

Chaboud, Alain et al.

**Working Paper**

## All-to-all trading in the U.S. treasury market

Staff Reports, No. 1036

**Provided in Cooperation with:**

Federal Reserve Bank of New York

*Suggested Citation:* Chaboud, Alain et al. (2022) : All-to-all trading in the U.S. treasury market, Staff Reports, No. 1036, Federal Reserve Bank of New York, New York, NY

This Version is available at:

<https://hdl.handle.net/10419/272849>

**Standard-Nutzungsbedingungen:**

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

**Terms of use:**

*Documents in EconStor may be saved and copied for your personal and scholarly purposes.*

*You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.*

*If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.*

NO. 1036  
OCTOBER 2022

# All-to-All Trading in the U.S. Treasury Market

Alain Chaboud | Ellen Correia Golay | Caren Cox |  
Michael Fleming | Yesol Huh | Frank Keane | Kyle Lee |  
Krista Schwarz | Clara Vega | Carolyn Windover

## **All-to-All Trading in the U.S. Treasury Market**

Alain Chaboud, Ellen Correia Golay, Caren Cox, Michael Fleming, Yesol Huh, Frank Keane, Kyle Lee, Krista Schwarz, Clara Vega, and Carolyn Windover

*Federal Reserve Bank of New York Staff Reports*, no. 1036

October 2022

JEL classification: G10, G23, D47

### **Abstract**

While the U.S. Treasury market remains the deepest and most liquid securities market in the world, several episodes of abrupt deterioration in market functioning over recent years have brought the market's resilience into focus. The adoption of all-to-all trading in the Treasury market could be one avenue to strengthen market resilience. Conceptually, all-to-all trading would allow any market participant to trade directly with any other market participant. This could be particularly helpful in times of stress, when the capacity of traditional intermediaries may be tested. In this paper, we discuss what all-to-all trading would mean for the cash secondary Treasury market, the benefits it might bring, and the conditions that might make adoption of the protocol more likely. We also review several trading protocols operating in the Treasury market that widen the field of trading partners and discuss the challenges to broader adoption of such protocols.

Key words: Treasury market, market structure, all-to-all

---

Correia Golay, Cox, Fleming, Keane, Windover: Federal Reserve Bank of New York (emails: ellen.correia.golay@ny.frb.org, caren.cox@ny.frb.org, michael.fleming@ny.frb.org, frank.keane@ny.frb.org, carolyn.windover@ny.frb.org). Chaboud, Huh, Schwarz, Vega: Board of Governors of the Federal Reserve System (emails: alain.p.chaboud@frb.gov, yesol.huh@frb.gov, krista.schwarz@frb.gov, clara.vega@frb.gov). Lee: U.S. Department of the Treasury (email: Kyle.Lee@treasury.gov). The authors thank David Bowman, Darrell Duffie, Dobrislav Dobrev, Joshua Frost, Diana Hancock, Peter Johansson, Eric Lewin, William Riordan, Asani Sarkar, Or Shachar, Nicholas Steele, Brian Smith, Brandon Taylor, Peter Van Tassel, Nathaniel Wuerffel, Emily Yang, and colleagues at the U.S. Securities and Exchange Commission for helpful comments. They also thank Claire Nelson and Stephen Spera for excellent research assistance and the market participants, academics, and representatives from trading platforms they spoke with for their useful insights.

This paper presents preliminary findings and is being distributed to economists and other interested readers solely to stimulate discussion and elicit comments. The views expressed in this paper are those of the author(s) and do not necessarily reflect the position of the Federal Reserve Bank of New York, the Board of Governors of the Federal Reserve System, the Federal Reserve System, or the U.S. Department of the Treasury. Any errors or omissions are the responsibility of the author(s).

To view the authors' disclosure statements, visit  
[https://www.newyorkfed.org/research/staff\\_reports/sr1036.html](https://www.newyorkfed.org/research/staff_reports/sr1036.html).

## Introduction

The U.S. Treasury market is the deepest and most liquid securities market in the world and plays a critical role in the U.S. and global financial system. Over the past decade, the secondary cash market for Treasury securities has experienced several episodes of abrupt and severe deterioration in the functioning of some market segments, highlighting the importance of exploring how market resiliency might be improved. In addition, the market has evolved significantly in recent decades, including changes in technology, market participants, and regulation, amid a substantial increase in the amount of Treasury securities outstanding. This increase in Treasury debt outstanding has been accompanied by an increase in demand for trading, which at times has outpaced the elasticity of broker-dealer balance sheets, possibly hindering dealers' willingness to intermediate trading in stressed market environments.<sup>1</sup>

All-to-all trading has been cited by some market observers as a potential way to increase opportunities to match buyers and sellers and mitigate the effects of intermediation constraints in the Treasury market, but to date there has been limited study of all-to-all trading in the market.<sup>2</sup> The aim of this study is to explore the concept of all-to-all trading in the Treasury secondary cash market and evaluate the benefits and challenges around broader adoption.<sup>3</sup>

This work leverages other reports and research on Treasury market structure and trading

---

<sup>1</sup> For a more robust discussion of recent strains in the Treasury market, see IAWG Staff Progress Report (2021).

<sup>2</sup> All-to-all trading in the U.S. Treasury market has been mentioned only briefly in a few reports/articles. See Duffie (2020), Liang and Parkinson (2020), Burne, (2021), Group of Thirty Working Group on Treasury Market Liquidity (2021), Ryan and Toomey (2021), Cantrill et al (2022), and "Duffie: SEC plan heralds all-to-all Treasuries trading," *Risk.net*, September 26, 2022, <https://www.risk.net/regulation/7954577/duffie-sec-plan-heralds-all-to-all-treasuries-trading>.

<sup>3</sup> While not the focus of this paper, all-to-all trading in Treasury repo markets also has the potential to support Treasury market resilience.

practices as well as studies of other markets where all-to-all-like trading is more prevalent. In addition, the Inter-Agency Working Group for Treasury Market Surveillance (IAWG), which consists of staff from the U.S. Department of the Treasury, the Board of Governors of the Federal Reserve System, the Federal Reserve Bank of New York (FRBNY), the Securities and Exchange Commission (SEC), and the Commodity Futures Trading Commission (CFTC), has undertaken work on this topic.<sup>4,5</sup> This study is informed by outreach that IAWG staff conducted with a variety of market participants, including liquidity providers, liquidity consumers, and trading platforms.<sup>6,7</sup>

There are several potential benefits to broader adoption of all-to-all trading in the U.S. Treasury market. Conceptually, increased use of all-to-all trading in the Treasury market would encourage market resilience by providing additional opportunities for trading partners to match on a trade without use of an intermediary. Increased use of all-to-all trading could result in lower transaction costs for liquidity consumers and could improve transparency around trade data. Market structure conditions that could increase the likelihood of all-to-all adoption include greater data transparency and broader central clearing.

---

<sup>4</sup> The IAWG was formed by the Treasury Department, SEC, and Federal Reserve Board in 1992 to improve monitoring and surveillance and strengthen interagency coordination with respect to the Treasury market following the Salomon Brothers auction bidding scandal. See U.S. Department of the Treasury et al. (1992). Today, the IAWG consists of staff from the Treasury Department, SEC, Federal Reserve Board, FRBNY, and CFTC.

<sup>5</sup> In looking at recent disruptions in the Treasury market, improving the resilience of market intermediation has been identified as a critical policy workstream for IAWG staff. As part of this workstream, staff have studied how the structure of the Treasury market could best promote market resilience. The initial focus of this work has been to study all-to-all trading in the secondary cash market.

<sup>6</sup> To research this topic, IAWG staff conducted 19 outreach discussions, including discussions with representatives of trading platforms, dealers, hedge funds, principal trading firms, asset managers, and academia.

<sup>7</sup> In this report, we define the term “liquidity” to mean the ability to buy or sell assets in size with limited price impact. Additionally, we refer to those market participants who provide purchase or sale liquidity for a variety of securities and times, such as dealers, as “liquidity providers” and those that seek to execute trades in specific securities and at particular times, such as customers, as “liquidity consumers.”

However, challenges remain to broader use of all-to-all trading. For example, most trading protocols in the U.S. Treasury market that offer access to a broader range of trading partners are limited to trading of on-the-run or near on-the-run notes and bonds, while less liquid parts of the market may have a greater need for the benefits all-to-all could provide. Additionally, we found that most Treasury market trading platforms that offer these trading protocols are legal counterparties to the trades executed over their platforms, which can create unclear and complex clearing and settlement risks with the platform itself and contribute to broader financial stability risks in the market. Finally, market structure changes always have the potential to affect the competitive landscape of a market, so the possibility that certain market participants could alter their activity in the Treasury market were all-to-all trading to become more broadly used must be carefully considered.

In Section 1 of the paper, we provide an overview of the current structure of trading and intermediation in the U.S. Treasury secondary cash market.<sup>8</sup> Section 2 then discusses conceptually how to think about the application of all-to-all trading in the Treasury market, what problems it might solve, and what conditions might allow for it to develop organically. In Section 3, we provide an overview of the trading protocols currently offered in the Treasury market that approximate all-to-all trading within their trading ecosystems. In Section 4, we look at the benefits and challenges broader adoption of these trading protocols face. Section 5 concludes.

---

<sup>8</sup> This section draws from IAWG Staff Progress Report (2021), which provides an overview of the structure of the Treasury market.

## Section 1: U.S. Treasury secondary cash market structure

The cash secondary market for U.S. Treasury securities has two main components:

In the interdealer cash market, trading is generally among dealers and principal trading firms (PTFs).<sup>9</sup> PTFs trade as principals for their own accounts and generally use automated trading strategies. Most interdealer cash trading takes place on electronic platforms provided by interdealer brokers (IDBs) which operate central limit order books.<sup>10, 11</sup> Electronic interdealer cash trading is concentrated in the most recently issued, or on-the-run, Treasury notes and bonds, consistent with the high “ATS and Interdealer” volumes for such securities reported in Table 1. Most interdealer trading of seasoned, or off-the-run, notes and bonds occurs on voice- and manual-assisted IDB platforms for which trading is less automated and at slower speeds. A small share of interdealer trading takes place directly between dealers, and between dealers and PTFs via direct bilateral streams. Direct bilateral streaming from liquidity providers to liquidity consumers has grown in recent years.

In the dealer-to-customer market, dealers buy securities from and sell securities to a variety of clients, including, but not limited to, foreign central banks, asset managers, pension funds, and hedge funds. A range of trading methods is used, from electronic request-for-quote (RFQ)

---

<sup>9</sup> Most PTFs are currently not registered as dealers with the SEC. However, earlier this year the SEC proposed rules that would require market participants, such as PTFs to register as dealers. See the SEC’s March 28, 2022 proposed rules, <https://www.sec.gov/news/press-release/2022-54>.

<sup>10</sup> Most interdealer brokers operate an alternative trading systems (ATS). A current list of ATSs that have an active Form ATS on file with the SEC can be found at <https://www.sec.gov/foia/docs/atstlist>. Alternative Trading System (“ATS”) List. Relatedly, earlier this year, the SEC proposed to, among other things, amend Regulation ATS to better protect investors, promote fair and orderly markets, and enhance cybersecurity for ATSs that trade Treasuries and other government securities. For more information, see <https://www.sec.gov/news/press-release/2022-10>.

<sup>11</sup> For more background on central limit order books, see Fleming, Schaumburg, and Yang (2015). For information on the growth in direct streaming, see McPartland (2019).

systems, to direct streaming, to voice trading.<sup>12</sup> Trading of off-the-run and other less liquid securities is much more common in the dealer-to-customer market than in the interdealer market, as seen in Table 1. Trading in these less liquid securities relies more on broker-dealers' intermediation capacity than does trading in more liquid securities.

**Table 1: Daily Trading Volume of U.S. Treasury Securities**

Security Type	On the Run		Off the Run		Total by Security Type
	ATS & Interdealer	Dealer to Customer	ATS & Interdealer	Dealer to Customer	
Notes and Bonds	\$265.1 B	\$154.4 B	\$40.5 B	\$86.8 B	\$546.8 B
Bills	\$12.9 B	\$21.8 B	\$20.2 B	\$61.0 B	\$115.8 B
TIPS	\$3.0 B	\$4.8 B	\$1.2 B	\$5.6 B	\$14.6 B
FRNs	\$0.1 B	\$0.4 B	\$0.1 B	\$0.9B	\$1.5 B
<b>Total by Segment</b>	\$281.1 B	\$181.4 B	\$61.9 B	\$154.4 B	
<b>Total by Seasoning</b>	\$462.5 B		\$216.3 B		

Source: Authors' calculations, based on data from FINRA TRACE.

Notes: The table reports average daily trading volume of U.S. Treasury securities in billions of dollars between January 3 and- June 30, 2022). When-issued trading activity before securities become on-the-run is excluded from the figures.

ATS: Alternative Trading System.

### Clearing

While dealer-to-customer transactions are typically cleared and settled bilaterally, interdealer cash transactions are cleared and settled either bilaterally or through a central counterparty (CCP), the Fixed Income Clearing Corp. (FICC), depending on whether the parties to the transaction are members of FICC. Dealers generally are FICC members, while PTFs and buy-side

---

<sup>12</sup> Recent buy-side commentary has noted that dealers are increasingly acting as agents by shopping inquiries instead of always being willing to add to inventory, consistent with the dealer intermediation channel being narrower and perhaps opening an opportunity for growth of all-to-all venues.



customers generally are not members.<sup>13</sup> As a CCP, FICC becomes a counterparty to each side of its members' transactions following novation and guarantees their performance, with each participant in such transactions facing FICC for the obligation rather than the original trade counterparty. This enables each member to settle a single long or short obligation per security issue with FICC, efficiently compressing all of the member's trades with FICC member counterparties. Clearing practices in the U.S. Treasury market are a current area of focus, with government agencies considering rules to facilitate additional central clearing in this market.<sup>14</sup>

#### Changes in market size and structure

The Treasury market's size and structure have evolved in recent decades, with important implications for its liquidity and resiliency. At the end of 2007, Treasury debt held by the public totaled \$5.1 trillion, or 35 percent of that year's gross domestic product (GDP). By the end of 2021, debt held by the public had reached \$23.2 trillion, or 95 percent of GDP.<sup>15</sup> The Congressional Budget Office projects continued growth in both the nominal debt and its size relative to GDP in the coming decades (Congressional Budget Office 2022).

Increased use of electronic trading and new types of market intermediaries have changed how market liquidity is provided and influenced the characteristics of that liquidity. The growth in

---

<sup>13</sup> For more information on Treasury market segments and their clearing arrangements, see IAWG Staff Progress Report (2021), pp. 3-4.

<sup>14</sup> See, for example, the SEC's September 14, 2022 proposed rules, <https://www.sec.gov/news/press-release/2022-162>.

<sup>15</sup> U.S. Department of the Treasury. Fiscal Service, Federal Debt Held by the Public [FYGFDPUN], retrieved from FRED, Federal Reserve Bank of St. Louis; <https://fred.stlouisfed.org/series/FYGFDPUN>, October 2, 2022. U.S. Office of Management and Budget and Federal Reserve Bank of St. Louis, Federal Debt Held by the Public as Percent of Gross Domestic Product [FYGFGDQ188S], retrieved from FRED, Federal Reserve Bank of St. Louis; <https://fred.stlouisfed.org/series/FYGFGDQ188S>, October 3, 2022.

electronic trading has contributed to a particularly marked shift in the composition of participants in the interdealer cash market. Before the introduction of electronic trading, dealers had been the predominant participants in the interdealer market. PTFs first gained access to electronic trading platforms in the cash market in the mid-2000s, and by 2014, they represented the majority of trading activity in the futures and electronically brokered interdealer cash markets (Joint Staff Report 2015).

Traditionally, dealers buy and sell from customers in large amounts, hold a portion of these positions across days, and maintain a large balance sheet to support their positions. In contrast, PTFs buy and sell frequently in the interdealer market and typically end the day with relatively small net directional exposure on a risk-adjusted basis. Many PTFs are able to operate with less capital than typical broker-dealers due to their more limited net exposure and because they are not subject to the same regulations as broker-dealers. PTFs tend to make trading decisions primarily based on immediate or near-term profitability and the level of market risk and do not typically maintain strong client relationships. PTFs also prefer to transact in more liquid securities, such as on-the-runs, where there is more data availability and transparency, along with electronic trading protocols that allow them to use automated trading strategies. High concentration among PTFs has resulted in a small number of PTFs playing a key role in price discovery and the provision of market liquidity (Joint Staff Report 2015, Harkrader and Puglia 2020). Increasingly, some dealers have also adopted similar electronic and high-frequency trading strategies.

Regulations adopted in response to the Global Financial Crisis of 2007-09 and changes in financial institutions' internal risk management and business strategies have also influenced

dealers' willingness and ability to intermediate (Duffie 2020). Following the Global Financial Crisis, reforms were made to strengthen the regulation, supervision, and risk management of the banking sector, including the Basel III reforms, first published in 2010 by the Basel Committee on Banking Supervision. U.S. regulators adopted the supplementary leverage ratio (SLR) for large bank holding companies as part of the U.S. implementation of the Basel III reforms. The SLR has been cited as among the factors motivating banking organizations to dedicate capital to higher-margin businesses and limiting the amount and flexibility of bank and bank-affiliated broker-dealer balance sheets dedicated to low-margin businesses, such as many forms of Treasury market intermediation.<sup>16</sup>

The growth of electronic trading and resulting changes in the mix of market participants have changed trading practices and the use of market infrastructure. As firms access multiple financial markets over ever-shorter time frames, markets have become increasingly interconnected, resulting in significantly faster information and risk transmission (Joint Staff Report 2015). Increased speed and sophistication in the transmission of security prices – generally associated with high-speed algorithmic trading strategies – have been linked to rapidly changing liquidity in periods of market stress.

In addition, the expansion of PTFs' role in the interdealer cash market beginning in the mid-2000s resulted in an increasing fraction of interdealer trades not being centrally cleared. In recent years, just over half of interdealer cash trades have not centrally cleared, compared with

---

<sup>16</sup> While many bank capital requirements are adjusted for the risk of the assets, SLR adds requirements without adjustments, meaning that Treasuries require as much capital as a riskier asset. For more information on the effects of higher capital requirements on markets and market making, see Boissay, Collard, and Lewrick (2018), Cimon and Garriott (2019), and Haselmann et al (2019).

central clearing of virtually all interdealer trades before the entry of PTFs in the interdealer market. As a result, about three-fourths of the entire Treasury market is now not centrally cleared.<sup>17</sup>

## **Section 2: What is all-to-all trading conceptually?**

“All-to-all trading” is a term used by market observers to describe a range of trading protocols that, in their purest form, would enable any market participant to trade directly with any other market participant.<sup>18</sup> In the context of U.S. Treasury securities, having an entirely all-to-all market structure would, at least in principle, merge the interdealer segment with the dealer-to-customer segment and allow any market participant to trade any U.S. Treasury security directly with any other market participant.<sup>19</sup> In practice, there are few if any markets that allow purely all-to-all trading, but many market segments, including those in the Treasury market, employ protocols that to varying degrees broaden the set of trading participants.

### What problems might it solve?

---

<sup>17</sup> Using data from the first half of 2017, the Treasury Market Practices Group estimated that all dealer-to-customer trades were uncleared and half of interdealer trades were uncleared. Altogether this represents approximately 75% of the cash Treasury market. See TMPG (2019) for more information.

<sup>18</sup> At the same time, all-to-all trading need not eliminate participation by traditional intermediaries.

<sup>19</sup> Earlier this year, the SEC proposed new rules further defining the definition of a dealer which would require market participants that assume dealer-like roles and/or engage in certain levels of buying and selling government securities to register with the SEC, become a member of a self-regulatory organization, and comply with federal securities laws and regulatory obligations. If adopted as proposed, market participants providing liquidity on all-to-all platforms may be required to register as dealers. See the SEC’s March 28, 2022 proposed rules, <https://www.sec.gov/news/press-release/2022-54>.

Some market observers argue that all-to-all trading could improve liquidity in the U.S. Treasury market as it may increase the amount of liquidity available to any one Treasury market participant. For instance, even in circumstances where dealer intermediation capacity is severely constrained, this market structure would allow any market participants with offsetting trading needs to meet and execute trades without having to pass through a dealer. Outside of matching end investors, all-to-all trading also conceptually has the potential to widen the field of liquidity providers a liquidity consumer can access in a trade. Advocates of all-to-all trading therefore argue that it would make the U.S. Treasury market more resilient to stress.

Market participants also observe that an all-to-all trading venue could offer increased transparency of executable and executed prices. They note that increased transparency could, in turn, potentially improve the bargaining power of liquidity consumers and potentially lower barriers for new liquidity providers that require more transparency to participate in trading securities. It is also suggested that such effects could be greater for less liquid Treasury securities, which have lower price transparency than more liquid securities like on-the-run notes and bonds. It is important to note that in a pure all-to-all set up, the barriers to entry to the all-to-all trading system would be very low, allowing nearly any investor type to join the system and participate in all-to-all trading in Treasury securities.<sup>20</sup> However, as will be discussed

---

<sup>20</sup> While some market observers think about all-to-all trading platforms as offering: 1) fair and equal access for all interested parties and 2) protocols that facilitate the interaction of trading interest among all participants without restrictions based upon participant type, in practice some trading platforms that describe their trading protocols as “all-to-all” may impose limits to platform access or interaction of trading interest among participants on the platform in response to the preferences of certain participants and to limit counterparty credit risk.

in Section 3, there are notable hurdles to usage of the current offerings of all-to-all like trading systems in the Treasury market.<sup>21</sup>

#### Markets with an all-to-all market structure

Several U.S. markets including equities (cash and futures), Treasury futures, and to a lesser degree, swaps contracts, and corporate bonds, have more all-to-all-like attributes than does the U.S. Treasury cash market.<sup>22</sup> In practice, only a subset of participants routinely act as liquidity providers in these markets. Nonetheless, Hendershott, Livdan, and Schurhoff (2021) find that even a small share of all-to-all trading in a market results in a more competitive trading environment, improving liquidity, and lowering the cost of trading.

#### Academic literature on the impact of all-to-all trading

There is limited academic literature on how the introduction of all-to-all trading affects market functioning and quality. This is in part because all-to-all trading has usually been adopted along with other changes in the market, such as increased transparency and central clearing, and in part due to the lack of adoption of pure all-to-all trading, making it difficult to isolate its effects. Benos, Payne, and Vasios (2020) document increased competition among liquidity providers and lower transaction costs in the interest rate swap (IRS) market after the Dodd-Frank Act

---

<sup>21</sup> Of course, multiple liquidity equilibria are possible. Musto, Nini, and Schwarz (2018) investigate the drivers of off-the-run Treasury security liquidity, and argue that policy changes affecting the liquidity environment could potentially shift securities into more or less liquid equilibria via powerful liquidity feedback effects.

<sup>22</sup> MarketAxess' open trading protocol is the main venue for all-to-all trading of corporate bonds. According to MarketAxess' [August 2022 data releases](#), trading activity over MarketAxess is estimated to account for 20.5% of credit market activity, and of that activity, 37% is done through the open trading protocol. Note that these estimates include data for U.S. corporates as well as emerging markets and Eurobonds, though the majority of trading estimated is for corporate bonds.

required sufficiently liquid IRS contracts to trade on all-to-all trading systems, such as Swap Execution Facilities (SEFs). Hendershott, Livdan, and Schurhoff (2021) show that in the U.S. corporate bond market, transaction costs decreased with the introduction of an all-to-all trading protocol. Even so, many investors still appear to prefer dealer intermediation to all-to-all trading. Hendershott, Livdan, and Schurhoff (2021) document that, by their definition, all-to-all trading in the U.S. corporate bond market stands at 12% as of 2018, with only 2% being investor-to-investor trading, 3% being dealers trading with new clients found through all-to-all trading and 7% being new liquidity providers to the all-to-all trading protocol (mostly PTFs) acting like dealers.<sup>23</sup>

#### What conditions could make all-to-all trading more likely to expand in the Treasury market?

Many market observers argue that all-to-all trading in the secondary U.S. Treasury market would be more likely to develop organically if certain market structure conditions evolved, including broader central clearing and greater pricing transparency. In a centrally cleared trade, the CCP becomes the counterparty to each side of the transaction. If the CCP became counterparty to a wider swath of trades, this would result in standardized risk management practices including counterparty, liquidity, and default risk management processes. As such,

---

<sup>23</sup> In addition to this literature, Dobrev and Meldrum (2020) suggest that, among other factors, the all-to-all trading structure in the U.S. Treasury futures market partly explains why in March 2020, during the height of the pandemic, U.S. Treasury futures market liquidity did not deteriorate as much as liquidity in the U.S. Treasury on-the-run cash market.

central clearing could enable operators of trading platforms to open their venues to a wider set of market participants.<sup>24</sup>

On the other hand, CCPs have membership requirements and set margin and liquidity requirements, which could impose additional costs on some market participants. It should also be noted that something close to all-to-all trading can occur without formal central clearing, as demonstrated by all-to-all trading platforms for corporate bonds where the platform effectively acts as the central counterparty to the trades, though this can create important clearing and settlement risks, which are discussed in detail in Section 4.

Pre- and post-trade transparency in various trade characteristics, such as price, size, counterparty, and time of trade, may also encourage an all-to-all trading structure. Potential new liquidity providers might be more willing to offer liquidity in markets with less information asymmetry between dealers and other market participants. This could potentially reduce the concerns of adverse selection experienced currently by liquidity consumers.<sup>25,26</sup>

---

<sup>24</sup> U.S. Treasury futures trade on one exchange and are cleared by the exchange. Even though equities trade on different exchanges, all transactions are cleared by the National Securities Clearing Corporation (NSCC).

<sup>25</sup> In this example, the liquidity consumers suffer from adverse selection because they are operating in a market with somewhat low data transparency and have limited information on competitive pricing, while the liquidity providers often have access to more information given their market footprint and trading volume.

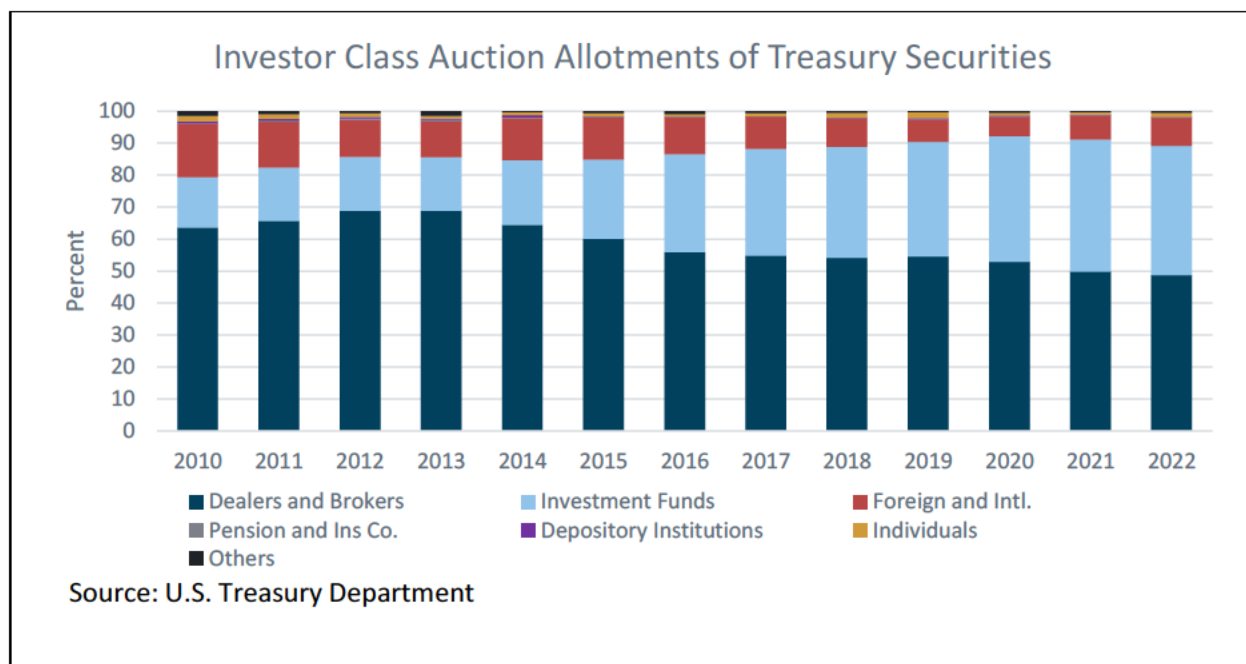
<sup>26</sup> In addition to making all-to-all trading more likely to develop organically, several academic papers find that increased pre- and post- trade transparency leads to more liquid markets (see, for example, Bessembinder, Maxwell, Venkataraman [2006]; Boehmer, Saar, and Yu [2005]; Loon and Zhong [2014, 2016]; and Daures-Lescourret and Fulop [2022]) because liquidity providers are more likely to provide liquidity when adverse selection costs are low (transparency is high), and liquidity demanders are more likely to ask for competitive prices if they have more information.



#### Box 1: One-to-all in the primary market

In the primary market for U.S. Treasury securities, investors can participate in auctions indirectly through a primary dealer or directly. Hence, the primary market for Treasury securities shares some similarities with an all-to-all market in that it does not require investors to rely on dealer balance sheets to intermediate between the seller, Treasury, and the buyer, the Treasury security investor. In some sense, the primary market is a one-to-all market.

This structure has generally been considered beneficial for Treasury, investors, and potentially primary dealers, as it reduces the reliance on primary dealers' balance sheets of needing to intermediate large auction sizes. While primary dealers still play an important role in the smooth distributions of Treasury auctions, and more so in certain Treasury products than in others, there has been notable growth in investor demand at auctions as shown in the chart below, both indirectly and directly. Of course, there are many reasons why the primary market is successful under this structure that are not applicable to the secondary market broadly – for example, Treasury is a regular and predictable seller of only liquid on-the-run securities– but it does exemplify how more options to accessing liquidity, rather than only through a dealer, can be beneficial.



### What conditions might limit the expansion of all-to-all?

There are various conditions that might limit adoption of all-to-all trading in the Treasury market. Some market participants observe that a subset of liquidity providers might choose to not engage with all-to-all trading if they perceived it as negatively affecting their business model. For example, the current dealer-intermediated market structure may result in some dealers benefiting from intermediation revenues. If they or other large liquidity providers were to choose not to participate in all-to-all venues, this could reduce the venues' ability to attract customers.

In addition, market contacts indicate that some customers are comfortable with their current mode of execution in the secondary market and value their relationships with their broker-dealers, making them hesitant or unmotivated to transact more in all-to-all trading venues. As discussed further in Section 4, dealers are considered particularly important for facilitating large

trades in less liquid securities. Moreover, at times of market stress, having these relationships is considered important as they provide some incentive for dealers to take the other side of a trade. The broker-dealer relationship is also cited as providing other benefits besides execution, such as financing and information about market conditions.

Attempts by platforms to launch all-to-all trading protocols that were unsuccessful reveal the importance of adoption by key stakeholders in the Treasury market ecosystem. For example, dealer support may be a necessary, but not sufficient, element for success. Without explicit demand from the largest and most active customers, the downstream providers of connectivity and post-trade services (e.g., order management services, vendors, clearinghouses, etc.) may not be sufficiently incentivized to provide the systems connectivity necessary to make all-to-all trading an attractive alternative for many market participants.

### **Section 3: Trading protocols in the Treasury market that offer a broader set of trading partners**

While all-to-all trading in its purest form does not exist in the U.S. Treasury market, there are a range of electronic trading protocols offered by various platforms that exhibit some attributes of all-to-all trading and widen the field of partners to a trade. Innovation has occurred, both through the entrance of new trading platforms to the Treasury market and through the introduction of new trading protocols by established platforms. Additionally, there are trading platforms that serve as aggregators for multiple types of trading protocols. Protocols that offer

wider sets of trading partners generally fall into four categories: anonymous request-for-quote, central limit order book, anonymous streaming, and match auctions.<sup>27</sup>

### Anonymous request for quote

Anonymous request-for-quote (RFQ) is a frequently cited protocol when discussing an expansion of all-to-all trading in the Treasury market. To understand how anonymous RFQ works, it is helpful to revisit how disclosed RFQ works, which is widely used in the Treasury market for client trading.

In a disclosed RFQ protocol, a customer sends an order to a number of disclosed counterparties, typically 4 to 5, with which the customer is already set up to trade. These counterparties respond with a quote and the customer can execute on whichever one they prefer, typically the one with the best price. In a disclosed RFQ, the trade is executed between the customer and the winning liquidity provider. Both have full knowledge of who is on the other side of the trade, and they face each other directly for clearing and settlement. Disclosed RFQ is the primary way in which off-the-run securities are traded, though any Treasury security can be traded this way.

In an anonymous RFQ protocol, a market participant can send out a request for a quote to all liquidity providers on the platform set up to engage in anonymous RFQ. This can be a much larger group of trading partners than the typical 4 or 5 available on a disclosed RFQ. The market participant will then receive a number of quotes back and can execute on the most attractive

---

<sup>27</sup> A variety of currently and formerly active trading platforms were studied for this paper, including Bloomberg FIT, BrokerTec, CBOE, Direct Match, Fenics UST, LiquidityEdge, MarketAxess, OpenDoor, TP-ICAP, and Tradeweb.

one. The trade is completed without either side of the trade having knowledge of their trading partner. In most cases, the trading platform serves as the intermediary and is the legal counterparty to both sides of the trade.<sup>28</sup> If a trade participant is a member of the CCP, the participant and platform submit that side of the trade to the CCP. The platform is thus able to step out of the trade if both trade counterparties are CCP members. If a counterparty to one leg of the trade does not centrally clear, the trading platform clears and settles that side of the trade bilaterally with that counterparty, assuming the settlement risk.<sup>29</sup>

A key element that places anonymous RFQ along the spectrum towards all-to-all trading is that it allows a customer to send out an RFQ to counterparties with whom the customer does not have an existing counterparty relationship. Moreover, theoretically any type of institution that meets the platform's membership criteria could sign up as a liquidity provider on an anonymous RFQ system, so this opens the possibility for a trading match between two counterparties outside of the typical set of intermediaries. In practice, the platforms have membership requirements that can be burdensome, and the liquidity providers on these platforms tend to be the typical liquidity providers, specifically dealers.

Some platforms also offer hybrid options in which a client can send out a RFQ to a certain number of disclosed counterparties with which it has a counterparty relationship and to the anonymous counterparties enabled with the platform.

---

<sup>28</sup> Throughout the remainder of this paper, we often discuss a trading platform being a counterparty to a trade. In these situations, the trading platform is either a registered broker-dealer entity or has access to a registered broker-dealer.

<sup>29</sup> For a detailed discussion of the role of trade platforms (inter-dealer brokers) in the clearing and settlement of Treasury cash market trades, see Treasury Market Practices Group (2019).

## Central limit order book

Central limit order books (CLOBs) operated by several IDBs have a major presence in the secondary market for on-the-run and near on-the-run Treasury notes and bonds. The IDBs offer the participating firms proprietary electronic screens that post the various bid and offer prices of the participants, along with the associated quantities. The IDB platforms act as blind brokers to the customers, standing in the middle of each trade as principal to each of the participants to preserve the anonymity of each party. The clearing and settlement process is similar to anonymous RFQ. The intermediating platform is the legal counterparty to each trade, and trades are centrally cleared when the counterparties are members of the CCP.

Initially, trading on major CLOBs was limited to government securities dealers that were CCP members. However, over time CLOB participation expanded to include non-dealer participants including PTFs and sometimes hedge funds. While overall participation on CLOBs has broadened from just government securities dealers, most activity remains concentrated among the dealers and PTFs.

Trade amounts on the existing large CLOBs are in \$1 million dollar increments. This standardization of trade sizes allows for efficiencies and faster trading and in concept could lower the barriers for certain investor types to participate in the protocol.

Similar to the anonymous RFQ protocol, while trading on the CLOBs is typically anonymous, there is a spectrum of offerings of this product and there are options with disclosed counterparty names as well.

In outreach, some participants note operational barriers to entry that have limited further expansion and broadening of participants on a CLOB, particularly for smaller participants or for those that are not members of the CCP. Other participants explain that the infrastructure costs to succeed in this trading environment are prohibitive. Because trading venues offering CLOBs assume settlement risks, many venues also have restrictions on the types of participants that may be members of the service, and place limits on the trading activity and risk taken by those participants.

A CLOB with a wider range of participants could look similar to the Treasury futures market.<sup>30</sup> However, there is broad consensus among market participants interviewed that this protocol as currently constructed in the Treasury cash market would likely not be successful for less liquid Treasury securities (such as off-the-runs), unusually sized trades, or for transactions in large size. However, it is possible that if an active trading platform were designed for these less-liquid securities and/or to allow for block trades, trading activity in these securities might increase to the point that a CLOB-like structure could be successful for off-the-run trading. It is noteworthy that in the equities market, for example, a fairly diverse set of securities with varying degrees of liquidity trade on CLOB-like structures.

---

<sup>30</sup> In futures markets, there are futures commission merchants (FCMs) which can place orders on behalf of customers, collect margin on behalf of customers, and ensure delivery of assets. The FCMs are required to be registered with the National Futures Association, as delegated by the Commodity Futures Trading Commission. This allows for a wider set of market participants to participate in the futures market through the FCMs, while the FCMs are subject to routine oversight.

### Anonymous streaming

Some electronic platforms offer the ability for liquidity providers to stream prices anonymously to other customers of the platform. When the prices streamed are executable prices, customers are then able to immediately execute trades based on those prices. Moreover, the platform becomes the counterparty to both sides of the trade as with the anonymous RFQ and anonymous CLOB and clearing and settlement works in a similar way.

Market participants may prefer to know who they are transacting with after they have done a trade, particularly in times of stress, in part due to counterparty credit concerns.<sup>31</sup> In those cases, disclosed price streaming (also called direct price streaming) may be a preferable protocol. In recent years, direct price streaming has become more common as a dealer or market maker can provide a custom or individualized price streaming to a customer. Multiple direct streams set up for an individual customer are sometimes described as a “customized name-disclosed CLOB”. Importantly, this allows the customer to see prices that are available to them before a potential trade without needing to signal a desire to trade. This type of disclosed counterparty-specific trading is further from all-to-all trading than an anonymous CLOB, but allows customization for certain types of participants, which cannot be done on a CLOB as currently designed.

---

<sup>31</sup> This concern could potentially be ameliorated in part if there was broader use of central clearing.



### Match auctions

Various approaches have been taken to creating anonymous match auctions, where market participants come together on a trading platform at particular times of day to match offsetting orders in specific securities. These protocols are largely anonymous and are primarily used for less liquid sectors of the Treasury market such as off-the-run notes and bonds, as well as TIPS. As with the other anonymous protocols, in anonymous match auctions, the platform becomes the counterparty to both sides of the trade.<sup>32</sup>

### Trading protocol trade-offs

The trading protocols—RFQ, CLOB, streams, match auctions—whether anonymous or not, each offer trade-offs for prospective all-to-all Treasury market participants.

<b>Table 2: Summary of U.S. Treasury Market Trading Protocols with A Broader Set of Trading Partners</b>		
<b>Trade protocol</b>	<b>Trade size increment</b>	<b>Securities predominantly traded</b>
Anonymous request-for-quote	Customizable	On-the-run notes and bonds
Central limit order book	Standardized	On-the-run notes and bonds
Anonymous streaming	Usually standardized	On-the-run notes and bonds
Match auctions	Customizable (but need to find a matching trade)	Less liquid securities (off-the-run notes and bonds, TIPS, etc.)

CLOBs, as they are currently constructed, present immediacy in risk transfer and enhanced price transparency, but are best suited to trading in standardized transaction sizes with more

---

<sup>32</sup> For more information, see “Trading platform innovation of the year: OpenDoor Trading”, *Risk.net*, December 8, 2017, <https://www.risk.net/awards/5362016/trading-platform-innovation-of-the-year-opendoor-trading>.

homogenous instruments, as summarized in Table 2. For example, analysis of data from the Trade Reporting and Compliance Engine (TRACE) of the Financial Industry Regulatory Authority (FINRA) shows that nearly all trades conducted on IDBs are in round million-dollar increments. By contrast, 78% of dealer-to-customer trades of at least \$1 million are executed in million-dollar increments.<sup>33</sup> Moreover, it could be difficult for those customers wishing to trade in increments of less than \$1 million to move to a CLOB given that trade sizes are standardized at \$1 million increments.

RFQ trading protocols offer market participants a choice in the size of the trade they seek, but the trade may take more time and have less price transparency. This is consistent with discussions held with market participants, where they caution that some buy-side accounts often execute non-round trade amounts and would find it difficult to move to a CLOB.

Anonymous streams offer immediacy and a wider range of counterparties, but disclosed streams, which have grown more significantly, further limit the number of counterparties to a trade, particularly when the streams are tailored to a particular customer.

Match auctions primarily work through matching market participants with similar and offsetting trading needs. Concentrating demand to buy and sell specific securities at specific times during the trading session increases the likelihood of finding offsetting matches for less liquid securities. However, in practice, finding offsetting matches at the same time in less liquid

---

<sup>33</sup> FINRA TRACE data was analyzed from January to June 2022. Overall, 99.0% of IDB transactions of at least \$1 million were in round million-dollar increments, while 77.6% of similar dealer-to-customer trades were round.

securities can be challenging, especially when a limited number of participants engage on the platform.

#### **Section 4: Challenges to broader adoption of trading protocols that approximate all-to-all**

Proponents of all-to-all trading argue it could expand the number of counterparties to a trade and improve the efficient transfer of risk in the market. Even so, market participants interviewed highlight a number of key challenges associated with the broader adoption of all-to-all trading in the Treasury market.

##### *Role of trading platforms*

Trading platforms have expanded potential trading partners and created efficiencies by consolidating trading, clearing, and settlement activity through the protocols discussed above. However, the concentration of activity in these platforms can also result in higher local and systemic clearing and settlement risks, as discussed below.

In the anonymous trading protocols, the trade is completed without either side having knowledge of what institution is on the other side of the trade, with the trade platform standing as the counterparty to both sides of the transaction. This structure provides some benefits to the trading platform clients; for example, the costs of onboarding new counterparties may be reduced for both sides of the trade because they only have to onboard the platform as a counterparty rather than all the potential trading partners who transact on the platform.

However, this structure could create challenges for both the trading platform and the broader marketplace if it results in a concentration of insufficiently managed risk. For example, for trades between participants in which one or both are not CCP members, the trading platform typically accepts the credit and settlement risk associated with the trades of the non-CCP member. As the platform takes on this risk, it may need to limit the number of clients it onboards or provide clients with lower credit limits to manage this risk. Additionally, as these platforms grow, clearing and settlement risks become more concentrated with the trading platforms, which can increase systemic risk if the platforms fail to effectively manage their direct and indirect clearing and settlement risks. In general, existing Treasury trading platforms are not subject to the same regulatory requirements for risk management as a CCP (Treasury Market Practices Group 2019).<sup>34</sup> Given these and other clearing and settlement risks, a number of proposals to increase the resilience of the Treasury market have suggested that central clearing should be mandatory.<sup>35</sup>

Another challenge in engaging with these protocols is that a market participant either has to become a client of the sponsoring firm of the trading platform or use an agent to use the platform. Depending on the membership requirements of the trading platform and the needs

---

<sup>34</sup> Most trading platforms in the Treasury market clear and settle a significant portion of traded activity bilaterally and are not subject to the regulations applicable to a Covered Clearing Agency (CCA). Currently there is one CCA for Treasury securities, the Fixed Income Clearing Corp, which is regulated by the SEC as a Covered Clearing Agency and is designated a systemically important financial market utility which also provides the Federal Reserve with certain supervisory authorities. The regulatory framework covers a variety of risk management and governance standards, including margin requirements, due diligence of its liquidity providers, and a requirement for sufficient liquidity resources.

<sup>35</sup> See Duffie (2020), Liang and Parkinson (2020), Group of Thirty Working Group on Treasury Market Liquidity (2021), and the SEC's proposed rules to improve risk management in clearance and settlement and to facilitate additional central clearing: <https://www.sec.gov/news/press-release/2022-162>.

of the market participant, this could create a significant barrier to entry, similar to the barriers to entry noted for memberships on some CLOBs, unless trading through an agent is widely available.

### *Counterparty anonymity*

Across the different all-to-all like trading protocols, anonymous trading is common, which facilitates broadening the counterparties to a trade. However, in the current market structure, some market participants prefer to transact with known counterparties. For example, protocols can also have some sort of disclosed counterparty or counterparty grouping, be it liquidity providers or liquidity consumers. In market outreach discussions, contacts note that the relationship and name recognition from disclosed RFQ are perceived to contribute to better execution. Additionally, trading with disclosed counterparties helps maintain relationships with liquidity providers, which is important to liquidity consumers.<sup>36</sup> The proliferation of direct streams from liquidity providers to liquidity consumers supports the arguments that some liquidity consumers prefer to transact with certain disclosed counterparties.

A key issue in discussions of counterparty disclosure with market participants is the pricing they would receive. As discussed in Section 2, pricing competitiveness in the corporate bond market tended to improve following the introduction of all-to-all trading. This experience may be most directly relatable to the potential use of all-to-all like trading protocols in the off-the-run

---

<sup>36</sup> Market participants also highlighted that disclosed RFQ trades provide a clear process for asset managers to document they are getting best execution for their clients by showing the other prices offered at the same time.

Treasury market, where liquidity is lower and heterogeneity of issuance is high, similar to the investment grade corporate bond market, though to a lesser extent.

However, some market participants believe they receive better pricing from a direct counterparty relationship with a dealer than through an anonymous trade due to the long-term trading relationships between counterparties, and also appreciate the ability to move large and/or illiquid positions discretely. If true, this could result in all-to-all trading possibly offering less competitive pricing in some situations, potentially challenging its broader adoption.

Some market participants note that dealers' ability to provide seemingly more-competitive pricing is potentially a product of the current market structure in which trading is more relationship based and less exchange based, and price transparency is limited. Were all-to-all to increase in use, the need for privileged relationships for certain transactions could decline and overall pricing could become more competitive, particularly for customers who are currently more reliant on dealer intermediation. Moreover, if all-to-all trading became more prevalent, this could result in increased price transparency, which could reduce the benefits of disclosed trading with trusted counterparties, and spur greater trading activity.

Some argue that were all-to-all trading to be successful in narrowing bid-ask spreads in the market, dealers might choose to reduce their activity in the market due to decreased profitability, ultimately reducing Treasury market liquidity overall. Others, such as Duffie (2020), argue that dealers would remain important liquidity providers in a market with all-to-all trading, especially for large trades.

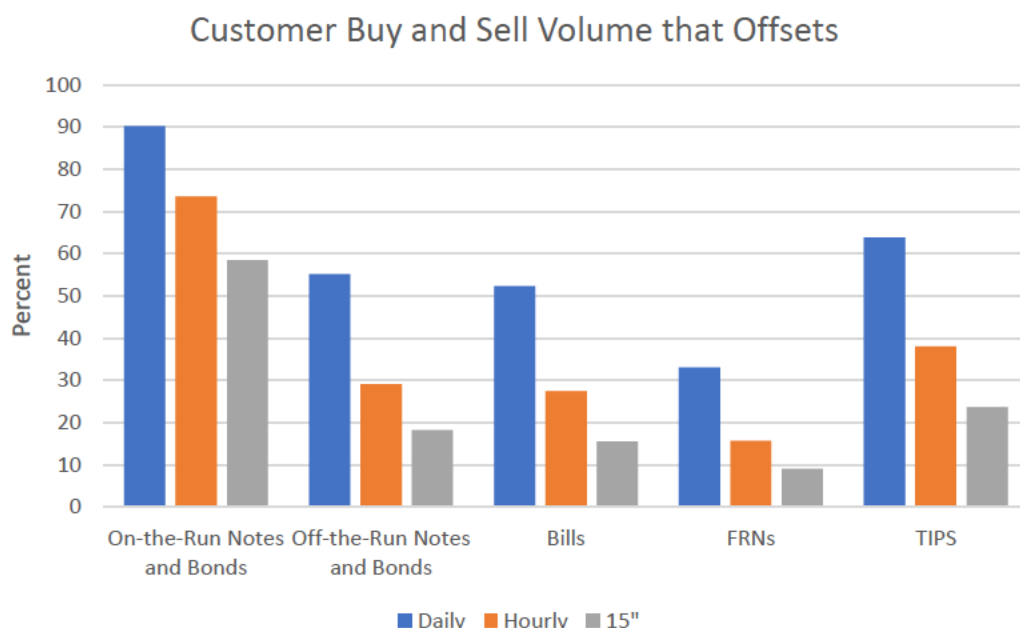
### *Security types traded*

While an ideal all-to-all trading marketplace would allow Treasury market participants to trade the full range of Treasury securities, most electronic trading protocols in the Treasury market are limited to trading on-the-run or near on-the-run notes and bonds. The strains experienced in March 2020 in the cash U.S. Treasury market were more pronounced in off-the-run securities due in part to dealer balance sheet and risk management constraints, suggesting that this is a market segment that could benefit from all-to-all trading. Trading in less liquid Treasury securities, such as deep off-the-run securities, occurs primarily through disclosed RFQ or via a message/voice trade between a client and broker-dealer, with message/voice trading used often in the case of block trades. As a result, trading in less liquid securities or larger sizes relies more on dealer intermediation than does trading in more liquid securities.

When asked why all-to-all trading has not been more broadly adopted in the off-the-run market, market participants note that all-to-all trading works best when there is concurrent (or near concurrent) interest to buy and sell a given security, which is much more common for actively traded on-the-run notes and bonds. In contrast, it is unusual to see simultaneous interest to buy and sell the same off-the-run security at around the same time. In addition, investors and dealers raised concerns about the information leakage of conducting block trades in off-the-runs on a CLOB or through RFQ to multiple parties.

Analysis of FINRA TRACE data supports the conjecture that purchases and sales of less-liquid Treasuries at around the same time are uncommon. Looking at off-the-run notes and bonds, only 18% of customer trading activity has offsetting activity in the same security within the

same 15-minute interval, as shown in the chart below. Similar dynamics are seen for TIPS, bills, and FRNs. However, the prevalence of matching trades increases notably when the time frame for matching is widened to the entire day, supporting the idea that routine batch matching auctions might provide opportunities for offsetting trades in less-liquid securities.



Source: Authors' calculations, based on data from FINRA TRACE.

Notes: The chart plots the percent of customer trading volume with dealers that has offsetting customer trading volume in the same security for the same settlement day within the same time interval between January 3 and June 30, 2022. As an example, if one or more customers bought \$40 million of the second off-the-run 10-year note for next-day settlement within a particular 15-minute interval and one or more customers sold \$10 million of the same security for next-day settlement within the same 15-minute interval, then we would say that \$20 million in customer trading volume offset out of a total of \$50 million traded for that security, settlement day, and interval.

As 74% of U.S. Treasuries outstanding are off-the-run notes and bonds, more all-to-all offerings in these securities could provide more options for market participants to trade less liquid securities and provide a potential release valve when demand for liquidity overwhelms intermediation capacity in a market stress event. For these protocols to be successful in the



currently less-liquid segments of the Treasury market, trading activity would likely need to increase. Creation of a viable trading venue, perhaps supported by increased transparency, could help bring about such an activity increase for these securities.

## **Section 5: Conclusion**

The U.S. Treasury market remains the deepest and most liquid securities market in the world. However, recent disruptions have increased discussion of how its resilience might be improved to ensure it continues to fulfill its vital role for the U.S. and global financial system. Some market observers argue that increased use of all-to-all trading in the Treasury market could help improve resilience by providing additional opportunities for trading partners to match on a trade without use of an intermediary. Increased use of all-to-all trading could also result in lower transaction costs for liquidity consumers and could improve transparency around trade data, both of which seem supportive of improved market functioning in times of both calm and stress. Market structure conditions that could make broader adoption of all-to-all trading more likely in the Treasury market include greater data transparency and broader central clearing. However, there are some non-negligible risks and challenges to broad use of all-to-all trading in the Treasury market. Several different trading protocols currently exist in the Treasury market that offer a broader range of trading partners. While each offers different opportunities for engaging in various ways of trading, most of them continue to focus on trading of on-the-run securities, with fewer options available in less liquid parts of the market, such as off-the-runs. Additionally, many of the trading protocols involve the trading platform sponsors serving as

legal counterparties to the trades conducted, which can create unclear and complex clearing and settlement risks in the market and contribute to broader financial stability risks. Finally, as with all changes to market structure, whether certain types of market participants might respond by changing their involvement in the Treasury market were all-to-all trading to increase in prevalence must be closely weighed. Such responses might reduce liquidity in the market – for example, if dealers were to reduce their presence in the market – or might increase liquidity – such as if new participants were to enter the market to take advantage of the new trading ecosystem.

Trading protocols are continuing to evolve in the Treasury market and trading platforms are introducing new ways of transacting. Additionally, the types of institutions that trade in the Treasury market are shifting and new entrants are altering the landscape of trading further. Finally, the regulatory landscape is changing, with the official sector making progress towards its objective of enhancing the resilience of the Treasury market.<sup>37</sup> Treasury market structure innovations—such as all-to-all trading, which could expand or deepen new avenues of trading—could also serve to enhance the Treasury market’s depth, liquidity, and resilience.

---

<sup>37</sup> For more information on the IAWG’s progress, see “Fact Sheet: Progress of the Inter-Agency Working Group on Treasury Market Surveillance in Enhancing the Resilience of Treasury Markets,” September 22, 2022, <https://home.treasury.gov/system/files/136/IAWG-Progress-Fact-Sheet.pdf>.

## References

Benos, E., R. Payne, and M. Vasios, 2020, “Centralized Trading, Transparency, and Interest Rate Swap Market Liquidity: Evidence from the Implementation of the Dodd–Frank Act.” *Journal of Financial and Quantitative Analysis*, 55(1), 159-192.

Bessembinder, H., W. Maxwell, and K. Venkataraman, 2006, “Market Transparency, Liquidity Externalities, and Institutional Trading Costs in Corporate Bonds.” *Journal of Financial Economics*, 82, 2, 251-288.

Boehmer, E, G. Saar, and L. Yu, 2005, “Lifting the Veil: An Analysis of Pre-trade Transparency at the NYSE.” *Journal of Finance*, 60, 2, 783-815.

Boissay, F., F. Collard, and U. Lewrick, 2018 “[Banking regulation, market liquidity, and the macro-economy.](#)” mimeo.

Burne, K., 2021, “[Future-Proofing the U.S. Treasury Market](#),” BNY Mellon Aerial View Magazine.

Cimon, D. and C. Garriott, 2019, “Banking regulation and market making.” *Journal of Banking and Finance*, 109, 1–14.

Cantrill, L., T. Crowley, J. Woytash, J. Schneider, and R. Chan, 2022, “[How Can Policymakers Improve the Functioning of the U.S. Treasury Market?](#)” PIMCO Viewpoints.

Congressional Budget Office, 2022, “[The 2022 Long-Term Budget Outlook.](#)”

Daures-Lescourret, L., and Fulop, A., Standardization, 2022, “Transparency Initiatives and Liquidity in the CDS Market.” *Journal of Financial Markets*, forthcoming.

Dobrev, D., and A. Meldrum, 2020, “[What Do Quoted Spreads Tell Us About Machine Trading at Times of Market Stress? Evidence from Treasury and FX Markets during the COVID-19-Related Market Turmoil in March 2020.](#)” FEDS Notes, September 25.

Duffie, D., 2020, "[Still the World's Safe Haven: Redesigning the U.S. Treasury Market After the COVID-19 Crisis](#)." Hutchins Center Working Paper No. 62, Brookings Institution.

Fleming, M., E. Schaumburg, and R. Yang, 2015, "[The Evolution of Workups in the U.S. Treasury Securities Market](#)." Federal Reserve Bank of New York Liberty Street Economics, August 20.

Group of Thirty Working Group on Treasury Market Liquidity, 2021, "[U.S. Treasury Markets: Steps Toward Increased Resilience](#)." Group of Thirty.

Harkrader, J.C., and M. Puglia, 2020, "[Principal Trading Firm Activity in Treasury Cash Markets](#)." FEDS Notes, August 4.

Haselmann, R., T. Kick, S. Singla, and V. Vig, 2019, "Capital regulation, market-making, and liquidity." Working paper presented at workshop on "Impact of regulation in a changing world: innovations and new risks," Bank for International Settlements, July.

Hendershott, T., D. Livdan, and N. Schurhoff, 2021, "All-to-All Liquidity in Corporate Bonds." Swiss Finance Institute Research Paper Series.

IAWG Staff Progress Report, 2021, "[Recent Disruptions and Potential Reforms in the U.S. Treasury Market: A Staff Progress Report](#)." U.S. Department of the Treasury, Board of Governors of the Federal Reserve System, Federal Reserve Bank of New York, U.S. Securities and Exchange Commission, and U.S. Commodity Futures Trading Commission.

Joint Staff Report, 2015, "[The U.S. Treasury Market on October 15, 2014](#)." U.S. Department of the Treasury, Board of Governors of the Federal Reserve System, Federal Reserve Bank of New York, U.S. Securities and Exchange Commission, and U.S. Commodity Futures Trading Commission, July 13.

Liang, N., and P. Parkinson, 2020, "[Enhancing Liquidity of the U.S. Treasury Market Under Stress](#)." Hutchins Center Working Paper no.72, Brookings Institution.

Loon, Y.C., and Z.K. Zhong, 2014, "The Impact of Central Clearing on Counterparty Risk, Liquidity and Trading: Evidence from Credit Default Swap Market." *Journal of Financial Economics*, 112(1), 91–115.

Loon, Y.C., and Z K. Zhong, 2016, “Does Dodd-Frank affect OTC transaction costs and liquidity? Evidence from real-time CDS trade reports.” *Journal of Financial Economics*, 119(3), 645–672.

Musto, D., G. Nini, and K. Schwarz, 2018, “Notes on Bonds: Illiquidity Feedback During the Financial Crisis.” *Review of Financial Studies*, 31(8), 2983-3018.

McPartland, K., 2019, “[How Bilateral Streams for U.S. Treasuries Really Work](#).” Greenwich Blog.

Treasury Market Practices Group, 2019, “[White Paper on Clearing and Settlement in the Secondary Market for U.S. Treasury Securities](#).”

U.S. Department of the Treasury, Securities and Exchange Commission, and Board of Governors of the Federal Reserve System, 1992, “[Joint Report on the Government Securities Market](#).” U.S. Government Printing Office.