



Municipal Securities Rulemaking Board



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Characteristics of Municipal Securities Trading on Alternative Trading Systems and Broker's Broker Platforms

Source: MSRB analysis with data obtained from MSRB's RTRS database and dealer registration database.

²⁰ A slight downward tick in the market share for direct dealer-to-customer trade reporting method by a change in trade reporting method by where an inter-dealer transaction between customer trade.

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Abstract¹

This paper focuses on the impact of electronic trading technology on the municipal securities market by analyzing inter-dealer trading activity on alternative trading systems (ATSs or ATS platforms) and broker's broker platforms. We use data collected from the MSRB's Real-Time Transaction Reporting System (RTRS) database, which populates an indicator for ATS trades, and from the dealer registration database, which indicates whether a trade reporting dealer is a registered broker's broker with the MSRB. The results show that not all inter-dealer trades are equally likely to occur on ATS platforms and broker's broker platforms. Trades on ATS platforms are smaller and more likely to involve municipal securities with complex features, such as insured bonds, bonds with call features, bonds subject to the alternative minimum tax (AMT bonds), or bonds traded at a discount that exhibit negative convexity due to the de minimis tax effect. This is consistent with market participants preferring ATS platforms for trades where the relevant security is more difficult to price, is harder to find and/or search costs are substantial. On the other hand, broker's broker platforms tend to attract larger-sized trades and are not necessarily a preferred trading venue for bonds with various complex features.

We caution that the conclusions from this paper are preliminary and may warrant further investigation, such as further exploring the characteristics of municipal securities trading on ATS and broker's broker platforms pursuant to Request-for-Quote (RFQ) and live quote trading protocols.

¹ The views expressed in the research papers are those of the author(s) and do not necessarily reflect the views and positions of the MSRB Board and other MSRB staff.

Introduction and Background

The purpose of this paper is to examine the characteristics of municipal securities that contribute to a higher (or a lower) probability of inter-dealer trading on an ATS platform or on a broker's broker platform. ATS and some broker's broker platforms offer several unique functions and features, such as electronic posting of quotes, requesting for quotes, auto-executions against posted and solicited quotes and anonymity to platform participants. Essentially, these platforms aggregate trading interests and provide dealers visible and readily accessible liquidity that may benefit municipal securities that are traded infrequently and are difficult to source. Municipal securities with complex structures, such as those with call features and/or those insured by a third-party insurer, may especially benefit from trading on an electronic platform, as these bonds are harder to value and are relatively scarce in the marketplace; it would be exceedingly challenging to locate a counterparty to trade in the marketplace without the assistance from electronic trading systems.

Similarly, municipal securities that are subject to various complicated tax rules sanctioned by the Internal Revenue Services (IRS), such as the AMT rule and the *de minimis* tax rule,² may also be difficult to price because of the uncertain impact on deriving a tax-equivalent yield due to the complex formulas. These bonds may benefit from electronic trading platforms that provide live price quotes visible to subscribers.

Related to the analysis of ATS trading activities, the MSRB previously published two pre-trade reports using proprietary data from the two largest ATS platforms for municipal securities predominant in individual investor-sized quotes and trades: The 2018 MSRB Pre-Trade Report and the follow-up 2020 MSRB Pre-Trade Report.³ The 2020 MSRB Pre-Trade Report concluded that both live offer quotes and responses to RFQs increasingly provide a valuable pricing indicator to the market. Between 2015 and 2018, ATS quotes may have become more visible to market participants and more informative to execution prices for market-wide inter-dealer, customer buy and customer sell trades because of increased quote provision and price competition.

Background on ATS and Broker's Broker Platforms

The advent of electronic trading venues in the fixed income market has changed the fixed-income trading landscape in recent years, including the municipal securities market. Currently, more than half of all inter-dealer trades in municipal securities are conducted via

² The *de minimis* tax rule sets the threshold at which a discount municipal bond should be taxed as a capital gain rather than as ordinary income. The *de minimis* amount is calculated by multiplying the face value by 0.25% and multiplying the result by the number of full years between the discounted bond's purchase date and the maturity date. The threshold is then calculated by subtracting the derived *de minimis* amount from the bond's par value.

³ See Wu, Simon Z. and John Bagley, "[Municipal Securities Pre-Trade Market Activity: What Has Changed Since 2015?](#)" The Municipal Securities Rulemaking Board, July 2020; and Wu, Simon Z., John Bagley and Marcelo Vieira, "[Analysis of Municipal Securities Pre-Trade Data from Alternative Trading Systems](#)," The Municipal Securities Rulemaking Board, October 2018.

an ATS platform or a broker's broker platform (see Table 1 below).⁴ An ATS is an electronic trading system that is not regulated as an exchange but is instead a venue for matching the buy and sell orders of its participants.⁵ The two main functions of an electronic trading venue such as an ATS platform or some electronic broker's broker platforms are: 1) posting (live quotes) and soliciting price quotes (request for quotes) electronically; and 2) electronic execution of a trade against posted or responding quotes. In addition, ATS platforms also provide front-end display with an aggregation of trading interests for subscribers and offer anonymity to participants that post quotes on their systems.⁶ As a result, market participants often prefer using an ATS platform to find counterparties for trading without disclosing their trading interest to the market. In general, electronic trading may facilitate the management of dealer inventory and reduce counterparty search costs by providing tools for participants to sort and filter liquidity for relevant bonds.⁷

Traditionally, broker's brokers performed similar functions to those provided by the modern-day ATS, such as aggregating liquidity and acting as agent or riskless principal in the purchase or sale of securities for dealers, institutions and other sophisticated market participants.⁸ A broker's broker acts in a limited capacity when providing anonymity, information flow, liquidity, transparency and order matching, and is compensated by a transaction commission or a mark-up.⁹ The business model has also evolved from a pure voice brokerage (via the usage of a telephone) historically to a hybrid usage of telephone negotiation and, increasingly, electronic systems.

There are two main trading protocols on ATS and some electronic broker's broker platforms for municipal securities, one via RFQs and the other via live quotes. An RFQ protocol enables an ATS participant seeking liquidity to broadcast, usually anonymously and almost

⁴ Not all electronic trading platforms are considered as an ATS platform, per SEC's Regulation ATS. A trading platform that meets the SEC's functional definition of an "exchange" must register either as a national securities exchange or comply with Regulation ATS, which requires registration as a broker-dealer. See Securities and Exchange Commission, Regulation of Exchanges and Alternative Trading Systems, Release No. 34-40760. The fixed income electronic trading platforms that are regulated as ATSs were those that have live matching trading protocols that brought together the orders of multiple buyers and sellers.

⁵ Most ATS platforms are regulated as broker-dealers under the Securities Exchange Act of 1934 ("Exchange Act") as well as Regulation ATS adopted by the SEC in 1998. Regulation ATS requires stricter recordkeeping and more intensive reporting when an ATS reaches more than five percent of the trading volume of any given security. See Exchange Act Rule 301(b)(5)(ii) of Regulation ATS.

⁶ Some ATSs offer complete anonymity by acting as the counterparty to both dealers transacting on the platforms, while others offer anonymity until time of trade when the two dealer counterparties become known to each other.

⁷ Staff of the Division of Economic and Risk Analysis of the SEC, "Report to Congress: Access to Capital and Market Liquidity," Securities and Exchange Commission, August 2017, Page 178.

⁸ See SIFMA, "The Role of Municipal Securities Broker's Brokers in the Municipal Markets," 2017.

⁹ Ibid.

always for selling interests,¹⁰ to many other participants simultaneously to solicit bids. The bids with attached size submitted in response to the request are for the soliciting party only.¹¹ Alternatively, market participants may utilize live quote posting protocol, offered mostly by ATS platforms, for municipal securities that provide auto-executions for other participants accessing the live quotes. Unlike responses to RFQs, about 90% of all live quotes for municipal securities are offer quotes. In addition, 80% of all municipal securities with live offer quotes have only a single quote provided by a single ATS participant at any given moment. The high frequency of unique offerings is the result of the fragmented nature of the municipal securities market (where there are about one million bonds outstanding) and the difficulty in shorting tax-exempt municipal securities due to liquidity constraints and the IRS rules regulating tax exemption.

By comparison, some broker's broker platforms are only used for quote solicitation, as opposed to posting unsolicited live quotes for auto-execution. Broker's broker platforms that also provide live quotes as well as the auto-execution capability are typically registered as both an ATS platform with the SEC and as a broker's broker with the MSRB.

Trade Reporting by ATS and Broker's Broker Platforms

All MSRB-registered dealers are required to report secondary market transactions through the MSRB's RTRS within 15 minutes of a trade occurring, with some exceptions. By contrast, electronic trading platforms may or may not have a reporting obligation and are generally divided into these following categories in terms of their trade reporting responsibilities:

- **Electronic trading platforms that are not registered as an ATS at all, per SEC's Regulation ATS.** These electronic trading platforms do not display live posted quotes or allow auto-executions against live quotes, and therefore are not registered as a dealer with the MSRB and do not have a trade reporting obligation.
- **Electronic trading platforms that allow live posted quotes and auto-executions.** These trading platforms are generally regulated as an ATS platform and therefore are registered as a dealer with the MSRB. However, even among these registered ATS platforms, the trade reporting mechanism is not uniform:
 - Some ATS platforms do not take either side of the trade for clearing or settlement purposes, so they are not a named participant in the trade itself. Instead, trading participants on these platforms, who are typically registered dealers with the MSRB, report trades to RTRS directly, resulting in a single trade report between the buyer and the seller.

¹⁰ Over 99% of RFQs are seeking bids to sell bonds. See Wu and Bagley, "Municipal Securities Pre-Trade Market Activity: What Has Changed Since 2015?" and Wu, Bagley and Vieira, "Analysis of Municipal Securities Pre-Trade Data from Alternative Trading Systems."

¹¹ Market participants are under no obligation to respond to a solicitation; on the other hand, quote solicitors also have discretion over whether to trade after receiving quotes. In recent years, an average of between 5 to 6 bids are received for each solicitation on an ATS platform. See Wu and Bagley, "Municipal Securities Pre-Trade Market Activity: What Has Changed Since 2015?"

- Other ATS platforms are reporting trades simply like a broker's broker would, except that those trades are flagged as an ATS trade. These ATS platforms, as well as broker's broker platforms, would report two transactions for each trade on the platform, one transaction with the buyer and the other transaction with the seller.

In instances where a trade on an ATS platform occurs, whether one or two transactions are reported to RTRS, all these transactions are marked as "ATS trades" in the RTRS trade report.

On a related note, the SEC Fixed Income Market Structure Advisory Committee (FIMSAC) recommended in October 2020¹² that the SEC, in coordination with FINRA and the MSRB as appropriate, clearly define "electronic trading" so that any new regulation or framework comprehensively covers the platforms and trading functionality that the SEC intends to cover without reliance on the current ATS definition. In addition, FIMSAC recommended that the SEC establish industry-standards for electronic trade reporting that address the current inconsistencies relating to ATS functionality, trading volume single-counting versus double-counting, and the treatment of "give-up" trades for settlement.¹³

¹² Prior to that, the SEC issued a Concept Release on September 28, 2020 to solicit comments regarding the regulation of ATS platforms trading corporate and municipal bonds. The Concept Release was partially in response to a 2018 recommendation by FIMSAC, who recommended, among other things, that the SEC forms, together with FINRA and the MSRB, a joint working group to review the regulatory framework for oversight of fixed income electronic trading platforms.

¹³ See FIMSAC, "[Recommendation Regarding Defining "Electronic Trading" for Regulatory Purposes](#)" (October 5, 2020). FIMSAC believes a consistent definition of electronic trading, and an industry standard for reporting electronic trading volumes, are "both necessary for the harmonization of applicable regulation, as well as to allow regulators, investors, dealers, analysts, and the public to better understand the liquidity, market share and transaction cost trends across the wide variety of electronic trading venues currently in existence."

Data and Methodology

The MSRB's RTRS database is chiefly used for this analysis, where, with a few exceptions, all secondary market municipal securities trades are reported to the MSRB within 15 minutes of a trade.¹⁴ In addition, to supplement the analysis, MSRB's proprietary and third-party security descriptive data ("security master database") show an individual security's relevant characteristics, such as coupon, call feature, insurance status, type of issuance, tax status, bond issuance date and maturity date, etc. Finally, for the broker's broker trade indicator, MSRB's dealer registration data are used to flag those trades if the trade reporting dealer is a registered broker's broker with the MSRB.

Trade reporting dealers started submitting an indicator for trades conducted on an ATS platform during the month of July 2016,¹⁵ with the first full month implementation of the ATS indicator for all ATS trades completed in August 2016.¹⁶ Therefore, this analysis covers the period from August 2016 through April 2021 for secondary market trades ("Relevant Period"), with a primary focus on reported inter-dealer trades, where a vast majority of ATS trades and broker's broker trades take place. In addition, only fixed-rate municipal securities are included in this analysis, as variable rate municipal securities, a small minority of all trades reported to the RTRS, are rarely traded between dealers via an ATS or a broker's broker platform. Finally, for inter-dealer trades with a dual ATS platform and a broker's broker designation (about 1.6% of all inter-dealer trades), since the trade size analysis shows a close similarity between these trades and trades conducted on a platform with a broker's broker designation only, the analyses in this paper will present the results for one combined group of broker's broker trades.

There are a few caveats in analyzing all electronic trading using RTRS data. First, only trades that were executed on an electronic platform that is registered as an ATS platform are reported to RTRS as an ATS trade. As mentioned above, per SEC's Regulation ATS, only electronic trading systems that allow live quote posting for municipal securities would be required to register as an ATS, and thus as a dealer with the MSRB. Electronic trading platforms that do not permit postings of live quotes, but instead rely upon other trading protocols such as the request for quotes, are exempt from registering as an ATS platform. Second, depending on the business model of an ATS platform, there are different ways of trade reporting by registered ATS platforms, with some ATS platforms allowing trade participants to report directly to the RTRS as a single transaction while others opting to report two transactions to the RTRS on behalf of trade participants, one for the buyer and the other for the seller, similar to a broker's broker transaction reporting.

¹⁴ RTRS was first implemented by the MSRB in January 2005. Prior to that, the trade reporting system maintained by the MSRB, TRS, was not a real-time trade reporting system and only required dealers to submit trades to TRS by the end of a trading day.

¹⁵ As required by the 2015 amendments to Rule G-14.

¹⁶ See [Release No. 34-77366, File No. SR-MSRB-2016-05 Federal Register Vol. 81, No. 53 \(March 18, 2016\)](#). Also see [MSRB Notice 2016-09 \(March 2, 2016\)](#).

Analysis: Bond Characteristics and Inter-Dealer Trading on ATS and Broker's Broker Platforms

Since most investors, especially individual investors,¹⁷ do not have direct access to ATS platforms as a subscriber, nearly all reported trades executed on ATS platforms are trades between dealers. Similarly, nearly all trades conducted via broker's broker platforms are inter-dealer trades as well, as those platforms are tailored towards dealers and only select institutional investors. The analyses in this section therefore focus on inter-dealer trades, unless otherwise noted.

Market Share of ATS and Broker's Broker Trading Volume

Table 1 shows the percentage of inter-dealer trades executed via an ATS platform and/or a broker's broker platform and finds, overall, that a majority (56.4%) of all inter-dealer trades and 26% of inter-dealer par value traded were executed on an ATS platform during the Relevant Period from August 2016 through April 2021.¹⁸ In addition, 5.3% of trades and 16.1% of the par amount traded were conducted on a broker's broker platform. By comparison, only 38.3% of inter-dealer trades were executed elsewhere, though these trades represented 58% of all par value traded.

Table 1. Market Share of ATS and Broker's Broker Platforms Among Inter-Dealer Trades¹⁹
(August 2016–April 2021)

Trading Venue	Number of Trades	Percent	Par Amount Traded (In Millions)	Percent
Direct Dealer-to-Dealer	6,268,972	38.3%	\$1,242,913	58.0%
ATS Platform	9,235,755	56.4%	\$556,441	26.0%
Broker's Broker Platform	869,427	5.3%	\$344,172	16.1%
Total	16,374,154	100.0%	\$2,143,526	100.0%

Source: MSRB analysis with data obtained from MSRB's RTRS database and dealer registration database.

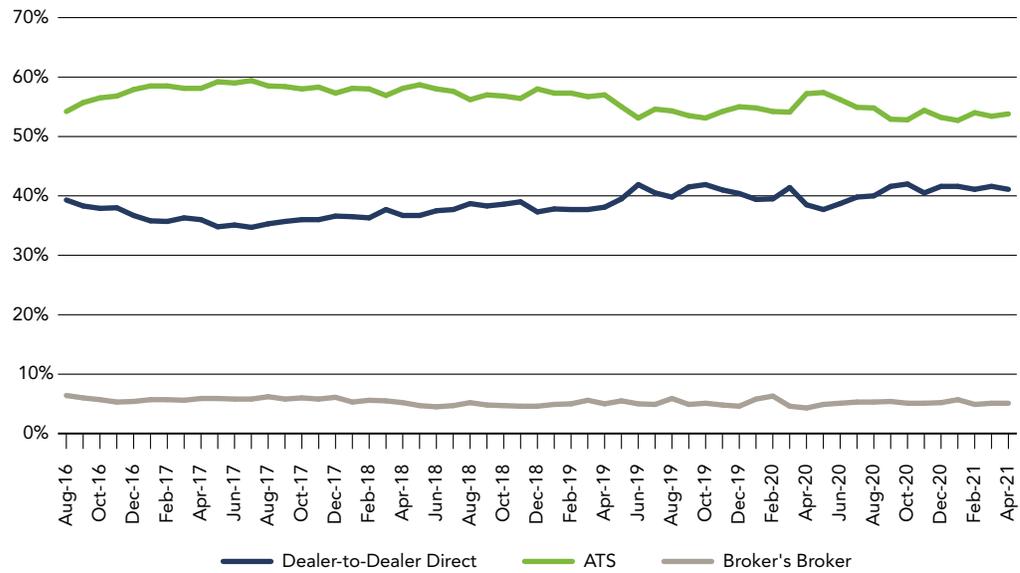
The market share of inter-dealer trades on ATS and broker's broker platforms was relatively stable during the Relevant Period, as illustrated in Charts 1a and 1b below.

¹⁷ For purposes of this analysis, individual investors refer to individual non-professional investors who buy and sell securities for their own personal accounts and often trade in relatively small amounts, such as a par value of \$100,000 or less when trading municipal securities.

¹⁸ As mentioned above, inter-dealer trades that were executed on platforms with dual ATS and broker's broker designation are classified as broker's broker platform trades in this paper.

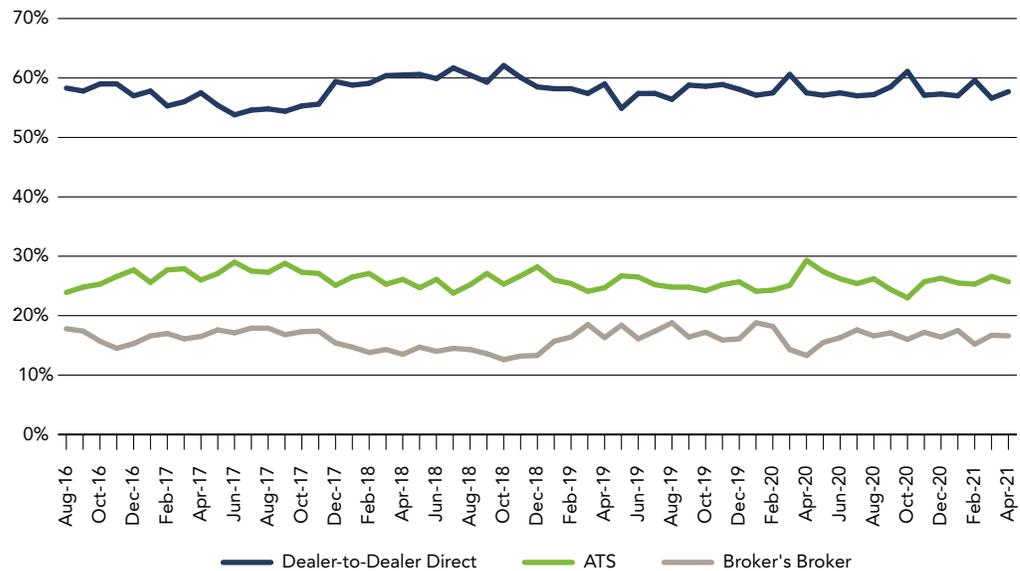
¹⁹ Illustrated percentages may not add up to 100% due to rounding.

**Chart 1a: Market Share of Inter-Dealer Trades by Trading Venues²⁰
(August 2016–April 2021)**



Source: MSRB analysis with data obtained from MSRB's RTRS database and dealer registration database.

**Chart 1b: Market Share of Inter-Dealer Par Value Traded by Trading Venues
(August 2016–April 2021)**



Source: MSRB analysis with data obtained from MSRB's RTRS database and dealer registration database.

²⁰ A slight downward tick in the market share for ATS trades and the corresponding upward tick in the market share for direct dealer-to-dealer trades around May 2019 was the result of a change in trade reporting method by one major dealer for municipal securities, where an inter-dealer transaction between two of its subsidiaries is added to each customer trade.

While trades on ATS platforms made up a majority of all inter-dealer trades, it should be noted that trading volume alone may not reflect the full market impact of electronic trading on ATS and some broker's broker platforms. Those platforms offer pre-trade transparency, and market participants trading in the broader municipal securities market benefit from price discovery on those platforms.²¹ The 2020 MSRB Pre-Trade Report on pre-trade transparency shows that price discovery on two ATS platforms attracted wider market exposure between 2015 and 2018, and quotes were informative to market-wide execution prices. As a result, more off-the-platform trades were executed closer to the best bid or best offer quotes on the ATS platforms at the time of their executions.

Trade Size Comparison for ATS and Broker's Broker Platforms

The 2018 MSRB Pre-Trade Report and the 2020 MSRB Pre-Trade Report both found that the average trade size as well as the average live quote size on the two predominantly individual-investor oriented ATS platforms were much smaller than the average trade size for all municipal securities executions.²² The section below analyzes trade size for trades on all ATS platforms, as well as trades on broker's broker platforms, in comparison with direct dealer-to-dealer trades and dealer-to-customer trades.

Table 2 below segregates all municipal securities trades reported to RTRS by types of trades (dealer-to-customer or inter-dealer) and trading venues (ATS platform, broker's broker platform and direct dealer-to-dealer) and confirms the disparity in trade size when measuring in averages. The average trade size for inter-dealer trades on ATS platforms was approximately \$60,000 par value during the Relevant Period, compared to \$198,000 par value for direct dealer-to-dealer trades, \$396,000 par value for trades on broker's broker platforms and \$218,000 par value for all dealer-to-customer trades.²³ However, when measuring in median trade size, the variation between the groups was less remarkable, with the median trade size of \$25,000 par value for inter-dealer trades on ATS platforms, compared to \$30,000 par value for direct dealer-to-dealer trades, \$110,000 for trades on broker's broker platforms and \$25,000 par value for all dealer-to-customer trades. This suggests that the average numbers are skewed by large institutional-sized trades. For example, as shown in Table 2, only 0.5% of all inter-dealer trades on ATS platforms had

²¹ See Wu and Bagley, "Municipal Securities Pre-Trade Market Activity: What Has Changed Since 2015?" Only ATS and broker's broker platform subscribers, mostly dealers and some institutional investors, have access to live quotes on a platform when not being filtered by a quote provider. In addition, even fewer market participants have access to responses to RFQs, as only market participants who send out RFQs can view the responses to the request.

²² See Wu and Bagley, "Municipal Securities Pre-Trade Market Activity: What Has Changed Since 2015?" and Wu, Bagley and Vieira, "Analysis of Municipal Securities Pre-Trade Data from Alternative Trading Systems."

²³ Almost all (> 99%) dealer-to-customer trades in municipal securities are executed via a non-ATS platform method. While select institutional customers have a direct subscription and access to ATS platforms, those trades are typically executed via a MSRB registered dealer.

\$1,000,000 par value or above, as compared to 3.9% for direct dealer-to-dealer trades, 10.2% for trades on broker's broker platforms and 3.8% for all dealer-to-customer trades.²⁴

Table 2. Trade Size Comparison
(August 2016–April 2021)

Trade Size	Dealer-to-Customer Trades	Inter-Dealer Trades		
		Direct Dealer-to-Dealer	ATS Platform	Broker's Broker Platform
Average	\$218,250	\$198,264	\$60,249	\$395,861
Median	\$25,000	\$30,000	\$25,000	\$110,000
Percentage of Trades with More Than \$1,000,000 Par Value	3.8%	3.9%	0.5%	10.2%

Source: MSRB analysis with data obtained from MSRB's RTRS database and dealer registration database.

Number of Securities Traded on ATS and Broker's Broker Platforms

Table 3 examines the number of municipal securities (unique CUSIP²⁵ numbers) traded on each venue between dealers. On average there were 5,084 municipal securities traded on ATS platforms daily during the Relevant Period, and 663 municipal securities traded on broker's broker platforms. While these numbers may seem to be low when considering there are nearly one million municipal securities outstanding, it compares favorably to the average of 4,141 municipal bonds traded daily between dealers via a non-ATS or non-broker's broker venue, as well as to the average of 13,525 municipal bonds traded daily between *all* market participants via *all* venues. Essentially, most municipal securities are rarely traded, and on a given trading day, less than 1.4% of all outstanding municipal securities are traded.²⁶

²⁴ As a comparison, the 2020 Federal Reserve Bank of New York paper examining trading of corporate bonds on electronic platforms also found a similar predominance of small trades on the ATS platforms. The paper attributed the findings to a lesser concern of information leakage, since small trades typically do not carry information content and therefore there would be no signal to the market. In financial markets, information leakage may lead to other market participants trading ahead of a main trading position. See Kozora, Matthew, Bruce Mizrach, Matthew Peppe, Or Shachar and Jonathan Sokobin, "Alternative Trading Systems in the Corporate Bond Market," The Federal Reserve Bank of New York Staff Report, Staff Report No. 938, August 2020.

²⁵ "CUSIP" is a registered trademark of the American Bankers Association.

²⁶ Based on an estimate of one million municipal securities outstanding.

Table 3. Average Daily Number of Municipal Securities Traded—By CUSIP Number (August 2016–April 2021)

All Trades	Inter-Dealer Trades		
	Direct Dealer-to-Dealer	ATS Platform	Broker's Broker Platform
13,525	4,141	5,084	663

Source: MSRB analysis with data obtained from MSRB's RTRS database, dealer registration database and security master database.

Characteristics of Municipal Securities and Trading on ATS and Broker's Broker platforms

Although ATS and electronic broker's broker platforms may reduce search costs by making trading interests more visible to participants and by providing easier access to other traders electronically, market participants may also face a higher risk of information leakage and adverse selection²⁷ when attempting to quote and trade on these venues.²⁸ There is a potential cost to live quote providers, who simply try to profit from the bid-ask spread, because quotes are widely distributed so informed traders may act on a quote that does not reflect the best market information currently available. As a result of this trade-off, market participants theoretically would be more likely to trade on an ATS platform or a broker's broker platform when the benefits of easier executions are viewed to trump the costs associated with potential information leakage and adverse selection.

The regression analysis below—a multinomial logistic regression model—tests the probability of a municipal security trading on an ATS platform or on a broker's broker platform among inter-dealer trades reported to the MSRB's RTRS, based on the trade size as well as various idiosyncratic characteristics of a bond, such as bond's yield, age, time to maturity, issuance purpose, interest rate structure, taxable status, insurance status, callable status, premium or discount and original issuance size. The multinomial logistic model measures the three-way choice of a trading venue—an ATS platform, a broker's broker platform or a direct dealer-to-dealer venue—for each inter-dealer trade, using the direct dealer-to-dealer venue as a base for measurement.²⁹ Essentially, the regression model measures the likelihood of, for example, trading on an ATS platform relative to trading on the direct dealer-to-dealer venue with statistical inference for a given bond with given

²⁷ For example, adverse selection for offer quotes refers to a situation when a buyer—a live quote accessor—may have better information than a seller—a live quote provider—about a municipal bond being offered, putting the seller at a disadvantage in the transaction with an exposed stale quote. As an example, a seller is offering a municipal bond at 101 via a live offer quote on an ATS platform. A buyer with better information accesses the live offer, and after the execution, the market for the bond rises to 102 due to the release of positive information. Essentially, the market moves against the seller's economic interest, with the seller forsaking the one-point margin.

²⁸ See Kozora, Mizrach, Peppe, Shachar and Sokobin, "Alternative Trading Systems in the Corporate Bond Market."

²⁹ For example, the regression analysis would estimate how much more (or less) likely for an individual investor-sized inter-dealer trade to trade on an ATS platform or a broker's broker platform relative to the direct dealer-to-dealer venue.

characteristics. The benefits of performing a regression analysis are manifold. One benefit is to be able to measure the correlation between one variable (dependent variable) and many other variables (independent variables or factors) simultaneously and statistically test the estimated impact for each factor while controlling for all other factors. The estimated impact from each independent variable is conditioned on the economic principal of "all else being equal."³⁰

Multinomial Logistic Regression Model:

$$\begin{aligned} \text{Probability of Inter-Dealer Trading on ATS and Broker's Broker Platforms}_{ij} \\ = \alpha + \beta_1 \text{Trade Size}_{ij} + \beta_2 \text{Taxable Bond}_{ij} + \beta_3 \text{AMT Bond}_{ij} \\ + \beta_4 \text{Insured Bond}_{ij} + \beta_5 \text{Callable Bond}_{ij} + \beta_6 \text{Discount Bond}_{ij} \\ + \beta_7 \text{General Obligation Bond}_{ij} + \beta_8 \text{Yield}_{ij} \\ + \beta_9 \text{Original Offered Amount}_{ij} + \beta_{10} \text{Age}_{ij} + \beta_{11} \text{Maturity}_{ij} + \varepsilon_{ij} \end{aligned}$$

The six indicator variables (taxable bond, AMT bond, insured bond, callable bond, discount or premium bond and general obligation bond) carry essentially a yes-or-no value (a value of one if yes and zero if no),³¹ subscript *i* corresponds to a particular security (CUSIP number) and subscript *j* corresponds to a particular trade. In addition, variables trade size and original offered amount, both expressed as par value, are specified in natural log, while yield,³² age³² and maturity³³ are expressed in level. Finally, a positive (negative) coefficient means that an increase (decrease) in the predictor leads to an increase (decrease) in the predicted likelihood of trading on a particular platform (ATS or broker's broker).

Empirically, the multinomial logistic model finds (see Table 4) the following characteristics of municipal securities to have a statistically³⁴ and economically significant³⁵ impact on the odds of trading on an ATS platform, in addition to having a smaller trade size: Bonds that are callable, insured by a third-party insurer, taxable, subject to AMT, or traded at a discount price are more likely to trade on an ATS platform. The significance of these correlations stands when controlling for other characteristics. For example, Table 4 shows that a municipal security with callable features has 24.6% higher odds of trading on an ATS platform than via a direct dealer-to-dealer venue.

As mentioned above, ATS platforms can reduce search costs by providing easier access to more counterparties. This may be especially true when certain municipal securities are more of a rarity and difficult to price. These results seem to confirm this hypothesis and suggest that ATS platforms are particularly useful for bonds where finding a counterparty is difficult and that are perhaps rarely traded. In addition, certain bonds may be more difficult to price because of their unique and complex tax structure (e.g., AMT bonds and *de minimis* tax

³⁰ Also known as the *ceteris paribus* assumption.

³¹ In statistics and econometrics, particularly in a regression analysis, an indicator (dummy) variable is one that takes the value of zero or one to indicate the absence or presence of some categorical effect that may be expected to shift the outcome.

³² Time elapsed since the bond issuance.

³³ Life span of a security at the time of its trade.

³⁴ At the 99 percent confidence level.

³⁵ For this analysis, the threshold for significant economic impact is defined as an impact on odds of 5 percent or more, or -5 percent or less.

rule for discount bonds³⁶), as well as other special features such as callable and/or insurance components, and it seems logical that these municipal securities would benefit more from trading electronically on an ATS platform than plain vanilla bonds. Furthermore, taxable municipal securities have become increasingly popular in recent years. While these municipal securities are not necessarily more "complex" than tax-exempt municipal securities, except for the more prevalent make-whole call provisions, they are less ubiquitous than tax-exempt municipal securities and thus may not have reliable benchmarks for pricing. They may also share the same trait of sourcing difficulty with municipal securities having complex features. Therefore, taxable municipal securities also exhibit a higher likelihood of trading on ATS platforms.

The multinomial logistic model also finds that, similar to ATS platforms, inter-dealer trading of taxable municipal securities, bonds traded at a discount, and bonds with call features is more likely to occur on broker's broker platforms than via a direct dealer-to-dealer approach. However, unlike bonds traded on ATS platforms by dealers, the model finds municipal securities that are insured, are subject to AMT and smaller-sized trades are less likely to trade on a broker's broker platform relative to direct dealer-to-dealer venues. The mixed findings for inter-dealer trading on a broker's broker platform may indicate that unlike ATS platforms, some broker's broker platforms may not supply a sufficient amount of live posted quotes to their members, which would negate the advantage of electronic trading systems in terms of providing a bond pricing reference. In addition, the trade size indicator shows that broker's broker platforms are more likely to be used to fill larger trades when compared to direct dealer-to-dealer venues (and of course, ATS platforms), with 38% higher odds of trading on a broker's broker platform when the trade size is doubled.

Please refer to Appendix B for detailed regression analysis results for all variables included in the multinomial logistic regression model.

³⁶ The *de minimis* tax rule creates difficulties in pricing discount tax-exempt municipal securities that are traded near par because of the tax implication in relation to a bond price threshold. As a result, most discount bonds exhibit negative convexity, as a vast majority of discount bonds are traded near par. See Kalotay, Andrew and Guy Davidson, "[Managing Duration Extension and Negative Convexity Near Par](#)," October 20, 2020, The Bond Buyer.

Table 4. Multinomial Logistic Regression Results—Odds of Inter-Dealer Trading on ATS and Broker’s Broker Platforms Relative to Direct Dealer-to-Dealer Venues for Select Bond Characteristics³⁷
(August 2016–April 2021)

Variable	Trading Venue	Impact on Odds
Trade Size	Broker’s Broker Platform	38.0%
	ATS Platform	-17.5%
Taxable Bonds	Broker’s Broker Platform	20.0%
	ATS Platform	7.4%
AMT Bonds	Broker’s Broker Platform	-26.2%
	ATS Platform	23.5%
Insured Bonds	Broker’s Broker Platform	-9.3%
	ATS Platform	16.4%
Callable Bonds	Broker’s Broker Platform	29.5%
	ATS Platform	24.6%
Discount Bonds	Broker’s Broker Platform	26.4%
	ATS Platform	19.8%

Note: For trade size, the impact on odds reflects the scenario of doubling in trade size; while for the other indicator variables, the impact on odds reflects the “yes” indicator.

Source: MSRB analysis with data obtained from MSRB’s RTRS database, dealer registration database and security master database.

Overall, the results presented in this section are consistent with the results from a 2018 research paper published by SEC economists that focused on pre-trade information of municipal bonds on ATS platforms, where it found bonds that are quoted have more complex features than bonds that are not quoted, but there is little difference in issuance purposes between bonds that are quoted and those that are not quoted on ATS platforms.³⁸

³⁷ Only variables with both statistical and economic significance (impact on odds of 5% or more, or -5% or less) are listed in Table 4. For the complete regression analysis results, please refer to Appendix B.

³⁸ See Craig, Louis, Abby Kim and Seung Won Woo, “Pre-Trade Information in the Municipal Bond Market,” Division of Economic and Risk Analysis of the SEC, July 2018.

Conclusion

This paper analyzes the impact of electronic trading technology in the municipal bond market through inter-dealer trading activity on ATS and broker's broker platforms. The results show that not all inter-dealer trades are equally likely to occur on ATS platforms. Trades on ATS platforms are smaller and more likely to involve municipal securities with complex features, such as insured bonds, bonds with call features, as well as bonds subject to complex taxing formulas (AMT and *de minimis* tax rules), etc. Consistent with investors preferring ATS platforms for trades where search costs are substantial and pricing is difficult, trades on ATS platforms are also more likely to occur for municipal bonds that are lesser known and may be difficult to source. Consequently, ATS platforms do seem to provide the value of visible liquidity and price discovery in the marketplace, especially for those municipal securities that are not widely known and transacted. On the other hand, broker's broker platforms tend to attract larger-sized trades and are not necessarily a preferred trading venue for bonds with complex features. It is possible that, on aggregate, broker's broker platforms are tailored toward trading dealer's principal positions or on behalf of institutional investors as opposed to trading on behalf of individual investors. In addition, some broker's broker platforms may not provide a sufficient amount of visible live quotes to subscribers when compared to fully electronic ATS platforms that specialize in both RFQs and live quotes with auto-execution functionality. Furthermore, ATS platforms generally offer better search functionality than some broker's broker platforms, which may especially benefit smaller trades and/or trades in more obscure municipal securities.

Interestingly, taxable municipal securities, which represent a small segment of all municipal securities and are not considered to be complex in terms of their structures, are nevertheless more likely to trade on both ATS and broker's broker platforms than direct dealer-to-dealer venues.

Finally, even among those registered ATS platforms reporting trades to RTRS, there is an absence of information that identifies the trading protocol. The trades on ATS platforms identified in RTRS data relate to either executions against live posted quotes or executions resulting from a request for quotes, and it is impossible to identify ATS trades from RTRS that are pursuant to, for example, the live quote protocol. It would be interesting to analyze whether there are differences in characteristics among bonds that tend to trade via the live quote protocol and bonds that tend to trade via the RFQ protocol, pending future data availability.

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Appendix A—Author

Simon Wu, Ph.D., Chief Economist—Mr. Wu is the Chief Economist for the Municipal Securities Rulemaking Board (MSRB). With two decades of experience applying economic expertise to securities policymaking and regulation, Mr. Wu oversees economic analysis of MSRB rulemaking and municipal market transparency initiatives, and leads related statistical, econometric and financial economic analysis. Before joining the MSRB, Mr. Wu served as a financial economic expert on securities trading, market structure, best execution, investment management and financial institution risk management at several economic consulting firms. Mr. Wu also served as Chief Economist at the Federal Housing Finance Agency (FHFA), Office of Inspector General, where he was involved in regulatory oversight on mortgage-backed securities issuance and trading, capital market risk management and unsecured lending by banks. He began his career as senior economist at the Financial Industry Regulatory Authority (FINRA) where he led economic studies in support of securities rule proposals and policy impact analysis. Mr. Wu has a doctorate and master's degree in economics from Vanderbilt University and a bachelor's degree in economics from Belmont University.

Appendix B—Regression Analysis

Multinomial Logistic Regression Model 1 (August 2016–April 2021):

$$\begin{aligned}
 & \text{Probability of Inter-Dealer Trading on ATS and Broker's Broker Platforms}_{ij} \\
 & = \alpha + \beta_1 \text{Trade Size}_{ij} + \beta_2 \text{Taxable Bond}_{ij} + \beta_3 \text{AMT Bond}_{ij} \\
 & + \beta_4 \text{Insured Bond}_{ij} + \beta_5 \text{Callable Bond}_{ij} + \beta_6 \text{Discount Bond}_{ij} \\
 & + \beta_7 \text{General Obligation Bond}_{ij} + \beta_8 \text{Yield}_{ij} \\
 & + \beta_9 \text{Original Offered Amount}_{ij} + \beta_{10} \text{Age}_{ij} + \beta_{11} \text{Maturity}_{ij} + \varepsilon_{ij}
 \end{aligned}$$

Variable	Trading Venues	Parameter Estimate	Standard Deviation	Wald Chi-Square	Probability Chi-Square	Impact on Odds*
Intercept	Broker's Broker Platform	(6.7155)	0.0157	182,940.9389	–	
	ATS Platform	3.0590	0.0077	157,994.5237	–	
Trade Size	Broker's Broker Platform	0.4651	0.0008	364,948.1625	–	38.0%
	ATS Platform	(0.2773)	0.0004	404,306.9869	–	-17.5%
Taxable Bonds	Broker's Broker Platform	0.1822	0.0044	1,719.9383	–	20.0%
	ATS Platform	0.0710	0.0021	1,123.2238	0.0000	7.4%
AMT Bonds	Broker's Broker Platform	(0.3033)	0.0131	538.2151	0.0000	-26.2%
	ATS Platform	0.2114	0.0051	1,752.2218	–	23.5%
Insured Bonds	Broker's Broker Platform	(0.0981)	0.0034	848.2754	0.0000	-9.3%
	ATS Platform	0.1521	0.0015	10,996.6667	–	16.4%
Callable Bonds	Broker's Broker Platform	0.2583	0.0027	9,359.0511	–	29.5%
	ATS Platform	0.2199	0.0012	34,950.0081	–	24.6%
Discount Bonds	Broker's Broker Platform	0.2344	0.0029	6,706.8932	–	26.4%
	ATS Platform	0.1809	0.0014	17,889.8297	–	19.8%
General Obligation Bonds	Broker's Broker Platform	(0.0144)	0.0025	33.7219	0.0000	-1.4%
	ATS Platform	0.0136	0.0011	147.8567	0.0000	1.4%
Yield	Broker's Broker Platform	0.0026	0.0001	320.4995	0.0000	0.3%
	ATS Platform	0.0025	0.0001	312.4210	0.0000	0.3%
Original Deal Offered Amount	Broker's Broker Platform	(0.0402)	0.0007	2,974.7069	–	-3.9%
	ATS Platform	0.0010	0.0003	9.5936	0.0020	0.1%

Variable	Trading Venues	Parameter Estimate	Standard Deviation	Wald Chi-Square	Probability Chi-Square	Impact on Odds*
Age	Broker's Broker Platform	0.0001	0.0000	6,951.1391	–	0.0%
	ATS Platform	(0.0000)	0.0000	1,945.4996	–	0.0%
Maturity	Broker's Broker Platform	(0.0000)	0.0000	13.9798	0.0002	0.0%
	ATS Platform	0.0000	0.0000	347.0146	0.0000	0.0%

R-Square	0.0695
Max-Rescaled R-Square	0.0852

Note: For trade size and original offered amount, the impact on odds reflects the scenario of doubling in size. For yield, age and maturity, the impact on odds reflects the scenario of a one-unit increase. For the other indicator variables, the impact on odds reflects the “yes” indicator. In addition, R-Square for a non-linear regression model such as the multinomial logistic regression model is considered “pseudo” as the model attempts to provide information similar to that provided by R-squared in an Ordinary Least Square (OLS) regression. However, it cannot be interpreted exactly as R-squared in an OLS regression is interpreted, which is the proportion of variance of the dependent variable explained by the independent variables.

Source: MSRB analysis with data obtained from MSRB's RTRS database, dealer registration database and security master database.

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