The Modern Bond Market

Tomy Lee Chaojun Wang Adam Zawadowski*

March 26, 2026

Abstract

We identify a widespread trading practice that mitigates fragmentation in the corporate bond market. On modern electronic platforms, traders request quotes for multiple bonds simultaneously and execute against any subset of the quotes. These List requests account for about 80% of all requests on MarketAxess in 2021–2022. Using List-level identifiers, we show that traders substitute across bonds within each List to mitigate quote uncertainty. This uncertainty is decreasing in the bond's offering size, an inverse proxy for fragmentation. Substitution is stronger among more fragmented bonds and between those with similar maturities and yields. Substitution within Lists reduces the average spread paid by roughly two-thirds relative to accepting all best quotes.

Keywords: Corporate bonds, fragmentation, multi-dealer platforms, List trading, substitution

JEL Classification: G12, G18, G23, D47

*Lee and Zawadowski are at the Central European University. Wang is at the Wharton School, University of Pennsylvania. We thank Gio Accurso, Julien Alexandre, and especially Sinem Uysal at MarketAxess and David Krein for the data and invaluable insights. We thank Thierry Foucault, Edith Hotchkiss, Tímea Molnár, Thomas Poulsen, Norman Schürhoff, Yancheng Qiu, Andrea Weber, Paul Whelan, Xian Wu, and seminar and conference participants at Boston College, SIEM Big Data and Market Microstructure Conference, 9th SAFE Market Microstructure Conference (Frankfurt), 20th Central Bank Conference on the Microstructure of Financial Markets (Hong Kong), AFA Annual Meeting (Philadelphia) for helpful comments and discussions. Emails and websites: Lee e-mail leeso@ceu.edu, web sites.google.com/view/tomylee/home; Wang e-mail wangchj@wharton.upenn.edu, web finance.wharton.upenn.edu/~wangchj/; Zawadowski e-mail zawadowskia@ceu.edu, web sites.google.com/view/zawadowski/home. The usual disclaimer applies.

I. Introduction

If I go out into the market and I can't find a price that's in line with where I think market levels should be, we have the substitutability in our process to look for bonds with similar characteristics.

–David LaRusso, Head of Fixed Income, Dimensional Fund Advisors
(Barnes, 2025)

Most corporate bonds do not trade on a given day, in part because a typical issuer maintains numerous bond issues outstanding. This fragmentation threatens to thinly disperse liquidity across economically similar bonds. While other markets standardize assets to mitigate this threat, the corporate bond market does not, perhaps because the issuers target particular debt structures (Rauh and Sufi, 2010; Colla, Ippolito and Li, 2013). Could a mechanism other than standardization overcome fragmentation in corporate bonds?

We document a widespread mechanism that does so. On modern trading platforms, a trader can simultaneously request quotes for often dozens of bonds from the same set of dealers. The dealers may provide quotes for all or some bonds, and the trader may accept any combination of those quotes, possibly from different dealers. Each trader can thus simultaneously request multiple bonds she considers substitutes and only select the ones quoted the smaller spreads, effectively aggregating liquidity that is otherwise fragmented across those bonds.[1] Such *List* requests comprise 80% of all requests on MarketAxess, the largest corporate bond trading platform.

Uncertainty over quoted prices is a prime candidate that could drive the use of Lists. If bond quotes were certain, each trader knows the exact bonds she will trade, rendering Lists redundant. With quote uncertainty, the trader has the incentive to search across bonds to

[1] Appendix B microfounds this claim in a model where traders are uncertain about the quotes they would receive and face the risk of losing access to past quotes.

find the less costly quotes, and substitute within Lists. This substitution would be stronger for the bonds with more uncertain quotes. Fragmentation, by shrinking the liquidity of each bond, raises quote uncertainty, and thus the substitution.

We test whether traders do substitute across bonds within each List and more so for bonds with more uncertain quotes. We then test whether fragmentation raises quote uncertainty and the substitution within Lists. We obtain the 10 million corporate bond requests on MarketAxess in 2021 and 2022. Our approach compares requests for similar bonds that were quoted nearly identical bid-ask spreads within the same List. This approach strips away all variation specific to the bond, the quoted price-level, and the trader-and-time. We find that traders substitute across bonds within each List. They especially do so among the less liquid bonds, for larger requested dollar quantities, and if the trader is less encumbered by investment mandates. All three attributes increase the uncertainty in quoted spreads. The bond's offering amount, by contrast, decreases the quote uncertainty, and the Lists whose bonds have larger offering amounts show monotonically less substitution. As an application of Lists, we show that traders view bonds closer in maturity and yield as closer substitutes, whereas the exact credit rating does not seem important to traders.

Our key empirical challenge is that traders have downward-sloping demands for bonds. Even absent any substitution, a trader is more likely to trade bonds quoted the smaller spreads in her List. We remove the effects of a downward-sloping demand curve using the "classroom rank" design of Murphy and Weinhardt (2020). They isolate the impacts of a student's test score from that of her test-score rank in her class by controlling for a polynomial of the test score and class fixed effects. Mapping to our setting, a List corresponds to a class, a bond request to a student, and each bond's quoted spread to a test score. We compare the trade probabilities (fill rates) of bond requests at different within-List ranks, controlling for a polynomial of the bonds' quoted spreads and List fixed effects. If traders substitute, then a higher ranked request would fill more often than a lower ranked request in the same

List, conditional on the quoted-spread polynomial, which effectively allows us to compare two requests quoted nearly identical spreads.

Section II describes our data. We observe every request choice and outcome seen by traders, including time stamps, requested and filled quantities, trade direction, all quotes offered and chosen, and benchmark prices available to the trader when submitting her request. Most importantly, each bond request belongs to a set of requests that a trader submitted together, called an order. We know to which order each bond request belongs, and whether the order is a List, a portfolio trade, or a single bond request.[2] Each of 616,052 Lists in our sample contains between two and 60 bond requests, and 12.7 on average. Among the List requests that received a quote, traders filled those whose average quoted spread was 12 bps, and left unfilled those whose average spread was 77 bps. From a back-of-the-envelop calculation, the average spread paid by traders would triple if they were forced to fill every request (with a quote) at its best spread.

Section III tests our substitution hypothesis within Lists. If traders substitute, then the bond requests with the slightly smaller spreads will be substantially more likely to fill, as the traders execute whichever requests quoted the smaller spreads. If traders do not substitute, the requests quoted similar spreads in the same List would have similar fill rates. We implement our approach by regressing the fill status of a bond request on its within-List rank by quoted spread, controlling for the cubic of this spread as well as List and bond fixed effects. Higher ranked requests have the smaller spreads. We estimate that a bond request ranked at the top of a List has a 3.9 percentage points higher fill rate than if it were ranked at the bottom, all else equal. This estimate rises to 11 percentage points for Lists that include HY bond requests, and is 2.6 percentage points for Lists made entirely of investment-grade

[2]Portfolio trades (Li, O'Hara, Rapp and Zhou, 2023) are a restrictive form of Lists, in which dealers must either submit a quote for all requested bonds or not reply, and the requesting trader must accept the quotes from the same dealer for all requested bonds or not trade. Portfolio trades comprise 2.5% of all requests, and 0.4% of all orders in our sample.

(IG) requests.

Sample splits reinforce this picture. Substitution is stronger within Lists whose bonds are less liquid, requests are for larger quantities, and requesting traders are dealers or proprietary traders, who tend to face lax investment mandates. Those traders substitute eight times as intensely as asset managers, who include mutual and pension funds, insurers, and index trackers. Such funds often face restrictive investment mandates that limit, yet do not eliminate (Koont, Ma, Pastor and Zeng, 2025), their ability to substitute bonds.

Order identifiers allow us to rule out all confounders specific to trader-time-and-List characteristics. The List fixed effects absorb all variation due to trader type, her dealer connections, the set of dealers contacted for the request, the submission date and time, and the joint distribution of bonds and requested quantities in the List. The List effects explain a large share of variation in quoted spreads. Adding them into a regression of quoted spreads on a benchmark spread and bond and date fixed effects, its adjusted R-squared increases by 32 percentage points.

We then link substitution to quote uncertainty and fragmentation. After accounting for all trader-time-List-specific factors and time-invariant bond characteristics, more than half of the total variation in quoted spreads remains unexplained. We measure quote uncertainty using this residual variation. Quote uncertainty is greater for less liquid bonds, for bigger trade sizes, and in non-asset manager Lists. These are precisely the settings in which we observe stronger substitution. We define fragmentation in a bond as the inverse of its offering amount, and find that the most fragmented bonds see the most intense substitution. More precisely, the rank coefficient declines monotonically from 9.8 to 1.3 percentage points across quintiles of Lists by the average offering amount.

Section V exploits Lists to identify the bond attributes along which traders substitute. If traders view bonds closer in maturity as closer substitutes, we expect them to substitute more intensely between bonds closer in maturity within a List than between random bonds

in the List. We partition bond requests in each List into halves with above or below the median remaining maturity. We call these halves "Sublists" by maturity. We find that traders substitute more intensely within the maturity Sublists than among random requests in the whole List. Repeating this exercise for yield spread and bond rating, traders substitute more intensely within Sublists by yield spread, and not within those by bond rating. Taken together, traders view maturity and yield spread, and not ratings, as the attributes driving substitutability of bonds.

Section VI tests the robustness of our results. They are robust to computing quoted spreads using yields rather than prices, to adding higher-order polynomials of quoted spreads, and to counting requests repeated on or off the platform as fills. Substitution is robust across List lengths, trader types, and trade directions, and the rank coefficients are approximately linear across rank deciles.

We proceed as follows. Section II describes the data. Section III documents substitution across bonds within Lists and examines how its intensity varies with bond liquidity, trade size, and trader type. Section IV links substitution to fragmentation through quote uncertainty. Section V identifies the bond attributes within which traders substitute. Section VI presents robustness tests. Section VII concludes with our contributions to the literature.

II. Data

Section II.A explains trading protocols for corporate bonds on MarketAxess. Section II.B describes the raw data, sample construction, and defines variables.

A. Empirical Setting

MarketAxess is the largest electronic platform for corporate bond trades in the US, where it hosts about 20% of all corporate bond trades. Its trading protocol has three steps. First,

a trader invites any number of available dealers to offer quotes for her chosen bond, quantity, and trade direction.[3] The trader specifies several other request attributes, such as the time dealers have to respond and whether to simultaneously submit the request to all participants anonymously (via the "Open Trading" option). Figure 1 depicts the screen that traders use to submit requests. Second, each invited participant may offer a quote. Each invited dealer sees the requesting trader's identity and the total number of invited dealers, though not the other dealers' identities. In practice, most traders invite all available dealers. Third, the trader observes all quotes (if any), then rejects all quotes or trades against exactly one quote (nearly always the quote most favorable to the trader).

Traders can bundle requests for different bonds into an *order*. All requests in an order are sent to the same dealers and share most attributes, except the chosen bond and quantity. MarketAxess offers three types of orders. A *List* order allows each invited dealer to offer quotes for any subset of its bond requests. A List requester can accept quotes from different dealers for different bond requests, though she can only accept one quote per request. Portfolio trade (PT) requires each responding dealer to offer a quote for every bond request in the order, and cannot enable Open Trading. The requester must reject all quotes or accept the complete set of quotes from one dealer. Single request-for-quote (SRFQ) contains one bond request.

B. Sample Construction

Raw sample. We obtain all corporate bond requests submitted on MarketAxess in 2021 and 2022, corresponding to 9,756,101 requests across 2,316,772 orders. Each observation is a bond request. Table I provides examples of requests in Lists. Order identifiers link together the bond requests belonging to the same order. Another field specifies whether the order is

[3]Traders differ in the sets of dealers they can contact, and each dealer may be unavailable for certain bonds or time periods.

a List or a PT.

The following fields are determined at the order level: the timestamp, the trader type, the number of dealers invited to bid on each request, the time that invited dealers have to offer quotes, and whether the order enabled Open Trading. The bond grade determines the pricing protocol, with high-yield bonds quoted in terms of flat price as the percentage of par value and investment-grade bonds in terms of the yield spread over the maturity-matched Treasury benchmark yield. We do not observe trader identities, and instead see the type of requesting traders partitioned into *Asset Manager*, *Broker-Dealer*, and *Other*. The Asset Managers include mutual funds, insurers, and other nonproprietary funds. The Broker-Dealers include all registered dealers. The Others include hedge funds and other proprietary funds.

The following fields are specific to each request: the bond CUSIP, requested quantity in face value, request direction (buy or sell), every quote received and whether it was from a dealer or a nondealer, and the quantity traded and at which quote. We compress these fields in four ways. (i) We do not differentiate between dealer and nondealer quotes, since this is not relevant for our question. (ii) We do not explore the number of invited dealers; most requests reach many dealers, 39 on average and 14 at the bottom tenth percentile. (iii) Our main variable of interest is a dummy variable "Filled" that equals one if and only if the traded quantity equals to the requested quantity.[4] (iv) We keep the best quote and discard all other quotes, because traders almost always either accept the best quote or reject all quotes.[5]

Supplementary data. Mergent-FISD provides bond ratings and remaining maturities. Moreover, we obtain the complete panel of "CP+" bid and ask prices and yields spanning our sample period from MarketAxess. The CP+ is a common benchmark that is updated in

[4]Only 0.46% of requests trade a quantity other than the requested quantity, see Table III.
[5]Only 0.53% of requests trade at a price other than the best response, see Table III.

real time for the vast majority of corporate bonds, as often as every 15 seconds. MarketAxess feeds the dealers' recent indicative prices and yields, actual quotes, and trade prices, alongside other information, into a machine learning algorithm to generate the CP+ prices and yields.[6] Most traders on MarketAxess subscribe to CP+, and these traders observe corresponding CP+ values before they finalize their bond requests.

Variable construction. To measure transaction costs of different bonds requested, we compute quoted spreads taking the contemporaneous CP+ midprice as the bond's fundamental value. For the IG requests, we convert the quoted yield spread into prices using the methodology in Appendix A.

The *Quoted spread* is the difference between the best quoted price and the CP+ midprice normalized by the CP+ midprice, measured in basis points:

$$\text{Quoted spread} = (2 \cdot \text{buy} - 1) \cdot \frac{\text{Best quoted price} - \text{CP+ midprice}}{\text{CP+ midprice}},$$

where the dummy variable *buy* equals one if and only if the request is a buy request and zero otherwise.

The *Rank by quoted spread* is the percentile of each request's *Quoted spread* among all *Quoted spreads* in its List, in ascending order. For each List, we assign rank one, the top rank, to the request with the smallest *Quoted spread* and assign rank zero, the bottom rank, to the request with the widest *Quoted spread*. Other requests are assigned a rank between one and zero linearly and in descending order by *Quoted spread*. Requests without a quote are treated as if their best spreads were wider than the widest spread we observe in our sample. Requests tied at the same spread in the List are randomly ordered among themselves. Table I illustrates how we rank requests and shows an example for a List.

Sample exclusions. We drop all single bond requests (1,941,656 requests) and all portfolio

[6] CP+ prices are shown to be reliable predictors of the quotes for the next request, see Jacobsen, Venkataraman and Xu (2025).

trade requests (243,546 requests).

Final sample. Our final sample consists of 7,814,445 requests across 616,052 Lists, thus 80.1% of the requests in the original sample. Table II defines all key variables. Table III presents the summary statistics of the final sample at the request-level. Asset managers submit the majority of List requests, while dealers and proprietary traders submit about a fifth each. 97% of requests have contemporaneous CP+ values reported by the platform and 93.6% receive at least one quote, allowing us to compute the *Quoted spread* for 91.6% of our final sample. Traders decline to fill 32.6% of requests that receive a quote. Table IV presents the summary statistics of the final sample at the List-level. Most Lists consist of requests in the same bond grade, only 4.75% are submitted in mixed grade Lists, in our analysis we lump these with pure High Yield Lists. Almost all Lists consist of only pure buy or sell requests, only 1.6% are mixed direction Lists.

A simple calculation illustrates the stakes: the average spread paid on filled trades is 11.8 basis points, whereas accepting every best quote would imply an average of 33.0 basis points—roughly three times as much.

III. Do Traders Substitute Within Lists?

We test whether traders substitute across bonds within Lists. Section III.A details our empirical design. Section III.B presents the results.

A. Econometric Framework

Traders who substitute within their Lists would trade the highest ranked bond requests by quoted spread in their Lists, and leave others unfilled. A simple approach would compare the fill rates of the highly ranked requests to lower ranked requests. We would conclude that traders substitute across bonds within Lists if the highly ranked requests have the higher fill

rates.

The simple approach falsely attributes two other sources of positive correlation between fill rate and within-List rank to substitution. First, under downward-sloping demand, requests quoted smaller spreads are more likely to fill, and those requests would mechanically be more highly ranked in their Lists. Second, certain bonds may systemically fill more often and receive smaller spreads. For example, investment mandates might force many traders to buy a highly liquid bond included in many indices, leading the requests for this bond to have high fill rates and be highly ranked.

To avoid these confounders, we compare the fill rates of requests for similar bonds that were quoted nearly identical spreads within the same List. Our implementation regresses the fill status of each request on its within-List rank by quoted spread, controlling for a cubic of the quoted spread and including List and bond fixed effects. Following Murphy and Weinhardt (2020), the cubic terms flexibly control for downward sloping demands, and thus we are effectively comparing requests that were quoted nearly identical spreads. The List fixed effects ensure within-List comparisons, removing all time-and-trader-specific differences in fill rates. The bond effects partial out time-invariant bond attributes, keeping comparisons between similar bonds. We conclude that traders substitute if the higher ranked bond requests are substantially more likely to fill than the lower ranked requests in the same List. In Appendix B we derive this formally from a simple model of bond trading.

We estimate following regression:

$$F_{b,\ell,t} = a_0 R_{b,\ell,t} + \text{cubic}(S_{b,\ell,t}) + \alpha_{\ell,t} + \gamma_b + \text{quadratic}(Q_{b,\ell,t}) + \varepsilon_{b,\ell,t}. \tag{1}$$

The dummy variable filled $F_{b,\ell,t}$ equals one if and only if the bond request b in List ℓ submitted on date t is filled in full quantity. The variable of interest is $R_{b,\ell,t}$, the rank by quoted spread of bond request b in List ℓ. The coefficient a_0 would be strictly positive if traders substitute

across bonds within Lists. All specifications control for the quoted spread $S_{b,\ell,t}$ up to the cubic term, the requested quantity $Q_{b,\ell,t}$ up to the quadratic term, and include List and bond fixed effects, $\alpha_{\ell,t}$ and γ_b. While we include requests that did not receive a quote or are missing a CP+ price when determining rank by quoted spread, they are excluded when estimating (1), because they lack a well-defined quoted spread.

Related design. Equation (1) is equivalent to the specification of Murphy and Weinhardt (2020) (their eqn. (1)). Murphy and Weinhardt (2020) identify the impact of each student's within-class rank by test score on her future achievement. Their empirical challenges mirror ours: future achievement is increasing in the test score itself, and differences in class composition and quality might generate positive correlation between class rank and future achievement in the absence of any rank effects. Mapping classes to Lists, students to bond requests, and test scores to quoted spreads establishes the equivalence between their regression specification and ours.

B. Results

Table V presents the coefficient estimates from (1). A bond request ranked at the top of a List has a 3.9 percentage points higher fill rate than if it were ranked at the bottom, all else equal. Adding the quadratic of requested quantity hardly affects this estimate. The effect is far larger, 11 pp, for Lists comprised of HY (or mixed grade) bond requests, and smaller for pure IG Lists. We conclude that traders substitute within Lists, and especially intensely so within HY Lists. That traders do not strongly substitute within IG Lists hints at an alternative motive of List trading aside from substitution.

Table VI reproduces Columns (3) and (5) of Table V across subsamples split along three dimensions: the average liquidity of bonds in the List, the average requested quantity, and the requesting trader's type.

We split the sample at the median of each dimension for a given List length. Substitution is substantially stronger within Lists of less liquid bonds: the coefficient on rank by quoted spread is 6.9 percentage points for illiquid Lists versus 2.2 percentage points for liquid ones. Substitution is also far stronger within larger-quantity Lists, at 10 pp compared to 1.1 pp for small-quantity Lists. Both patterns are consistent with traders substituting more intensely when the stakes are higher—either because the bonds are costlier to trade or because more dollars are at risk.

Substitution differs strikingly across trader types. Non–asset managers—comprising broker-dealers and proprietary traders—substitute far more intensely than asset managers: the coefficient on rank is 16 pp for non-AMs versus 2.0 pp for AMs. Asset managers are more likely to be constrained by investment mandates, index-replication requirements, and client requests, all of which limit their ability to treat bonds as interchangeable. Broker-dealers and proprietary traders face fewer such restrictions and are also more likely to employ automated trading systems and dedicated bond traders, for whom the ability to act quickly and superior analysis of small spread differences are especially important.

IV. Quote Uncertainty

Our hypothesis is that traders ask for quotes in Lists due to the uncertainty in quotes they face. We conservatively estimate the degree of traders' uncertainty over the spreads quoted for each bond request in their Lists at the time of submission. To do so, from the total variation in quoted spreads, we strip away all variation attributable to high-dimensional fixed effects and controls, some of which the trader could not have exactly known at submission.

A. *Econometric Framework*

We suppose the following. The quoted spread $Q_{b,\ell(i,t),i,t}$ for bond b in List $\ell(i,t)$ sent by trader i at time t is

$$Q_{b,\ell(i,t),i,t} = f(\theta_{i,t}, L_{\ell(i,t)}) + B_b + \eta_{b,t} + \epsilon_{b,\ell,i,t}. \tag{2}$$

Trader- and List-specific component $f_t(\theta_{i,t}, L_{\ell(i,t)})$ is the combined impact of trader i's time-varying type $\theta_{i,t}$ (e.g., how informed she is about the future returns of b) and characteristics of List $\ell(i,t)$ (e.g., sets of invited dealers and bonds in the List). Time-invariant bond-specific component B_b captures the cross-sectional variation in bonds' quoted spreads that is constant across traders. It arises from, for example, differences in bond attributes. Time-varying bond-specific component $\eta_{b,t}$ represents changes in adverse selection risk or level of liquidity in the bond, perhaps due to dealer preference shocks particular to that bond. Both bond components B_b and $\eta_{b,t}$ as well as unexpected shocks to the quoted spread $\epsilon_{b,\ell(i,t),i,t}$ have zero mean over bonds b. All time-varying components have zero mean.

Under the conservative assumption that traders know $f(\theta_{i,t}, L_\ell)$ and B_b but not $\eta_{b,t}$ and $\epsilon_{b,\ell,i,t}$, the combination of List and bond fixed effects allow us to isolate the quote uncertainty faced by traders as they submit Lists. Stripping away all List-specific variation from the quoted spread Q yields

$$Q^{\ell\,\mathrm{FE}} \coloneqq Q_{b,\ell(i,t),i,t} - \mathbb{E}_b[Q_{b,\ell(i,t),i,t}] = B_b + \eta_{b,t} + \epsilon_{b,\ell(i,t),i,t}.$$

Further removing bond-specific variation yields

$$Q^{\ell\,\mathrm{FE},b\,\mathrm{FE}} \coloneqq Q^{\ell\,\mathrm{FE}} - \mathbb{E}_t[Q_{b,\ell(i,t),i,t}] = \eta_{b,t} + \epsilon_{b,\ell(i,t),i,t}.$$

Taken together, the share of total variation in quoted spreads that a trader knows as she submits her List is given by

$$\frac{Var(Q^{\ell\,\mathrm{FE},b\,\mathrm{FE}})}{Var(Q_{b,\ell(i,t),i,t})}.$$

The empirical counterpart to this share is the adjusted R-squared from a linear regression of quoted spread $Q_{b,\ell,t}$ on List and bond fixed effects, α_ℓ and γ_b,

$$Q_{b,\ell,t} = \alpha_{\ell,t} + \gamma_b + \mathbf{X}\beta + \varepsilon_{b,\ell,t}, \tag{3}$$

in which the controls $\mathbf{X}$ include up to two variables to yet more conservatively estimate traders' quote uncertainty.

Requested quantity is a key potential determinant of quotes that Equation (2) subsumes into unexpected shocks $\epsilon_{b,\ell(i,t),i,t}$. We assume that the requested quantity linearly and additively separably affects the quoted spread. Under this assumption, controlling for requested quantity in (3) yields an adjusted R-squared that corresponds to the share of quote variation known to the submitting trader.

We further control for the bond's future realized return. The expected returns of a bond would be an important contributor to the time-varying bond component $\eta_{b,t}$ of quoted spreads. The future realized returns removes any variation in quotes due to changes in expected returns, which only a perfectly informed trader would be able to predict.

Taken together, our design assigns to trader's uncertainty only the variation in quoted spreads that the regressors in specification (3) do not absorb. Doing so assumes that the traders perfectly know the effects of their own time-varying type interacted with all List-specific attributes, fixed bond characteristics, the requested quantity, as well as changes in future returns on their quoted spreads. We view the resulting adjusted R-squared as a

conservative upper bound on the share of quoted-spread variation that traders can predict.

B. Results

Table VII presents the estimates from regression (3). The adjusted R-squared is below 50% across all specifications, including in both pure IG Lists and HY Lists (including mixed grade).[7] We therefore conservatively conclude that more than half of the total variation in quoted spreads cannot be predicted by traders at the time of their List submissions. These traders thus face a high degree of quote uncertainty.

Three details of our estimates broadly support our econometric framework and economic intuition. First, having List fixed effects explains more than double the share of quoted-spread variation than having date fixed effects, consistent with time-varying trader type and List attributes playing a large role in quote setting. Second, the HY bond quotes are substantially less predictable than the investment-grade quotes in every specification, as we would expect given that the HY bonds are less liquid and higher risk. Third, adding future realized return hardly increases the explained share, consistent with the List and bond effects and the requested quantity capturing most of the plausibly explainable variation in quoted spreads.

C. What drives Quote Uncertainty?

We next ask whether quote uncertainty varies across the same dimensions along which substitution varies.

Table VIII reproduces the full specification of Table VII across subsamples split by average liquidity score, requested quantity, and trader type. Quote uncertainty is substantially larger for less liquid bonds: the residual standard deviation is 49.5 bps for the illiquid

[7] Sample sizes vary as some Lists have exactly one request with a response, and because we cannot compute returns if the bond lacks CP+ prices or has nonstandard coupon rates or schedules.

subsample versus 29.3 bps for the liquid one. It is also larger for Lists requesting bigger quantities (54.2 vs. 22.3 bps) and for non–asset manager Lists (60.4 vs. 19.3 bps). Each of these patterns mirrors the corresponding pattern in substitution intensity reported in Table VI. Traders substitute more intensely in precisely the settings where they face more uncertainty over the quotes they will receive.

To understand the bond-level drivers of quote uncertainty, Table IX regresses the absolute value of the residual from Column (4) of Table VII on a battery of request and bond characteristics. Requests by asset managers have substantially smaller absolute surprises, by 12 to 19 basis points, consistent with their Lists being more predictable as they tend to trade highly liquid bonds for which quotes are more certain. Larger requested quantities predict larger surprises, consistent with price impact uncertainty increasing in trade size. Most importantly, bonds with larger offering amounts have significantly smaller absolute surprises: a one-log-unit increase in offering amount reduces the absolute surprise by about 6 basis points. Larger offerings concentrate liquidity in fewer issues, reducing fragmentation and the resulting uncertainty over quotes. Remaining maturity and high-yield status both increase surprises, reflecting the greater fundamental uncertainty and dealer inventory risk associated with longer-duration and lower-rated bonds. Bond ratings, conditional on yield spread, do not independently predict quote surprises.

D. Does Fragmentation Drive Substitution?

We directly test whether substitution intensifies when fragmentation is more severe, using offering amount as an inverse proxy. Bonds with smaller offerings are traded less frequently and by fewer dealers, reflecting greater fragmentation of liquidity. As shown in Table IX, offering amount is also a strong predictor of quote uncertainty: larger offerings have significantly smaller absolute quote surprises.

Table X splits the sample into quintiles by the average offering amount of bonds in each List. The coefficient on rank by quoted spread declines monotonically from 9.8 pp in the smallest-offering quintile to 1.3 pp in the largest. Traders substitute nearly eight times as intensely among the most fragmented bonds. Table XI confirms the results by redoing the analysis in Lists split by quintiles according to the average quote uncertaintty of the bonds.

This result is consistent with a unified view in which fragmentation is costly because it creates uncertainty over quotes. If a trader could perfectly predict every bond's quote, she could request the single bond that will be quoted the smallest spread, and Lists would be redundant. It is precisely when quotes are uncertain—because liquidity is dispersed across many small issues—that traders benefit from requesting substitute bonds in a List and filling whichever receives the bestquotes.

V. Which Bond Attributes Matter to Traders?

We exploit substitute Lists to identify the bond attributes that are important to traders. We find that remaining maturity and yield spread are important to traders, whereas bond ratings are not important conditional on maturity and yield spread.

Empirical framework. If an attribute is important to a trader, she would treat the bonds that share this attribute as closer substitutes than the bonds that do not. She would then be especially likely to fill a bond request whose quoted spread is smaller than the other bonds in the List with the same important attribute relative to those without. Applying this intuition to our design, given an attribute, we split each List into two *subLists* corresponding to the requests whose value of this attribute is larger or smaller than the median within the List. We rank requests by their quoted spreads within the subLists, then add these within-subList ranks to our main specification (1). For the attributes important to traders, a higher corresponding within-subList rank would substantially increase fill rates of requests above

and beyond the overall within-List rank. We bring this modified design to the subsample of substitute Lists, because convenience Lists would not be informative about how traders substitute across bonds.

More precisely, consider the two subLists of List ℓ for some attribute $\mathcal{A} \in \{$bond rating, remaining maturity, yield spread$\}$. For maturity, one subList includes the requests in ℓ whose remaining bond maturity is less than the median across all requests in ℓ, and the other subList includes the other requests in ℓ. Requests exactly at the median are randomly assigned. Analogous steps generate the subLists for the other attributes.

We estimate the following specification on the subsample of substitute Lists:

$$F_{b,\ell,t} = a_1 R^{\mathcal{A}}_{b,\ell,t} + a_0 R_{b,\ell,t} + \text{cubic}(S_{b,\ell,t}) + \alpha_{\ell,t} + \gamma_b + \text{quadratic}(Q_{b,\ell,t}) + \varepsilon_{b,\ell,t}. \tag{4}$$

The new independent variable, $R^{\mathcal{A}}_{b,\ell,t}$, is the within-subList rank by quoted spread of bond request b in List ℓ on date t in attribute $\mathcal{A}$. We compute this rank the same way as the overall within-List rank $R_{b,\ell,t}$, except we treat the subList for attribute $\mathcal{A}$ to which request b belongs as an entire List. All other terms in (4) are identical to (1). We conclude that an attribute is important to traders if the coefficient a_1 is substantially positive.

We perform two falsification tests of this specification. First, we randomly partition Lists into halves and estimate the impacts of ranks within the resulting random subLists. We falsify our design if those within-random-subLists ranks have significant impacts.

Results. Table XII presents the estimates from (4). For the substitute Lists, the within-subList ranks in maturity and yield spread are statistically and economically significant and positive, both when the subList ranks for different attributes are included separately or jointly. The subList rank in rating is economically small and insignificant. The random subList rank is insignificant everywhere. We conclude that remaining maturity and yield spread are important to traders, whereas bond ratings are not. Comparing Columns (6) and

(7) we can also see that while maturity only matters for IG bonds, yield is and important factor in both IG Lists and non-IG Lists.

VI. Robustness

We verify that substitution within Lists is robust to alternative trading cost measures, higher-order controls for quoted spreads, incorporating repeated requests on and off the platform, and alternative sample splits. Section VI.A examines heterogeneity in substitution across List length, trader type, and trade direction. Section VI.B redoes our main tables using yield spreads instead of price spreads as the measure of trading costs. Section VI.C controls flexibly for higher order polynomials of quoted spreads. Section VI.D incorporates repeated requests to distinguish extensive-margin substitution from delayed filling. Section VI.E flexibly estimates the effects of decile rank on fill rates, and shows that the effects are approximately linear in rank. Section VI.F examines the determinants of receiving no response.

A. Heterogeneity

Table XIII reproduces Columns (3) and (5) in Table V across subsamples split by List length, trader type, and trade direction. Lists are either long, including 10 or more requests, or short. They consist entirely of buy or sell requests. Requesting traders that are not asset managers are either broker-dealers or proprietary traders labeled as other.

The results in Table XIII consistently show substitution, with estimated coefficients broadly similar to those in Table V. Both dealers and proprietary traders substitute far more intensely than asset managers, with coefficients of 21 and 10 pp respectively. Substitution is more intense within buy Lists than sell Lists (5.1 vs. 2.6 pp), perhaps because buyers are not restricted by their current holdings. Long Lists exhibit somewhat stronger

substitution than short Lists (4.4 vs. 2.9 pp).

B. Using Yield Spreads as Trading Costs

In our baseline analysis we measure trading costs using price spreads. An alternative is to annualize the total trading cost until maturity by using spreads measured in yields. Columns (1) and (2) of Table XIV reproduce our baseline specification with rank and spread controls computed from yield spreads instead of price spreads. The results are broadly consistent with our baseline estimates. We conclude that our results are not sensitive to the choice of spread measure.

C. Higher Order Quotes

Our baseline specification controls for a cubic polynomial of quoted spreads. This functional form flexibly absorbs the mechanical relationship between spreads and fill rates due to downward-sloping demand. To verify that our results do not depend on this particular functional form, Columns (3) and (4) of Table XIV replace the cubic with a seventh-order polynomial of quoted spreads. Substitution remains strongly significant in both subsamples.

D. Repeated Requests

Traders can substitute within Lists in two ways. First, at the extensive margin, traders can abandon the requests they leave unfilled in favor of higher ranked requests. Second, at the intensive margin, they can merely delay filling the lower ranked requests. For example, traders may face temporary budget constraints, and yet target a portfolio of specific bonds. Such traders would fill the higher ranked requests today, up to their budget constraints, then repeat the other requests as the constraints slacken.

This section isolates the intensity of substitution at the extensive margin by removing

any substitution due to repeated requests in our estimates. More precisely, we replace the dependent variable in our main regression (1) with a dummy *Not Abandoned* that equals one if and only if a request is filled *or* repeated, whether on MarketAxess or elsewhere. Appendix C describes the construction of this variable in detail using TRACE data.

Columns (5) and (6) of Table XIV present the results. Both coefficients are positive and strongly significant, though smaller than the baseline estimates. The reduction is expected: reclassifying repeated requests as not abandoned mechanically raises the fill rate of lower ranked requests, compressing the rank coefficient. That significant substitution remains after accounting for repeated requests confirms that traders abandon—not merely delay—their lower ranked requests.

E. Linearity of Ranking Effects

A sequence of dummy variables indicates the decile rank of each request's quoted spread among all quoted spreads within its List. The *top-Kth decile request* indicates a bond request whose quoted spread belongs to the smallest Kth decile among the quoted spreads in its List. The top decile is $K = 1$ and the bottom decile is $K = 10$. Requests without a quote are treated as if their quoted spread is larger than the largest one we observe in our sample.

Figure 2 plots the estimated coefficients in Lists of at least the Length of 10 for each decile from a regression identical to (1), except the rank $R_{b,\ell,t}$ is replaced by nine top Kth decile request indicators for $K \in \{2, \ldots, 10\}$. The top decile is the baseline. We find that the higher decile requests are more likely to fill than the lower decile requests in the same List. The estimated coefficients are linearly increasing across the deciles, consistent with linear rank effects.

F. No Responses

An extreme form of illiquidity is when a request receives no responses at all. Table XV examines the determinants of no response using the same battery of characteristics as the quote surprise regressions in Table IX. The patterns are strikingly similar. Requests by asset managers are 7 to 11 percentage points less likely to receive no response. Bonds with larger offering amounts are significantly less likely to go unquoted, consistent with larger issues being more liquid and attracting more dealer attention. High-yield bonds and bonds with higher excess yields are more likely to receive no response, reflecting the thinner dealer coverage for riskier and less liquid securities. These results reinforce the interpretation that fragmentation and illiquidity—the same forces that drive quote uncertainty—also determine whether a bond attracts any dealer attention at all.

VII. Contributions

Over-the-counter trading is typically modeled as search for a single asset (e.g., Duffie, Garleanu and Pedersen, 2005). Vayanos and Weill (2008) introduce two assets with identical cashflows into the search framework and show that one asset endogenously becomes more liquid. Sambalaibat (2022) adds nondirected search in CDS and bond markets and show that the presence of the CDS market increases liquidity in the bond market. Milbradt (2017) allows for a continuum of heterogeneous bonds and show that firms can prefer issuing fragmented bonds. Oehmke and Zawadowski (2015) and Oehmke and Zawadowski (2017) model substitution between bonds and their CDS and show that bond fragmentation drives trading in the more liquid CDS market. None of these models incorporate substitutability between multiple assets as we do.

Recent theories analyze multi-dealer platforms, such as MarketAxess. Baldauf and Mollner (2023) consider the potential for information leakage from contacting many dealers.

Wang (2023) shows that it is optimal for traders request quotes only a few dealers at a time. We instead examine whether a trader would request multiple bonds at once.

We belong to the empirical literature on multi-dealer platforms. Hendershott and Madhavan (2015) examine factors that determine whether a trader uses a platform or bilaterally trade with a dealer. O'Hara and Alex Zhou (2021) find that the introduction of multi-dealer platforms reduced transaction costs. Allen and Wittwer (2023) identify relationship discounts as the driver of limited platform adoption in sovereign bond markets. Kargar, Lester, Plante and Weill (2023) document that traders often repeat unfilled requests both on and off platforms. Hendershott, Livdan and Schürhoff (2021) find that the option to anonymously request quotes from nondealer participants improves transaction costs. No prior work studies Lists, despite their dominance on the largest corporate bond platform and their ability to aggregate liquidity across substitute bonds.

A complementary literature examines portfolio trading, which is the simultaneous trading of a set of bonds with the same dealer. Meli and Todorova (2022) develop an algorithm to identify portfolio trades in TRACE. Li et al. (2023) apply this algorithm and find that portfolio trading increases bond market liquidity. Wittwer and Allen (2024) document frequent bundling of trades within and across asset classes in fixed income markets. The bonds in a bundle or a portfolio trade must be complements. We instead document that the dominant form of trading on the largest corporate bond platform is used to substitute across bonds.

Chaudhary, Fu and Li (2022) measure the price impacts of demand shocks on sets of similar bonds. List trading is a potential channel through which demand shocks propagate across similar bonds.

References

Allen, J., Wittwer, M., 2023. Centralizing Over-The-Counter Markets? Journal of Political Economy doi:10.1086/725361.

Baldauf, M., Mollner, J., 2023. Competition and Information Leakage. Journal of Political Economy , 000–000doi:10.1086/727709.

Barnes, D., 2025. "A fixed income price is not a fact. A fixed income price is an opinion". URL: https://www.fi-desk.com/a-fixed-income-price-is-not-a-fact-a-fixed-income-price-is-an-opinion/.

Chaudhary, M., Fu, Z., Li, J., 2022. Corporate Bond Multipliers: Substitutes Matter. doi:10.2139/ssrn.4292266.

Colla, P., Ippolito, F., Li, K., 2013. Debt Specialization. The Journal of Finance 68, 2117–2141. URL: https://onlinelibrary.wiley.com/doi/abs/10.1111/jofi.12052, doi:10.1111/jofi.12052. _eprint: https://onlinelibrary.wiley.com/doi/pdf/10.1111/jofi.12052.

Duffie, D., Garleanu, N., Pedersen, L.H., 2005. Over-the-Counter Markets. Econometrica 73, 1815–1847. doi:10.1111/j.1468-0262.2005.00639.x.

Hendershott, T., Livdan, D., Schürhoff, N., 2021. All-to-All Liquidity in Corporate Bonds. doi:10.2139/ssrn.3895270.

Hendershott, T., Madhavan, A., 2015. Click or Call? Auction versus Search in the Over-the-Counter Market. Journal of Finance 70, 419–447. doi:10.1111/jofi.12164.

Jacobsen, S.E., Venkataraman, K., Xu, D.X., 2025. Illiquidity meets intelligence: Ai-driven price discovery in corporate bonds. Available at SSRN 5297667 .

Kargar, M., Lester, B.R., Plante, S., Weill, P.O., 2023. Sequential Search for Corporate Bonds. doi:10.2139/ssrn.4284242.

Koont, N., Ma, Y., Pastor, L., Zeng, Y., 2025. Steering a Ship in Illiquid Waters: Active Management of Passive Funds. Review of Financial Studies 38, 2887–2935. URL: https://academic.oup.com/rfs/article-abstract/38/10/2887/8133974, doi:10.1093/rfs/hhaf003.

Li, J.S., O'Hara, M., Rapp, A.C., Zhou, X.A., 2023. Bond Market Illiquidity: Is Portfolio Trading the Solution? doi:10.2139/ssrn.4495516.

Meli, J., Todorova, Z., 2022. Portfolio Trading in Corporate Bond Markets. doi:10.2139/ssrn.4295453.

Milbradt, K., 2017. Asset heterogeneity in over-the-counter markets. working paper .

Murphy, R., Weinhardt, F., 2020. Top of the Class: The Importance of Ordinal Rank. The Review of Economic Studies 87, 2777–2826. URL: https://doi.org/10.1093/restud/rdaa020, doi:10.1093/restud/rdaa020.

Oehmke, M., Zawadowski, A., 2015. Synthetic or real? the equilibrium effects of credit default swaps on bond markets. Review of Financial Studies 28, 3303–3337.

Oehmke, M., Zawadowski, A., 2017. The Anatomy of the CDS Market. Review of Financial Studies 30, 80–119. doi:10.1093/rfs/hhw068.

O'Hara, M., Alex Zhou, X., 2021. The electronic evolution of corporate bond dealers. Journal of Financial Economics 140, 368–390. doi:10.1016/j.jfineco.2021.01.001.

Rauh, J.D., Sufi, A., 2010. Capital Structure and Debt Structure. The Review of Financial Studies 23, 4242–4280. URL: https://doi.org/10.1093/rfs/hhq095, doi:10.1093/rfs/hhq095.

Sambalaibat, B., 2022. A theory of liquidity spillover between bond and cds markets. The Review of Financial Studies 35, 2525–2569.

Vayanos, D., Weill, P.O., 2008. A Search-Based Theory of the On-the-Run Phenomenon. Journal of Finance 63, 1361–1398. doi:10.1111/j.1540-6261.2008.01360.x.

Wang, C., 2023. The limits of multi-dealer platforms. Journal of Financial Economics 149, 434–450.

Wittwer, M., Allen, J., 2024. Bundling trades in over-the-counter markets. SSRN working paper .

Table I: Example of Observations in the Same List

The Table shows the composition of a specific List order of length 10. Each line is a separate request for a bond with a different CUSIP identifier within the same order. *Quoted spread* measures the difference between the best offered price and the CP+ midprice as a percentage of the midprice. *Rank by quoted spread* takes the value of 1 for the bond with the lowest *Quoted Spread* in the list and 0 for the one with the highest, linearly decreasing inbetween. Table II defines all other variables.

Order ID	CUSIP	Buy	Requested quantity ($ '000)	Responses	Quoted spread (bps)	Filled	Rank by quoted spread
90982045	89055FAC7	1	250	3	22.86	1	1.00
90982045	25257DAA6	1	250	5	37.43	1	0.89
90982045	05453GAC9	1	250	7	45.34	1	0.78
90982045	043436AX2	1	250	6	83.66	1	0.67
90982045	52736RBJ0	1	250	5	89.24	0	0.56
90982045	75606DAQ4	1	500	2	94.21	0	0.44
90982045	00081TAK4	1	500	5	113.36	1	0.33
90982045	44267DAF4	1	500	4	159.68	1	0.22
90982045	390607AF6	1	250	1	271.98	0	0.11
90982045	45174AAA0	1	500	0	-	0	0.00

Table II: Variable definitions

Name	**Variable definition**
List attributes:	
Length	number of different bonds requested in a List
Asset Manager	requester type is flagged as asset manager
Broker-Dealer	requester type is flagged as broker-dealer
Other	indicator if requester type is flagged neither as asset manager, nor as broker-dealer by the platform
Request and bond attributes:	
Buy	indicator of 1 if buy, 0 if sell
CP+ available	indicator whether a CP+ algorithmic price is available and reported by the platform
CP+ implied spread	the difference between CP+ offer and bid prices normalized by the CP+ midprice at the time of the request in basis points
CP+ excess yield	the average of the reported CP+ bid and offer spreads (above the maturity-matched Treasury yield) at the time of the request in basis points
High Yield (HY)	bond requested using High Yield protocol
Investment Grade (IG)	bond requested using High Grade protocol
Liquidity score	liquidity score reported by the platform at the time of the request, (1 least liquid to 10 most liquid)
Offering amount	par value of bonds initially offered in millions of USD
Remaining maturity	the remaining time to maturity of the bond in years
Requested quantity	par value of bonds requested in millions of USD
S&P rating	S&P rating of the bond at the time of the request in notches ($AAA = 1$ to $D = 22$)
Outcomes:	
Filled	indicator whether the request was filled in full quantity
No response	indicator of getting no responses for a given request
Partially filled	indicator whether the request was filled but not in full quantity
Quoted spread	the difference between the best offered price and the CP+ midprice as a percentage of the midprice
Rank by quoted spread	within a list we rank *Quoted spread* from lowest (rank 1) to highest (rank 0), if the CP+ price does not exist for the bond or there are no responses, it is assumed to have the highest transaction cost, ties are decided randomly
Responses	number of responses received for the given request
Rejected all quotes	indicator whether all offers were rejected conditional on getting at least one response
Not filled at best response	indicator if request was filled not at the best response

Table III: Summary Statistics at the Request-level

Mean and 10th, 25th, 50th, 75th and 90th percentile of the most important request-level variables using all 7,814,445 requests submitted in Lists. Table II defines all variables.

	Mean	p10	p25	p50	p75	p90
Submitter types:						
Asset Manager	0.567	0	0	1	1	1
Broker-Dealer	0.216	0	0	0	0	1
Other	0.217	0	0	0	0	1
Request and bond attributes:						
Buy	0.473	0	0	0	1	1
CP+ available	0.970	1	1	1	1	1
CP+ excess yield (bps)	180.7	32.5	68.2	123.9	234.5	389.3
CP+ implied spread (bps)	13.3	3.37	5.69	9.91	17.0	27.2
Liquidity score	6.72	3	5	7	9	10
Offering amount (mill. USD)	1,225	400	550	996	1,500	2,500
Remaining maturity (years)	8.87	2.41	3.88	6.2	9.17	23.3
Requested quantity (mill. USD)	0.456	0.006	0.025	0.165	0.587	1
S&P rating (notch)	9.18	5	7	9	11	14
Outcomes:						
Filled	0.631	0	0	1	1	1
No response	0.064	0	0	0	0	0
Partially filled	0.0046	0	0	0	0	0
Not filled at best response	0.0054	0	0	0	0	0
Outcomes $\mid \geq 1$ responses:						
Filled	0.674	0	0	1	1	1
Quoted spread (bps)	32.6	-4.21	2.06	10.6	35.0	92.0
Quoted spread (bps) | Filled	11.8	-6.67	0.38	5.68	16.2	36.3
Quoted spread (bps) | Rejected all quotes	76.7	4.07	15.4	42.6	99.5	203.3
Rejected all quotes	0.326	0	0	0	1	1
Responses	8.39	2	4	8	12	15

Table IV: Summary Statistics at the List-level

Mean and 10th, 25th, 50th, 75th and 90th percentile of the most important list-level variables using all 616,052 Lists. Table II defines all variables.

	Mean	p10	p25	p50	p75	p90
List attributes:						
Length	12.7	2	3	6	15	38
All buys	0.470	0	0	0	1	1
All sells	0.514	0	0	1	1	1
Mixed direction	.0161	0	0	0	0	0
All IG	.722	0	0	1	1	1
All HY	.23	0	0	0	0	1
Mixed grade	.0475	0	0	0	0	0
Submitter type:						
Asset Manager	.643	0	0	1	1	1
Broker-Dealer	.124	0	0	0	0	1
Other	.234	0	0	0	0	1

Table V: Request Filled Conditional on the Rank by Quoted Spread

Results of regression specification (1). An observation is a bond request in a List. We exclude requests that did not receive a quote or for which the CP+ price is not available. The dependent variable is the dummy *Filled* indicating whether a bond request fills. The main independent variable of interest is *Rank by quoted spread* which takes the value of 1 for the bond with the lowest *Quoted Spread* in the List and 0 for the one with the highest, linearly decreasing inbetween. Columns (1)-(3) include all Lists with increasing number of controls. Column (4) includes Lists purely composed of IG bond requests, Column (5) includes HY and mixed grade Lists. Table II defines all variables. Square brackets indicate t-statistics clustered by List and by Bond.

	All Lists			Rating	
	(1)	(2)	(3)	(4) IG	(5) non-IG
Rank by quoted spread	0.037	0.039	0.039	0.026	0.11
	[35.2]	[36.8]	[36.8]	[25.4]	[46.1]
Adjusted R^2	0.709	0.714	0.714	0.739	0.637
Within R^2	0.096	0.085	0.085	0.056	0.122
List FE	Yes	Yes	Yes	Yes	Yes
Bond FE		Yes	Yes	Yes	Yes
Spread Controls	Yes	Yes	Yes	Yes	Yes
Quantity Controls			Yes	Yes	Yes
Number of Lists	592,052	591,931	591,931	426,153	165,731
Number of Bonds	17,235	16,484	16,484	12,763	14,230
Number of Obs.	7,137,423	7,136,560	7,136,560	4,906,262	2,229,256

Table VI: Fill Rates Conditional on the Rank by Quoted Spread

Results of regression specification (1). An observation is a bond request in a List. We exclude requests that did not receive a quote or do not have a CP+ benchmark price. The dependent variable is the dummy *Filled* indicating whether a bond request fills. The main independent variable of interest *Rank by quoted spread* takes the value of 1 for the bond with the lowest *Quoted Spread* in the list and 0 for the one with the highest, linearly decreasing inbetween. Column (1) includes Lists with above median average *Liquidity Score* for any given list length, while Column (2) those below. Column (3) includes Lists with below median average *Requested Quantity* for any given list length, while Column (2) those above. Column (5) includes Lists requested submitted by *Asset Managers*, while Column (6) those requested by any other trader. Table II defines all variables. Square brackets indicate t-statistics clustered by List and by Bond.

	Liquidity Score		Requested Quantity		Trader Type	
	(1) liquid	(2) illiquid	(3) small	(4) large	(5) AM	(6) non-AM
Rank by quoted spread	0.022	0.069	0.011	0.10	0.020	0.16
	[19.7]	[48.1]	[10.8]	[68.5]	[21.2]	[68.1]
Adjusted R^2	0.732	0.682	0.699	0.658	0.531	0.614
Within R^2	0.072	0.095	0.059	0.103	0.084	0.106
List FE	Yes	Yes	Yes	Yes	Yes	Yes
Bond FE	Yes	Yes	Yes	Yes	Yes	Yes
Spread Controls	Yes	Yes	Yes	Yes	Yes	Yes
Quantity Controls	Yes	Yes	Yes	Yes	Yes	Yes
Number of Lists	292,907	298,938	294,291	297,524	387,162	204,625
Number of Bonds	14,435	16,144	15,625	15,656	15,814	15,357
Number of Obs.	3,668,690	3,466,691	3,740,093	3,395,458	4,306,596	2,829,020

Table VII: Explaining Quoted Spreads within Lists

Results of regression specification (3). An observation is a bond request in a List. We exclude requests that did not receive a quote or do not have a CP+ benchmark price. The dependent variable is the *Quoted Spread* measured in basis points. *Residual Std. Dev.* is the standard deviation of the residuals (after winsorizing at the 1% and the 99% level) from the regression measured in basis points or in USD when multiplied by the *Quantity Requested*. Columns (1)-(4) include all Lists with increasing number of controls, Column (5) includes Lists purely composed of IG bond requests, Column (6) includes HY and mixed grade Lists. Table II defines all variables. Square brackets indicate t-statistics clustered by List and by Bond.

	All Lists				Rating	
	(1)	(2)	(3)	(4)	(5) IG	(6) non-IG
CP+ implied spread	2.48	2.42	1.11	0.86	0.60	1.07
	[152.4]	[151.6]	[80.6]	[86.6]	[64.2]	[73.6]
Adjusted R^2	0.176	0.190	0.290	0.496	0.511	0.429
Within R^2	0.176	0.158	0.025	0.016	0.012	0.020
Residual Std. Dev. (bps)	56.5	55.9	52.3	40.5	24.1	63.9
Residual Std. Dev. (USD)	3,957	3,889	3,598	2,871	1,629	4,772
List FE				Yes	Yes	Yes
Bond FE			Yes	Yes	Yes	Yes
Date FE		Yes				
Quantity Controls	Yes	Yes	Yes	Yes	Yes	Yes
Number of Lists	612,170	612,170	612,116	591,931	426,153	165,731
Number of Bonds	17,283	17,283	16,535	16,484	12,763	14,230
Number of Obs.	7,157,541	7,157,541	7,156,793	7,136,560	4,906,262	2,229,256

Table VIII: Explaining Quoted Spreads within Lists: Sample Splits

Results of regression specification (3). An observation is a bond request in a List. We exclude requests that did not receive a quote or do not have a CP+ benchmark price. The dependent variable is the *Quoted Spread* measured in basis points. *Residual Std. Dev.* is the standard deviations of the residuals (after winsorizing at the 1% and the 99% level) from the regression measured in basis points or in USD when multiplied by the *Quantity Requested*. Column (1) includes Lists with above median average *Liquidity Score* for any given list length, while Column (2) those below. Column (3) includes Lists with below median average *Requested Quantity* for any given list length, while Column (2) those above. Column (5) includes Lists requested by *Asset Managers*, while Column (6) those requested by anyone else. Table II defines all variables. Square brackets indicate t-statistics clustered by List and by Bond.

	Liquidity Score		Requested Quantity		Trader Type	
	(1)	(2)	(3)	(4)	(5)	(6)
	liquid	illiquid	small	large	AM	non-AM
CP+ implied spread	0.78	0.90	0.59	1.03	0.56	1.07
	[61.1]	[79.4]	[57.5]	[83.7]	[61.8]	[82.6]
Adjusted R^2	0.507	0.470	0.569	0.440	0.457	0.435
Within R^2	0.013	0.018	0.014	0.018	0.016	0.018
Residual Std. Dev. (bps)	29.3	49.5	22.3	54.2	19.3	60.4
Residual Std. Dev. (USD)	2,223	3,464	227	4,705	1,141	4,541
List FE	Yes	Yes	Yes	Yes	Yes	Yes
Bond FE	Yes	Yes	Yes	Yes	Yes	Yes
Date FE						
Quantity Controls	Yes	Yes	Yes	Yes	Yes	Yes
Number of Lists	292,907	298,938	294,291	297,524	387,162	204,625
Number of Bonds	14,435	16,144	15,625	15,656	15,814	15,357
Number of Obs.	3,668,690	3,466,691	3,740,093	3,395,458	4,306,596	2,829,020

Table IX: Determinants of Request-level Absolute Quote Surprises

The dependent variable is the in absolute value of the residual of the *Quoted spread* (bps) from the model of Column (4) in Table VII. An observation is a bond request in a List. We exclude requests that did not receive a quote or do not have a CP+ benchmark price. All columns include all Lists with different regressors. Table II defines all variables. Square brackets indicate t-statistics clustered by List and by Bond.

	All Lists						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Asset Manager	-19.3	-18.1	-18.2	-12.9	-12.6	-12.0	
	[-116.3]	[-111.6]	[-108.7]	[-105.3]	[-105.8]	[-107.2]	
Quantity Requested (log)	2.63	2.53	2.46	1.37	1.32	1.26	2.14
	[84.9]	[78.3]	[78.4]	[57.9]	[59.3]	[64.8]	[81.3]
Offering amount (log)		-8.75		-5.76	-5.77		
		[-49.9]		[-43.1]	[-46.6]		
Liquidity score			-2.90				
			[-64.6]				
Remaining maturity (log)				7.68	6.32	6.21	5.46
				[79.5]	[59.2]	[11.2]	[9.53]
High Yield				14.9	12.2	6.46	7.39
				[41.3]	[37.2]	[14.7]	[16.2]
S&P rating				1.00	0.0041		
				[20.0]	[0.076]		
CP+ excess yield					0.034	0.028	0.029
					[23.4]	[21.8]	[21.7]
Adjusted R^2	0.177	0.209	0.219	0.292	0.308	0.357	0.334
Within R^2	0.144	0.176	0.187	0.263	0.280	0.060	0.026
List FE							Yes
Bond FE						Yes	Yes
Date FE	Yes	Yes	Yes	Yes	Yes	Yes	
Number of Lists	591,931	590,241	591,123	586,272	586,001	589,931	589,931
Number of Bonds	16,484	14,218	15,195	13,430	13,364	14,134	14,134
Number of Obs.	7,136,560	6,988,786	7,097,389	6,768,520	6,747,372	6,963,353	6,963,353

Table X: Fill Rates: Sample Split by Offering Amount

Results of regression specification (1). An observation is a bond request in a List. We exclude requests that did not receive a quote or do not have a CP+ benchmark price. The dependent variable is the dummy *Filled* indicating whether a bond request fills. The main independent variable of interest *Rank by quoted spread* takes the value of 1 for the bond with the lowest *Quoted Spread* in the list and 0 for the one with the highest, linearly decreasing inbetween. The sample of all Lists is split into quintiles at each *List Length* along the average *Offering amount* in the List, which is calculated by averaging the *Offering amount* of the bonds in the List. Table II defines all variables. Square brackets indicate t-statistics clustered by List and by Bond.

	Quintiles by Offering Amount				
	(1)	(2)	(3)	(4)	(5)
	1st	2nd	3rd	4th	5th
Rank by quoted spread	0.0978	0.0636	0.0457	0.0316	0.0128
	[40.3]	[32.1]	[26.3]	[20.7]	[9.11]
Adjusted R^2	0.639	0.703	0.715	0.717	0.760
Within R^2	0.114	0.092	0.083	0.071	0.051
List FE	Yes	Yes	Yes	Yes	Yes
Bond FE	Yes	Yes	Yes	Yes	Yes
Spread Controls	Yes	Yes	Yes	Yes	Yes
Quantity Controls	Yes	Yes	Yes	Yes	Yes
Number of Lists	110,255	119,408	119,420	121,012	119,926
Number of Bonds	15,196	14,723	14,475	13,809	12,235
Number of Obs.	1,286,170	1,391,520	1,442,567	1,487,587	1,519,801

Table XI: Fill Rates: Sample Split by Quote Uncertainty

Results of regression specification (1). An observation is a bond request in a List. We exclude requests that did not receive a quote or do not have a CP+ benchmark price. The dependent variable is the dummy *Filled* indicating whether a bond request fills. The main independent variable of interest *Rank by quoted spread* takes the value of 1 for the bond with the lowest *Quoted Spread* in the list and 0 for the one with the highest, linearly decreasing inbetween. The sample of all Lists is split into quintiles at each *List Length* along the average quote uncertainty of the List, which is calculated by averaging the quote uncertainty of the bonds in the list. Bond-level quote uncertainty is the standard deviation of the residuals (after winsorizing at the 1% and the 99% level) for a given bond using residuals from the regression in Column (4) of Table VII. Table II defines all variables. Square brackets indicate t-statistics clustered by List and by Bond.

	Quintiles by Quote Uncertainty				
	(1)	(2)	(3)	(4)	(5)
	1st	2nd	3rd	4th	5th
Rank by quoted spread	0.0264	0.0219	0.0442	0.0631	0.102
	[17.5]	[14.1]	[23.0]	[27.1]	[39.3]
Adjusted R^2	0.650	0.715	0.702	0.677	0.622
Within R^2	0.031	0.054	0.074	0.093	0.129
List FE	Yes	Yes	Yes	Yes	Yes
Bond FE	Yes	Yes	Yes	Yes	Yes
Spread Controls	Yes	Yes	Yes	Yes	Yes
Quantity Controls	Yes	Yes	Yes	Yes	Yes
Number of Lists	121,363	120,724	119,470	117,181	112,839
Number of Bonds	9,761	13,620	14,618	14,823	13,274
Number of Obs.	1,532,441	1,502,180	1,453,766	1,370,397	1,272,499

Table XII: Fill Rates Using subLists Formed Along Different Bond Attributes

Results of regression specification (1). An observation is a bond request in a List. We exclude requests that did not receive a quote or do not have a CP+ benchmark price. The dependent variable is the dummy *Filled* indicating whether a bond request fills. The main independent variable of interest *Rank by quoted spread* takes the value of 1 for the bond with the lowest *Quoted Spread* in the list and 0 for the one with the highest, linearly decreasing inbetween. In each List we form subLists along several dimensions, where we split the list into two sublists at the median value of the given attribute. *SubList rank: attribute* is the rank by *Quoted spread* within the subList formed along the given attribute. We exclude Lists shorther that four requests to make sure both subLists have at least two. Columns (1)-(5) include all Lists, Column (6) includes Lists purely composed of IG bond requests, Column (7) includes HY and mixed grade Lists. Table II defines all variables. Square brackets indicate t-statistics clustered by List and by Bond.

	All Lists					Rating	
	(1)	(2)	(3)	(4)	(5)	(6) IG	(7) non-IG
Rank by quoted spread	0.019	0.042	0.024	0.044	0.011	-0.0018	0.097
	[12.6]	[26.9]	[16.3]	[30.2]	[5.19]	[-0.84]	[18.9]
Sublist rank: maturity	0.019				0.015	0.019	0.0019
	[25.0]				[16.2]	[19.1]	[0.91]
Sublist rank: rating		0.0013			-0.0014	-0.00041	-0.0023
		[1.61]			[-1.55]	[-0.42]	[-1.12]
Sublist rank: yield			0.014		0.0089	0.0069	0.014
			[17.8]		[9.29]	[6.74]	[6.26]
Sublist rank: random				-0.00081	-0.00064	-0.0015	0.0023
				[-1.06]	[-0.66]	[-1.49]	[1.00]
Adjusted R^2	0.715	0.716	0.716	0.716	0.713	0.733	0.636
Within R^2	0.085	0.086	0.085	0.086	0.084	0.056	0.123
List FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bond FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Spread Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Quantity Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of Lists	345,541	318,155	342,503	420,665	241,435	174,799	66,635
Number of Bonds	15,978	15,974	16,047	16,309	15,604	12,093	12,579
Number of Obs.	5,241,524	5,078,693	5,321,756	6,734,069	3,417,438	2,463,865	952,123

Table XIII: Robustness of Baseline Results: Different Sample Splits

We reproduce Columns (3) and (5) in Table V with different sample splits. Column (1) includes Lists *List Length* of at least 10, while Column (2) those below 10. Column (3) includes Lists submitted by *Broker-Dealers*, while Column (4) those categorized as *Other* traders (i.e. neither *Asset Manager*, nor *Broker-Dealer*). Lists in Column (5) only contain *Buy* requests, while those in Column (6) only sell requests. Table II defines all variables. Square brackets indicate t-statistics clustered by List and by Bond.

	List Length		Trader Type		Direction	
	(1) Short Lists	(2) Long Lists	(3) Broker-Dealer	(4) Other	(5) Buy	(6) Sell
Rank by quoted spread	0.029	0.044	0.21	0.10	0.051	0.026
	[29.8]	[29.2]	[64.8]	[39.6]	[33.9]	[22.7]
Adjusted R^2	0.653	0.726	0.424	0.600	0.693	0.738
Within R^2	0.078	0.088	0.114	0.121	0.088	0.080
List FE	Yes	Yes	Yes	Yes	Yes	Yes
Bond FE	Yes	Yes	Yes	Yes	Yes	Yes
Spread Controls	Yes	Yes	Yes	Yes	Yes	Yes
Quantity Controls	Yes	Yes	Yes	Yes	Yes	Yes
Number of Lists	362,970	228,860	72,865	131,669	284,481	309,924
Number of Bonds	15,744	15,840	14,116	14,594	15,504	15,858
Number of Obs.	1,478,578	5,657,069	1,300,085	1,527,986	3,362,893	3,765,794

Table XIV: Robustness of Baseline Results: Different Measures

We reproduce Columns (3) and (5) in Table V with different measures and controls. In Columns (1)-(2) we replace *Rank by quoted spread* and *Spread Controls* measured based on price spreads in Table V with spreads measured in terms of yields. In Columns (3)-(4) we add *Spread Controls* up to 7th order instead of the baseline of up to 3rd order in Table V. In Columns (5)-(6) we replace the dependent variable *Filled* with a generalized indicator *Not Abandoned* expands the notion of filling a request by any request that was repeated on or off platform, for details see Appendix C. In each column pair, the first column is for *All Lists* , while the second is for *non-IG* Lists. Table II defines all variables. Square brackets indicate t-statistics clustered by List and by Bond.

	Yield Spreads		Higher Order Quotes		Not Abandoned	
	(1)	(2)	(3)	(4)	(5)	(6)
	All	non-IG	All	non-IG	All	non-IG
Rank by quoted spread (Yield)	0.044	0.084				
	[40.2]	[36.6]				
Rank by quoted spread (Price)			0.020	0.089	0.028	0.052
			[18.6]	[35.9]	[38.8]	[33.2]
Adjusted R^2	0.713	0.632	0.716	0.640	0.474	0.371
Within R^2	0.082	0.107	0.094	0.130	0.012	0.012
List FE	Yes	Yes	Yes	Yes	Yes	Yes
Bond FE	Yes	Yes	Yes	Yes	Yes	Yes
Spread Controls (up to 3rd order)	Yes	Yes			Yes	Yes
Spread Controls (up to 7th order)			Yes	Yes		
Quantity Controls	Yes	Yes	Yes	Yes	Yes	Yes
Number of Lists	591,458	164,342	591,931	165,731	591,931	165,731
Number of Bonds	16,442	14,160	16,484	14,230	16,484	14,230
Number of Obs.	7,124,395	2,198,702	7,136,560	2,229,256	7,136,560	2,229,256

Table XV: Determinants of No Response

The dependent variable is the dummy *No response* indicating whether a bond request received no responses. An observation is a bond request in a List. All columns include all Lists with varying regressors. Table II defines all variables. Square brackets indicate t-statistics clustered by List and by Bond.

	All Lists						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Asset Manager	-0.11	-0.097	-0.093	-0.087	-0.070	-0.065	
	[-79.1]	[-73.8]	[-75.3]	[-66.8]	[-66.4]	[-66.5]	
Quantity Requested (log)	0.010	0.0098	0.0097	0.0078	0.0089	0.0091	0.014
	[41.1]	[38.1]	[39.1]	[32.0]	[41.0]	[42.3]	[50.9]
Offering amount (log)		-0.047		-0.040	-0.025		
		[-43.7]		[-34.8]	[-29.6]		
Liquidity score			-0.016				
			[-57.8]				
Remaining maturity (log)				0.0029	-0.0044	0.0020	-0.0020
				[3.90]	[-7.29]	[0.43]	[-0.41]
High Yield				0.025	0.029	0.020	0.026
				[10.4]	[13.9]	[7.11]	[9.04]
S&P rating				0.0034	-0.00040		
				[10.0]	[-1.25]		
CP+ excess yield					0.00012	0.00013	0.00014
					[16.3]	[16.1]	[16.3]
Adjusted R^2	0.082	0.100	0.110	0.107	0.114	0.173	0.159
Within R^2	0.070	0.088	0.097	0.094	0.097	0.034	0.017
List FE							Yes
Bond FE						Yes	Yes
Date FE	Yes	Yes	Yes	Yes	Yes	Yes	
Number of Lists	616,052	612,677	613,760	607,519	605,067	610,136	610,136
Number of Bonds	21,570	16,388	17,150	14,994	13,914	14,589	14,589
Number of Obs.	7,814,445	7,600,428	7,692,338	7,344,263	7,153,937	7,388,494	7,388,494

Figure 1: MarketAxess Client Order Screen

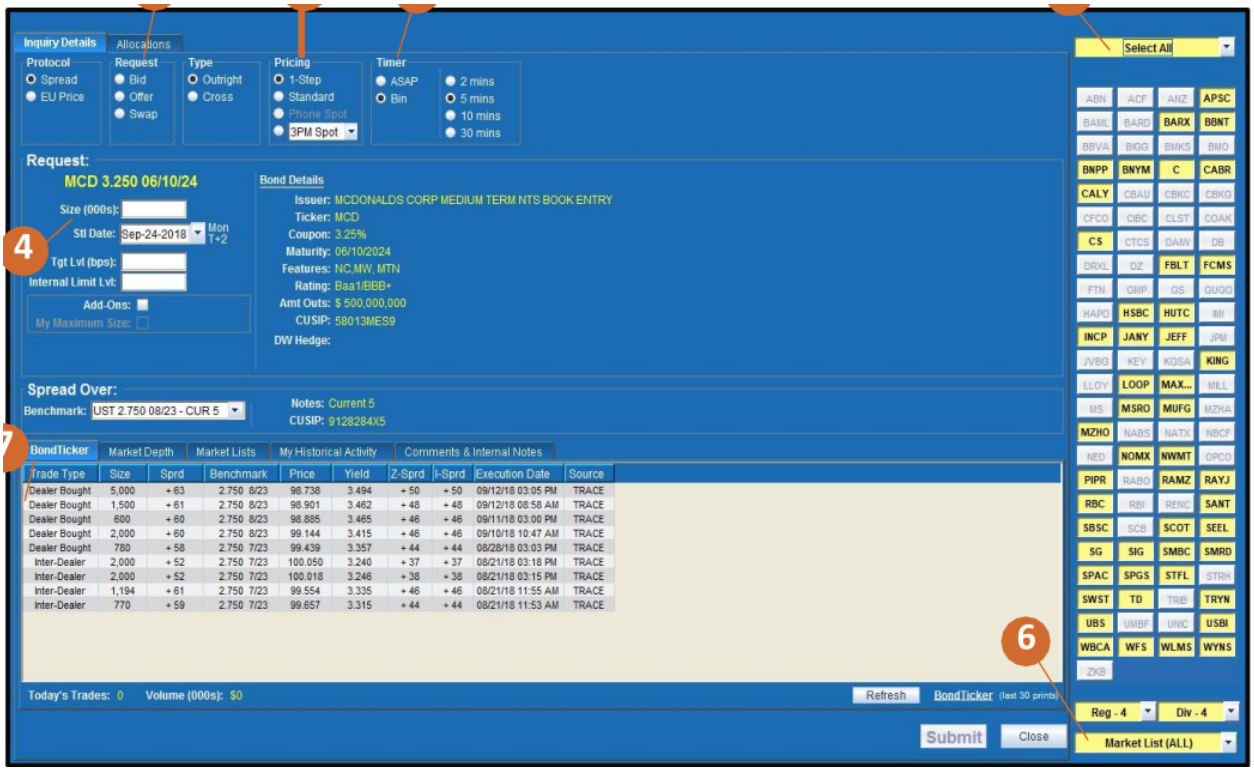
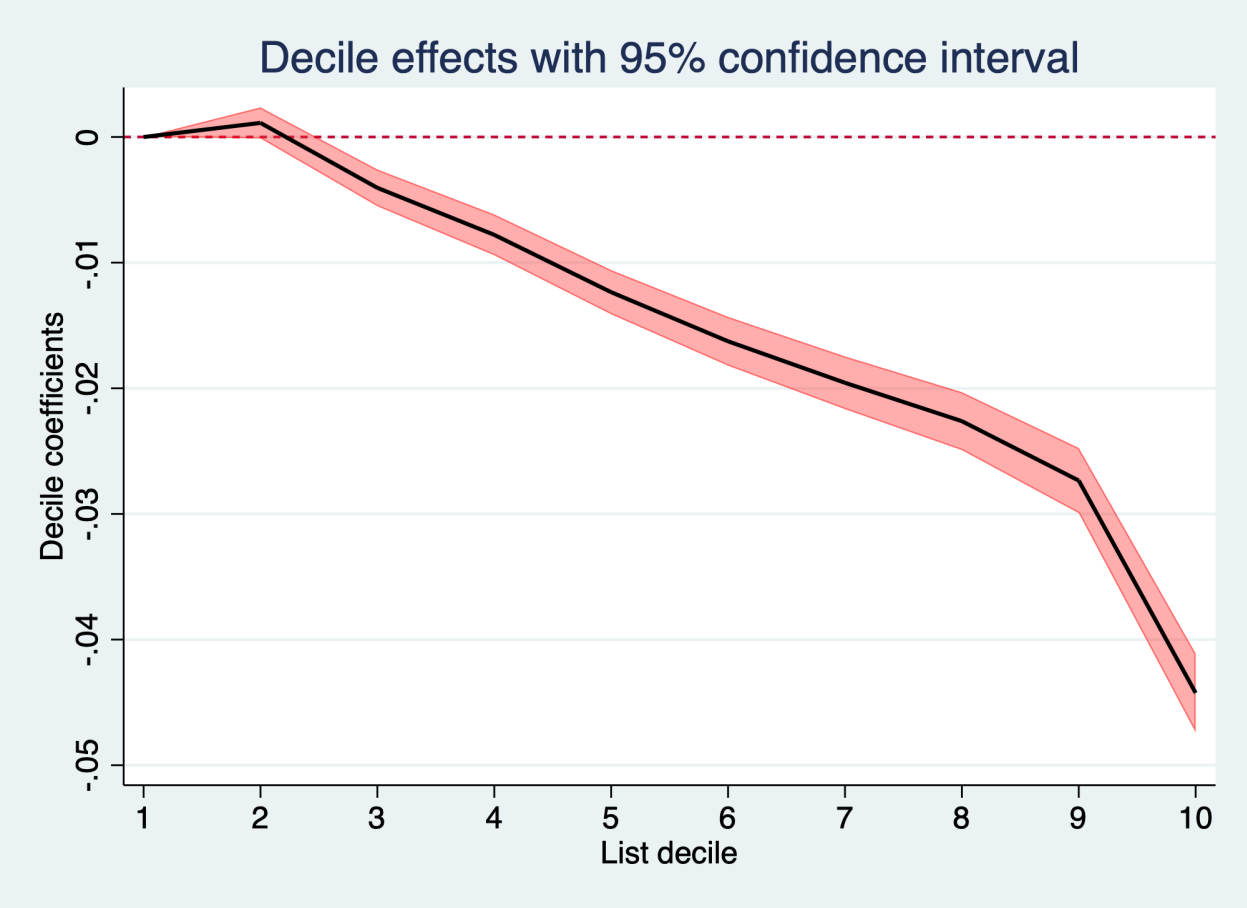


Figure 2: The effect of deciles on fill rates

Results of regression specification (1) using Lists of *List length* of at least 10 but with decile dummies for rank within the List by *Quoted spread* instead of the continuous variable *Rank by quoted spread* as independent variables. An observation is a bond request in a List. We exclude requests that did not receive a quote. The dependent variable is a dummy *Filled* indicating whether a bond request fills. The graph shows the coefficients on the 10 deciles, setting the first decile (the one with the lowest *Quoted spread*) as a zero. The shaded area is the 95% confidence interval.



A. Imputing Quoted Prices

The quotes for IG requests are reported in terms of the excess yields (quoted bond yield minus Treasury benchmark yield). Thus for IG quotes we need to convert the quoted excess yields into prices using the reported CP+ benchmark prices and yields.[8] For every request, we observe the CP+ bid and ask prices, the bid and ask yields, and the excess yield of the CP+ bid and ask yields relative to the benchmark treasury yield. A model-free linear transformation provides the *Quoted Price*:

$$\begin{aligned}\text{Quoted Price} = \text{`CP+ ask price'} \\ - \frac{\text{`CP+ ask price'} - \text{`CP+ bid price'}}{\text{`CP+ bid excess yield'} - \text{`CP+ ask excess yield'}} \\ \times (\text{`Quoted Excess Yield'} - \text{`CP+ ask excess yield'}),\end{aligned}$$

which we set to missing if the resulting best quoted price deviates by more than 50% from the CP+ midprice.

For Table XIV we also need to convert quoted prices of High Yield bonds into excess yields. We use a model-free linear transformation to get the *Quoted excess yield*

$$\begin{aligned}\text{Quoted excess yield} = \text{`CP+ offer excess yield'} \\ - \frac{\text{`CP+ offer excess yield'} - \text{`CP+ bid excess yield'}}{\text{`CP+ bid price'} - \text{`CP+ offer price'}} \\ \times (\text{`Quoted Excess Price'} - \text{`CP+ offer price'}),\end{aligned}$$

[8] Note that in case of successful trades MarketAxess also reports the quotes in terms of prices but these do not seem to be always reliable, thus we do the conversion even in case of successful trades.

B. Model of Search Across Substitute Bonds

A. *Trading Game*

We write a very stylized model to help fix ideas. A risk-neutral trader seeks to buy one unit of a bond from a competitive dealer. We model a buying decision, sell is analogous. There are two perfectly substitutable bonds, and both bonds are worth a unit in terms of financial value. The reservation cost to the trader is assumed to be very high for one unit of bond and zero for the second unit, thus the trader wants to buy exactly one bond.

First, the trader either requests a quote for one bond from the dealer or submits a List that includes both bonds. The trader incurs a "reputation" cost $\eta > 0$ for each quote she rejects. This cost can represent the present value of worse quotes in unmodeled future periods as the dealer demands compensation to bother submitting quotes that are unlikely to fill.

Second, for each bond i, whether it is requested individually or as part of a List, the dealer submits a competitive ask quote equal to her reservation price, $1 + c_i$. The half spread c_i is independently drawn from an exponential distribution, $f(c_i) \overset{iid}{\sim} \frac{1}{\bar{c}} \exp^{-c_i/\bar{c}}$ for $c_i \geq 0$. Thus, the mean and the standard deviation of the half-spread are equal to each other, $\mathbb{E}[c_i] = \sqrt{Var(c_i)} = \bar{c}$. We refer to "spreads" to denote half spreads from now on.[9]

Third, if the trader requested one bond, she may reject the quote and request a quote for the second bond. The trader cannot trade the first bond if she rejects the first quote,[10] and thus the trader accepts the second quote whenever she requests it. If the trader submitted a List, she trades the lower quoted bond. The model leads to the below proposition:

Proposition 1. *The trader submits a list if the expected transaction cost $\bar{c}$ is high enough relative to the cost of rejecting a request, and submits up to two single-bond requests consec-*

[9] Both the exponential distribution and that the mean and standard deviation are closely related is consistent with what we see in the data.

[10] This assumption captures the trader's need for immediacy in a simple way. A trader who sequentially searches across multiple substitute bonds would sometimes need to trade the last requested bond.

utively otherwise.

Proof. The trader's expected cost from initially submitting a List is $E[\min\{c_1, c_2\}] + \eta = \bar{c}/2 + \eta$. This follows from the following: The distribution of c_{min} is described by $P(c_{min} > y) = \prod_{i=1}^{2} P(c_i > y) = e^{-2\frac{1}{\bar{c}}y}$ and thus $E[c_{min}] = \int_0^\infty P(Y > y)\, dy = \frac{\bar{c}}{2}$. Given that the trader initially requests a quote for one bond, she optimally rejects the quote if its spread c_i exceeds a cutoff $\hat{c}$, $c_i > \hat{c}$. If the trader rejects the initial quote, she incurs the cost η and certainly accepts the second quote, whose expected spread is $\bar{c}$. Thus, the cutoff $\hat{c} = \bar{c} + \eta$. The trader's expected cost of submitting a single bond request is then $\bar{c}\left(1 - e^{-1-\eta/\bar{c}}\right)$. The probability that the first bond is accepted is $P(c_i < \hat{c}) = 1 - e^{-\hat{c}/\bar{c}}$ and in this case the conditional expectation is $E(c_i | c_i < \hat{c}) = \bar{c} - \frac{\hat{c}e^{-\hat{c}/\bar{c}}}{1-e^{-\hat{c}/\bar{c}}}$. Thus the expected cost of the trader of acquiring one bond through consecutive requests is

$$(1 - e^{-\hat{c}/\bar{c}}) \left(\bar{c} - \frac{\hat{c}e^{-\hat{c}/\bar{c}}}{1 - e^{-\hat{c}/\bar{c}}} \right) + e^{-\hat{c}/\bar{c}} (\bar{c} + \eta) \tag{5}$$

Plugging in $\hat{c} = \bar{c} + \eta$ yields the expected cost of the consecutive transaction in the text. Taken together, the trader initially submits a List if $1/2 + \eta/\bar{c} < 1 - e^{-1-\eta/\bar{c}}$, and a single bond request otherwise. That $1/2 - e^{-1-x} - x$ is strictly positive at $x = 0$ and strictly decreasing in x' without a lower bound leads to the above proposition. □

Proposition 1 implies that, if the cost of rejecting a request does not grow with $\bar{c}$, the trader submits a list for sufficiently high expected spread $\bar{c}$. Which, given the exponential distribution of c_i, also means lists will be submitted if there is high uncertainty about the spread. If the cost of rejecting a quote is a real cost (like time), submitting a list is socially optimal whenever the trader chooses to do so. If the cost of rejecting a quote is a transfer (e.g., to the dealer in later transactions), then submitting a list would always be socially optimal.

B. *Econometric Implications*

The main competing explanation of substitute Lists in which some offers are not accepted are simple Lists of convenience in which the trader asks for several unrelated bonds. The main difference between the two is that in a List of convenience the decision whether to accept a quote for a given bond only depends on its own spread, while in a substitute List it also depends on the spread of the other bond in the List. With List fixed effects it is impossible to measure such "peer effects" and thus we derive a simple econometric method to measure the presence of substitute Lists and the strength of substitution.

Assume that there are two types of traders submitting such Lists of length two. A $\nu \in [0,1]$ fraction of traders submit two bonds in a substitute List just as above. Denote by f_i the probability that the quote for bond i at transaction cost c_i is accepted by the trader. The trader will accept the offer for bond i if $c_i < c_j$, resulting in $f_i = 1$ and $f_j = 0$ $(j \neq i)$. Portion $1-\nu$ of the Lists are submitted by traders as Lists of convenience and the trader has an independent downward sloping demand for both bonds. Thus, the probability of accepting the quote for bond i (and thus the request being filled) is $f_i = 1 - \lambda_i \cdot c_i$ where $\lambda_i \geq 0$. Define the dummy variable *Rank* which equals one for bond i in List ℓ if and only if $c_{i,\ell} < c_{-i,\ell}$ and zero otherwise. With this mix of traders, the expected probability of filling the request for bond i in List ℓ is

$$f_{i,\ell} = \nu \cdot \text{Rank}_{i,\ell} + (1-\nu) \cdot (1 - \lambda_i \cdot c_i) = 1 + \nu \cdot \text{Rank}_{i,\ell} - (1-\nu) \cdot \lambda_i \cdot c_i,$$

where we neglected the fact that $f_{i,\ell} \in [0,1]$ for simplicity. This leads to the following Proposition.

Proposition 2. *In the following regression specification with List fixed effects,*

$$f_{i,\ell} = \alpha + \beta \cdot \mathit{Rank}_{i,\ell} + \gamma \cdot c_{i,\ell} + \delta_l + \epsilon_{i,\ell}, \tag{6}$$

the coefficient on $\text{Rank}_{i,\ell}$ *is* $\beta = \nu \geq 0$ *and the coefficient on the quoted (half) spread is* $\gamma = -(1-\nu) \cdot \overline{\lambda} \leq 0$*, where* $\overline{\lambda}$ *is the average* λ_i*.*

We base the empirical specification in our empirical analysis (1) on (6) defined above in Proposition 2.

C. Filling trades off platform

Kargar et al. (2023) document that traders on MarketAxess frequently repeat requests that do not fill. In Columns (5) and (6) of Table XIV we broaden our dependent variable to encompass both filled and repeated requests to capture the trader's intent to fill instead of giving up. We find that including repeated requests as filled does not change our main results. In this Appendix we explain in detail how this variable is constructed.

Supplementary data. TRACE provides all corporate bond transactions including those outside MarketAxess. We use Enhanced TRACE for all bonds where it is available and standard TRACE for the other bonds. The standard TRACE truncates trading quantities above $1 million for HY bond trades and $5 million for IG trades, while including all bond trades. Enhanced TRACE does not truncate, while excluding privately placed (Rule 144A) bond trades.[11]

We match trades (filled requests) on MarketAxess to TRACE. All matches must have the same bond CUSIP and quantity, and have TRACE time stamp at most two minutes prior to and up to 24 hours after the MarketAxess time stamp. For the bonds retrieved from standard TRACE, we let any quantity above the truncation cutoff to be a potential match. In case of multiple matches, we check whether TRACE and MarketAxess recorded: (i) time stamps within 10 minutes of each other; (ii) trade prices within a rounding error; and (iii) consistent trader type—as a dealer-to-customer trade on TRACE if the requester were an asset manager or proprietary trader, and as an interdealer trade if a dealer was the requester. We select the match which satisfies the largest number of these three criteria. This procedure yields a unique match for 99.2% of the trades in our sample and fails to find a match for the remainder.

Variable construction. We identify *Not abandoned* requests following Kargar et al. (2023).

[11] Academic TRACE neither truncates nor excludes any bonds, but was not available for our entire sample period at the time of analysis.

A request on MarketAxess is an *Initial request* if, in the previous seven calendar days, there was no unfilled request for the same bond, quantity, and trade direction by the same trader type (i.e., dealer or customer). The request is *Repeated* if it is unfilled and, in the next seven calendar days, there is either *(a)* a request on MarketAxess for the same bond, quantity, and trade direction by the same trader type or *(b)* a trade on TRACE for the same bond and quantity and consistent trader type. We form sequences of repeated requests by linking each repeated request to the first request or trade that meets conditions (a) or (b). The request is *Not abandoned* if it either fills or is repeated, and *Eventually filled* if it either fills or the sequence of its linked repeated requests eventually ends in a trade. There are 6,390,705 initial requests in Lists.

Table XVII provides the summary statistics of initial requests. The majority of unfilled initial requests are abandoned, where 73.7% of initial requests are filled, 12.3% are repeated, and the remaining 14.1% are abandoned. Most of these repeated requests eventually fill. Only a small share of requests eventually fill off the platform. The statistics in Table XVII are very close to those found in Kargar et al. (2023).

The initial requests that traders leave unfilled have far worse quoted spreads conditional on receiving a quote. The average quoted spread across all initial requests with a quote is 13.3 basis points, is sharply smaller for those that are filled at 5.26 bps, and far larger for those unfilled at 39.4 bps.

Table XVI: Additional Variable Definitions

Name	**Variable definition**
Initial request	indicator if there is no unfilled request in the previous seven calendar days requesting the same bond in the same amount, direction and by the same trader type
Abandoned	indicator if an unfilled request is neither repeated on the platform nor filled in Trace within the seven calendar days from the request
Repeated	indicator if after an unfilled request, a request for the same bond with the same quantity, direction and requester type is submitted on the platform or filled in Trace within seven calendar days
Times repeated	for repeated trades the cumulative number of repeat requests on the platform less than seven calendar days apart, including the request that is filled in Trace without a request on the platform
Eventually filled	a request is either filled on the platform right away or filled after repeated requests on the platform, or filled in Trace within the next seven calendar days
None Abandoned	indicator if all of the unfilled requests in the List are either repeated on the platform or filled in Trace within seven calendar days from the request; set to 1 if list is entirely filled

Table XVII: Summary Statistics at the level of Initial Requests

Mean and 10th, 25th, 50th, 75th and 90th percentile of the most important request-level variables using all 6,390,705 initial requests submitted in Lists. For variable definitions, see Table XVI.

	Mean	p10	p25	p50	p75	p90
Filled	0.737	0	0	1	1	1
Abandoned	0.141	0	0	0	0	1
Repeated	0.123	0	0	0	0	1
Times repeated | Repeated	2.17	1	1	1	2	4
Eventually filled	0.819	0	1	1	1	1
— on platform	0.772	0	1	1	1	1
— off platform	0.046	0	0	0	0	0
Quoted spread (bps)	13.3	-1.12	0.375	1.96	6.60	30.8
— | Filled	5.26	-1.48	0.089	1.34	3.72	13.2
— | Not filled	39.4	0.745	2.71	7.91	35.0	119