



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

U.S. Commodity Futures Trading Commission

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This is a report of staff findings from the U.S. Department of the Treasury, the Board of Governors of the Federal Reserve System, the Federal Reserve Bank of New York, the U.S. Securities and Exchange Commission, and the U.S. Commodity Futures Trading Commission. The report represents only the views of staff, and the organizations listed above have expressed no view regarding the analysis, findings, or conclusions contained herein.

Section 1: Introduction

The Treasury market is the deepest and most liquid market in the world and a central component of the U.S. and global financial systems. However, recent years have seen several episodes of abrupt and disruptive deterioration in the functioning of some segments of the market. Although some disruptions came amid the extreme public health and economic shock at the onset of the COVID-19 pandemic, other disruptions arose in seemingly more benign environments. Furthermore, the market has evolved significantly over recent decades and is expected to continue to change, including as a result of growth in electronic trading and substantial increases in the amount of Treasury securities outstanding. To help ensure that the Treasury market continues to reliably fulfill its vital role, the authorities overseeing the market are pursuing a program of analysis to inform policy making. This paper provides a progress report on those efforts.

The Treasury market has multiple segments, including outright purchase and sale transactions; overnight and term financing transactions known as repurchase agreements or repos; and derivatives, particularly futures. Although different authorities regulate different market segments or market participants, the authorities collaborate to help ensure effective surveillance and coordinated policymaking. This paper presents the views of 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).[1]

Over time, the authorities' primary objectives in the Treasury market have been threefold. First, as the issuer of Treasury securities, the Treasury Department seeks to finance the federal government at the lowest cost to the taxpayer over time. Second, the authorities aim for the Treasury market to support the broader financial system. The market does so by serving as a source of safe and liquid assets that support the efficient, stable flow of capital and credit to households and businesses, and by establishing a benchmark credit-risk-free yield curve. Third, the Federal Reserve implements monetary policy partly through transactions in the Treasury market. More broadly, the smooth operation of the Treasury market is important to the transmission of the stance of monetary policy to broader financial conditions and the U.S. economy.

The IAWG staffs' recent work in support of these objectives has had several components, which are laid out in the remainder of this paper. Section 2 sets the stage for the work by reviewing the basic structure of the Treasury market. As described in section 3, the staffs have reviewed recent market stresses with a view to understanding the key drivers of disruption and potential mitigants. Looking to the future, as described in section 4, the staffs have identified six

[1] 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 markets following the Salomon Brothers auction bidding scandal. See 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, January 22, available at https://www.treasury.gov/resource-center/fin-mkts/Documents/gsr92rpt.pdf. Today, the IAWG consists of staff from the Treasury Department, SEC, Federal Reserve Board, FRBNY, and CFTC.

principles that they view as useful in guiding public policy in the Treasury market to achieve the official sector's objectives. Finally, as described in section 5, the staffs are analyzing specific policy areas in which steps could be taken to strengthen the market's resilience. This policy analysis is ongoing, and the paper describes both some conclusions and some areas where further consideration is needed.

Section 2: The Structure of the Treasury Market

The Treasury market includes markets for outright purchases and sales of securities, or cash transactions; for repos; and for futures on Treasury securities. Each of these markets involves different but overlapping participants, trading venues, and infrastructure, and some of these markets can be further divided into distinct segments.

The cash market has two main components.

- In the *interdealer* market, securities dealers trade with each other and with principal trading firms (PTFs), which trade as principals for their own accounts and almost exclusively use automated trading strategies. Most interdealer trading takes place on electronic platforms provided by interdealer brokers (IDBs) that operate central limit order books. Electronic interdealer trading is concentrated in the most recently issued, or on-the-run, Treasury securities. Dealers typically trade more seasoned, or off-the-run, securities, on voice-based IDB platforms. Interdealer transactions are cleared and settled either bilaterally or through a central counterparty (CCP), the Fixed Income Clearing Corp. (FICC), depending on whether both parties to the transaction are members of FICC; dealers generally are members, while PTFs generally are not members. As a CCP, FICC becomes a counterparty to centrally cleared transactions and guarantees their completion, and each participant in such transactions settles bilaterally with FICC rather than with its original counterparty.

- In the *dealer-to-customer* market, dealers buy securities from and sell securities to a variety of clients, including, but not limited to, asset managers, pension funds, and hedge funds. Trading of off-the-run securities is relatively more common in the dealer-to-customer market than in electronic interdealer trading, and a range of trading methods is used, from electronic request-for-quote (RFQ) systems to voice trading. Dealer-to-customer transactions are typically settled bilaterally through clearing banks.

In a repo transaction, one participant sells a Treasury security to another participant and commits to repurchase the security at a specified price on a specified later date. The price difference between the purchase and repurchase can be converted to an interest rate, and the transaction's net effect is comparable to a loan collateralized by the Treasury security. The transaction can require a particular security, known as specific collateral, or can allow any Treasury security within a broad class, known as general collateral. A repo can be overnight or for a longer term. The Treasury repo market has four main components.

- In *triparty repo*, excluding the centrally cleared triparty segment described below, cash investors such as money market mutual funds (MMFs) provide financing to borrowers, typically securities dealers. Transactions are typically arranged bilaterally between the cash investor and the borrowing dealer. Triparty transactions are settled at a clearing bank, which holds the securities in custody but does not become a counterparty to the transactions.

- In *centrally cleared bilateral repo*, firms that are members of FICC lend to each other. These transactions are generally arranged either electronically or by voice

through IDBs. Historically, most cleared repo transactions were between dealers. However, FICC's sponsored service has allowed a growing volume of transactions involving non-traditional institutional participants such as MMFs and hedge funds. These participants become sponsored members of FICC and have their obligations to FICC guaranteed by a full member of FICC, the sponsoring member. FICC enables its members to aggregate their cleared bilateral repos with offsetting cleared cash trades to settle a single net position per security.

- In *centrally cleared triparty repo,* transactions are centrally cleared by FICC and settled on The Bank of New York Mellon's triparty platform. These transactions have generally taken place through the General Collateral Finance (GCF) repo service, where FICC member dealers trade with each other on a blind-brokered basis. In September 2021, FICC also introduced a sponsored general collateral repo service in which centrally cleared repos between sponsored members and their sponsors are settled on the triparty platform.[2]

- In *non-centrally cleared bilateral repo,* counterparties arrange and settle the transaction bilaterally, without involving a triparty service or central counterparty. Given that FICC requires its full members (also called netting members) to centrally clear trades with each other, a non-centrally cleared bilateral repo typically involves an institution that is not a FICC netting member, frequently a leveraged borrower such as a hedge fund, on at least one side of the transaction.

Treasury futures consist of standardized contracts to buy or sell Treasury securities on a specified future date and at a specified price. Each contract requires delivery of securities within a specific range of original and remaining maturities. For example, the 10-year futures contract requires delivery of Treasury notes with 6½ to 10 years to maturity. Treasury futures trade electronically on the Chicago Board of Trade, an exchange operated by CME Group, and are centrally cleared by CME Clearing.

Prices in the cash, repo, and futures markets are linked because it is possible to purchase a Treasury security in the cash market, finance the purchase in the repo market, sell the corresponding futures contract short, and then deliver the security in satisfaction of the futures contract when the futures contract expires. The cash-futures basis is the return on such a sequence of transactions, for whichever security is cheapest to deliver among those allowed for the futures contract. Arbitrage tends to drive the basis toward zero, meaning that under normal conditions, the difference between cash and futures prices reflects mostly the cost of repo borrowing until the futures expiry date.[3] Certain levered funds specialize in cash-futures basis trading and related relative-value strategies, but dealers and buy-side investors also take on these positions. A number of other types of cross-market trading and market-making activities also link the cash, repo, and futures markets.

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[2] See Securities and Exchange Commission, 2021, "Self-Regulatory Organizations; Fixed Income Clearing Corporation; Notice of Filing of Amendment No. 1 and Order Granting Accelerated Approval of a Proposed Rule Change, as Modified by Amendment No. 1, to Add the Sponsored GC Service and Make Other Changes," August 30, available at https://www.sec.gov/rules/sro/ficc/2021/34-92808.pdf.

[3] The basis can also include a risk premium because basis trades entail various risks, including variation in interest rates on overnight repo funding and potential margin calls on the futures position.

The Treasury market's size and structure have changed in important ways in recent decades. 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 2020, debt held by the public had reached $21.6 trillion, or 101 percent of GDP. The Congressional Budget Office projects continued growth in both the nominal debt and its size relative to GDP in the long run.[4]

As the market has grown, increased use of electronic trading and shifting types of market intermediaries have changed how market liquidity is provided and influenced the characteristics of that liquidity. The growth in 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 main 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.

Dealers have historically been able to 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 tend to buy and sell frequently in the interdealer market and typically end the day with little net directional exposure. Because they take on little net exposure, many PTFs are more thinly capitalized than typical broker-dealers. The electronic interdealer market also does not create client relationships. As a result, PTFs tend to make trading decisions primarily based on immediate profitability and the level of market risk. Increasing concentration among PTFs has resulted in a small number of PTFs playing a key role in price discovery and the provision of market liquidity.

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' capacity to intermediate.[5] 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. Even when the demand for intermediation in the Treasury market has spiked and potential profits from intermediation have risen, banks and bank-affiliated broker-dealers sometimes have not meaningfully expanded their balance sheets in aggregate to meet the increase in demand.

The growth of electronic trading and resulting changes in the mix of intermediaries have changed trading practices and the use of market infrastructure. As firms access multiple markets over ever-shorter time frames, markets have become increasingly interconnected, resulting in significantly faster risk and information transmission. In addition, the expansion of PTFs' role in

[4] Congressional Budget Office, 2021, "The 2021 Long-Term Budget Outlook," available at https://www.cbo.gov/system/files/2021-03/56977-LTBO-2021.pdf.

[5] See Darrell Duffie, 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, available at https://www.brookings.edu/wp-content/uploads/2020/05/WP62_Duffie_v2.pdf.

the interdealer market beginning in the mid-2000s resulted in a decreasing fraction of interdealer trades being centrally cleared. In recent years, approximately one-half of interdealer cash trades (representing about one-quarter of the total cash market) have been centrally cleared, compared with central clearing of virtually all interdealer trades (representing about one-half of the total cash market) before the entry of PTFs in the interdealer market.[6]

[6] See Treasury Market Practices Group, 2019, "White Paper on Clearing and Settlement in the Secondary Market for U.S. Treasury Securities," available at https://www.newyorkfed.org/medialibrary/Microsites/tmpg/files/CS_FinalPaper_071119.pdf.

Section 3: Recent Disruptions in the Treasury Market

While the disruptions to the Treasury market at the onset of the COVID-19 pandemic in March 2020 were unique and unprecedented in nature, they have some similarities with other recent market disruptions, including the October 2014 flash rally and the September 2019 repo market pressures.[7] This section of the paper examines the 2020 episode and then considers similarities and differences between that episode and others. A recurring theme is that trading volumes and demand for intermediation can surge suddenly, but intermediaries' willingness or capacity to respond can be relatively inelastic compared with these surges, potentially leading to rapid deterioration in market functioning. The surging demand for intermediation can include both demand for market liquidity (the ability to buy and sell assets) and funding liquidity (the ability to obtain financing against collateral).[8] Approaches to improving the resilience of intermediation are the focus of the first of the policy workstreams described later in the paper. Another recurring theme is that the official and private sectors may have limited real-time visibility into the positions and flows driving market dislocations. Potential improvements to data quality and availability are the focus of the second policy workstream. Experience has also highlighted challenges around trading venue transparency and oversight, central clearing, and leverage and liquidity risk management, the subjects of the remaining workstreams.

Notwithstanding the dislocations we study here, it is important to emphasize that the Treasury market remains deep, liquid, and resilient, and that most shocks do not result in any appreciable market functioning or liquidity stress. Continued study of market dynamics during both calm conditions and stress episodes will allow market participants, policymakers, and researchers to identify ways to enhance the resilience of the Treasury market going forward and to minimize the need for government interventions during stress.

A. March 2020 COVID-19 disruptions

Beginning in late February 2020, the threat to public health from the global spread of the COVID-19 pandemic created extraordinary uncertainty about the economic outlook and triggered extreme volatility across financial markets. Within a few weeks, the functioning of Treasury markets was significantly disrupted. Market liquidity deteriorated and the prices for closely related instruments diverged significantly.

The disruptions to Treasury markets caught many participants and observers by surprise because they were driven by heavy sales during a period when many had expected a flight to safety to bolster demand for Treasury securities. Typically, demand for Treasury securities increases during market shocks as investors seek to hold safe and liquid assets. However, investors value Treasury securities in part because they are easy to liquidate. In the unique circumstances of the COVID-19 shock, a broad range of investors wanted to raise cash at the same time and sold their most liquid non-cash assets, often Treasury securities, to do so. This

[7] For a comparison of Treasury market volatility and liquidity provision across several episodes of market stress, see Alex Aronovich, Dobrislav Dobrev, and Andrew Meldrum, 2021, "The Treasury Market Flash Event of February 25, 2021", FEDS Notes, Board of Governors of the Federal Reserve System, May 14, available at https://www.federalreserve.gov/econres/notes/feds-notes/the-treasury-market-flash-event-of-february-25-2021-20210514.htm.

[8] See Markus K. Brunnermeier and Lasse Heje Pedersen, 2008, "Market Liquidity and Funding Liquidity," *Review of Financial Studies* 22(6), 2201-2238.

selling was particularly heavy, in terms of the amount of duration risk transferred, in longer-maturity securities. Amid these sales, Treasury yields exhibited extreme volatility. The benchmark 10-year yield fell from 1.46 percent on February 21 to 0.54 percent on March 9, rebounded to 1.18 percent by March 18, then fell again to close the month at 0.70 percent. Intraday yields varied over an even wider range.

The heavy sales demonstrated the potential for sudden, large shifts in investor positioning in the Treasury market. Although trading volumes soared, intermediaries' capacity did not keep up with the selling pressure, and market liquidity deteriorated. Some Treasury holders appeared to react to the decline in market liquidity by selling securities for precautionary reasons lest conditions worsen further, and these sales only added to the stress on the market. The cash-futures basis widened sharply as securities sales pressured the cash market while rising volatility increased the risks of arbitrage, and additional cash sales came from basis traders unwinding positions. Even as many investors were selling longer-dated Treasury securities, the desire for cash-like assets prompted a surge in demand for Treasury bills and generated unique stresses in that market sector. Some of these dynamics were difficult for the official sector to assess in real time given data gaps.

Sustained, forceful official sector actions were ultimately required to break the cycle of stresses and support smooth market functioning, as well as the economy more broadly. The actions most relevant for the Treasury market included open market operations by the Federal Reserve; enactment of the Coronavirus Aid, Relief, and Economic Security (CARES) Act, which delivered aid to the American people funded by additional Treasury issuance; and temporary changes in financial regulations.[9]

The sequence of events associated with the March 2020 market disruption has been well documented elsewhere.[10] We focus here on examining how the pandemic shock influenced the

[9] During this time, the official sector also took numerous other actions to stabilize the broader economy and financial system.

[10] The discussion here draws on sources including: Group of Thirty Working Group on Treasury Market Liquidity, 2021, "U.S. Treasury Markets: Steps Toward Increased Resilience," report, available at https://group30.org/publications/detail/4950; Glenn Hubbard et al., 2021, "Task Force on Financial Stability," report, Brookings Institution and University of Chicago Booth School of Business, available at https://www.brookings.edu/wp-content/uploads/2021/06/financial-stability_report.pdf; Treasury Borrowing Advisory Committee, 2021, "Treasury Market Functioning," presentation to the U.S. Department of the Treasury, May 4, available at https://home.treasury.gov/system/files/221/CombinedChargesforArchivesQ22021.pdf; Duffie (2020); Nellie Liang and Pat Parkinson, 2020, "Enhancing Liquidity of the U.S. Treasury Market Under Stress," Hutchins Center Working Paper No. 72, Brookings Institution, available at https://www.brookings.edu/wp-content/uploads/2020/12/WP72_Liang-Parkinson.pdf; Financial Stability Board, 2020, "Holistic Review of the March Market Turmoil," available at https://www.fsb.org/wp-content/uploads/P171120-2.pdf; Financial Stability Oversight Council, 2020, "2020 Annual Report," available at https://home.treasury.gov/system/files/261/FSOC2020AnnualReport.pdf; Board of Governors of the Federal Reserve System, 2020a, "Financial Stability Report: May 2020," available at https://www.federalreserve.gov/publications/files/financial-stability-report-20200515.pdf; Board of Governors of the Federal Reserve System, 2020b, "Financial Stability Report: November 2020," available at https://www.federalreserve.gov/publications/files/financial-stability-report-20201109.pdf; Commodity Futures Trading Commission, 2021, "CFTC Interim Staff Report: Cleared Derivatives Markets: March-April 2020," available at https://www.cftc.gov/media/5971/InterimStaffClearedDerivativesMarket0420_0621/download; Federal Reserve Bank of New York, 2021, "Open Market Operations During 2020," report prepared for the Federal Open Market Committee by the Markets Group of the Federal Reserve Bank of New York, available at

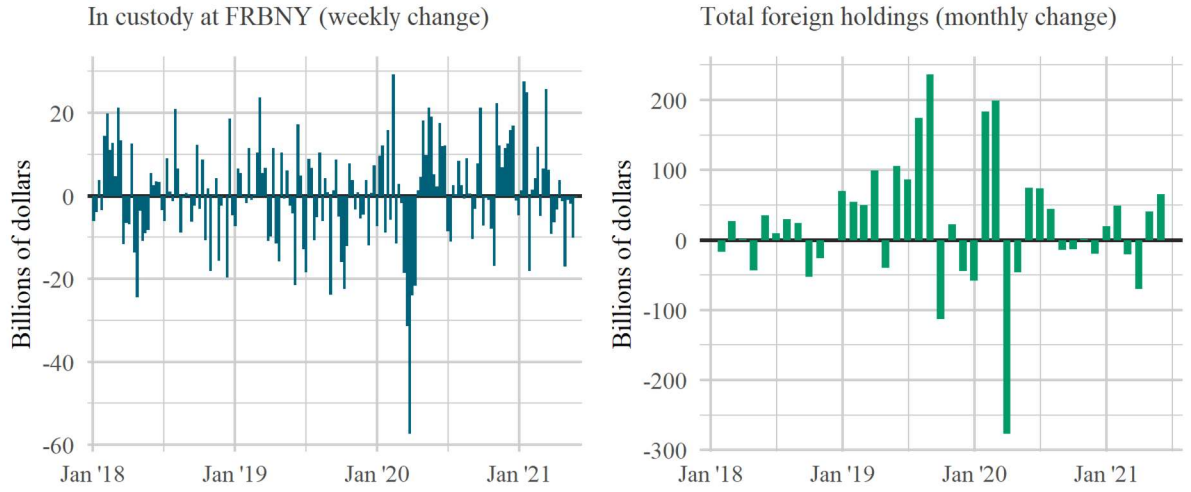
supply of and demand for market liquidity and funding liquidity. Across market segments, the central pattern is that the supplies of market liquidity and funding liquidity were not elastic enough to respond fully to surges in demand. Official sector actions that substantially shifted supply or demand appeared to be particularly influential in stabilizing the market.

Demand for liquidity

Demand for market liquidity and funding liquidity came from many sources. A broad range of investors wanted to sell mostly off-the-run and longer-dated Treasury securities in favor of cash and cash-like instruments such as Treasury bills, increasing the need for market liquidity. At the same time, many market participants sought funding against Treasury collateral. Notable sources of the demand for liquidity included:

Foreign official and private investors. Foreign investors were significant net sellers of Treasury securities. More than half of the net sales were by foreign official institutions, such as central banks that sought to support local currencies. Additional sales came from private investors that needed dollars. Some foreign sales were reportedly motivated by precautionary desires to convert Treasury securities to cash before market functioning deteriorated further. Data on the extent of foreign selling became available to the public and parts of the official sector only with the passage of time. For example, the par value of foreign official institutions' holdings of Treasury securities in custody at the FRBNY fell by $42 billion from just under $3 trillion in the week ending March 18 (Figure 1, left panel). This shift became public when the FRBNY released weekly custody data on March 19. Custody holdings would decline by another $118 billion into early April. Treasury International Capital (TIC) data would later show that

Figure 1 - Foreign holdings of Treasury securities



Sources: FRBNY; Treasury Department; Bloomberg

https://www.newyorkfed.org/medialibrary/media/markets/omo/omo2020-pdf.pdf; Lorie K. Logan, 2020, "Treasury Market Liquidity and Early Lessons from the Pandemic Shock," remarks at Brookings-Chicago Booth Task Force on Financial Stability meeting, October 23, available at https://www.newyorkfed.org/newsevents/speeches/2020/log201023; the IAWG members' internal analysis; and market outreach.

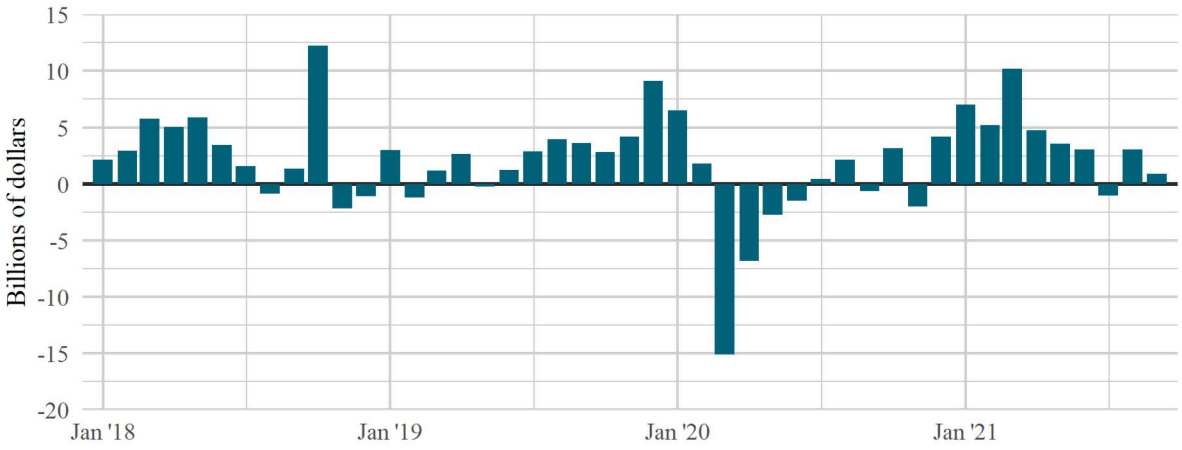
total foreign holdings of Treasury securities declined by about $275 billion in market value in the entire month of March (Figure 1, right panel). Given the significant price appreciation on net during March, the foreign selling was likely higher in par terms.

Open-end mutual funds managing redemptions. Funds often hold Treasury securities to meet liquidity needs. Facing substantial redemptions or possible redemptions, many different types of funds sold Treasury holdings in March 2020 to raise cash. Open-end mutual funds' net sales of Treasury securities totaled an estimated $266 billion in the first quarter of 2020.[11]

Real-money investors rebalancing their holdings. Although market prices were extraordinarily volatile in late February and March 2020, on net, equity prices fell dramatically, and prices of Treasury securities rose significantly. Real-money investors, especially longer-term investors such as pension funds and life insurance companies, responded in many cases by rebalancing their portfolios from Treasury securities to equities. In part because existing data collection on the cash Treasury market does not identify dealers' customers, the sources of these flows were difficult for the official sector to precisely determine in real time. One indication of this source of selling pressure was a decline in the amount of STRIPS outstanding (Figure 2). STRIPS are effectively long-term, zero-coupon Treasury securities, constructed by separating the principal and coupon payments of an ordinary Treasury note or bond.[12] Investors with long duration needs, particularly liability-driven investors such as pension funds and life insurance companies, often buy STRIPS. The amount of STRIPS outstanding fell as investors sold STRIPS and dealers reconstituted the STRIPS components into whole securities.

Figure 2 - Principal STRIPS outstanding

Monthly change



Source: Treasury Department

[11] Ayelen Banegas, Phillip J. Monin, and Lubomir Petrasek, 2021, "Sizing hedge funds' Treasury market activities and holdings," FEDS Notes, Board of Governors of the Federal Reserve System, October 6, available at https://www.federalreserve.gov/econres/notes/feds-notes/sizing-hedge-funds-treasury-market-activities-and-holdings-20211006.htm.

[12] STRIPS stands for "Separate Trading of Registered Interest and Principal of Securities."

Leveraged investors adjusting to changes in risks or covering losses and margin calls. The extraordinary risk environment drove leveraged investors to sell Treasury securities for several reasons. As market volatility soared, leveraged investors reduced positions in a variety of assets, including Treasury securities, to remain within risk limits. In the second week of March, equity prices and Treasury security prices fell simultaneously. This reversal of the typical correlation reportedly drove changes in portfolio allocations for levered investors whose strategies relied on Treasury securities as a hedge for equities, such as funds employing risk-parity strategies. As with real-money investors, incomplete or delayed data on positions and flows made some of these dynamics difficult to measure immediately. Research based on SEC Form PF data later estimated that hedge funds sold a net $173 billion of Treasury securities in March 2020, after adjusting for changes in market prices due to movements in interest rates.[13]

Changing risks put particular pressure on cash-futures basis trades, which are typically highly leveraged. Investors arbitraging the cash-futures basis face three risks: volatility in interest rates and the availability of funding if they use overnight repos to finance the trade, variation margin calls for any mark-to-market losses on the futures position, and the potential for increases in initial margin requirements to maintain the futures position. All three risks proved salient and pronounced in March 2020. Because futures prices rose significantly, traders with short futures positions had large mark-to-market losses. The central counterparty for Treasury futures responded to price volatility by increasing initial margin requirements to protect itself against potential defaults, meaning that investors had to post additional collateral. Moreover, repo rates were volatile at times, and some investors reported difficulty obtaining financing from dealers. Margin calls may have forced some investors to exit trades, or the risks may have led investors to unwind trades as a precaution. The widening basis then caused further mark-to-market losses for investors that had remained in the trade. Several data sources indicate that levered funds unwound cash-futures basis trades, adding to the total sales of Treasury securities, but these data were not uniformly available to the official sector in real time.[14]

MMFs purchasing Treasury bills. The dash for cash that drove sales of longer-maturity and off-the-run Treasury securities also increased the demand for Treasury bills. Over the course of March 2020, retail and institutional investors flooded government MMFs with net inflows of $838 billion.[15] Prime MMFs, which are not restricted to investing in government debt, registered net outflows. The growth of government MMFs contributed to exceptional demand for short-dated Treasury securities. MMF holdings of Treasury securities increased by $312 billion, or 30 percent, of which $221 billion was allocated to Treasury bills.[16] The increase in MMF holdings of Treasury bills represented nearly 10 percent of total privately held Treasury bills at the time.

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[13] See Banegas, Monin, and Petrasek (2021).

[14] Futures positioning data showed a reduction in the short positions of levered funds. Advisers to private investment funds such as hedge funds reported reduced Treasury securities positions on SEC Form PF. Treasury International Capital (TIC) data showed foreign Treasury securities holdings falling in March in countries that are reported to be the domiciles for several offshore funds. Data from the Trade Reporting and Compliance Engine (TRACE) of the Financial Industry Regulatory Authority (FINRA) also provide suggestive indications of reductions in basis trading, but do not precisely identify transactions associated with cash-futures basis activity.

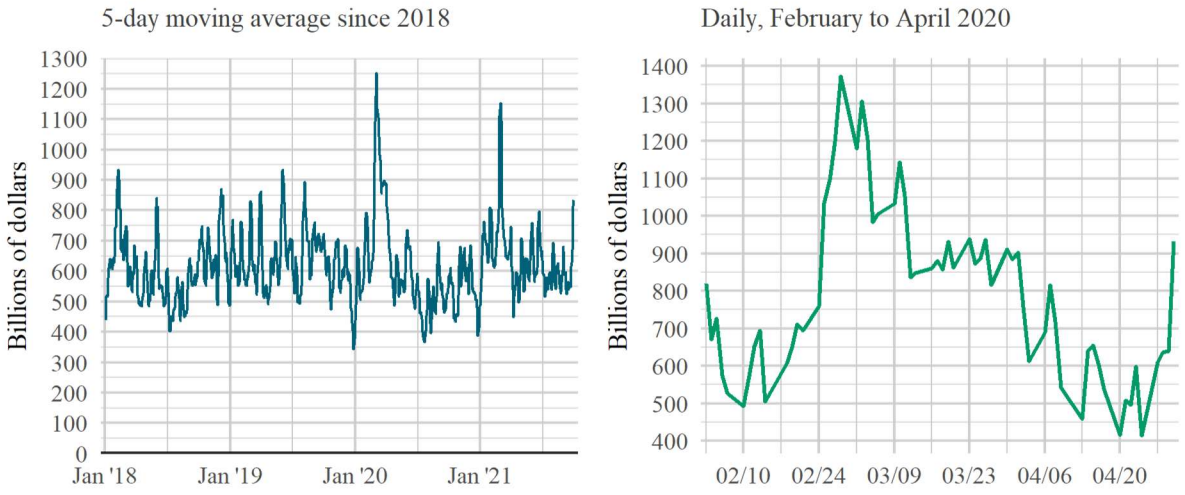
[15] Securities and Exchange Commission, 2020, "Money Market Fund Statistics: Form N-MFP Data, period ending March 2020," available at https://www.sec.gov/files/mmf-statistics-2020-03.pdf.

[16] Treasury Department staff analysis of public Form N-MFP filings.

Supply of liquidity

Providers of market liquidity and funding liquidity sought to meet the demand, and trading volumes rose significantly, especially during the first few weeks of the episode. Treasury cash transaction volumes (Figure 3) reached a new high of more than $1.3 trillion on February 28, compared with a daily average of around $600 billion, according to data from the Trade Reporting and Compliance Engine (TRACE) of the Financial Industry Regulatory Authority (FINRA). The amount of risk traded in the futures market, measured on a duration basis, mirrored the increased cash trading.

Figure 3 - Total transaction volumes



Source: TRACE

However, liquidity providers faced significant challenges, and measures of market functioning deteriorated. By March 13, the bid-ask spread for the 10-year on-the-run security increased to 1.4 ticks, compared with a typical level of about 0.5 ticks.[17] The widening in bid-ask spreads was even more pronounced for longer tenors and for less liquid off-the-run securities, where customer sales were heavier (Figure 4). Bid-ask spreads for the on-the-run 30-year bond widened to more than 6 times the post-Global Financial Crisis average by mid-March. In addition, yield spreads between similar maturity off-the-run and more-liquid on-the-run securities widened, indicating a rising price for market liquidity. Market depth fell, and the price impact associated with cash transactions increased to five to six times normal levels on March 12 and 13.[18] In the futures market, order book depth fell and bid-ask spreads widened meaningfully. Spreads on electronic trading platforms not only widened but became more volatile, with cash markets affected more severely than futures markets.[19]

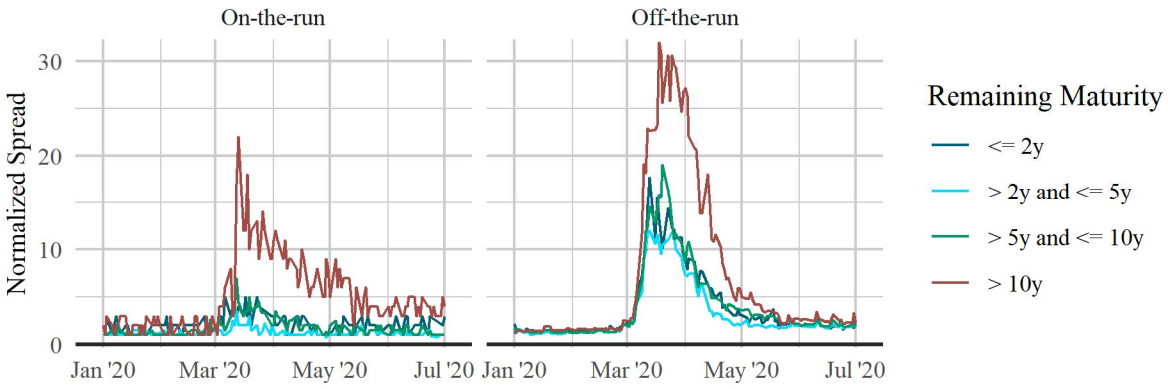
[17] A tick is equal to 1/32nd of $1.

[18] Michael Fleming and Francisco Ruela, 2020, "Treasury Market Liquidity during the COVID-19 Crisis," *Liberty Street Economics*, April 17, available at https://libertystreeteconomics.newyorkfed.org/2020/04/treasury-market-liquidity-during-the-covid-19-crisis/.

[19] Dobrislav Dobrev and Andrew 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

Figure 4 - Bid-ask spreads

Daily averages by maturity group



Note: Spread normalized by dividing by the 5th percentile (reference) spread observed Jan. 1 - Feb. 15, 2020.
Reference spreads calculated by tenor and separately for on-the-run and first, second, third, and fourth or more off-the-run securities.
Source: Bloomberg

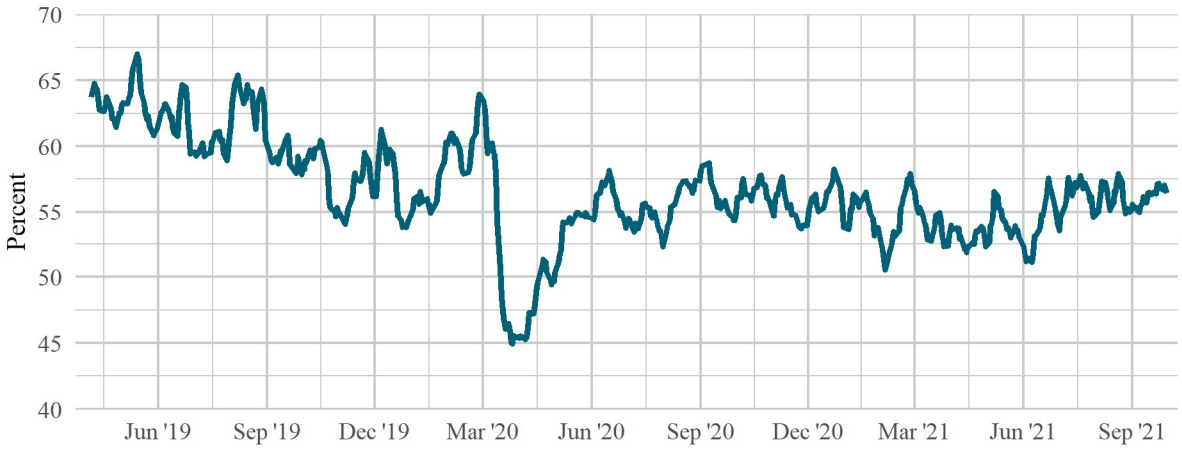
Among the notable challenges to the supply of liquidity were:

Increasing risks to market-making. Higher volatility, changes in correlations, greater customer flows, and a host of pandemic-related uncertainties all raised the risk of making markets. The higher risks appeared to be particularly relevant for PTFs, whose lower capitalization relative to dealers may leave them with less capacity to absorb adverse shocks. In the first week of March, a large share of the increased trading volume came from PTFs, and on March 9, PTFs' share of trading on electronic IDB platforms was just over 60 percent, a typical level. But as heavy net investor sales continued, the balance of activity in the interdealer market shifted (Figure 5). PTFs' total share of activity fell to a low of 45 percent on March 16. Dealers' total volumes on electronic IDB platforms also declined, but less sharply than PTFs' volumes. Additionally, there was substantial heterogeneity in responses among dealers and among PTFs.

March 2020", FEDS Notes, Board of Governors of the Federal Reserve System, September 25, available at https://www.federalreserve.gov/econres/notes/feds-notes/what-do-quoted-spreads-tell-us-about-machine-trading-market-stress-march-2020-20200925.htm.

Figure 5 - PTF share on electronic interdealer broker platforms

5-day moving average



Source: TRACE

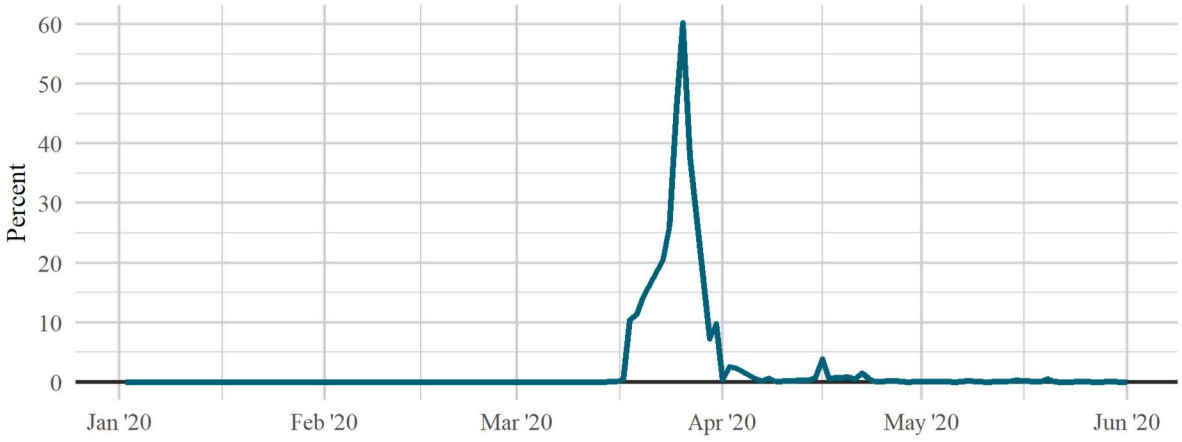
Dealer activity limits. The changing risk environment also limited some traditional dealers' trading. Dealers in aggregate increased their trading volumes and market share but eventually hit internal balance sheet constraints, such as risk and nominal balance sheet limits, as well subjective constraints related to profitability and risk tolerance. These limits are determined by dealers' business strategies and internal risk management frameworks and, for bank-owned dealers, may be influenced by regulations adopted after the Global Financial Crisis. Some dealers were able to swiftly increase these limits to a certain extent, while others were unable or unwilling to increase their limits. Market commentary from primary dealers suggested that risk management concerns in the volatile environment limited their capacity to use their balance sheets to absorb the heavy flows from customers. Additionally, dealers had entered March 2020 with elevated inventories of Treasury securities, which potentially left less room for further expansion.

Differences across markets in the use of circuit breakers. Circuit breakers in Treasury futures markets were periodically activated in response to significant price volatility, particularly for longer-dated tenors. The cash Treasury market does not have circuit breakers and continued to trade during these times, though without the price discovery from futures. The activation of futures circuit breakers reportedly challenged some trading strategies that rely on high-frequency hedging between cash and futures markets. Additionally, exchange-traded funds that hold Treasury securities were subject to the circuit breakers in the equity market, which are distinct from futures circuit breakers.

Scarcity of Treasury bills. As customer demand for Treasury bills soared, primary dealers nearly exhausted their net inventory of these securities, which fell from $23 billion on March 11 to $1 billion on March 25. By March 26, about 60 percent of all trading in bills occurred at a negative yield, according to TRACE data (Figure 6). Market makers expressed concern that if they sold bills, they would be unable to cover without taking a loss, and market functioning worsened. Daily transaction volumes in bills averaged $78 billion during the week ending March 27, a 28 percent decline from the daily average over the prior four weeks. Bloomberg data show that the 5-day moving average bid-ask spread for the on-the-run 3-month bill widened from 1 basis point in mid-February to nearly 8 basis points in late March, exceeding levels seen during the depths of the Global Financial Crisis.

Figure 6 - Bills trading at negative rates

Daily share of total bill trading



Source: TRACE

Procyclicality of margin requirements. Increasing margin requirements at CCPs and trading platforms, while important for managing risk in the volatile market environment, also raised the cost of intermediation in some market segments. Some intermediaries have also cited gaps in data and tools that would allow them to better predict CCP margin calls.[20]

Operational difficulties and risks. The sudden shift to work-from-home arrangements in response to the pandemic created operational challenges, as market participants and infrastructure providers operated complex trading, settlement, and compliance businesses in a remote fashion. Although operational structures continued to perform overall, intermediaries reportedly increased their discretionary caution due to challenges of trading and hedging positions from home.

[20] See Basel Committee on Banking Supervision, Committee on Payments and Market Infrastructures, and Board of the International Organization of Securities Commissions, 2021, "Consultative report: Review of margining practices," available at https://www.bis.org/bcbs/publ/d526.pdf.

The effects of the official sector response

Federal government responses to market stress and to the broader economic effects of the pandemic supported the smooth functioning of the Treasury market both by reducing the demand for liquidity and by increasing the supply of liquidity.

Federal Reserve repo operations. As pressures emerged in funding markets, the FRBNY's Open Market Trading Desk increased its overnight repo operations, from $100 billion to an ultimate peak offering of $1 trillion per day, and added large term repo operations. These repos were offered to primary dealers, which could choose to intermediate funding to the broader market.

Federal Reserve purchase operations. Beginning on March 13, the Federal Reserve purchased Treasury securities at an unprecedented scale and speed, and the Federal Open Market Committee (FOMC) ultimately committed on March 23 to "purchase Treasury securities and agency mortgage-backed securities in the amounts needed to support smooth market functioning and effective transmission of monetary policy to broader financial conditions."[21] Federal Reserve holdings of Treasury securities rose by more than $800 billion in the first three weeks of these operations. On some individual days, the Desk purchased as much as $75 billion of Treasury securities, an amount comparable to the highest *monthly* pace of Treasury security purchases during the Federal Reserve's large-scale asset purchase programs following the Global Financial Crisis. The purchases alleviated some of the pressure on intermediaries from customer sales of Treasury securities, and measures of market functioning began to normalize later in the month.

FIMA repo facility. On March 31, the Federal Reserve announced a temporary repo facility for foreign and international monetary authorities (FIMA).[22] The facility complemented the provision of dollar funding abroad through the reduction of pricing on standing weekly U.S. dollar liquidity swap lines and addition of weekly 84-day swap operations on March 15, the expansion of dollar liquidity swap lines announced by the Federal Reserve and several other central banks on March 19, and an increase in the frequency of operations offered through existing swap lines with other central banks on March 20.[23] The FIMA facility, made permanent in July 2021, allows foreign official entities to raise dollars without selling Treasury securities outright. While the facility saw relatively little take-up, it provided confidence to FIMA investors that funding would be available when needed.

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[21] Federal Open Market Committee, 2020, "Federal Reserve issues FOMC statement," March 23, available at https://www.federalreserve.gov/newsevents/pressreleases/monetary20200323a.htm.

[22] Board of Governors of the Federal Reserve System, 2020c, "Federal Reserve announces establishment of a temporary FIMA Repo Facility to help support the smooth functioning of financial markets," March 31, available at https://www.federalreserve.gov/newsevents/pressreleases/monetary20200331a.htm.

[23] Board of Governors of the Federal Reserve System, 2020d, "Coordinated Central Bank Action to Enhance the Provision of U.S. Dollar Liquidity," March 15, available at https://www.federalreserve.gov/newsevents/pressreleases/monetary20200315c.htm; Board of Governors of the Federal Reserve System, 2020e, "Federal Reserve announces the establishment of temporary U.S. dollar liquidity arrangements with other central banks," March 19, available at https://www.federalreserve.gov/newsevents/pressreleases/monetary20200319b.htm; and Board of Governors of the Federal Reserve System, 2020f, "Coordinated central bank action to further enhance the provision of U.S. dollar liquidity," March 20, available at https://www.federalreserve.gov/newsevents/pressreleases/monetary20200320a.htm.

Aid for the economy, and lower market volatility. On March 27, the CARES Act was signed into law, providing economic assistance through a variety of programs to American families and workers, small businesses, local governments, and industries.[24] This news further calmed markets, and the reduction in volatility likely eased the demand for liquidity while also helping to reduce some of the risks inhibiting the supply of liquidity.

Increased Treasury bill issuance. The CARES Act resulted in a significant increase in the U.S. government's financing needs. The Treasury Department responded first by increasing issuance of Treasury bills, and later in April by beginning to increase issuance of coupon securities. Bills outstanding increased by about $1.3 trillion from the end of March to the end of April, and then by another $1.1 trillion by the end of June. After a few weeks of massive issuance, bill yields stabilized above zero, and bid-ask spreads narrowed.

Regulatory relief for some balance sheet pressures. On April 1, the Federal Reserve Board announced a temporary rule change to exclude Treasury securities and deposits at Federal Reserve Banks from the calculation of the SLR for bank holding companies.[25] Additionally, on May 15, the federal bank regulatory agencies announced a temporary rule change to allow depository institutions to choose to exclude Treasury securities and deposits at Federal Reserve Banks from the calculation of the SLR.[26] These actions aimed to mitigate pressures on banking organizations' balance sheets resulting from the growing supply of bank reserves and enable firms to expand their balance sheets to continue to intermediate and conduct other banking activity. The temporary exemptions expired as scheduled on March 31, 2021.

B. Other disruptions

The Treasury market has experienced other occasional disruptions in recent years. The October 2014 flash rally and the mid-September 2019 repo market pressures, though much smaller in scale and different in source from the March 2020 events, similarly demonstrated how surging demand for liquidity can collide with inelastic liquidity supply amid heightened risks.[27]

October 15, 2014, flash rally

The markets for Treasury securities, Treasury futures, and other closely related financial instruments experienced an unusually high level of volatility and a very large and rapid round-

[24] Pub. L. No. 116-136 (2020).
[25] Board of Governors of the Federal Reserve System, 2020g, "Federal Reserve Board announces temporary change to its supplementary leverage ratio rule to ease strains in the Treasury market resulting from the coronavirus and increase banking organizations' ability to provide credit to households and businesses," April 1, available at https://www.federalreserve.gov/newsevents/pressreleases/bcreg20200401a.htm.
[26] Board of Governors of the Federal Reserve System, Federal Deposit Insurance Corporation, and Office of the Comptroller of the Currency, 2020, "Regulators temporarily change the supplementary leverage ratio to increase banking organizations' ability to support credit to households and businesses in light of the coronavirus response," May 15, available at https://www.federalreserve.gov/newsevents/pressreleases/bcreg20200515a.htm.
[27] Market volatility was also associated with reductions in Treasury liquidity in a number of less recent episodes. See, for example, Kenneth Garbade and Irene Rosey, 1977, "Secular Variation in the Spread Between Bid and Offer Prices on U.S. Treasury Coupon Issues," *Business Economics* 12(4), 45-49, and Michael J. Fleming, 2003, "Measuring Treasury Market Liquidity," Federal Reserve Bank of New York *Economic Policy Review* 9(3), 83-108.

trip in prices on October 15, 2014.[28] Trading volumes spiked as the yield on the 10-year Treasury security declined 37 basis points intraday before closing the day only 6 basis points below its opening level. This level of intraday volatility had previously occurred on only a few occasions and had been associated with significant policy announcements, but on this occasion, the swing in prices seemed unrelated to any new information. The swiftness of the round-trip in prices with no obvious catalyst was unprecedented in the Treasury market, although other electronically traded markets had experienced similar occurrences.

Alongside the large price moves, the Treasury market experienced a significant drop in market depth and liquidity. Throughout the event window, PTFs accounted for the majority of trading volumes but significantly reduced the dollar amount of standing quotes in central limit order books. Broker-dealers increased their trading volumes, but to a much lesser extent, and provided less liquidity in the order books by widening their spreads and in some cases withdrawing for brief periods from the offer side of the book. Risk management considerations motivated both behaviors.

Before 2014, many did not believe that an event of this type was likely to occur in the Treasury market. This disruption made clear that the rise of electronic trading in the Treasury market meant that market liquidity provision had become more short-term in nature, some liquidity providers were backed by less capital, and liquidity was more vulnerable to shocks as a result of the change in the composition of liquidity providers. In addition, electronic trading permitted rapid increases in orders that removed liquidity. These fragilities are similar to ones observed during the March 2020 events. Similarly, in 2014, the growth of Treasury debt outstanding and increased concentration of asset holdings had already created the potential for very large trading flows that put pressure on intermediation capacity, foreshadowing the extraordinary customer sales that overwhelmed the market in 2020.

Data gaps are another similarity to March 2020. Following the October 2014 disruption, analysis found that diversity in trading venues and participants and fragmented and incomplete data reporting had left market participants and individual regulatory agencies with only a very limited view of Treasury risk transfer and price discovery. These gaps posed challenges to understanding the causes of the flash rally. Although improvements were instituted following the October 2014 episode, the experience of March 2020 showed that visibility into the Treasury market remains incomplete for both the official and private sectors.

September 2019 repo market pressures

In September 2019, a confluence of factors disrupted the repo market and demonstrated that repo demand and supply can be very inelastic in the short run, creating the potential for repo interest rates to rise very rapidly and to very high levels in response to relatively small shocks.

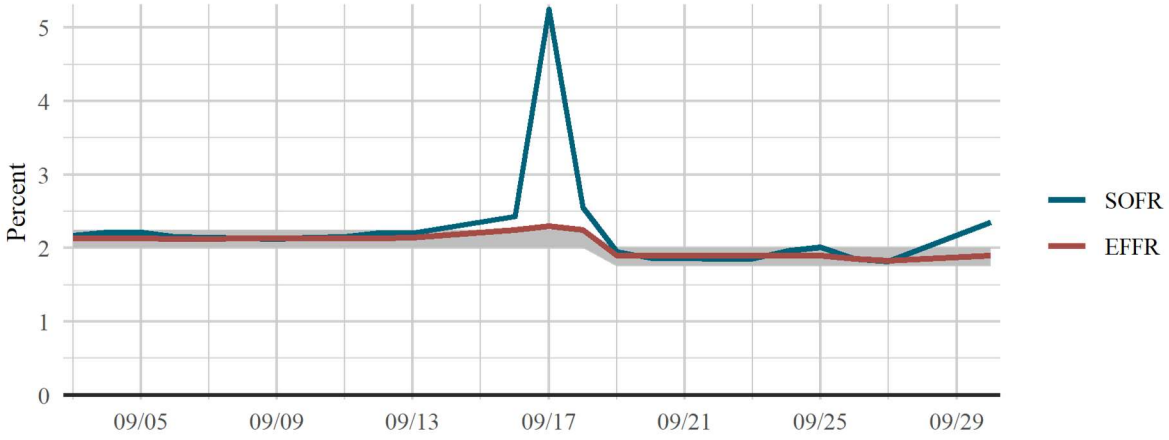
Overnight repo rates began to rise on September 16, 2019, and accelerated on September 17. The Secured Overnight Financing Rate (SOFR), a broad measure of the cost of overnight Treasury repo borrowing, spiked to 5.25 percent, an increase of more than 300 basis points from

[28] See 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, 2015, "Joint Staff Report: The U.S. Treasury Market on October 15, 2014," available at https://home.treasury.gov/system/files/276/joint-staff-report-the-us-treasury-market-on-10-15-2014.pdf.

the level two business days earlier (Figure 7). Overnight repo rates also became notably more dispersed. Some transactions on September 17 occurred at rates as high as 9 percent, and the spread between the 1st and 99th percentiles of rates on transactions used to compute SOFR was 675 basis points. By contrast, earlier in 2019, the daily spread between the 1st and 99th percentiles had averaged around 25 basis points. Other funding markets also experienced pressures, and the effective federal funds rate (EFFR) on September 17 printed at 2.30 percent, above the FOMC's target range of 2 to 2.25 percent at the time.

Figure 7 - Money market rates in September 2019

Shaded region = FOMC federal funds target range



Source: FRBNY

The disruption occurred on the same day as a drain of reserves from the banking system and a Treasury securities auction settlement. To meet corporate tax payments due on September 16, cash was withdrawn from bank accounts and MMFs and deposited in the Treasury General Account (TGA) at the Federal Reserve. In addition, cash flowed into the TGA from settlements of mid-month auctions of Treasury securities. Altogether, bank reserves fell by about $120 billion over two business days.[29] The auction settlement also increased the amount of Treasury securities outstanding, raising demand to fund these securities. While modest funding pressures are not unusual in the middle of the month given corporate tax payments and Treasury settlements, the strains in September 2019 were substantially larger than anticipated. However, the September 2019 event occurred when bank reserves were at their lowest levels in more than five years.

Both the demand and supply sides of funding markets appeared inelastic in the very short run in this episode. On the demand side, a high interest rate for one night does not have a large cost in dollar terms. Given the potential costs or even infeasibility of rapidly unwinding a portfolio, market participants that use overnight repos to fund their positions may be willing to pay very high interest rates for at least one night before unwinding their positions, especially if

[29] See Sriya Anbil, Alyssa Anderson, and Zeynep Senyuz, 2020, "What Happened in Money Markets in September 2019?", FEDS Notes, Board of Governors of the Federal Reserve System, February 27, available at https://www.federalreserve.gov/econres/notes/feds-notes/what-happened-in-money-markets-in-september-2019-20200227.htm.

they expect funding stress to dissipate. On the supply side, a variety of obstacles can keep potential cash investors from increasing their lending into a funding market when rates rise. Some funding markets are not anonymous and rely on relationships between participants that can take time to form. In part to maintain these relationships, cash investors may make relatively gradual changes in their allocation of funds to different market segments. Investors may also face other internal hurdles that often cause them to slowly adjust allocations across market segments. And segmentation within the repo market implies that some cash investors cannot lend directly to some potential borrowers.[30] Additionally, post-Global Financial Crisis regulations that greatly strengthened the resilience of the banking sector may also may have affected systemically important banking organizations' willingness or capacity to expand their balance sheets to intermediate between different money markets. Perhaps more importantly, banking organizations' own risk management decisions also play a role.

While the September 2019 disruption was largely contained to funding markets, the repo market volatility negatively affected trading conditions in segments of the Treasury cash and futures markets that rely more heavily on repo. For instance, liquidity of off-the-run Treasury securities in the cash market deteriorated because dealers depend on repo markets to finance holdings of off-the-run securities that they cannot sell quickly. In contrast, market liquidity of on-the-run securities did not appear to be affected, because dealers can more quickly offload positions in these securities in the deep and liquid interdealer market. Volatile repo rates also reportedly caused some hedge funds to unwind positions in cash-futures basis trades, whose profitability depends on repo rates, causing a widening in the cash-futures basis. These unwinds were considered relatively orderly, unlike what was to occur six months later in March 2020.

The Federal Reserve injected reserves into the banking system to quell the escalating strains in funding markets and to bring the EFFR back into its policy target range. The Desk conducted overnight repo operations on September 17 of up to $75 billion and continued to conduct overnight and term repo operations on subsequent days. In mid-October, the Federal Reserve also began purchasing Treasury bills to maintain, over time, reserve levels at or above the level that prevailed in early September, and continued to conduct repo operations to ensure that the supply of reserves remained ample.[31] While the Federal Reserve operations were effective in restoring the balance of supply and demand and quelling money market pressures, rates spiked before the repo operations were put in place.

Other episodes

The Treasury market ordinarily is highly resilient and can absorb significant shocks. For example, the repo market has generally calmed quickly on its own after month-end and quarter-end rate pressures in the post-Global Financial Crisis regulatory regime. However, occasional

[30] See, for example, Sriya Anbil, Alyssa Anderson, and Zeynep Senyuz, 2021, "Are Repo Markets Fragile? Evidence from September 2019", Finance and Economics Discussion Series No. 2021-028, Board of Governors of the Federal Reserve System, available at https://www.federalreserve.gov/econres/feds/files/2021028pap.pdf.

[31] See Federal Reserve Bank of New York, 2020, "Open Market Operations During 2019," report prepared for the Federal Open Market Committee by the Markets Group of the Federal Reserve Bank of New York, available at https://www.newyorkfed.org/medialibrary/media/markets/omo/omo2019-pdf.pdf.

small stresses do occur and can reflect similar drivers to the events in March 2020, October 2014, and September 2019.

Most recently, on February 25, 2021, a large shift in investor sentiment triggered very high trading volumes (Figure 3, above) that temporarily overwhelmed the intermediation capacity of the Treasury market. Yields jumped, market liquidity deteriorated, and trading volumes rose to record levels leading up to the Treasury Department's auction of a 7-year note. After the yield realized in the auction exceeded market expectations by 4 basis points, with the lowest bid-to-cover ratio on record since the 7-year note was reintroduced in 2009, trading conditions deteriorated abruptly. The most notable decline in market liquidity occurred in on-the-run securities in the interdealer market, especially longer-dated securities.[32] For a 5-minute span, there were no bids for the 20-year security on the largest electronic IDB platform.

Some market participants observed that the stresses on February 25, 2021, were exacerbated by lack of elasticity in liquidity supply resulting from activity limits that IDB platforms impose on some firms, especially PTFs that do not participate in central clearing. IDBs often stand as counterparties to both sides of each trade on their platforms and establish activity limits to mitigate exposures in the event a participant fails to settle. When an IDB participant is a member of FICC, the participant's positions facing the IDB are centrally cleared, meaning that FICC guarantees settlement. When a participant is not a member of FICC, the IDB receives no such guarantee and typically sets tighter activity limits, in part because centrally clearing only one leg of a trade (as occurs if a FICC non-member trades with a FICC member on an IDB platform) gives the IDB a directional position at FICC that can increase the IDB's margin requirement. Some firms reportedly were required to limit their trading on February 25, 2021, after reaching IDB limits. However, FICC membership is not necessarily the sole determinant of IDB activity limits, and FICC members are subject to FICC's risk management requirements.

[32] For a comparison of the speed of recovery in market liquidity following the February 2021 episode versus other episodes of market stress, see Aronovich et al. (2021).

Section 4: Principles for the Treasury Market

In light of the key official sector objectives of financing the federal government, supporting the broader financial system, and implementing monetary policy, and drawing on experience in the Treasury and other markets, the IAWG staffs considered the principles that should guide public policy in the Treasury market. The staffs sought to define principles that could guide decisions over the longer term and not only in response to recent market events. Accordingly, some aspects of the principles reflect longstanding strengths of the market, while fully achieving other aspects of the principles could require meaningful change. The staffs judged that defining the principles broadly in this way would help ensure consideration of the full range of benefits and costs of potential policy steps.

The IAWG staffs propose six guiding principles for the Treasury market:

1. Resilient and elastic liquidity

The market should have the capacity to support robust primary issuance and secondary trading across a wide range of economic and financial circumstances. Liquidity provision by private sector market participants should expand as needed in response to changes in macroeconomic conditions, shocks to the financial system, and shocks to individual market participants or types of participants.

Some temporary reduction in liquidity can be a normal consequence of abrupt changes in market conditions. However, the market should adapt over time so that liquidity remains robust even as regulations, market structure, Treasury issuance, monetary policy, and other aspects of the financial environment continue to evolve. In general, participants should be able to transfer positions efficiently on the open market.

A diverse and competitive set of market makers and investors should foster resilience by rendering market liquidity less susceptible to shocks or environmental changes that affect particular participants or types of participants.

2. Transparency that fosters public confidence, fair trading, and a liquid market

Treasury securities' central role in financing the federal government and as the benchmark safe asset creates a public interest in information about market activity. The official sector, in particular, should have a clear view of the activity in the Treasury market.

Public transparency can enhance liquidity by fostering a greater understanding of market activity across market participants. However, public data releases should be designed to avoid creating disincentives for providing liquidity. Appropriate transparency and oversight should also support participants' continued confidence that the market is fair and free of deception.

3. Prices that reflect prevailing and expected economic and financial conditions

Treasury securities' benchmark role in the financial system makes it particularly important that prices reflect economic and financial fundamentals and remain free of manipulation. Price distortions due to technical factors should be minimal.

4. Economic integration across cash, funding, and derivatives markets

The cash Treasury market, the market for Treasury repurchase agreements, and the Treasury derivatives market involve closely related instruments and economically connected transactions. Frictions that lead to large or volatile deviations between the prices of economically similar instruments should be limited. Nevertheless, policies or regulations may appropriately differ across these markets given the particular characteristics of each market.

5. Financing that does not pose a significant threat to financial stability

The ability to borrow against Treasury securities supports price discovery, demand for government debt, and liquidity across financial markets. However, leverage that makes the financial system vulnerable to instability should be avoided. The quantity, source, stability, and tenor of funding and the market environment may influence this vulnerability.

6. Infrastructure that operates effectively and efficiently

Well-designed and well-managed infrastructure can support liquidity, transparency, efficient pricing, economic integration across markets, and financial stability. To achieve these ends, market infrastructure should robustly manage financial and operational risks and limit settlement uncertainty, including when trading volumes are unusually high. Moreover, operational costs should not be excessive relative to the level of safety and functioning provided.

Section 5: Workstreams for Specific Policy Analysis

The IAWG staffs are examining a range of policy steps that could advance the official sector's objectives for the Treasury market.[33] In evaluating potential reforms, the staffs are paying particular attention to how different options would support the six principles described in the preceding section.

We report here on five workstreams: improving resilience of market intermediation; improving data quality and availability; evaluating expanded central clearing; enhancing trading venue transparency and oversight; and examining effects of leverage and fund liquidity risk management practices. In all five workstreams, the IAWG staffs have observed that it is important to consider the effects of potential interactions between workstreams.

A. Improving resilience of market intermediation

Investigating the drivers behind intermediation of Treasury securities is a critical focus for the IAWG staffs. As discussed in Section 3, intermediation capacity did not keep pace with the demand for intermediation services amid the wave of sales of Treasury securities in March 2020. Additionally, strains in intermediation in repo markets were cited as one of the drivers that resulted in upward pressures in funding markets, a condition that was even more pronounced in September 2019. These episodes have occurred against the backdrop of the increasing amount of Treasury debt outstanding over recent years, which has outpaced the growth of dealer balance sheets and capital generally committed to Treasury market making. These dynamics make elastic intermediation even more critical to the smooth functioning of the Treasury market.

The staffs continue to consider steps that could enhance the efficiency, flexibility, and resilience of intermediation in the Treasury cash and repo markets going forward, particularly during times of stress. This work has included an initial review of reforms that have been proposed by researchers and market participants. Separately, new facilities have already been introduced that could enhance the resilience of Treasury market intermediation.

Standing repurchase agreement facilities

The Federal Reserve had long used repos as a core part of its monetary policy framework before the Global Financial Crisis. In recent years, the Federal Reserve has executed various forms of large-scale repos, including daily repo operations with primary dealers, which were introduced in September 2019, and repos with Foreign and International Monetary Authorities, which were introduced in March 2020. These operations, along with other measures, contributed to the stabilization in Treasury market conditions in the spring of 2020.

In July 2021, the FOMC voted to approve the establishment of a Standing Repurchase Agreement Facility (SRF) and a standing FIMA Repo Facility. The SRF is offered daily against

[33] Reports by market participants and researchers that propose potential reforms include Duffie (2020), Group of Thirty Working Group on Treasury Market Liquidity (2021), Hubbard et al. (2021), Liang and Parkinson (2020), Treasury Borrowing Advisory Committee (2021), and Andrew Metrick and Daniel K. Tarullo, 2021, "Congruent Financial Regulation," paper prepared for *Brookings Papers on Economic Activity* spring conference, available at https://www.brookings.edu/wp-content/uploads/2021/03/BPEASP21_Metrick-Tarullo_conf-draft.pdf.

securities eligible for open-market operations at a minimum bid rate of 0.25 percent and an aggregate operation limit of $500 billion.[34] The FOMC determined that primary dealers would continue to be eligible counterparties for repo operations under the SRF and that it was appropriate to gradually expand access to depository institutions.[35]

The FIMA Repo Facility is offered daily against Treasury securities maintained in custody at the FRBNY by foreign central bank and international accounts at a minimum bid rate of 0.25 percent and a per-counterparty limit of $60 billion. Counterparties for the FIMA Repo Facility are foreign official institutions with custody accounts at the FRBNY that have been approved by the Foreign Currency Subcommittee of the FOMC.

These repo facilities, by acting as a standing backstop, are intended to help address pressures in money markets that could impede effective implementation of monetary policy. By containing these pressures, repo facilities can both facilitate smooth market functioning and promote the effectiveness of monetary policy. Although not their primary purpose, these facilities can reduce stresses in Treasury cash and repo markets by giving eligible participants a liquidity alternative to sales and thereby help prevent stresses in Treasury markets from spilling over more broadly to U.S. financial markets—spillovers that would impair the implementation and transmission of monetary policy.

Other reforms proposed by the public

Following the Treasury market strains in March 2020, many academics and market participants have proposed reforms to improve the resilience of the Treasury market. The IAWG staffs are continuing to study these recommendations.

Expanded central clearing. Central clearing of Treasury securities transactions has been put forward as a way to reduce risk and increase intermediation capacity. The IAWG staffs continue to examine central clearing in detail. Section 5C of this paper discusses potential benefits and costs.

Increased all-to-all trading. As discussed in Section 2, intermediation of off-the-run Treasury securities and in Treasury repo takes place largely through securities dealers, whose tolerance for balance sheet growth can affect intermediation capacity for the market. An increase in all-to-all trading could allow for a larger share of trading directly between non-dealer buyers and sellers and potentially lessen the reliance on dealer intermediation.

Potential modifications to the SLR. As discussed in section 3, following the market stresses at the onset of the pandemic, federal banking regulators temporarily excluded Treasury securities and deposits at Federal Reserve Banks from the calculation of the SLR. The objective of the change was in part to allow banking organizations to expand their balance sheets to continue to intermediate. When the Board announced that the temporary change to the SLR would expire as scheduled on March 31, 2021, the Board noted that it would be inviting public

[34] Eligible securities include U.S. Treasury securities, agency debt securities, and agency mortgage-backed securities.

[35] The expansion of access to depository institutions will initially allow depository institutions with holdings of Treasury, agency debt, and agency mortgage-backed securities greater than $5 billion or with total assets greater than $30 billion to express interest in access to the SRF.

comment on several SLR modifications in the future.[36] Modifications could be considered that would allow for increased intermediation capacity for large bank holding companies, while ensuring that any changes do not erode the overall strength of bank capital requirements.

Increased congruence of regulatory standards across Treasury markets. Over recent years, Treasury trading activity by non-bank-affiliated entities, particularly PTFs, has increased, but these institutions are not subject to the same regulations as bank-affiliated entities. As Treasury debt outstanding grows, non-bank-affiliated entities' participation in the Treasury market may continue to increase. Market participants and researchers have proposed a review of regulations applied to non-bank-affiliated broker-dealers active in the Treasury markets to ensure that the regulations are sufficiently robust.[37] Along the same line, researchers have highlighted the segmented nature of U.S. Treasury market regulation and the resulting potential for differences in margining, repo haircut, and capital requirements across various entity types. Market participants and researchers have discussed the need for alignment of methodologies for regulating leverage in the various types of institutions that are active in the Treasury market to ensure similar management of risk across the market.[38] Finally, Treasury securities are exempt from some laws and regulations that apply to other security types, including certain margin requirements. The SEC chair has directed SEC staff to consider whether firms that significantly trade in the Treasury market should be registered as dealers with the SEC.[39]

Further work

The IAWG staffs are studying these proposals, along with investigating Treasury market intermediation in general, to consider improvements that can be made to the resilience of the Treasury market.

B. Improving data quality and availability

Recent periods of stressed liquidity conditions in the Treasury market have brought into clear view the need for the quality and availability of data to evolve so that the public and private sectors may remain well informed amid the ongoing evolution of Treasury market structure. The IAWG staffs are continuing to examine the quality and availability of data in the Treasury market to consider additional areas of improvement. The staffs considered the official sector's data needs as well as the potential benefits and costs of public data releases. Additionally, the staffs considered data on both positions and transactions and examined the granularity and timeliness of data.

Robust, timely information on positions and transactions can help the official sector to identify and address vulnerabilities. If stresses nonetheless emerge, high-quality and timely data can enable the official sector to respond appropriately, both in its immediate decisions and in

[36] See Board of Governors of the Federal Reserve System, 2021a, "Federal Reserve Board announces that the temporary change to its supplementary leverage ratio (SLR) for bank holding companies will expire as scheduled on March 31," March 19, available at https://www.federalreserve.gov/newsevents/pressreleases/bcreg20210319a.htm.
[37] See Group of Thirty Working Group on Treasury Market Liquidity (2021).
[38] See, for example, Metrick and Tarullo (2021).
[39] Chair Gary Gensler, "Testimony Before the United States Senate Committee on Banking, Housing, and Urban Affairs," September 14, 2021, available at https://www.sec.gov/news/testimony/gensler-2021-09-14.

adjusting policy over time. In March 2020, gaps and lags in position data and insufficiently granular transaction data made it challenging for the official sector to fully evaluate in real time the drivers of the heavy selling pressure in the Treasury market. In particular, there was a need for timely information on the positions and transactions of institutions other than dealers. And in both September 2019 and March 2020, the lack of data on non-centrally cleared bilateral repos made it difficult to assess the demand for repo funding and the extent of intermediation in the repo market. The IAWG staffs believe that collecting more detailed and timely data on positions and transactions would enable improvements in market surveillance, oversight and policy, though the costs of any additional data collection must also be carefully weighed. In addition, broader use of legal entity identifiers could improve the ability of the official sector to understand Treasury market participant activity across market segments.

Treasury cash transactions

Since 2017, FINRA has collected post-trade transaction data for secondary market Treasury cash securities transactions through TRACE on behalf of the official sector.[40] The data includes all transactions where a FINRA member is a counterparty, including FINRA members that are alternative trading systems. For Treasury cash transactions, the official sector undertook a thorough review of public transparency in 2018, ultimately resulting in coordination with FINRA to release weekly aggregated volume data beginning in March 2020. In addition, historical data back to January 2019 was released in May 2021.

In considering public release of aggregated volume data, the official sector considered several factors. First, for the most active market participants, prices in the Treasury market were generally already very transparent, especially for benchmark securities. Volumes were less transparent, particularly in trading between dealers and investors. Second, a key principle in pursuing further transparency was to do no harm to the market. Feedback from a comprehensive group of market participants indicated that releasing volume information too quickly or with too much granular detail may hamper the ability to trade large, concentrated positions. Such trades are particularly important for off-the-run securities. As a result, it was decided to start by releasing weekly trading volumes aggregated by security type, tenor, on- vs. off-the-run, and interdealer or dealer-to-customer market segment.[41] Given the positive feedback received on the

[40] Staff at the Federal Reserve Board and FRBNY have published a series of reports using TRACE data to analyze Treasury market activity. See, for example, Doug Brain et al., 2018a, "Unlocking the Treasury Market Through TRACE," FEDS Notes, Board of Governors of the Federal Reserve System, September 28, available at https://www.federalreserve.gov/econres/notes/feds-notes/unlocking-the-treasury-market-through-trace-20180928.htm; Doug Brain et al., 2018b, "Breaking Down TRACE Volumes Further," FEDS Notes, Board of Governors of the Federal Reserve System, November 29, available at https://www.federalreserve.gov/econres/notes/feds-notes/breaking-down-trace-volumes-further-20181129.htm; James Collin Harkrader and Michael Puglia, 2020, "Principal Trading Firm Activity in Treasury Cash Markets," FEDS Notes, Board of Governors of the Federal Reserve System, August 4, available at https://www.federalreserve.gov/econres/notes/feds-notes/principal-trading-firm-activity-in-treasury-cash-markets-20200804.htm; and Michael Fleming, Or Shachar, and Peter Van Tassel, 2020, "Treasury Market When-Issued Trading Activity," *Liberty Street Economics,* November 30, available at https://libertystreeteconomics.newyorkfed.org/2020/11/treasury-market-when-issued-trading-activity.

[41] Weekly Treasury volume data from TRACE are available at https://www.finra.org/filing-reporting/trace/data/trace-treasury-aggregates.

release of this data, and the lack of negative market feedback, it is consistent with prior principles to explore increasing transparency further.

Efforts are also ongoing to improve the coverage and quality of the TRACE data. First, the Federal Reserve Board has announced a new rule requiring banks with at least $100 million in average daily trading to report transactions to TRACE.[42] Second, FINRA has considered several enhancements to improve the accuracy and quality of the information collected. The potential enhancements include increasing the precision of timestamps, standardizing price reporting, addressing platform-related fees included in the price, and better identifying trading strategies.[43] In September 2021, FINRA's board approved filing with the SEC proposed enhancements to the TRACE data collection.[44]

In March 2020, large flows from investors were captured by the TRACE data but were not identifiable beyond the FINRA-member dealer intermediary that facilitated the trade. Understanding the source of these flows required the official sector to contact dealers, wait for other datasets that are significantly lagged, and rely on separate sources of information. For example, FRBNY weekly custody data released in mid-March corroborated anecdotal commentary on foreign sales, as did the monthly TIC holdings data released several weeks later. Increasing the frequency and detail of foreign flow data would help the official sector better understand any future episodes of market stress. Domestic positions data for Treasury cash securities are also generally limited to intermediaries and are lagged and aggregated. For example, on the FR2004 report, the FRBNY collects data from primary dealers on weekly holdings by security type and maturity sector. On Form PF, the SEC collects quarterly or annual holdings of private funds, such as hedge funds, that are advised by asset managers with at least $150 million in private fund assets under management. Staff are exploring whether more information on the positions and flows of domestic investors would provide additional insights into the drivers of episodes of volatility and illiquidity.

Treasury futures

For Treasury futures and options, pre- and post-trade data is widely available. The CFTC has also made important data sets available to IAWG staff, recognizing the interconnectedness of the Treasury futures market with markets for Treasury securities. Continued collaboration and sharing of analysis across the official sector should allow for additional insights into cross-market dynamics.

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[42] See Board of Governors of the Federal Reserve System, 2021b, "Announcement of Board Approval Under Delegated Authority and Submission to OMB" (FR 2956; OMB No. 7100-NEW), Federal Register 86, No. 206 (October 28): 59716-59718. Currently, in organizations that have both a bank entity and a FINRA-member dealer entity, only trades by the dealer entity are required to be reported to TRACE.

[43] See FINRA, 2020, "FINRA Requests Comment on Enhancements to TRACE Reporting for U.S. Treasury Securities," Regulatory Notice 20-43, December 23, available at https://www.finra.org/rules-guidance/notices/20-43.

[44] See FINRA, 2021, "Report from FINRA Board of Governors Meeting – September 2021," September 29, available at https://www.finra.org/media-center/newsreleases/2021/report-finra-board-governors-meeting-september-2021.

Treasury repo

Data on Treasury repo has important gaps in coverage. Repo transaction data are available for triparty repo and centrally cleared bilateral repo, but not for non-centrally cleared bilateral repo. The triparty and centrally cleared bilateral repo data include repos against both general and specific collateral, as well as transactions with term and overnight maturities. These data are made fully available on the next business day to some parts of the official sector, and the FRBNY publishes aggregated data each business day on the previous day's volumes and interest rates. However, there remains a significant data gap in the bilateral repo market outside of central clearing for both the official and private sectors. Non-centrally cleared bilateral repo represents a significant portion of the Treasury market, roughly equal in size to centrally cleared repo. In 2015, the Treasury Department's Office of Financial Research conducted a pilot exercise that collected bilateral repo transactions, including non-centrally cleared bilateral transactions, from participating firms for three reporting dates; however, there has been no regular data collection on non-centrally cleared bilateral repo since then.[45,46] Collection of additional data on non-centrally cleared bilateral repo could enhance the official sector's visibility into a key segment of Treasury markets and into the nature and extent of leverage in this market.

Secondarily, real-time price transparency remains limited in the repo market. While interdealer trading platforms allow market participants to view some prices for cleared bilateral repos and for the anonymous GCF triparty repo service, access to these platforms is limited, and the platforms do not include the non-GCF triparty and non-centrally cleared bilateral market segments. Market participants typically need direct contact with a repo dealer for real-time pricing in these market segments. Continued collaboration across the official sector on repo transparency can help support insight and analysis on this segment of the Treasury market, and additional transparency for the private sector could be considered.

C. Evaluating expanded central clearing

The IAWG staffs continue to examine the potential for expanded central clearing of transactions in various segments of the Treasury market. Central clearing is widely used in financial markets to reduce risk and improve efficiency. In the United States, central clearing is generally used or mandated for several asset classes, including equities, exchange-traded derivatives, and certain standardized swaps. Significant parts of the Treasury market are already centrally cleared, including the entire futures market as well as portions of the cash and repo markets (primarily transactions between dealers). However, other segments of the Treasury market are not cleared at a CCP, including non-centrally cleared bilateral repos, most triparty repos, cash transactions by most PTFs on the electronic platforms of IDBs, and most dealer-to-

[45] Findings from the pilot exercise are in Viktoria Baklanova et al., 2016a, "The U.S. Bilateral Repo Market: Lessons from a New Survey," Office of Financial Research Brief Series 16-01, available at https://www.financialresearch.gov/briefs/files/OFRbr-2016-01_US-Bilateral-Repo-Market-Lessons-from-Survey.pdf.

[46] Gaps likewise exist in data on securities lending transactions, which are similar to repos but motivated by a participant's desire to obtain a particular security. For results from an OFR pilot collection of securities lending data, see Viktoria Baklanova et al., 2016b, "A Pilot Survey of Agent Securities Lending Activity," Office of Financial Research Working Paper 16-08, available at https://www.financialresearch.gov/working-papers/files/OFRwp-2016-08_Pilot-Survey-of-Securities-Lending.pdf.

customer transactions. Overall, the Treasury Market Practices Group has estimated that 13 percent of cash transactions are centrally cleared; 68 percent are bilaterally cleared; and 19 percent involve hybrid clearing, in which one leg of a transaction on an IDB platform is centrally cleared and the other leg is bilaterally cleared.[47]

Expansion of central clearing to segments of the Treasury market that currently are not centrally cleared could have a range of benefits, including:

Standardized, enhanced, and more transparent risk management. A CCP establishes and enforces standardized risk management requirements, such as margins, for the portfolios cleared by its members. To the extent that non-centrally cleared transactions use margins and haircuts based on the low-risk nature of Treasury securities, resulting in little to no margin changing hands, margin established by a CCP, which reflects the market risk of Treasury prices and other risk factors such as concentration of positions, would likely be more conservative.[48] Additionally, a CCP's risk management requirements are disclosed in the CCP's rule book, which is available to the authorities and all market participants, and changes to which are generally subject to review by the CCP's supervisory authority or authorities. Improved risk management could enhance the market's resilience to shocks.

Balance sheet netting, settlement netting, and trade guarantees. A CCP nets down gross exposures across participants, reducing firms' exposures while positions are open as well as the size of cash and securities flows required at settlement. For financial intermediaries, netting could reduce the amount of balance sheet required for intermediation and could enhance capacity to make markets during both normal times and stress events. The staffs observed that balance sheet savings from central clearing would likely be larger for repos than for cash transactions, as unsettled cash transactions can already be netted on dealers' balance sheets for accounting purposes. By reducing gross exposures and flows and by providing a guarantee for centrally cleared transactions, a CCP may also reduce the likelihood that small shocks would be amplified and result in larger stress in the Treasury or other markets.[49] Cross-margining between the cash and futures markets can also provide balance sheet savings and have the effect of netting down some exposures, and is possible only when the cash and repo components of a cash-futures position are centrally cleared.[50]

Visibility. The centralization of transactions at a CCP can simplify data collection and improve visibility into market conditions for the authorities and, to some degree, for market participants.

Constituent for additional improvements in market infrastructure. The benefits provided by central clearing could in principle support other potential improvements in market infrastructure such as all-to-all trading, although there may be other structural barriers to such

[47] The estimates are based on data for the first half of 2017. See Treasury Market Practices Group (2019).
[48] Treasury Market Practices Group (2019) describes risk management practices in bilaterally and centrally cleared cash market transactions.
[49] An analysis of FR2004SI data found that in March 2020, broader central clearing could have significantly reduced chains of settlement failures by netting out failures to deliver with failures to receive. See Michael Fleming and Frank Keane, 2021, "The Netting Efficiencies of Marketwide Central Clearing," Federal Reserve Bank of New York Staff Report No. 964, available at https://www.newyorkfed.org/medialibrary/media/research/staff_reports/sr964.pdf.
[50] Cross-margining is currently available only for positions held by firms that are both clearing members of CME and netting members of FICC. CME and FICC have suggested the potential for enhancements to cross-margining.

changes, and these changes and their potential to reduce risk or enhance liquidity would themselves require further evaluation.

Expanded central clearing could also have a number of costs in the Treasury market. Among these costs are:

CCP participation costs. An expansion of central clearing could increase costs of participating in the Treasury market. In order to centrally clear transactions, market participants can interact with CCPs either directly, as members, or indirectly, as clients of members. Members may be subject to a range of costs, including: posting initial margin; committing to an obligation to provide funding for the CCP's liquidity needs in certain stressed conditions; potentially bearing mutualized losses if another member defaults; and meeting the CCP's operational and risk management requirements. In addition, CCP obligations affect bank-affiliated participants' regulatory capital and liquidity requirements, potentially offsetting balance sheet benefits from netting. Clients typically compensate members for these costs.

Potential reductions in intermediation and market liquidity. Some intermediaries could respond to costs of participating in a CCP by pulling back from the market or by increasing the price of intermediation, such as bid-ask spreads, to recover these costs.

Concentration of risk. Although central clearing reduces counterparty and operational risks to market participants, the risk that remains is concentrated at a single systemically important institution, the CCP, whose resilience is of great importance.

In assessing potential costs, it is important to distinguish between costs to individual market participants and costs to the broader financial system. The IAWG staffs identified externalities that could result in private market participants choosing to centrally clear fewer transactions than would be optimal for the market as a whole. For example, improved risk management may be costly for individual participants but makes the system more stable. An expansion of central clearing that required market participants to internalize costs of better risk management might better align participants' incentives and prevent excessive risk taking, even if these costs reduced participation in the market. In particular, expansion of central clearing could address the contagion risk to a CCP that currently arises when one side of a trade on an IDB platform is centrally cleared but the other side is not. This risk is of particular importance in light of the share of transactions subject to hybrid clearing. Related, expansion of central clearing would reduce the need for IDBs to independently manage the counterparty credit risk of PTFs. However, it is also possible that risk management could be improved by means other than central clearing, such as enhanced prudential regulation of intermediaries.

In order to reap the benefits of expanded central clearing, it would be important to continue to ensure strong supervision and regulation of the CCP, commensurate with the expanded scope of clearing. The CCP's ability to cover its funding liquidity needs in the event of a participant's default would also need to keep pace with any expansion of the scope of cleared activity.

Additionally, the potential benefits and costs of expanded central clearing vary across market segments. Segments also differ in the mechanisms available for market participants to access the CCP and in the data available to the authorities. The benefits, costs, and feasibility of expanded clearing can depend on these differences between market segments.

D. Enhancing trading venue transparency and oversight

Alternative Trading Systems (ATSs) have become a significant source of orders and trading interest for government securities, particularly in the interdealer market. ATSs for government securities now operate with complexity similar to that of markets that trade stocks in the National Market System (NMS) in terms of automation and speed of trading, the use of limit order books, order types, algorithms, connectivity, data feeds, and the active participation of PTFs. Nonetheless, ATSs for government securities are subject to less regulatory oversight and do not face the same transparency obligations as similarly situated platforms trading corporate fixed income or equity securities.

Regulatory framework and policy challenges

Trading platforms that bring together buyers and sellers of securities are regulated as exchanges under the Securities and Exchange Act of 1934 (the Exchange Act). An entity that meets the Exchange Act's definition of "exchange" must either register as a national securities exchange and, thus, operate as a self-regulatory organization under Section 6 of the Exchange Act, or operate under an exemption to such registration, such as the exemption provided under Regulation ATS.

ATSs meet the definition of "exchange" but are exempt from registration if they comply with the conditions of Regulation ATS, which are designed to facilitate investor protection and fair and orderly markets principles.

Today, the regulatory principles of Regulation ATS have certain limitations with respect to systems that trade U.S. government securities. For instance, if an ATS solely trades U.S. government securities and is registered as a broker-dealer or is a bank, it is not required to comply with Regulation ATS. ATSs that trade both U.S. government securities and other securities are not required to comply with all the conditions of the Regulation ATS exemption. For example, ATSs that trade U.S. government securities are not subject to the Fair Access Rule, which requires an ATS with a significantly large percentage of trading volume in a security or type of security to establish standards for access to its systems and apply those standards fairly to potential and existing subscribers. Despite shared operational complexities, ATSs that trade U.S. government securities are not subject to the same public disclosure requirements and SEC oversight rules as NMS stock ATSs. As a result, users of ATSs for Treasury securities, for example, have less information about the manner in which these ATSs operate and the potential for conflicts of interest and information leakage relative to the disclosure required of NMS stock ATSs.

In addition, although trading on ATSs for Treasury securities is highly automated and dependent on sophisticated technology, ATSs that consist of significant volume for Treasury securities are not subject to the protections and obligations of Regulation Systems Compliance and Integrity (Regulation SCI). These protections and obligations include having robust policies and procedures that ensure trading, market data, clearing, and other critical systems have sufficient capacity, resilience, and security adequate to maintain their operational capability.

When the SEC adopted Regulation ATS in 1998, it also adopted Rule 3b-16 under the Exchange Act to provide a functional test to determine when an entity meets the statutory

definition of "exchange." While the adoption of Rule 3b-16 encompassed many of the larger systems that existed at that time, the rule did not include within the definition systems that offer the use of non-firm trading interest and communication protocols. Many trading venues that operate today do not meet the definition of "exchange" but provide a functionally equivalent marketplace for bringing together buyers and sellers for U.S. government securities. For example, RFQ platforms, which are a significant source of liquidity for U.S. government securities, typically do not fall within the exchange definition, as they allow buyers and sellers to interact and find a counterparty using non-firm trading interests, and are not subject to the same regulations as registered exchanges or ATSs.

Proposed regulation of Government Securities ATSs

On September 28, 2020, the SEC proposed (the 2020 Proposal) to apply the operational transparency, investor protection, and regulatory oversight provisions of Regulation ATS and system integrity provisions of Regulation SCI to ATSs that trade U.S. government securities and repurchase and reverse repurchase agreements on government securities ("Government Securities ATSs").[51] With regard to the Government Securities ATSs, the SEC proposed to:

- eliminate the exemption from compliance with Regulation ATS for a Government Securities ATS that solely trades government securities or repurchase and reverse repurchase agreements on government securities, and registers as a broker-dealer or is a bank;
- allow the SEC, similar to existing provisions for other securities asset classes, to require an ATS to register as a national securities exchange if the ATS meets the 40 percent average daily volume (ADV) threshold in Treasury securities or agency securities, and the SEC determines after notice and hearing that the Government Securities ATS's exemption from the definition of "exchange" is not necessary or appropriate in the public interest or consistent with the protection of investors;
- require all Government Securities ATSs to publicly file Form ATS-G, on which an ATS would disclose information about its manner of operations and potential conflicts of interest on the system;
- provide a process for the SEC to review Form ATS-G disclosures for clarity, completeness, and potential violations of law and if necessary, declare ineffective Form ATS-G filings; and
- apply the Fair Access Rule and Regulation SCI to a Government Securities ATS that, during at least four of the preceding six calendar months, had (1) with respect to Treasury securities, 5 percent or more of the ADV in the United States as reported to FINRA or (2) with respect to agency securities, 5 percent or more of the ADV in the United States as reported to FINRA.

[51] See Securities Exchange Act Release No. 90019 (September 28, 2020), 85 FR 87106 (December 31, 2020).

In addition, the SEC issued a concept release on the regulatory framework for electronic platforms that trade U.S. government securities, corporate bonds, and municipal securities, including their trading operations, services, fees, market data, and participants.

Current status of the proposal

SEC staff are continuing to consider all of the comment letters on the 2020 Proposal, with particular focus on trading venues that provide a functionally equivalent marketplace for bringing together buyers and sellers for U.S. government securities but are not required to register as a national securities exchange or operate as an ATS.

Ensuring a level playing field for all markets for U.S. government securities and appropriately tailoring Regulations ATS and SCI are critical considerations as the SEC considers its next steps regarding the 2020 Proposal.

E. Examining effects of leverage and fund liquidity risk management practices

An important theme in the evolution of the Treasury market has been the growing size and influence of certain investor positions and trading flows, such as those from open-end funds and hedge funds. During March 2020, for example, fixed-income open-end funds experienced significant investor withdrawals, which they met in part by liquidating Treasury securities. Although funds were able to manage their liquidity without suspending redemptions, this use of Treasury securities to rapidly pay out redemptions may have contributed to the Treasury market stress. Moreover, funds' challenges may have been greater if the official sector had not intervened swiftly in financial markets. The IAWG staffs believe that further study may be warranted to better understand how funds managed their liquidity during this period and the effects of funds' actions on the Treasury market.

Additionally, leverage can magnify the impact of price movements and lead to collateral or margin calls. Hedge funds that invest in the Treasury market with high levels of leverage may have limited tolerance for certain price movements or be forced to sell Treasury securities to meet collateral or margin obligations. Treasury securities funded in repo markets are vulnerable to additional selling pressure in stressed conditions if short-term borrowing becomes unavailable or expensive and positions need to be unwound quickly.

Before the pandemic, borrowing and the use of leverage increased among the most leveraged hedge funds. At the same time, hedge funds increased their exposures to Treasury securities, especially through cash-futures basis trading and other strategies designed to exploit pricing discrepancies between instruments that are expected to trade with very high correlation. Some researchers have suggested that differences in regulation may contribute to the buildup of leverage in such trades.[52] In March 2020, hedge funds were among the largest sellers of Treasury securities as expected price relationships broke down, highly levered positions magnified losses, and some funds faced margin calls.[53] These sales may have amplified price declines in the Treasury and other markets.

[52] See Metrick and Tarullo (2021).
[53] See Financial Stability Board (2020).

To examine these effects, the Financial Stability Oversight Council (FSOC) has established the Open-End Funds Working Group and reestablished the Hedge Fund Working Group, both of which are interagency staff-level efforts. These groups will consider the risks to financial stability arising from open-end fund liquidity and redemption features and update the FSOC's assessment of potential risks to financial stability from hedge funds, their activities, and their interconnections with other market participants. The IAWG staffs support this work and plan to consider resulting recommendations to evaluate whether additional action is necessary for Treasury market resilience.

Section 6: Conclusion

The IAWG staffs plan to continue to take a comprehensive and collaborative approach to exploring policy options and evaluating potential next steps. The staffs intend for their work to complement the work of the FSOC on open-end mutual funds and hedge funds as well as align with the broad agenda laid out by the Financial Stability Board regarding core bond markets and nonbank financial intermediation. The staffs welcome continued engagement with academics and market participants to deepen understanding of options for strengthening the resilience of the Treasury market.