

# Still the World's Safe Haven?

## Redesigning the U.S. Treasury Market After the COVID-19 Crisis

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### ABSTRACT

I review the functionality of the secondary market for U.S. Treasuries in March 2020, when the Covid-19 crisis triggered investor flows that overwhelmed intermediaries. Although the Fed was able to largely restore market liquidity through its unprecedented rate of Treasury purchases and other actions, the design of the Treasury market was revealed to be overdue for an upgrade. I propose a study of the costs and benefits of mandating the central clearing of Treasury transactions of all firms that are active in the market. Without a broad central clearing mandate, the size of the Treasury market will outstrip the capacity of dealers to safely intermediate the market on their own balance sheets, raising doubts over the safe-haven status of U.S. Treasuries and concerns over the cost to taxpayers of financing growing federal deficits.

This paper was prepared as background for the Hutchins Center webinar, "[COVID-19 and the financial system: How and why were financial markets disrupted?](#)". An earlier version of this paper was published as a Hutchins Center Working Paper on May 27, 2020. The author is grateful for comments from Bill Allen, Sriya Anbil, Michael Bordo, John Cochrane, Dobrislav Dobrev, Michael Fleming, Guy Debelle, Andy Filardo, Jean-Sébastien Fontaine, Kenneth Garbade, Itay Goldstein, Beth Hammack, Bob Hall, Bob Hodrick, Jeffrey Ingber, Anil Kashyap, Frank Keane, Sven Klingler, Don Kohn, Arvind Krishnamurthy, Nellie Liang, Hanno Lustig, Antoine Martin, James McAndrews, Dennis McLaughlin, Bill Nelson, Gerard O'Reilly, Jun Pan, Patrick Parkinson, Elena Pastorino, Simon Potter, Hyun Shin, Manmohan Singh, Andreas Schrimpf, Jeremy Stein, Neal Stoughton, Vadimir Sushko, Elöd Takáts, John Taylor, Ramin Toloui, Paul Tucker, Yesha Yadav, Joshua Younger, David Weisbrod, David Wessel, Haoxiang Zhu, and several anonymous market participants. All opinions expressed the author's own. He has received helpful research assistance from Renhao Jiang, Sahit Dendekuri, and David Yilin Yang.

The author is a member of the board of Dimensional Funds, representing the interests of shareholders of mutual funds, some of which invest in Treasury securities, and has also recently been compensated for an expert report in litigation covering issues that include central clearing and all-to-all trade in the market for swaps.

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# Introduction

The market for U.S. Treasuries has long been viewed as the world's deepest and most liquid financial market.<sup>1</sup> That presumption was questioned when the Covid-19 crisis triggered heavy investor trade demands that overwhelmed the capacity of dealers to intermediate the market. Over several tense days, yields rose sharply, calling into question the longstanding view that Treasuries are a reliable safe haven in a crisis. The space available on dealer balance sheets for warehousing additional investor trade flows diminished, bid-offer spreads widened dramatically, the yields of similar-maturity Treasuries were no longer close to each other, settlement failures jumped, and market depth plummeted. I will document these facts later in this note.

In a massive response designed to shore up market liquidity, the Federal Reserve System purchased \$1 trillion of Treasuries in the three-week period from March 16, and then continued to buy at a high rate. The Fed also offered unconstrained short-term financing for dealers' Treasury inventories and exempted Treasuries and reserves from a key capital requirement. By mid-April, these and other emergency actions by the Fed had significantly calmed the market.

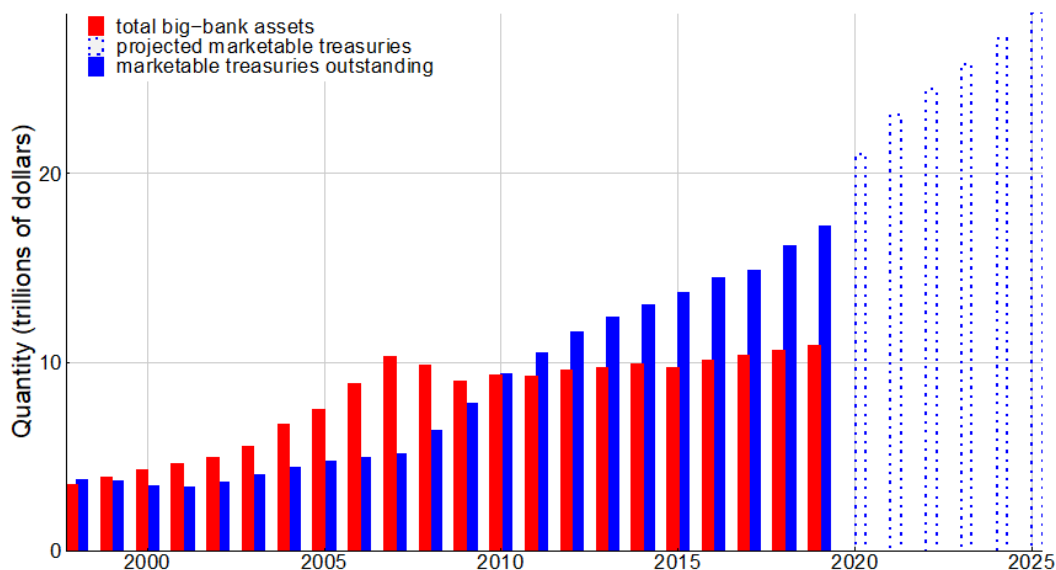
Despite the success of the Fed's aggressive actions to restore liquidity to the Treasury market, the Covid-19 Crisis tested the extent to which the secondary market for Treasuries can safely and efficiently handle surges in investor trading demands that can be expected, episodically, in coming years. Although the Fed accomplished what it needed to do, *as a design principle, the lack of a robust private-market structure should not be acceptable based on the notion that the Fed can rescue the market as a last resort.*

The bulk of trading of Treasuries initiated by non-dealer investors is intermediated by a small number of bank-affiliated securities dealers. Regulatory reforms triggered by the financial crisis of 2008-2009, however, have limited the appetite of bank dealers to warehouse investor flows on their balance sheets. New capital requirements and other new regulations<sup>2</sup> now force bank shareholders to bear far more of the costs of financing their market-making inventories. These rule changes have improved financial stability and reduced implicit bailout subsidies to bank creditors. Since 2008, however, growing federal deficits have caused the stock of marketable Treasuries to grow significantly. Large bank balance sheets have not kept pace, as shown in Figure 1. Figure 2 shows that the total amount marketable Treasuries has also grown dramatically relative to the quantity of Treasury inventories for which primary dealers obtain financing.

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1. When issuing the U.S. Treasury Department's 2016 "Notice Seeking Public Comment on the Evolution of the Treasury Market Structure," Antonio Weiss, Counselor to the Treasury Secretary, stated that "The Treasury market remains the deepest, most liquid market in the world, a source of safety and liquidity, and a haven in times of turbulence."
2. Beyond higher dealer capital requirements, increased dealer credit spreads induced by other post-crisis reforms imply higher debt funding costs for dealer inventories, as explained by Andersen, Duffie, and Song (2019) and Berndt, Duffie, and Zhu (2020). Klingler and Sundaresan (2020) analyze dealer balance sheet costs for Treasuries in their Appendix B.4. He, Nagel, and Song (2020) offer a model of the "inconvenience yield" associated with the SLR regulatory capital constraint on dealer balance sheets and "find that during the two weeks of turmoil, Treasury yields rose substantially above maturity-matched OIS rates, reflecting the inconvenience yield."

In short, the Treasury market appears to have outgrown the capacity of dealers to safely intermediate the market on their own balance sheets, raising questions about the future safe-haven status of U.S. Treasuries and concerns over the cost to taxpayers of financing growing federal deficits.



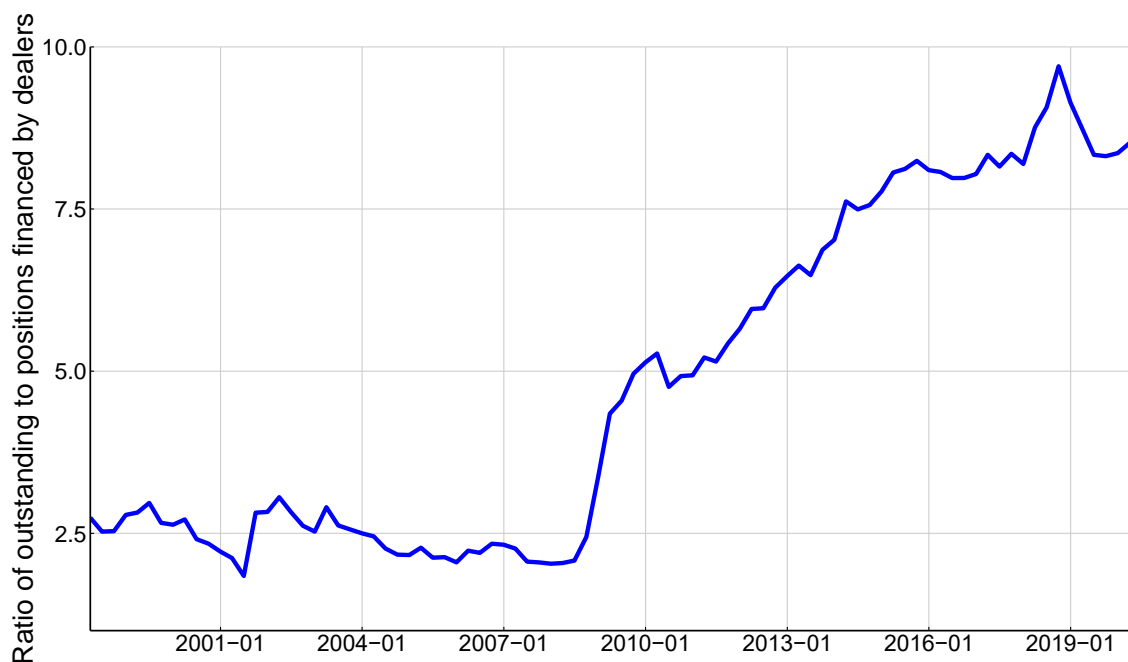
**Figure 1.** In blue are shown year-end total outstanding amounts of marketable Treasuries, 1998-2019 (data: FRED), with projections for 2020-2025 based on federal deficit projections made on April 13, 2020 by the [Committee for a Responsible Federal Budget](#). In red are shown the total assets of the holding companies of Goldman Sachs Group, Morgan Stanley, Merrill Lynch, Lehman Brothers, Bear Stearns, Bank of America, JP Morgan Chase, Citigroup, and Wells Fargo, from 10K disclosures.

As shown in Figure 1, the stock of Treasuries outstanding is projected to grow at an even higher rate, in part because of the immense fiscal response of the U.S. government to the Covid-19 Crisis. In 2020 alone, the stock of marketable U.S. Treasuries is expected<sup>3</sup> to increase by about \$3.8 trillion, from \$16.7 trillion to \$20.5 trillion. Extremely large projected fiscal deficits, relative to GDP, could also begin to increase Treasury yield volatility. If Treasury prices become more volatile, the stress on dealer balance sheets of handling surges in trade demands will be magnified by increases in the per-unit riskiness of dealer Treasury inventories. This could exacerbate a negative feedback effect by which lower market depth causes yet greater price volatility. Some European sovereign bond issuers suffered a nasty taste of this feedback in 2011-2012.

To intermediate the large expected increases in U.S. Treasury trade volumes using the current market design, bank holding companies would need to substantially increase their capital commitments to Treasury market intermediation. Bank holding company shareholders, however, would not benefit from this commitment of capital unless intermediation rents rise sufficiently through increased price concessions from customers. The resulting illiquidity, or episodes of illiquidity and elevated yield volatility, would adversely impact the prices of Treasuries---not a good outcome for U.S. taxpayers.

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3. This is based on federal deficit projections made on April 13, 2020, by the [Committee for a Responsible Federal Budget](#). This projection does not incorporate the additional \$1 trillion Covid19 measure under active consideration by Congress.



**Figure 2.** The ratio of total outstanding amounts of marketable Treasuries to the amounts of Treasuries for which primary dealers received financing, 1998 to end of 2019.<sup>4</sup> Data: FRED and Federal Reserve Bank of New York.

Meanwhile, the risk of an accident in the plumbing of the Treasuries market, by which trades are cleared and settled, already suggests the need for a more robust system of central clearing, as I will explain later in this note, drawing from recent work by the Treasuries Market Practices Group,<sup>5</sup> congressional testimony, and government reports. A major overhaul of central clearing infrastructure, coupled with new rules requiring the central clearing of the Treasury transactions of all firms that are active in the market, would significantly reduce the need to warehouse trade flows on dealer balance sheets. Dealers would be better able to net their buy and sell trades with central counterparties (CCPs). Further, given broad access to a CCP, some Treasury transactions could flow directly from ultimate sellers to ultimate buyers without necessarily impinging on dealer balance sheet space. The transparency of the trade settlement process would improve, and counterparty settlement risk would decline, improving financial stability. Depending on the results of an effectiveness study, the most natural central-clearing mandate would likely cover both repo (financing) and cash-market trades, among other related types of transactions for which central clearing is now available at the Fixed Income Clearing Corporation.

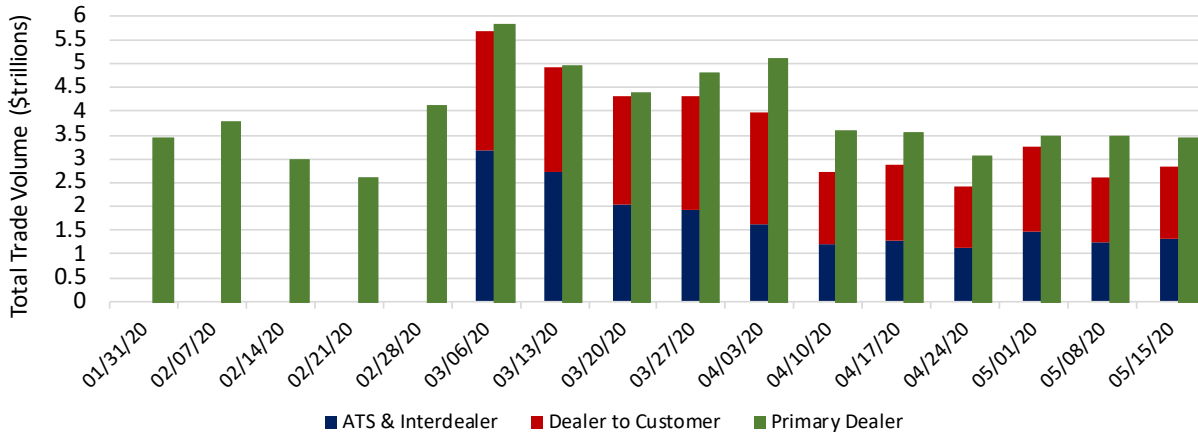
The infrastructure associated with this market reform would likely be expensive. Nevertheless, the outlook for the future market conditions of U.S. treasuries suggests that the expense is justified.

4. The quantity of Treasury securities financed includes overnight and term, nominal securities as well as TIPS, and covers securities financed with repurchase agreements and securities lending agreements.

5. The Treasury Markets Practices Group states at its [web site](#) that “The TPMG is composed of senior business managers and legal and compliance professionals from a variety of institutions—including securities dealers, banks, buy side firms, market utilities, and others—and is sponsored by the Federal Reserve Bank of New York.”

Regulators<sup>6</sup> of U.S. Treasury markets may now wish to consider a cost-benefit analysis of a broad mandate for central clearing, similar in scope to central clearing rules for derivatives markets.

The cost to taxpayers of financing federal deficits depends on the efficiency of the secondary market for Treasuries. Bids in the primary auction market for U.S. Treasuries are based largely on resale prices in the secondary market. Risks to financial instability associated with a weak market design are also consequential.



**Figure 3.** Total Treasury market volumes. In blue, from TRACE data, interdealer volumes (including ATS), for weeks ending on the indicated dates. In red, from TRACE data, dealer-to-customer volumes. In green, from FR 2004 data, primary dealer transactions for the week ending on the Wednesday before the indicated date. FR 2004 counts a single transaction between two primary dealers as two transactions, one for each dealer. TRACE data series are publicly accessible on a regular basis beginning only in March 2020. Data sources: [TRACE data provided by FINRA](#). FR 2004 data from [the Federal Reserve Bank of New York](#).

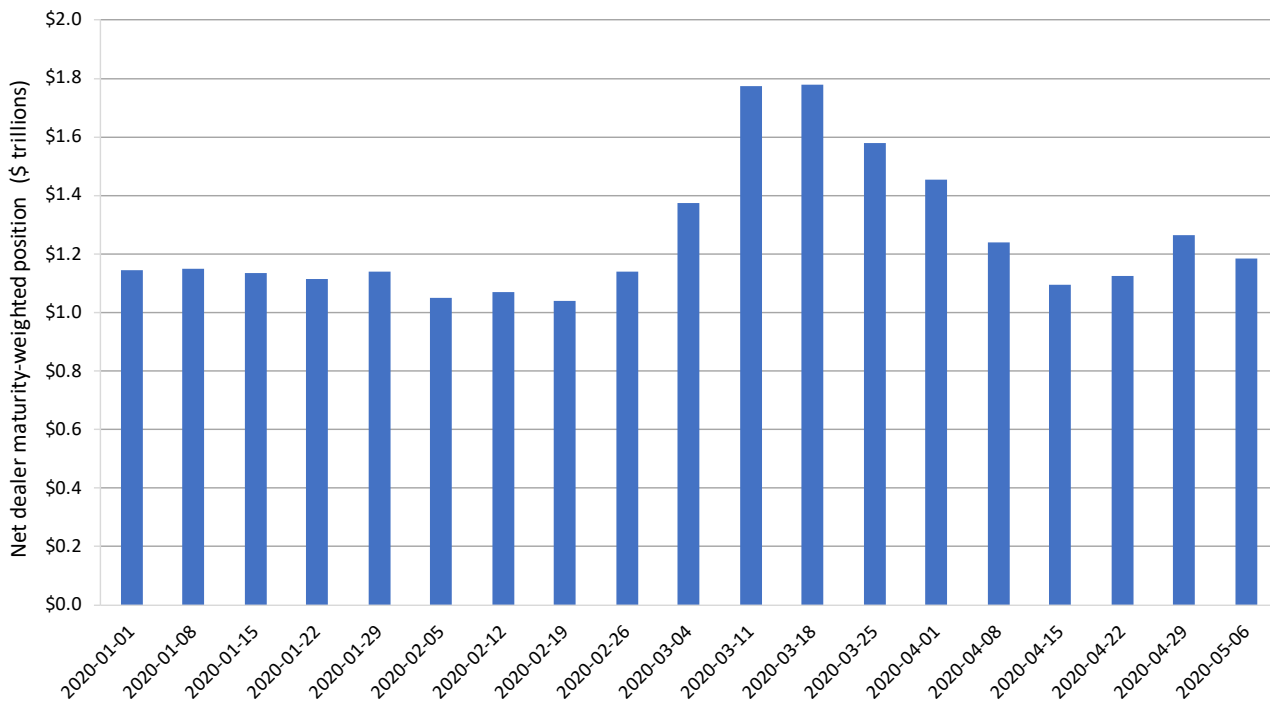
## What happened to Treasury market liquidity during the COVID-19 Crisis?

In March 2020, unusually large Treasury trading volumes (Figure 3) caused dealer net inventories to increase (Figure 4), given the need to temporarily warehouse the flood of sales from global investors responding to worsening Covid-crisis news.<sup>7</sup> The large sellers included hedge funds and foreign official-sector investors. For example, according to the [Treasury’s International Capital Flow Report](#), in March 2020, foreign holders sold, net of purchases, \$299 billion of Treasury Bonds and Notes, far above normal. These sales may have been motivated by hedge funds subjected to heavy margin calls, by crisis-induced demands for U.S. dollar funding by foreign banks, and for the management of currency prices by foreign central banks. Figure 5 shows that the March 2020 gross sales of U.S. Treasury Notes and Bonds to U.S. residents (almost of whom would be U.S. dealers) was an extreme outlier, about \$700 billion above the

6. Yadav (2020) reviews the fraught regulatory framework for U.S. Treasury markets.

7. Motivations for these sales are explained by Schrimpf, Shin, and Shushko (2020), Cheng, Wessel, and Younger (2020), and He, Nagel, and Song (2020).

previous all-time record high. The amount of financing that dealers needed to support their Treasury inventories rose sharply, as shown in Figure 6.



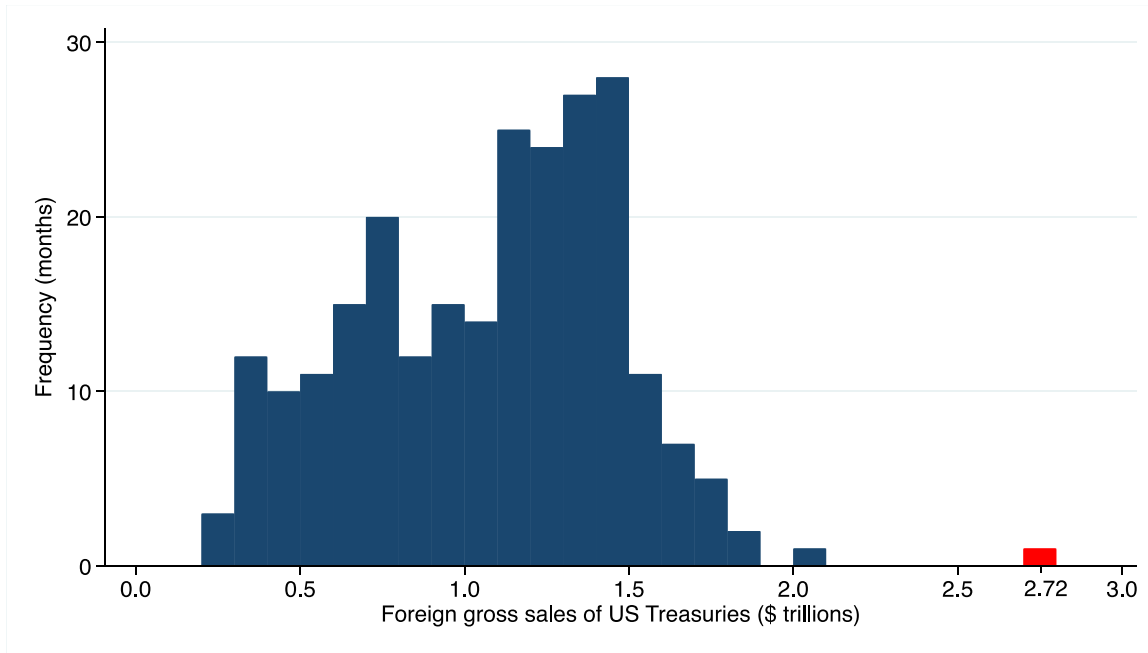
**Figure 4.** The aggregate net inventory (long minus short) of primary dealers, maturity weighted by multiplying the net position in dollars by the number of years to the center of each reported maturity class, to roughly reflect the sensitivity of market values to changes in yields. (The data necessary to compute duration-based price sensitivities are not available.) Data: [Federal Reserve Bank of New York](#).

In its 2020 Financial Stability Report, the Fed wrote: “As investors sold less-liquid Treasury securities to obtain cash, dealers absorbed large amounts of these Treasury securities onto their balance sheets. It is possible that some dealers reached their capacity to absorb these sales, leading to a deterioration in Treasury market functioning.”

The flood of customer orders to liquidate Treasury positions was only one of a number of Covid-crisis-induced increases in the assets of the largest bank holding companies. Margin collateral held by bank dealers rose. Bank customers sought new loans and heightened levels of intermediation in other assets. In the short run at least, the balance sheet space available to some large dealers was tightly constrained, after considering the complexity of regulatory requirements, imperfections in a bank holding company’s internal processes for allocation of capital and liquidity to its various businesses, and the aversion of managers to the risk of breaching their internal limits.

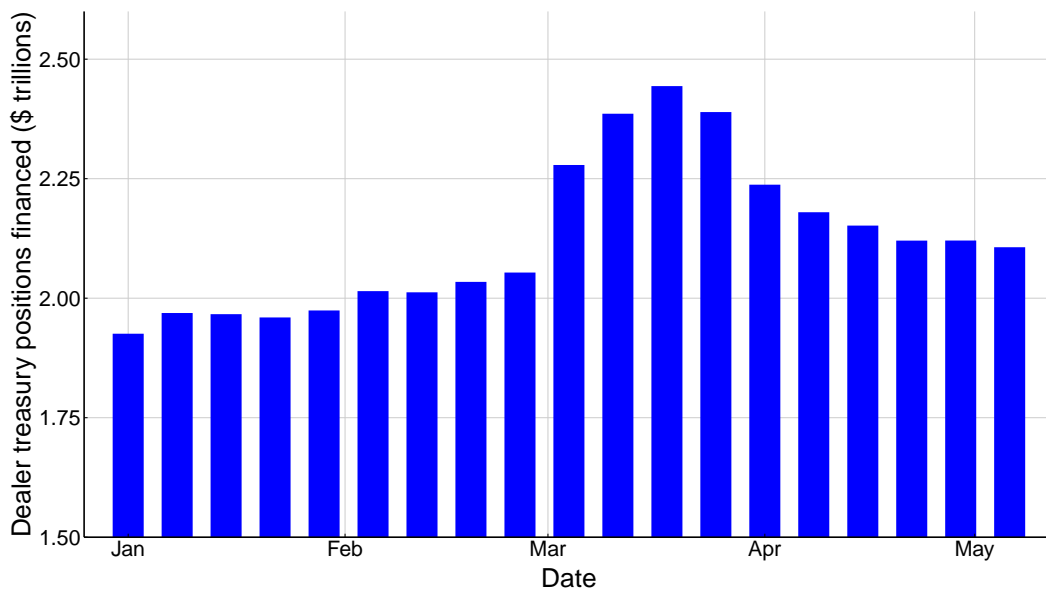
The enormous purchases of Treasuries by the Fed, shown in Figure 7, did not free as much space on bank holding company balance sheets as one might have hoped, because the Fed pays for these Treasuries with reserves, which the banking system must absorb. Although reserves (deposits at the Fed) are perfectly safe and liquid, they were subject to regulatory capital requirements under the Supplementary Leverage Ratio Rule (SLR). On April 1, the [Fed temporarily exempted](#) both Treasuries and reserves from the SLR rule for bank holding companies, although it was not until the middle of May that the Fed, the

Office of the Comptroller of the Currency, and the Federal Deposit Insurance Corporation adopted a [similar SLR exemption for commercial bank subsidiaries](#). Treasuries held by bank-affiliated dealers remain subject to risk-based capital requirements, given their obvious re-pricing risk.

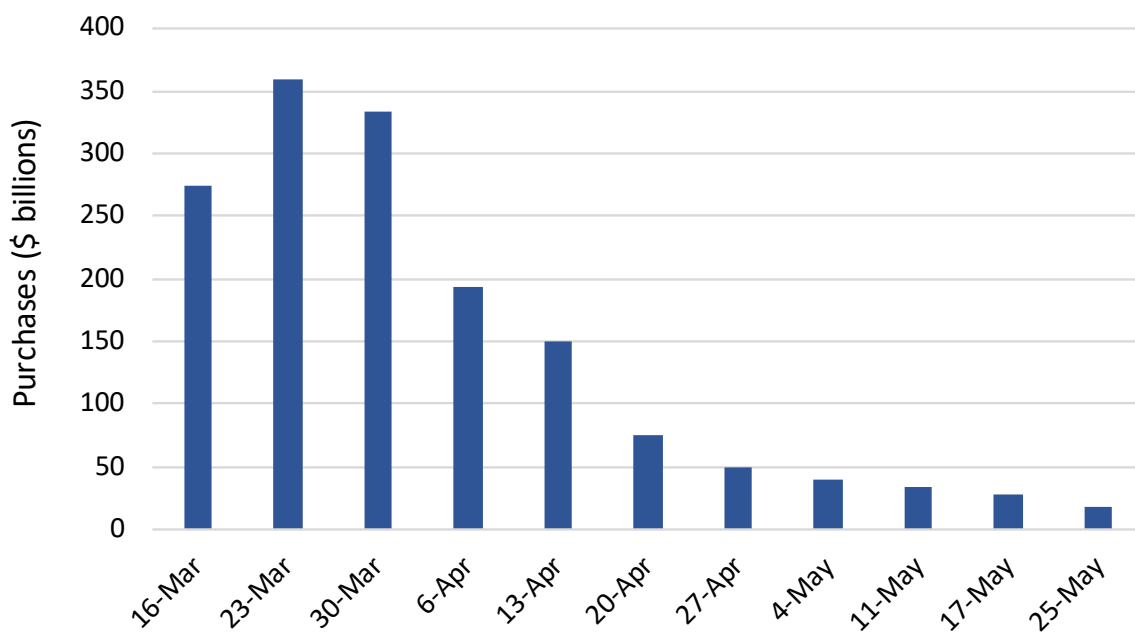


**Figure 5.** A histogram of monthly gross sales of U.S. Treasury bonds and notes by foreigners to U.S. residents, since January 2000. The gross-sales amount for March, 2020, indicated in red at \$2.72 trillion, is the record high to date. Data source: U.S. Department of the Treasury, [Treasury International Capital System](#).

In the financial crisis of 2008-2009, large banks were found to be woefully under-capitalized. Bank regulators responded appropriately after that crisis with significant increases in required capital ratios. Bank shareholders are generally loath to issue new equity shares, especially in a crisis, given the expected adverse impact of issuances on share prices. In order to ensure that they can continue to meet a required ratio of capital to assets, bank executives generally prefer to limit the growth of assets over the issuance of new equity, as reflected in Figure 1, which shows a dramatic post-2008 drop in the growth rate of assets of the largest U.S. bank holding companies. When customers of their dealer subsidiaries are demanding liquidity and balance sheets are at the same time constrained by capital and liquidity ratios, dealers offer customers wider bid-offer spreads. Indeed, as shown in Figure 8, the bid-ask spreads offered by Treasury dealers to their customers increased by a multiple of over 10.



**Figure 6.** The quantity of Treasuries for which primary dealers obtained financing, January to May, 2020. For clarity, the vertical axis begins at \$1.5 trillion. Data source:<sup>8</sup> [Federal Reserve Bank of New York](#).

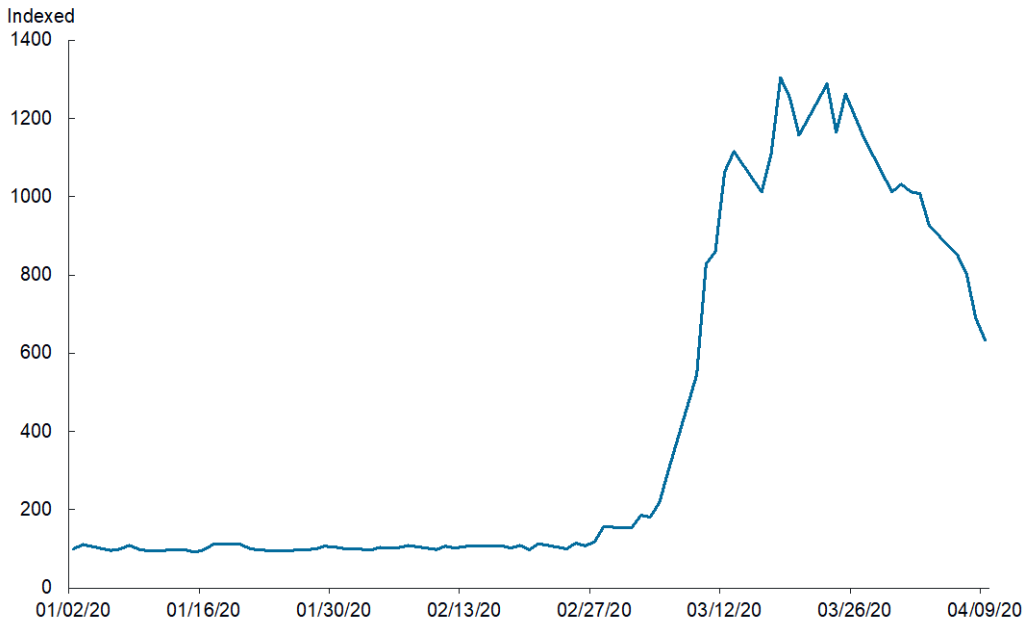


**Figure 7.** Total weekly purchases of Treasuries by the Fed from the week of March 16, 2020. Data: Federal Reserve.

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8. The quantity of Treasury securities financed includes overnight and term, nominal securities as well as TIPS, and covers securities financed with repurchase agreements and securities lending agreements.





**Figure 8.** Treasury bid-offer spreads posted at Bloomberg, indexed to 100 at January 2, 2020. Figure source: Lorie Logan, Manager of the System Open Market Account and Head of the Open Market Trading Desk, Federal Reserve Bank of New York, published with her [speech of April 14, 2020](#). The underlying data source is Bloomberg Financial LP.

In one prominently reported<sup>9</sup> anecdote, on March 16, when Vikram Rao, the head bond trader of Capital Group, asked executives that he knew at many of the big banks “for an explanation on why they wouldn’t trade, they had the same refrain: There was no room to buy bonds and other assets and still remain in compliance with tougher guidelines imposed by regulators after the previous financial crisis. In other words, capital rules intended to make the financial system safer were, at least in this instance, draining liquidity from the markets. One senior bank executive leveled with him: ‘We can’t bid on anything that adds to the balance sheet right now.’”

In the interdealer limit-order-book market for the benchmark on-the-run 10-year Treasuries, market depth dropped by a factor of more than 10, as shown in Figure 9, from a J.P. Morgan analysis. New York Fed analyses by Fleming and Ruela (2020) and Fleming (2020) find similar losses in market depth and estimates that trade price impacts<sup>10</sup> increased above normal levels by a factor of over 5. Fleming (2020) finds that bid-offer spreads in the interdealer market increased from normal by a factor of about 5. The

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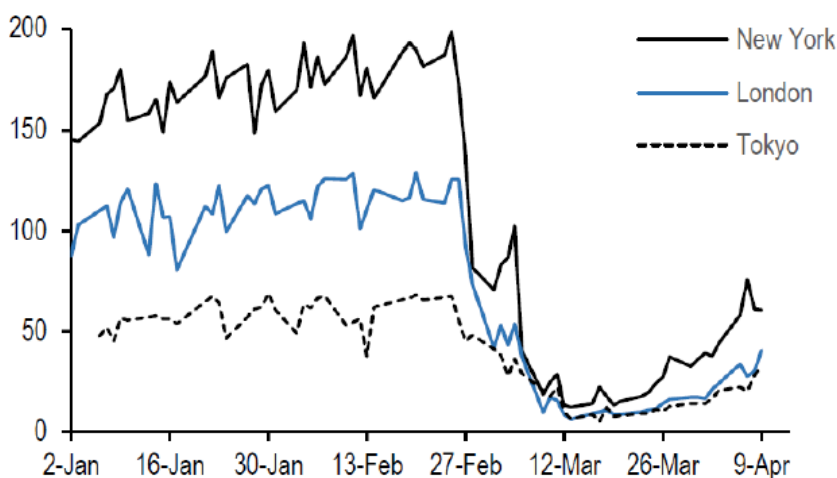
9. Justin Baer, “The Day Coronavirus Nearly Broke the Financial Markets,” *Wall Street Journal*, May 20, 2020.

10. Price impact is the impact on market prices of net order flow. Fleming and Ruela (2020) and Fleming (2020) estimate price impact as the slope coefficient associated with a regression of one-minute price changes on net order flow (buyer-initiated trades less seller-initiated trades).

fraction of trading by PTFs dropped significantly, leaving most of the increase in trade to be handled by dealers.<sup>11</sup>

Generally, the ability of the market to digest large trade demands began to break down in mid March. The prices of Treasuries fluctuated wildly, compared to normal. As an example, consider the extreme hit to investors holding the 30-year Treasury bond, whose yield jumped from 1.34% on March 16, 2020 to 1.77% on March 18, 2020, representing a loss in market value of over 10% in just two days.

At the beginning of March, as shown in Figure 10, yields were on average about 1 basis point out of alignment with a smooth yield curve, according a standard measure due to Hu, Pan, and Wang (2013) that is now commonly known among practitioners as “root mean squared error” (RMSE).<sup>12</sup> Off-the-run Treasuries, those not recently issued, were particularly mispriced, according to the Fed’s 2020 Financial Stability Report and the research reports of J.P. Morgan’s Fixed Income Strategy Group. Normally, hedge funds and dealers would quickly step in to buy Treasuries whose prices are low relative to the price implied by Treasuries that are close-maturity substitutes.

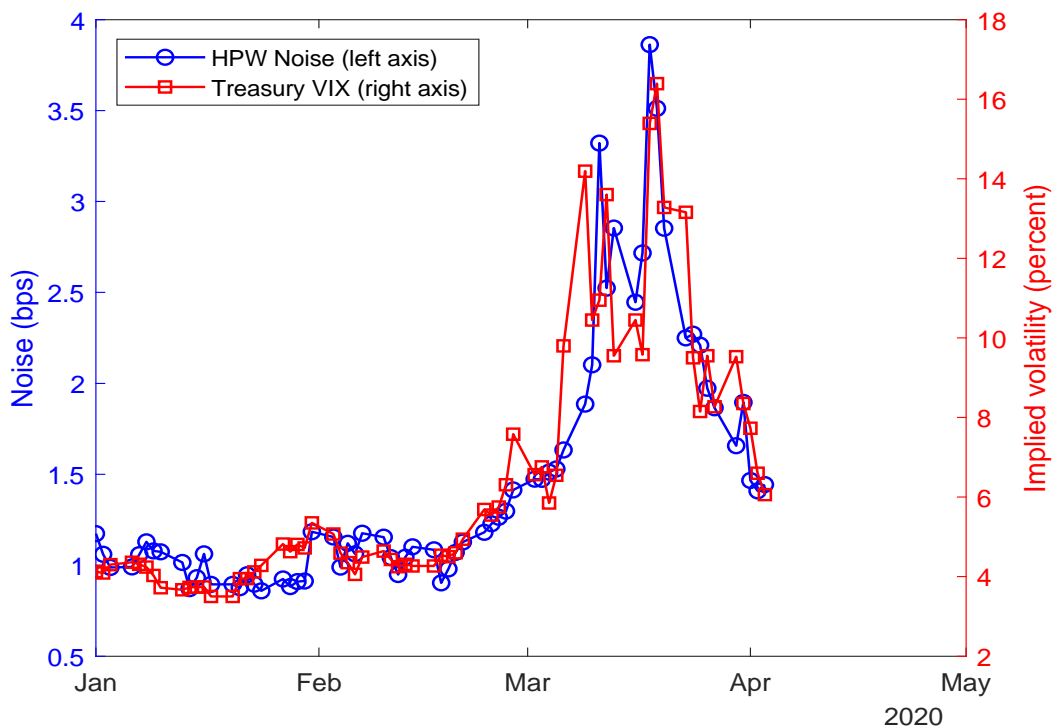


**Figure 9.** Treasury market depth on Brokertec for 10-year on-the-run notes. The market depth shown is the total of the quantities on the order book at the inside three price tiers on both sides of the limit order book, bid and ask, divided by two, in millions, for each of the New York, London, and Tokyo trade venues/ respectively). The London data are averages for local trading until the New York open. The New York data are averages from the New York open to 3pm ET. The Tokyo data are averages for the local open to London open. The figure was obtained from JP Morgan and appeared in “Almost back to ‘normal’ An update on fixed income market liquidity,” US Fixed Income Strategy, JP Morgan, Joshua Younger and Henry St. John, April 2, 2020. Fleming (2020) finds a similar profile of declines in market depth.

11. According to J.P. Morgan analysis by Henry St. John, Joshua Younger, and Sejal Aggarwal, “Evidence suggests that a large share of HFTs withdrew completely from the market in March. Total depth at the top 20 levels on both sides of the market collapsed, with a fairly staggering peak-to-trough decline of 92%. The HFT fraction of this far larger slice of the order book similarly collapsed, falling to as low as 41% in late March, from an average level of 88% over the previous year.” Source: “The Life Aquatic: Deeper Depth in the Treasury Market Infrastructure,” J.P. Morgan Fixed Income Strategy, June 5, 2020.

12. In its “U.S. Treasury Daily” research report of May 21, 2020, J.P. Morgan reported that RMSE had declined from the high of 3.0 basis points to 1.3 basis points by the middle of May.

Similarly, the prices of Treasury derivatives went far out of alignment with the prices of the underlying deliverable Treasury notes, as depicted in Figure 11, which is based on the analysis of Schrimpf, Shin, and Sushko (2020). The cash-futures basis shown in this figure is the difference between the one-month repo rate for Treasuries and the corresponding repo rate that is implied by the prices of Treasury securities and Treasury futures contracts. In an efficient market, the actual repo rate and the implied repo rate should be nearly the same, as was the case in early 2020, given the opportunity to arbitrage the basis between the two. In mid-March, however, the cash-futures basis grew to hundreds of basis points. Large hedge funds that had previously taken positions motivated by the cash-futures basis were caught off guard with highly levered positions in this trade. Hauser (2020) comments that “Leverage rates of 40-60 times were common, but anecdotal reports suggest some ran much higher.” The widening of the basis generated margin calls that forced large liquidations of these basis trades,<sup>13</sup> further contributing to dislocations in Treasury prices and adding to the pressure on dealer balance-sheets.

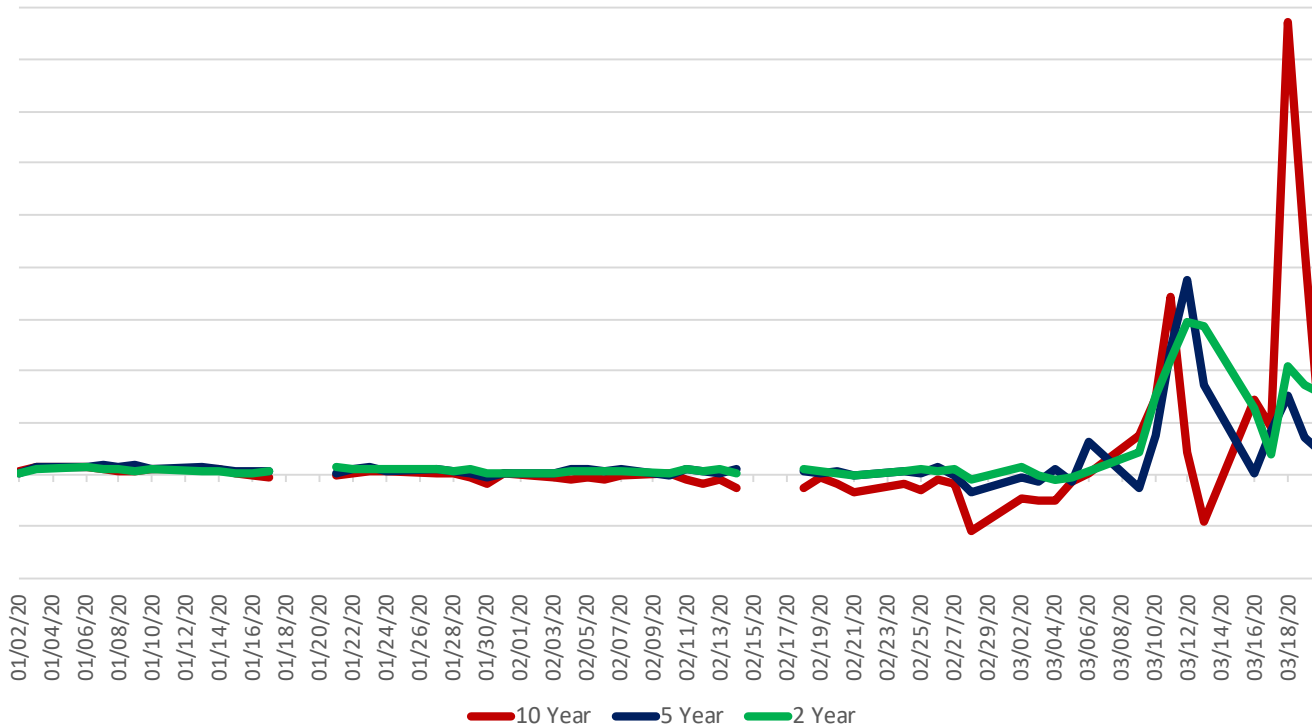


**Figure 10.** Implied volatility of the 10-year Treasury note and the Hu-Pan-Wang measure of yield curve noise, in basis points. The implied volatility measure is from CBOE TYVIX data, based on options on the 10-year Treasury note. The Hu-Pan-Wang (2013) noise measure of Treasury market illiquidity is the square root of the mean squared error (RMSE) obtained when fitting the prices of Treasury securities to a smooth mathematical model of the yield curve. The figure was provided to the author by Professor Jun Pan, SAIF.

13. For more details, see Hauser (2020), Schrimpf, Shin, and Shusko (2020) and Cheng, Wessel, and Younger (2020).

Around the same time, traders were suddenly forced to work at home under Covid-19 social distancing requirements, an additional factor limiting dealer intermediation capacity. Yet the unusually large volumes handled by dealers, coupled with the choice of market-makers to ultimately quote exceptionally wide bid-offer spreads and minimal quantities at their best price quotes, seems to point more toward a high shadow price of access to over-stuffed balance sheets than to physical remote-site limits on traders.

With the Fed’s exceptionally aggressive purchases of Treasuries, the relaxation of the SLR capital rule for reserves and Treasuries, and the Fed’s offer of essentially unlimited repo financing for dealer Treasury positions, Treasury market liquidity returned significantly toward normal by mid April, 2020, as explained in the Fed’s 2020 [Financial Stability Report](#).



**Figure 11.** The cash-futures Treasury basis. The difference, in percent, between (a) the repo rate implied by selling Treasury futures, purchasing the cheapest-to-deliver underlying Treasury note, and closing the futures contract at maturity by delivering the Treasury note, and (b) the actual market general-collateral one-month repo rate. The data shown in the figure were provided to the author by Andreas Schrimpf, Hyun Song Shin, and Vladyslav Sushko, from Graph 3 of their paper “Leverage and Margin Spirals in Fixed Income Markets During the Covid-19 Crisis,” BIS Bulletin, Number 2, April 2, 2020.

March 2020 is the fourth time in the last century that the Fed rescued the U.S. Treasury market from extreme dysfunctionality. Garbade (2020) describes the first three, in 1939, 1958, and 1970. Given the extreme stresses on the U.S. Treasury market at the opening of the Second World War in September 1939, Garbade writes that the Fed stepped in and “ ‘relieved’ Treasury dealers of their positions and then used

the dealers as brokers, asking them to bring to the Bank's attention the offerings of their customers.<sup>14</sup> The other two Fed rescues, also connected to military conflict, were in the summer of 1958, when U.S. armed forces threatened to become involved in security concerns in the Middle East,<sup>15</sup> and in May 1970, on the back of the announcement by President Nixon of a U.S. military incursion from Vietnam into Cambodia and the subsequent tragic Kent-State protest.<sup>16</sup> Similarly, Allen (2018) describes how the Bank of England rescued the U.K. government securities market from bouts of illiquidity several times in the middle of the twentieth century.

It is the natural role of a central bank to provide support to its government securities market under such extreme circumstances, including those of March 2020. In this sense, the Fed's March 2020 rescue of the Treasury market was just one more case for the history books. Going forward, however, there is a counterproductive moral hazard in relying on future Fed rescues of the U.S. Treasury market as an alternative to reforming the structure of the market so that it can better intermediate large episodic future surges in demand. These surges that can be expected to arrive with greater frequency and magnitude, given the historically high and growing ratio of federal debt to GDP and the ballooning stock of outstanding Treasury securities relative to the capacity of dealer balance sheets.

## Upgrading the structure of the secondary market for U.S. Treasuries

The secondary market for U.S. Treasuries has two main segments. In the customer-to-dealer segment, "buy-side" investors trade with dealers. Buy-side investors include hedge funds, pension funds, insurance firms, foreign central banks, sovereign wealth funds, operating companies (for cash management), mutual funds, and large multi-function asset management firms, among others. The second segment is the interdealer market, where dealers trade mainly with each other and principal trading firms (PTFs). Only a small fraction of interdealer trade is conducted by other types of firms.<sup>17</sup> The PTFs trade exclusively on electronic limit-order-book markets using high-frequency trading (HFT) strategies. Limit-order-book trade is exclusively of on-the-run securities. In the interdealer market, dealers trade on limit-order-book markets and also bilaterally, whether through interdealer brokers (IDBs) or directly with each other. Dealers frequently use the interdealer market to offset or hedge inventory imbalances arising from customer trades. IDBs match buyers and sellers, providing anonymity to each.

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14. [footnote from Garbade (2020), Chapter 4] "Federal Reserve Bank of New York (1940, pp. 26, 38, and 45-46), noting that 'the dealers were relieved by the Federal Reserve Bank of New York of the securities held in their portfolios on the outbreak of the war,' that dealers 'were relieved of their positions by the Federal Reserve Bank of New York ... after the outbreak of war,' and that the New York Bank had 'lightened the portfolios of the dealers and enlisted their services to submit to it all offerings made to them by customers.' See also memo from Allan Sproul to files, Federal Reserve Bank of New York, September 1, 1939, noting that, at a dealer meeting at the New York Fed at 9:30 a.m. on September 1, Sproul stated that 'it looked as if this might be the day,' and that the Bank was 'prepared to see that no disorder develops ... In order to make our program effective, ... we are willing to clean up the dealers' net positions at a price 1/8 below last night's late closing prices.' "

15. See Garbade (2020), Chapter 15.

16. See Garbade (2020), Chapter 28.

17. See the 2015 "Joint Staff Report on the U.S. Treasury Market."

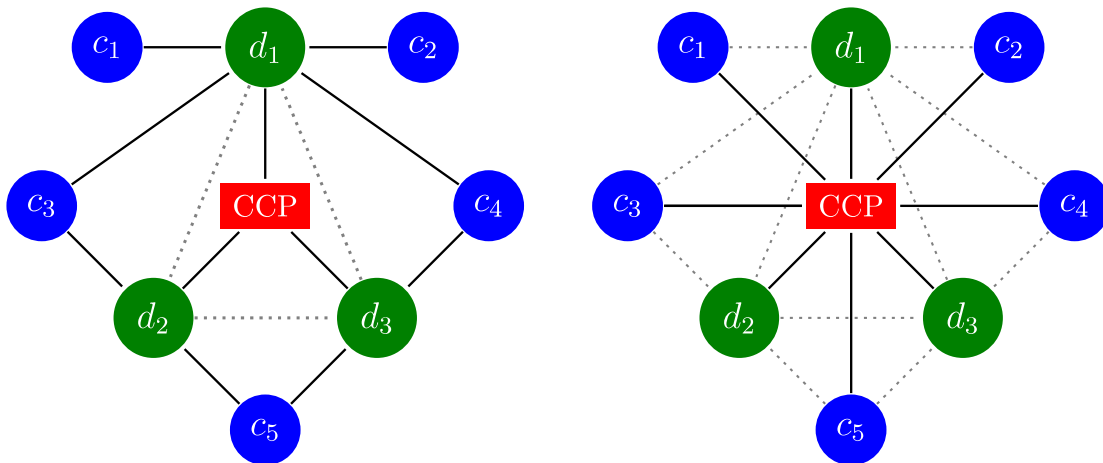
In March through May of 2020, according to TRACE data provided by FINRA, the aggregate volume of Treasury transactions was roughly balanced between the customer-to-dealer and interdealer segments of the market,<sup>18</sup> as shown in Figure 3.

Once a transaction between two parties is executed, the trade is “cleared” in a sequence of steps that prepares the trade for settlement, the final exchange of cash for securities. Central clearing involves the additional step of guaranteeing trade settlement. Once a trade is centrally cleared, the original buyer and seller are no longer exposed to each other for settlement risk -- they instead face the central counterparty (CCP), also known as a “clearinghouse.” In case of a default, the surviving clearing members of the CCP are mutually responsible for providing the liquidity needed to resolve the failure, and to cover ultimate losses through their capital contributions to the CCP’s default guarantee fund. Typically, the CCP operator contributes a comparatively small amount of capital to this guarantee fund.

Some interdealer Treasuries transactions are centrally cleared at the Fixed Income Clearing Corporation (FICC). Other interdealer transactions are not centrally cleared, and are instead cleared on the balance sheets of interdealer brokers. The majority of customer-to-dealer transactions are not centrally cleared. Treasury Market Practices Group (2018) estimates that 12.7% of U.S. Treasury transactions are centrally cleared for both original counterparties, and that 19.4% of transactions are centrally cleared between an interdealer broker and one of the original counterparties but not the other counterparty. The remaining 67.9% of transactions, most of which are customer-to-dealer, do not involve a CCP. Combining these estimates, a participant in the Treasuries market faces a CCP on only 22.4% of Treasury transactions. By comparison, central clearing covers virtually 100% of exchanged traded derivatives and equities, and the majority of swap-market transactions.

The left-hand schematic of Figure 12 illustrates the limited extent to which central clearing is currently applied in the U.S. Treasury market, primarily by dealers and interdealer brokers that are members of the Fixed Income Clearing Corporation (FICC). The right-hand schematic illustrates a hypothetical CCP that could be used by dealers, interdealer brokers, PTFs, and other large investors that trade Treasuries, such as pension funds, insurance firms, hedge funds, mutual funds, and other asset management firms.

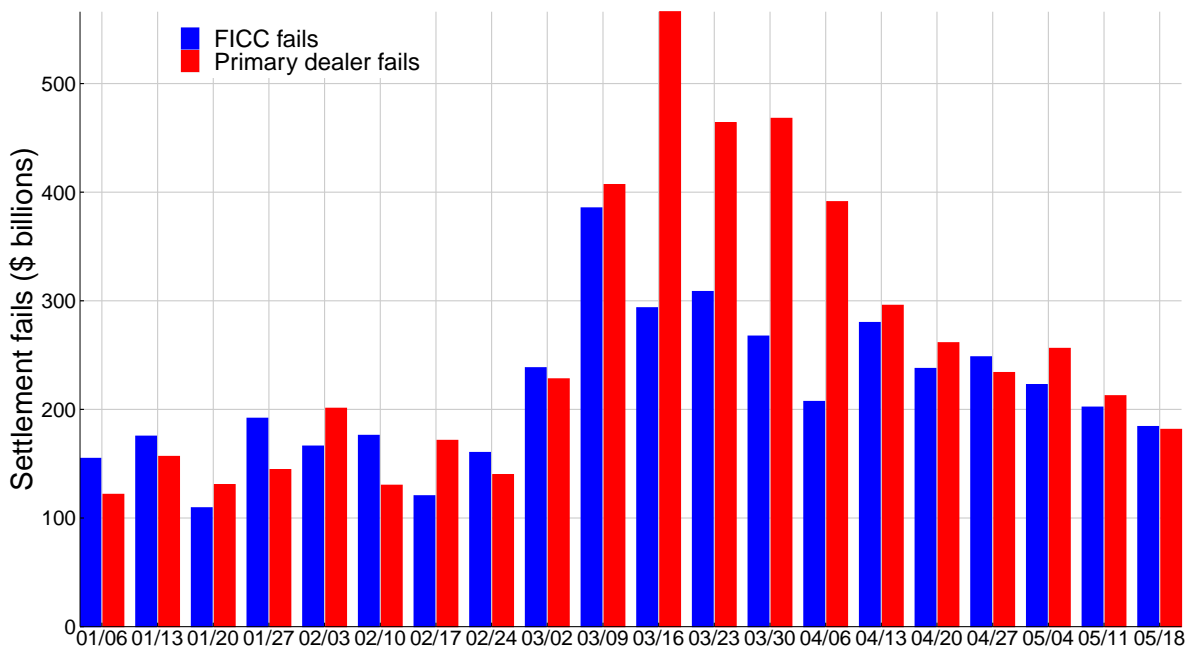
18. FINRA combines “ATS” and “interdealer” transactions into a single reporting category that I treat as interdealer, given that the majority of ATS trade is not customer-to-dealer (and there is essentially no “customer-to-customer” trade).



**Figure 12.** The left-hand schematic illustrates the limited degree to which central clearing is currently used in the U.S. Treasury market, primarily by dealers and interdealer brokers that centrally clear at the Fixed Income Clearing Corporation (FICC). The right-hand schematic illustrates the notion of a CCP that is used by dealers, interdealer brokers, PTFs, insurance firms, asset management firms, and other firms that actively trade Treasuries or Treasury repos. Figure source: Duffie and Krishnamurthy (2016).

The general lack of central clearing in the U.S. Treasury market is a significant missed opportunity to improve market robustness and efficiency, especially given the expectation of large future increases in risk flows in the Treasury market. Central clearing increases the transparency of settlement risk to regulators and market participants, and in particular allows the CCP to identify concentrated positions and crowded trades, adjusting margin requirements accordingly. Central clearing also improves market safety by lowering exposure to settlement failures, which rose significantly during the most stressful days in March,<sup>19</sup> as shown in Figure 13. As depicted, settlement failures rose less in March for trades that were centrally cleared by FICC than for all trades involving primary dealers. A possible explanation is that central clearing reduces “daisy-chain” failures, which occur when firm A fails to deliver a security to firm B, causing firm B to fail to firm C, and so on.

19. Although settlement fails were relatively high in mid-March in comparison to surrounding recent months, fails were much below levels experienced during the financial crisis of 2008-2009, which preceded the implementation of settlement-fail penalties, as shown by Fleming, Keane, Martin, and McMorrow (2014). As explained by Ingber (2017) in the context of GSCC, settlement fails can be converted by a CCP to future obligations. When the market is relatively weak at matching buyers and sellers, settlement fails can serve the useful purpose of expanding the “virtual supply” of Treasuries available for trade. An intermediary that does not have immediate access to a specific issue can nevertheless respond to a request for trade by selling the issue and then looking for the issue from others, sometimes failing to locate it. If settlement fails were stamped out, say with a much larger fail penalty rather than an improvement in market structure, dealers would often choose to decline counterparty requests for trade given taking the risk of a fail, which would eliminate some beneficial trades.



**Figure 13.** Treasuries settlement fails at FICC and for primary dealers. Data sources: [FICC](#) and [Federal Reserve Bank of New York](#).

Central clearing also reduces the amount of dealer balance-sheet space necessary to maintain liquid markets. This arises from improved netting, by which a dealer’s commitments to settle a buy trade with one counterparty and a sell trade with another can both be novated to the CCP, so that the dealer’s settlement commitment and counterparty exposure is only the net of those of the buy and sell trades. To illustrate this concept with a simplified example, suppose Firm A is due to settle a purchase of \$100 million of 10-year Treasury notes with Firm B. Meanwhile, B is due to settle the purchase of \$80 million of these Treasuries with Firm C, while C is due to settle \$90 million with A. The total of the settlement amounts at risk is thus \$270 million. If, however, the three trades are centrally cleared at a CCP, the settlement risks collapse to \$10 million for A with the CCP, \$20 million for B with the CCP, and \$10 million for C with the CCP, for a new total amount of settlements of only \$40 million. Ingber (2017) provides more realistic examples of netting and describes the improvements in netting resulting from the formation in 1986 of the Government Securities Clearing Corporation (GSCC), a precursor of FICC.

As I explain in Duffie (2019), the existence of broadly accessible central clearing also allows for (but does not on its own ensure) the emergence of trading directly between ultimate non-dealer buyers and non-dealer sellers, further reducing the amount of dealer balance sheet space necessary to efficiently match buyers and sellers. All-to-all trade does not need to rely entirely on continuously operating limit-order-book markets. Trade in less actively traded off-the-run Treasuries can be conducted using all-to-all request-for-quote protocols. In a market that includes all-to-all trade, dealers would continue to play an important role in liquidity provision, especially for large trades, bilaterally and on trade platforms, just as dealers currently do in equities and derivatives markets.

In 2010, the Dodd-Frank Act mandated the central clearing of all standardized derivatives, including the largest category of derivatives, standard interest rate swaps, subject to exemptions for derivatives that



are used by non-financial firms for hedging purposes. According to [ISDA](#), 91% of standard interest rate derivatives transactions conducted in 2020, through May 1, were centrally cleared.

Concerns are sometimes expressed about concentrating settlement risk in a large market at a central counterparty, thus making the CCP systemically important and potentially “too big to fail.” Because of these concerns, large U.S. CCPs are [designated by the Financial Stability Oversight Council](#) as systemically important, which implies a heightened level of supervision by U.S. regulators. Without careful regulation, supervision, and failure resolution planning, CCPs can indeed present significant risks to financial stability (Powell, 2017). These risks include high exposures to large clearing members, which also tend to be systemically important. Central clearing is an effective approach only with strong CCP risk management and regulatory oversight.

The potential settlement risk to be centrally cleared for U.S. Treasury securities trades is actually lower than that for equity trades that are already routinely centrally cleared. For example, Figure 14 shows that the total-market settlement risk for the 10-year Treasury note is typically lower than that for the SPDR S&P 500 ETF, a centrally cleared exchange-traded security. Shown in red is a rough estimate of the gross potential daily settlement risk for trades of the on-the-run 10-year Treasury note,<sup>20</sup> based on all transactions in both the interdealer and customer-to-dealer market segments of the Treasury market, and incorporating the effect of daily price volatility. In blue, Figure 14 shows the larger estimated gross one-day settlement risk for the SPDR S&P500 ETF, which trades on NYSE Arca. The normal settlement cycle for equities is 2 days, as opposed to the one-day settlement cycle typical of Treasuries trades, so the difference in settlement risks illustrated in Figure 14 is actually understated. Like the vast majority of U.S. exchange-traded equity transactions, transactions in SPDR ETFs are centrally cleared by the [National Securities Clearing Corporation](#), which is designated as systemically important financial market infrastructure and [regulated by the Securities and Exchange Commission](#).

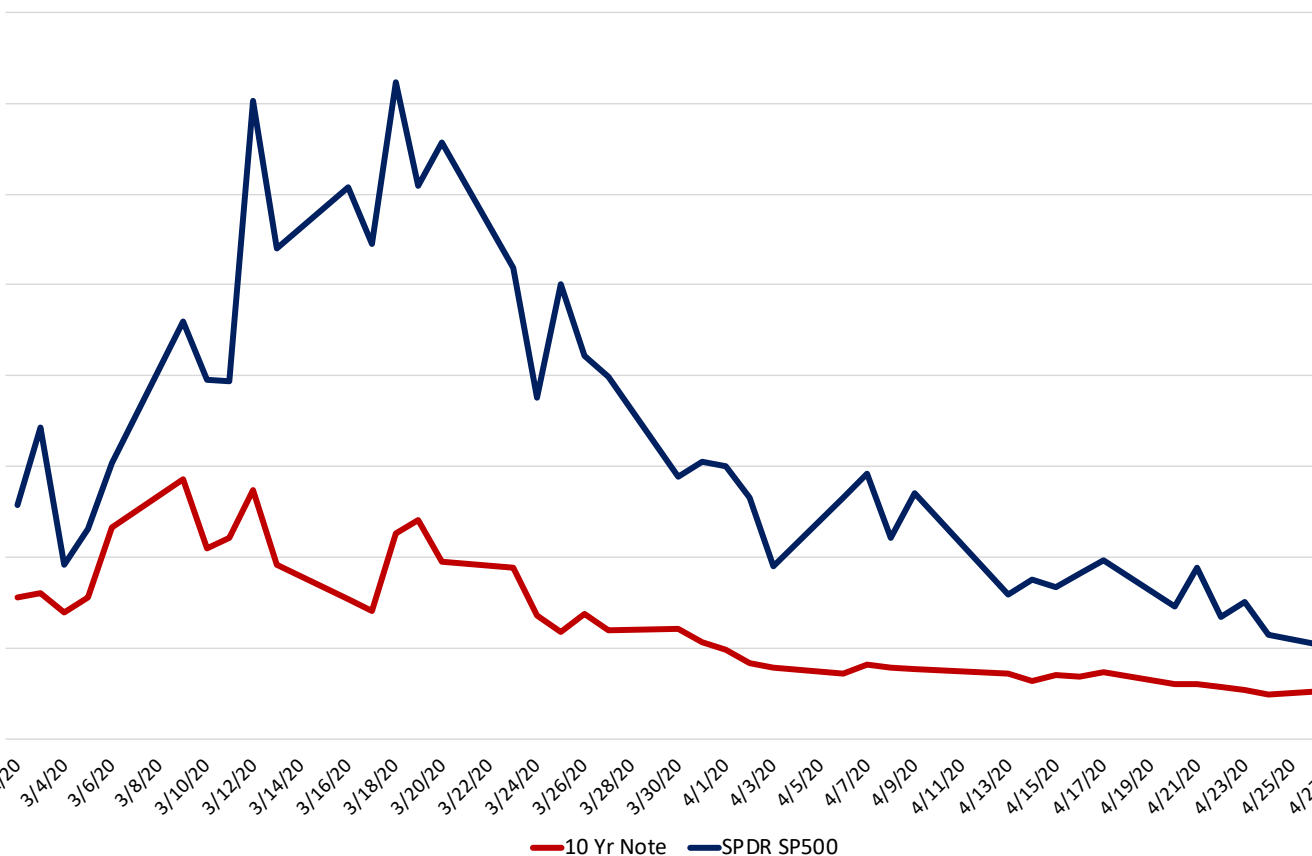
Although the aggregate gross amount of settlement risk for U.S. Treasury securities is no larger than that for some equities, the Treasury settlement commitments of individual investors can be extremely large, implying the need for significant commitments by clearing members to provide liquidity (financing) to the CCP in the event of the failure of one or more clearing members. For example, [CPMI-IOSCO mandated disclosure by FICC](#) for the last quarter of 2019 shows a combined liquidity commitment by clearing members to the FICC’s Capped Contingent Liquidity Facility (CCLF) of \$108 billion dollars, covering repos and cash trades of Treasury and Agency securities. Commitments by bank-affiliated dealers to the CCLF count against regulatory liquidity requirements, including the Liquidity Coverage Ratio (LCR). Increasing the breadth of central clearing of Treasuries transactions would substantially increase the liquidity commitments of clearing member firms to CCPs. In addition to standing liquidity commitments, the amount of margin that must be posted to CCPs can grow markedly in stress periods, as Huang and Takáts (2020) show was the case during the Covid19-induced stresses of March, 2020.

However, the current market approach of no central clearing for the majority of Treasuries (cash and repo) transactions does not remove the need for dealers to maintain large stocks of high-quality liquid assets and other sources of liquidity to cover margins and settlement risks for their bilateral Treasuries transactions. To the contrary, the netting of most purchases against sales at a CCP would lower the overall liquidity requirements of dealers, assuming that dealers continue to intermediate the market effectively. It would be difficult to estimate the amount of liquidity savings associated with central clearing without conducting a quantitative analysis of Treasuries transactions data.

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20. This risk is the product of the dollar market value of total daily trading volume to be settled and an estimate of the one-day volatility of the return on the 10-year note, as implied by the market price of options on the 10-year note.

Over the past five years, an expansion of central clearing in Treasury markets has come under increasing policy discussion. In their 2015 “[Joint Staff Report on the U.S. Treasury Market](#),” which addressed “significant and unexplained volatility” in Treasury markets that occurred on October 15, 2014, the staffs of the Treasury Department, Fed Board of Governors, the New York Fed, the SEC, and the CFTC wrote that the “significance of trading volume of firms outside the FICC membership—now larger in aggregate than that of FICC netting members—raises the question of whether trades cleared for non-CCP members are processed as prudently as those for firms inside the CCP. Trades cleared outside the CCP may not be subject to the same level of settlement risk mitigation techniques such as margin collection, disciplined clearing fund balance requirements, and pre-defined loss sharing arrangements.”



**Figure 14.** Estimated total one-day gross settlement risk for on-the-run 10-year U.S. Treasury notes and for SPDR S&P 500 ETFs. One-day gross settlement risk is defined as the dollar market value of the volume of trade multiplied by the standard deviation (“volatility”) of daily returns. Treasuries trades normally settle in one day (T+1), whereas exchange-traded equities such as the SPDR S&P500 ETF settle in two days (T+2). Notional (principal amount) trade volumes for the 10-year Treasury note are weekly aggregates from [TRACE data provided by FINRA](#). The weekly total of on-the-run trade 10-year notes (shown as on-the-run “> 7 years and <= 10 years”) are divided by five to estimate average daily volume.<sup>21</sup> The prices of the 10-year Treasury note were computed from yields reported by the U.S. Treasury. SPDR S&P 500 ETF dollar volumes are based on share trade volumes and closing prices on NYSE-Arca,

21. This is the first regular public reporting of TRACE data bearing on Treasury markets, and is available only for aggregate weekly trade volumes by maturity class, on-the-run versus off-the-run, and only from the week of March 6, 2020.

from [data provided by Wall Street Journal](#). The daily standard deviation of returns is approximated by dividing the reported annualized implied volatility of the Black-Scholes option-implied volatility by the square root of the number of trading days per year. The option-implied volatility for the S&P 500 and for the 10-year Treasury note<sup>22</sup> are from data provided by the Chicago Board Options Exchange (CBOE).

In a 2017 [hearing of the House Financial Services Committee reviewing the structure of U.S. fixed-income markets](#), John Shay, Nasdaq’s Global Head of Fixed Income and Commodities testified that “The clearing market structure, in our view, has fallen behind the realities of automated trading. The lack of a centralized clearing solution poses material counterparty risks to the market and leads to the following: less transparency as to the size of exposure; concentration risks; clients having to post collateral at multiple venues; and a decentralized default management process that is cumbersome and prone to delays and errors.”

In its 2017 [Report to President Donald J. Trump on Core Principles for Regulating the United States Financial System](#), the Treasury Department addressed gaps in the central clearing of Treasuries, focusing only on the interdealer market, by writing: “First, there is less netting down of settlements than there would be if all interdealer market participants were FICC members. Second, if a large PTF with unsettled trading volumes were to fail, the failure could introduce risk to the market and market participants.” The Treasury Department concluded its recommendations in this area by writing: “To better understand these arrangements and the consequences of reform options available in the clearing of Treasury securities, Treasury recommends further study of potential solutions by regulators and market participants.”

In a written submission to the same hearing, Randy Snook, executive vice president of the Securities Industry and Financial Markets Association, stated:

*SIFMA supports the further investigation and study, to be led by Treasury, of the potential costs and benefits of implementing a mandatory central clearing requirement for the cash Treasury market, and we believe this study should consider all potential forms of a clearing requirement that could be implemented across the cash Treasuries product ecosystem (i.e., on and off-the run issues, the when-issued market, repos, etc.). We also support further study and evaluation of the costs and benefits of mandatory centralized repo clearing.*

In a separate written submission to this hearing, Murray Pozmanter, Managing Director of DTCC (parent of FICC) and Head of Clearing Agency Services stated that “clearing of Treasury securities would provide several benefits, including the reduction of aggregate counterparty and credit risk in the system; increased transparency; more efficient use of collateral; and increased balance sheet relief for CCP members.”

In its 2019 report, “Best Practice Guidance on Clearing and Settlement,” the private-sector Treasury Markets Practice Group summarized its position on the “Potential role for expanded central clearing in mitigating clearing and settlement risk,” writing:

*The TMPG learned through its work that the changes to market structure that have occurred have also resulted in a substantial increase, in both absolute and percentage terms, in the number of*

22. Since the time at which I collected the implied volatility time series for the 10-year Treasury note, the CBOE has discontinued reporting these data.

*trades that clear bilaterally rather than through a central counterparty. This principally stems from the increased prevalence of PTF activity on IDB platforms. The majority of dealer-to-customer activity also continues to be bilaterally cleared. Mandatory central clearing has long been required in the futures market, and under Dodd-Frank central clearing has now been mandated or incentivized for many swap instruments. Central clearing offers certain immediate benefits for individual firms, including transfer of counterparty credit risk to the CCP through novation, multilateral netting of exposures, and other risk mitigation features, such as margining, that also serve to reduce liquidity risks and risks to broader market functioning. However, these need to be weighed against other considerations such as the cost of clearing, the ability to access a CCP, and the concentration risk typically associated with central clearing. Members of the TMPG did not form a consensus view as to whether increased use of central clearing services should effectively be compelled, through either a regulatory mandate or strong regulatory incentives, but there was agreement that certain market participants were less likely to voluntarily move to more widespread use of central clearing in the current environment. Thus, the TMPG believes that to the extent that public policy interests are served by moving to more widespread utilization of central clearing, that is something best addressed by the official sector."*

A broad Treasury-market clearinghouse could potentially be based on an expansion of the role of FICC or a new stand-alone facility operated as a private-sector utility or by a government agency. Tucker (2015) discusses tradeoffs associated with the choice between public-sector CCPs and private-sector CCPs. The CCP would likely, depending on the results of a quantitative analysis and effectiveness study, achieve significant balance-sheet economies and operational efficiencies by incorporating the central clearing of when-issued transactions,<sup>23</sup> Treasury auction settlements, and repo transactions, as was eventually done at GSCC (Ingber, 2017).

Some of the benefits of central clearing could in principle be achieved through more rapid trade settlement, potentially even intra-day settlement, although this would require new approaches to financing in the Treasuries market, which relies on the one-day settlement cycle to set up necessary financing.

## Concluding remarks

The weak functionality of the secondary market for U.S. Treasuries on Covid-19 crisis news was a wake-up call. Given the enormous volumes of trade in this market, which will rise markedly with the massive upcoming growth in U.S. federal debt, regulators of the U.S. Treasury market may now wish to conduct a study of the costs and benefits of introducing a broad central clearing mandate. This would improve financial stability, increase market transparency, and reduce the current heavy reliance of the market on the limited space available on dealer balance sheets for intermediating trade flows.

This upgrade of the Treasury market would be a significant undertaking. Yet similarly onerous major upgrades of U.S. financial market structures were accomplished after the financial crisis of 2008-2009, which revealed important weaknesses in the markets for repos and swaps. In the tri-party repo market, dangerous intra-day credit exposures in excess of \$1.5 trillion were significantly reduced by a [private](#)

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23. The when-issued trading of Treasuries, in the week before issuance, heightens settlement risk because of the longer delay between trade and settlement.

[sector task force](#) empaneled by the Federal Reserve Bank of New York. In the swap market, the Commodity Futures Trading Commission implemented Dodd-Frank legislation that mandated broad central clearing of approximately \$100 trillion in notional outstanding U.S. dollar interest rate derivatives, [according to ISDA](#). This reform has not damaged the liquidity or depth of the swap market – just the opposite.

In March 2020, the Fed rescued the Treasury market by quickly removing from the market over \$1 trillion of Treasuries that would have otherwise clogged dealer balance sheets, and by relaxing the Supplementary Leverage Ratio rule for reserves and Treasuries. Because reserves are literally risk-free and perfectly liquid, a capital requirement for reserves serves no useful economic purpose. Obviously, the same cannot be said for Treasuries, as the events of March 2020 have clearly demonstrated.

The efficiency and stability of financial markets are public goods on which many market participants depend, without necessarily having the individual incentives to support. The efficiency and stability of the market for U.S. Treasuries is a matter of national economic security – this is the instrument by which the U.S. Government funds itself. I expect that the U.S. official sector now has a key role to play in reforming this market.

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