407	−0.0405	−0.0423	−0.0414	−0.0401
	(0.0319)	(0.0318)	(0.0316)	(0.0308)	(0.0294)	(0.0304)	(0.0233)	(0.0237)	(0.0239)	(0.0240)	(0.0234)	(0.0238)
Firm Fixed Effects	Yes											
Month Fixed Effects	Yes											
$\mathbb{1}_{\{T>\theta\}} \times (T-\theta)$	−1.0240	−0.7611	−0.5631*	−0.3081**	−0.1878**	−0.2602**	10.5310**	3.1818**	0.9843**	0.3165**	0.1802**	2.0327**
$-\mathbb{1}_{\{T\leq\theta\}} \times (T-\theta)$	(1.3907)	(0.5663)	(0.2319)	(0.1142)	(0.0697)	(0.0960)	(0.6335)	(0.2667)	(0.1148)	(0.0572)	(0.0390)	(0.1864)
N	3,482,571						1,926,684					
R^2	0.4040	0.4045	0.4071	0.4114	0.4112	0.4116	0.3375	0.3434	0.3417	0.3358	0.3328	0.3439

	Ask						Bid					
	$\theta = 0.25$	$\theta = 0.5$	$\theta = 1$	$\theta = 2$	$\theta = 3$	$\theta^* = 6.6667$	$\theta = 0.25$	$\theta = 0.5$	$\theta = 1$	$\theta = 2$	$\theta = 3$	$\theta^* = 0.5211$
	Panel B: Liquidity Premium $illiq_{reg}^{ask/bid}$											
Constant	−0.0228	−0.0080	0.0245	0.0993**	0.1730**	0.4104**	0.4215**	0.4105**	0.4126**	0.4512**	0.5018**	0.4098**
	(0.0334)	(0.0337)	(0.0339)	(0.0338)	(0.0341)	(0.0360)	(0.0370)	(0.0350)	(0.0355)	(0.0365)	(0.0374)	(0.0350)
$\mathbb{1}_{\{T \leq \theta\}} \times (T - \theta)$	0.1322	0.1535	0.1513*	0.1463**	0.1278**	0.0889**	−6.0137**	−2.0990**	−0.6285**	−0.1195	−0.0131	−1.9656**
	(0.5288)	(0.1881)	(0.0722)	(0.0333)	(0.0208)	(0.0086)	(0.2664)	(0.2756)	(0.1436)	(0.0689)	(0.0410)	(0.2649)
$\mathbb{1}_{\{T > \theta\}} \times (T - \theta)$	0.0517**	0.0516**	0.0510**	0.0488**	0.0463**	0.0369**	0.0332**	0.0348**	0.0360**	0.0357**	0.0342**	0.0349**
	(0.0049)	(0.0050)	(0.0052)	(0.0056)	(0.0061)	(0.0087)	(0.0053)	(0.0053)	(0.0056)	(0.0061)	(0.0066)	(0.0053)
$\mathbb{1}_{\{T > \theta\}} \times (T - \theta)$	−0.0805	−0.1019	−0.1003	−0.0975**	−0.0815**	−0.0519**	6.0468**	2.1338**	0.6646**	0.1553*	0.0472	2.0004**
$-\mathbb{1}_{\{T \leq \theta\}} \times (T - \theta)$	(0.5308)	(0.1908)	(0.0758)	(0.0374)	(0.0256)	(0.0163)	(0.2712)	(0.2776)	(0.1457)	(0.0716)	(0.0446)	(0.2670)
N	225						225					
R^2	0.4601	0.4602	0.4609	0.4654	0.4708	0.4822	0.2415	0.2537	0.2446	0.2190	0.2069	0.2538

Table IA2: **Spillover Analysis of Swap-Implied Liquidity Premia**

Table IA2 presents a vector autoregression (VAR) analysis of monthly average swap-implied ask and bid liquidity premia (in percentage points) on lagged liquidity premia for different breakpoints that separate short-term from long-term maturities of the liquidity term structure:

$$\begin{aligned}
\text{illiq}_t^{\text{ask}}(T<\theta) &= \alpha_{\text{short}}^{\text{ask}} + \sum_{i=1}^{2}\phi_{i,\text{short}}^{\text{ask}}\text{illiq}_{t-i}^{\text{ask}}(T<\theta) + \sum_{i=1}^{2}\beta_{i,\text{long}}^{\text{ask}}\text{illiq}_{t-i}^{\text{ask}}(T\geq\theta) + \varepsilon_t,\\
\text{illiq}_t^{\text{bid}}(T<\theta) &= \alpha_{\text{short}}^{\text{bid}} + \sum_{i=1}^{2}\phi_{i,\text{short}}^{\text{bid}}\text{illiq}_{t-i}^{\text{bid}}(T<\theta) + \sum_{i=1}^{2}\beta_{i,\text{long}}^{\text{bid}}\text{illiq}_{t-i}^{\text{bid}}(T\geq\theta) + \varepsilon_t,\\
\text{illiq}_t^{\text{ask}}(T\geq\theta) &= \alpha_{\text{long}}^{\text{ask}} + \sum_{i=1}^{2}\beta_{i,\text{short}}^{\text{ask}}\text{illiq}_{t-i}^{\text{ask}}(T<\theta) + \sum_{i=1}^{2}\phi_{i,\text{long}}^{\text{ask}}\text{illiq}_{t-i}^{\text{ask}}(T\geq\theta) + \varepsilon_t,\\
\text{illiq}_t^{\text{bid}}(T\geq\theta) &= \alpha_{\text{long}}^{\text{bid}} + \sum_{i=1}^{2}\beta_{i,\text{short}}^{\text{bid}}\text{illiq}_{t-i}^{\text{bid}}(T<\theta) + \sum_{i=1}^{2}\phi_{i,\text{long}}^{\text{bid}}\text{illiq}_{t-i}^{\text{bid}}(T\geq\theta) + \varepsilon_t.
\end{aligned}$$

Average monthly liquidity premia $\text{illiq}^{\text{ask/bid}}$ for all bonds with durations above and below breakpoint θ are determined with the difference approach, i.e., as the difference of the bond yield and a theoretical credit adjusted yield calculated by discounting the bond's cash flows with a bootstrapped discount curve computed from swap rates and a CDS curve. A time trend and the square of the time are removed from the time series of monthly average liquidity premia. The breakpoints θ equal 3 months, 6 months, 1 year, 2 years, and 3 years. We present Newey and West (1987) standard errors with 3 lags in parentheses. We provide χ^2 statistics for the null hypotheses, that i) both lag parameters are jointly 0 and ii) the sum of both lag parameters is 0. The sample period is from Oct. 1, 2004 to Sept. 30, 2012. * and ** indicate significance at the 5% and 1% levels, respectively.

	Ask					Bid				
	$\theta=0.25$	$\theta=0.5$	$\theta=1$	$\theta=2$	$\theta=3$	$\theta=0.25$	$\theta=0.5$	$\theta=1$	$\theta=2$	$\theta=3$
	Panel A: Short-Term Liquidity Premium $illiq_t^{ask/bid}(T<\theta)$									
Constant	0.0032	0.0024	0.0025	0.0018	0.0010	−0.0012	−0.0047	−0.0067	−0.0051	−0.0039
	(0.0724)	(0.0822)	(0.0718)	(0.0631)	(0.0563)	(0.1016)	(0.1189)	(0.1181)	(0.0981)	(0.0804)
$\text{illiq}_{t-1}^{\text{ask/bid}}(T<\theta)$	0.4193**	0.4336**	0.4779**	0.3787**	0.3673**	0.7012**	0.6452**	0.6605**	0.5017**	0.4753**
	(0.1481)	(0.0837)	(0.0921)	(0.0982)	(0.0770)	(0.1142)	(0.1416)	(0.0748)	(0.0662)	(0.0548)
$\text{illiq}_{t-2}^{\text{ask/bid}}(T<\theta)$	0.0313	0.1756*	0.0870	0.1347	0.1523*	−0.0993	0.0132	−0.0238	0.0781	0.1324
	(0.1390)	(0.0821)	(0.0907)	(0.0678)	(0.0660)	(0.1076)	(0.1026)	(0.0484)	(0.0715)	(0.0997)
$\text{illiq}_{t-1}^{\text{ask/bid}}(T\geq\theta)$	−0.3060	−0.9764	−0.6668	−0.1022	0.1044	−0.0920	−0.9727	−1.3665	−0.6437	−0.2391
	(0.4628)	(0.5262)	(0.4132)	(0.3915)	(0.3549)	(1.0935)	(0.7455)	(0.7539)	(0.7972)	(0.6055)
$\text{illiq}_{t-2}^{\text{ask/bid}}(T\geq\theta)$	−0.3646	−0.0837	−0.3237	−0.4533	−0.4813	−0.0780	0.4493	0.7602	0.4138	0.0770
	(0.5624)	(0.6316)	(0.5482)	(0.4925)	(0.4117)	(1.0223)	(0.7600)	(0.7508)	(0.7978)	(0.5744)
H_0: $\phi_{1,\text{short}}^{\text{ask/bid}}=0, \phi_{2,\text{short}}^{\text{ask/bid}}=0$	12.2194**	29.9294**	31.7875**	18.5066**	22.7964**	89.8912**	115.1602**	95.8715**	63.9488**	76.2974**
H_0: $\phi_{1,\text{short}}^{\text{ask/bid}}+\phi_{2,\text{short}}^{\text{ask/bid}}=0$	10.5234**	25.1217**	24.7494**	18.1564**	18.1129**	81.7559**	98.1427**	90.3459**	24.5554**	27.7246**
H_0: $\beta_{1,\text{long}}^{\text{ask/bid}}=0, \beta_{2,\text{long}}^{\text{ask/bid}}=0$	1.9814	18.6756**	22.2960**	12.8875**	8.4810*	0.2688	5.7694	11.2983**	1.9837	1.2889
H_0: $\beta_{1,\text{long}}^{\text{ask/bid}}+\beta_{2,\text{long}}^{\text{ask/bid}}=0$	1.9123	13.2946**	14.3864**	9.8661**	8.1984**	0.2578	4.5868*	9.4018**	1.5332	1.2884
N						94				
R^2	0.2538	0.3776	0.4377	0.2865	0.2648	0.3910	0.3147	0.3191	0.2387	0.2747

	Ask					Bid				
	$\theta = 0.25$	$\theta = 0.5$	$\theta = 1$	$\theta = 2$	$\theta = 3$	$\theta = 0.25$	$\theta = 0.5$	$\theta = 1$	$\theta = 2$	$\theta = 3$
	Panel B: Long-Term Liquidity Premium $illiq_t^{ask/bid}(T \geq \theta)$									
Constant	−0.0027	−0.0033	−0.0032	−0.0034	−0.0035	−0.0039	−0.0042	−0.0043	−0.0040	−0.0038
	(0.0177)	(0.0164)	(0.0152)	(0.0137)	(0.0125)	(0.0193)	(0.0178)	(0.0145)	(0.0125)	(0.0114)
$\text{illiq}_{t-1}^{\text{ask/bid}}(T < \theta)$	−0.0357	0.0189	0.0122	0.0498	0.0873*	0.0427	0.0452*	0.0447**	0.0686**	0.0938**
	(0.0277)	(0.0321)	(0.0301)	(0.0308)	(0.0368)	(0.0234)	(0.0181)	(0.0123)	(0.0128)	(0.0171)
$\text{illiq}_{t-2}^{\text{ask/bid}}(T < \theta)$	0.0415	0.0187	0.0371*	0.0329	0.0275	0.0331*	0.0208	0.0303**	0.0407**	0.0425*
	(0.0234)	(0.0136)	(0.0154)	(0.0183)	(0.0209)	(0.0156)	(0.0140)	(0.0090)	(0.0138)	(0.0214)
$\text{illiq}_{t-1}^{\text{ask/bid}}(T \geq \theta)$	0.9374**	0.8242**	0.8922**	0.8966**	0.8997**	0.6151**	0.6013**	0.6394**	0.7138**	0.7461**
	(0.0958)	(0.0956)	(0.1025)	(0.1059)	(0.0991)	(0.1210)	(0.1124)	(0.1155)	(0.1161)	(0.1046)
$\text{illiq}_{t-2}^{\text{ask/bid}}(T \geq \theta)$	−0.1307	0.0057	−0.0400	−0.0491	−0.0633	0.1145	0.1732	0.1733	0.0628	0.0164
	(0.0767)	(0.1079)	(0.1009)	(0.0869)	(0.0803)	(0.1223)	(0.1143)	(0.1243)	(0.0991)	(0.0905)
H_0: $\beta_{1,\text{short}}^{\text{ask/bid}} = 0, \beta_{2,\text{short}}^{\text{ask/bid}} = 0$	3.1756	2.4704	5.9443	4.5679	7.7370*	39.5763**	37.1338**	49.7570**	54.6464**	98.4966**
H_0: $\beta_{1,\text{short}}^{\text{ask/bid}} + \beta_{2,\text{short}}^{\text{ask/bid}} = 0$	0.0712	1.2797	2.1238	4.2704*	7.7340**	28.1767**	34.6423**	46.9903**	51.0746**	79.7507**
H_0: $\phi_{1,\text{long}}^{\text{ask/bid}} = 0, \phi_{2,\text{long}}^{\text{ask/bid}} = 0$	145.1936**	280.3132**	343.2987**	406.1465**	342.9471**	263.0745**	440.8164**	524.1720**	486.6117**	442.2562**
H_0: $\phi_{1,\text{long}}^{\text{ask/bid}} + \phi_{2,\text{long}}^{\text{ask/bid}} = 0$	133.2373**	219.7953**	326.7703**	387.3104**	336.7237**	256.4033**	431.6646**	470.4445**	432.5804**	422.1271**
N	94									
R^2	0.7007	0.7258	0.7721	0.8059	0.8294	0.7696	0.7918	0.8463	0.8843	0.8982

Table IA3: **Regression of Ask and Bid Liquidity Premia on Duration for AAA Rated Bonds**

Table IA3 presents the regression of ask and bid liquidity premia (in percentage points) on the bond's duration and control variables for different breakpoints that separate the short end from longer maturities of the liquidity term structure:

$$\text{illiq}^{\text{ask}}_{\text{diff/reg}}(T) = \alpha^{\text{ask}} + \beta_1^{\text{ask}} \mathbb{1}_{\{T\leq\theta\}} \times (T-\theta) + \beta_2^{\text{ask}} \mathbb{1}_{\{T>\theta\}} \times (T-\theta) + \gamma^{\text{ask}}\text{CONTROLS} + \varepsilon,$$

$$\text{illiq}^{\text{bid}}_{\text{diff/reg}}(T) = \alpha^{\text{bid}} + \beta_1^{\text{bid}} \mathbb{1}_{\{T\leq\theta\}} \times (T-\theta) + \beta_2^{\text{bid}} \mathbb{1}_{\{T>\theta\}} \times (T-\theta) + \gamma^{\text{bid}}\text{CONTROLS} + \varepsilon.$$

In Panel A (panel regression), the liquidity premium $\text{illiq}^{\text{ask/bid}}_{\text{diff}}$ is determined for each bond and each trade as the difference of the AAA-rated bond's yield and a theoretical risk free yield calculated by discounting the bond's cash flows with the Treasury curve. In Panel B (cross-sectional regression), the average liquidity premium $\text{illiq}^{\text{ask/bid}}_{\text{reg}}$ for each monthly duration bucket is determined as in Dick-Nielsen et al. (2012) as the proportion of the yield spread of a AAA-rated bond (in excess of the Treasury curve) explained by the liquidity measure lm in a linear regression, where lm is the equal-weighted average of the Amihud (2002) liquidity measure, imputed roundtrip costs as in Feldhütter (2012), and the standard deviations of these measures (we exclude CDS quotes and ratings in the first-step regression in equation (IA-16)). The explanatory variable is the duration T (in years) minus the breakpoint θ for $T \leq \theta$ and $T > \theta$. In Panel A, we additionally include the control variables AGE in years and the logarithm of the outstanding amount (ln(AMT)) and use firm and month fixed effects. The breakpoints θ equal 3 months, 6 months, 1 year, 2 years, and 3 years and we estimate an endogenous breakpoint θ^*. In Panel A, we present standard errors clustered at the firm level in parentheses. In Panel B, we use White (1982) standard errors. The sample period is from Oct. 1, 2004 to Sept. 30, 2012. * and ** indicate significance at the 5% and 1% levels, respectively.

	Ask						Bid					
	$\theta=0.25$	$\theta=0.5$	$\theta=1$	$\theta=2$	$\theta=3$	$\theta^*=4.0787$	$\theta=0.25$	$\theta=0.5$	$\theta=1$	$\theta=2$	$\theta=3$	$\theta^*=0.8092$
	Panel A: Liquidity Premium $illiq^{ask/bid}_{diff}$											
$\mathbb{1}_{\{T\leq\theta\}} \times (T-\theta)$	0.7061**	0.4063**	0.2654**	0.1695**	0.1328**	0.1083**	−3.2910**	−1.0781**	−0.3528**	−0.0701**	−0.0090	−0.5085**
	(0.1686)	(0.0644)	(0.0296)	(0.0124)	(0.0076)	(0.0056)	(0.0741)	(0.0259)	(0.0163)	(0.0114)	(0.0084)	(0.0174)
$\mathbb{1}_{\{T>\theta\}} \times (T-\theta)$	0.0626**	0.0615**	0.0574**	0.0462**	0.0326**	0.0176**	0.0262**	0.0305**	0.0362**	0.0392**	0.0373**	0.0344**
	(0.0113)	(0.0113)	(0.0110)	(0.0098)	(0.0071)	(0.0028)	(0.0058)	(0.0063)	(0.0074)	(0.0095)	(0.0111)	(0.0070)
	Controls											
AGE [in years]	0.0076*	0.0083*	0.0100**	0.0113**	0.0108**	0.0109**	0.0328**	0.0303**	0.0288**	0.0314**	0.0337**	0.0289**
	(0.0033)	(0.0033)	(0.0032)	(0.0028)	(0.0021)	(0.0015)	(0.0024)	(0.0020)	(0.0020)	(0.0028)	(0.0033)	(0.0019)
ln(AMT)	0.0130*	0.0119*	0.0106*	0.0142**	0.0166**	0.0124	−0.0152**	−0.0137**	−0.0131**	−0.0178**	−0.0182**	−0.0128**
	(0.0050)	(0.0050)	(0.0050)	(0.0048)	(0.0058)	(0.0070)	(0.0038)	(0.0036)	(0.0034)	(0.0029)	(0.0030)	(0.0035)
Firm Fixed Effects	Yes											
Month Fixed Effects	Yes											
$\mathbb{1}_{\{T>\theta\}} \times (T-\theta)$ $-\mathbb{1}_{\{T\leq\theta\}} \times (T-\theta)$	−0.6434**	−0.3449**	−0.2080**	−0.1233**	−0.1002**	−0.0906**	3.3172**	1.1086**	0.3890**	0.1093**	0.0463**	0.5429**
	(0.1761)	(0.0714)	(0.0357)	(0.0172)	(0.0094)	(0.0051)	(0.0776)	(0.0309)	(0.0193)	(0.0158)	(0.0141)	(0.0207)
N	116,404						66,449					
R^2	0.4443	0.4472	0.4574	0.4787	0.4943	0.5017	0.2003	0.2156	0.2191	0.1964	0.1837	0.2209

	Ask						Bid					
	$\theta = 0.25$	$\theta = 0.5$	$\theta = 1$	$\theta = 2$	$\theta = 3$	$\theta^* = 4.9303$	$\theta = 0.25$	$\theta = 0.5$	$\theta = 1$	$\theta = 2$	$\theta = 3$	$\theta^* = 0.4167$
	Panel B: Liquidity Premium $illiq_{reg}^{ask/bid}$											
Constant	-0.1128^{**}	-0.1060^{**}	-0.0877^{**}	-0.0440^{**}	0.0006	0.0644^{**}	0.1780^{**}	0.1693^{**}	0.1640^{**}	0.1728^{**}	0.1907^{**}	0.1705^{**}
	(0.0177)	(0.0181)	(0.0178)	(0.0156)	(0.0128)	(0.0110)	(0.0163)	(0.0146)	(0.0138)	(0.0142)	(0.0137)	(0.0144)
$\mathbb{1}_{\{T\leq\theta\}} \times (T-\theta)$	0.5345	0.2164^{*}	0.1512^{**}	0.1166^{**}	0.0974^{**}	0.0674^{**}	-2.7170^{**}	-0.9499^{**}	-0.3059^{**}	-0.0735^{*}	-0.0198	-1.3124^{**}
	(0.2772)	(0.0871)	(0.0456)	(0.0204)	(0.0117)	(0.0054)	(0.1653)	(0.1626)	(0.0796)	(0.0326)	(0.0190)	(0.1994)
$\mathbb{1}_{\{T>\theta\}} \times (T-\theta)$	0.0171^{**}	0.0168^{**}	0.0157^{**}	0.0122^{**}	0.0078^{*}	-0.0003	0.0092^{**}	0.0104^{**}	0.0116^{**}	0.0118^{**}	0.0109^{**}	0.0102^{**}
	(0.0029)	(0.0030)	(0.0030)	(0.0031)	(0.0032)	(0.0035)	(0.0031)	(0.0031)	(0.0032)	(0.0035)	(0.0038)	(0.0031)
$\mathbb{1}_{\{T>\theta\}} \times (T-\theta)$	-0.5174	-0.1996^{*}	-0.1356^{**}	-0.1044^{**}	-0.0896^{**}	-0.0677^{**}	2.7262^{**}	0.9603^{**}	0.3175^{**}	0.0853^{*}	0.0306	1.3226^{**}
$-\mathbb{1}_{\{T\leq\theta\}} \times (T-\theta)$	(0.2783)	(0.0887)	(0.0471)	(0.0219)	(0.0133)	(0.0073)	(0.1671)	(0.1634)	(0.0805)	(0.0339)	(0.0206)	(0.2002)
N	152						152					
R^2	0.2315	0.2328	0.2430	0.2851	0.3400	0.3936	0.1177	0.1383	0.1294	0.0875	0.0611	0.1432