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FEDERAL RESERVE BANK *of* NEW YORK

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Abstract

As the economic disruptions associated with the COVID-19 pandemic increased in March 2020, there was a global dash-for-cash by investors. This selling pressure occurred across advanced sovereign bond markets and caused a deterioration in market functioning, leading to central bank interventions. We show that these market disruptions occurred disproportionately in the U.S. Treasury market and were due to investors' selling pressures being far more pronounced and broad-based. Furthermore, we assess differences in key drivers of the market disruptions across sovereign bond markets, based on an analysis of the data as well as structured outreach to a range of market participants.

Key words: sovereign bond markets, financial crisis, COVID-19

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In the early months of 2020, at the onset of the COVID-19 pandemic, heightened economic and market uncertainty led to a flight-to-quality as investors shifted their portfolios towards safe, sovereign bonds. As the shock intensified in the second week of March 2020, however, this flight-to-quality became a global dash-for-cash, as investors sought to sell sovereign bonds to meet redemptions and margin calls and to build cash buffers.[2] These actions occurred across advanced economy sovereign bond markets, causing bond yields to spike and market functioning to deteriorate broadly and sharply, and prompting central banks to intervene via asset purchases to restore market functioning.[3]

This dash-for-cash occurred across advanced economy (AE) sovereign bond markets, though a range of metrics demonstrate that the March 2020 market disruptions occurred disproportionately in the U.S. Treasury market. To better understand this result, we assess differences in key drivers of the market disruptions across sovereign bond markets, based on an analysis of the data as well as structured outreach to a range of market participants.

The first driver we consider is the depth and breadth of selling pressures across sovereign bond markets. The second driver is the difference in the buildup of leverage by investors leading up to the March 2020 shock. The third and final driver is the differences in market microstructure across sovereign bond markets, including market-maker obligations, the prevalence of central clearing, and reliance on electronic or voice trading platforms.

We find that a main driver of the disproportionate disruptions to the Treasury market is that selling pressures were far more pronounced and broad-based in U.S. Treasuries than in other sovereign bond markets, reflecting the U.S. dollar's role as the dominant global investment and funding currency. Differences in leverage dynamics also played a major role in explaining why the Treasury market faced larger disruptions to market functioning. Stronger pre-pandemic Treasury issuance, as well as supportive financing conditions and other factors, helped pave the way for a heavier build-up of leverage in the Treasury market than in other sovereign bond markets. As a result, the COVID-19 shock catalyzed more de-leveraging, and hence higher selling pressure, in the Treasury market. Finally, despite a number of differences in the market microstructure across sovereign bond markets, we conclude these differences were not primary drivers of the disproportionate disruptions to the Treasury market in March 2020.

Although not the focus of this article, we note that in response to the global dash for cash, a number of central banks intervened in their respective sovereign bond markets by conducting asset purchases. In line with our results that disruptions to the Treasury market were more severe relative to other sovereign bond markets, the Federal Reserve's response was larger and more front-loaded relative to

[2] Fleming, Liu, Podjasek, and Schurmeier (2021) provides an analysis of this shift from flight-to-quality towards a demand for larger cash buffers in the U.S.

[3] A burst of recent work has focused on analyzing Treasury market conditions during the COVID-19 shock, including Duffie (2020), Fleming and Ruele (2020), and Schrimpf, Shin and Sushko (2020). Further, Haddad, Moreira, and Muir (2020), and Kargar et al (2020) focus on how the COVID-19 shock effected the U.S. corporate bond market.

other central bank counterparties, such as the European Central Bank, the Bank of England, and the Bank of Japan (see Figure A1 in the Appendix).[4]

For a historical comparison, periods of heightened market volatility and uncertainty during the global financial crisis of 2007-08 (GFC) were also accompanied by short periods of rising Treasury yields and sharp strains in Treasury market functioning. However, Treasury selling pressures were not as strong during the GFC relative to the COVID-19 March 2020 event, likely reflecting concerns over bank creditworthiness during the GFC, which favored a shift by investors from bank deposits to Treasuries. Furthermore, the composition of Treasury investors in 2008-9 was different relative to 2020, with significantly lower participation from leveraged investors and open-ended mutual funds.

The COVID-19 March 2020 event was also quite different from the disruptions in U.S. financial markets observed in September 2019.[5] Rather than a global dash-for-cash, the adverse events of September 2019 were related to the low level of U.S. aggregate reserves (see, for example, Logan (2020a) and Copeland, Duffie, and Yang (2021)).

The rest of the article is organized as follows. The first section offers perspective on the performance of various measures of market functioning across jurisdictions during the shock. The second section explores drivers for the apparent outsized reaction in U.S. Treasury markets vis-a-vis foreign sovereign markets, including differences in: (1) the breadth and depth of selling pressures; (2) the expansion of sovereign supply and build-up of leverage; and (3) features of market microstructures.

Section 1: Dislocations were Generally More Pronounced in U.S. Treasuries than in Foreign Markets

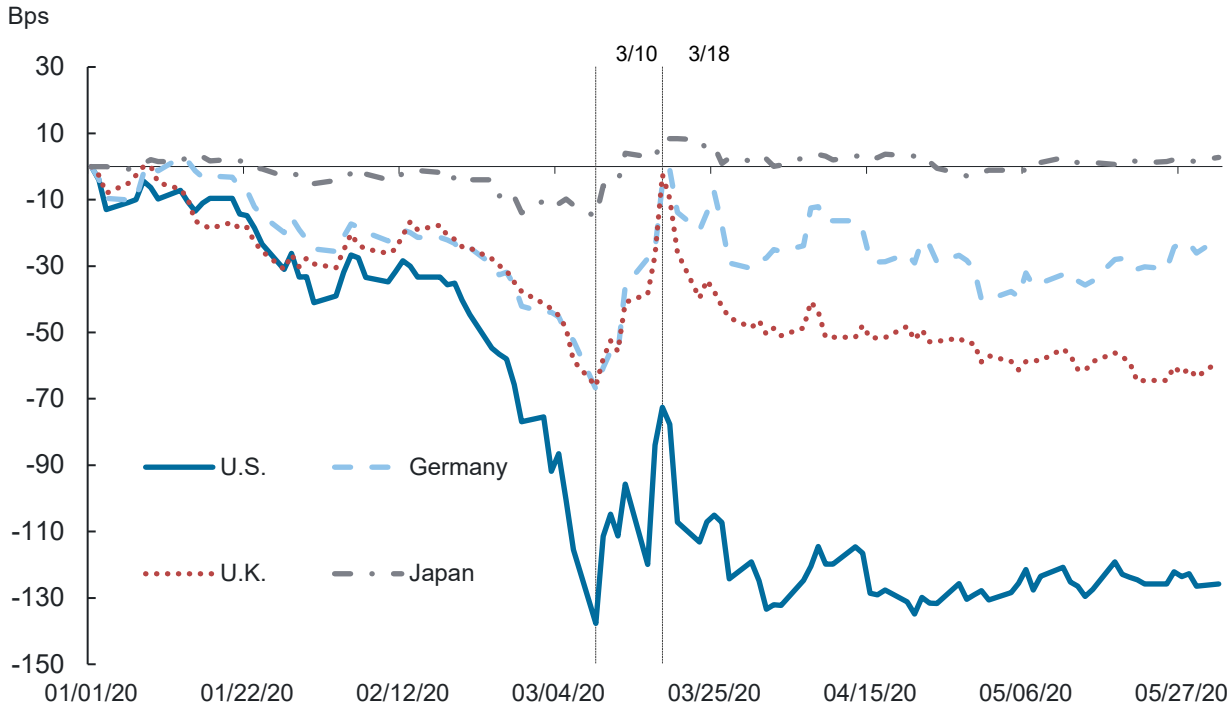
At the start of the COVID-19 pandemic in late-February 2020, investors digested the economic repercussions of the spread of the virus and impending lock-down measures, and as is typical during periods of heightened economic uncertainty, began to demand higher-quality, safe assets. This behavior resulted in investors shifting their portfolios towards sovereign bonds, and the resulting buying pressure drove sovereign yields to broadly decline. As the crisis intensified in March 2020, however, investors' demand for cash surged, leading to selling pressure on sovereign bonds and so increases in yields. This down-and-up pattern in yields is illustrated for 10-year U.S., German, U.K., and Japanese bonds in Figure 1.[6]

[4] Logan (2020b), Clarida, Duygan-Bump, and Scotti (2021), Fleming, Liu, Podjasek, and Schurmeier (2021), and Vissing-Jorgensen (2021) detail the Federal Reserve's actions in the Treasury market in response to the COVID-19 shock. Hutchinson and Mee (2022) and Hernandez de Cos (2021) describe the European Central Bank's response to the COVID-19 shock, Kuroda (2020) details the Bank of Japan's response and Tenreyro (2021) compares the Bank of England and Federal Reserve's responses to the COVID-19 shock.

[5] For details on the September 2019 disruption, see Afonso et al (2021).

[6] In comparison to the other sovereign bond yields, overall declines in U.S. Treasury yields were larger in magnitude and sustained throughout the months after March 2020. This contrast largely reflected growing expectations at that time for the FOMC to reduce the Fed funds target range in response to the economic slowdown. Central banks in other jurisdictions were viewed as having comparably less room to lower respective policy rates.

Figure 1: Cumulative Yield Changes Across Sovereign Bond Markets

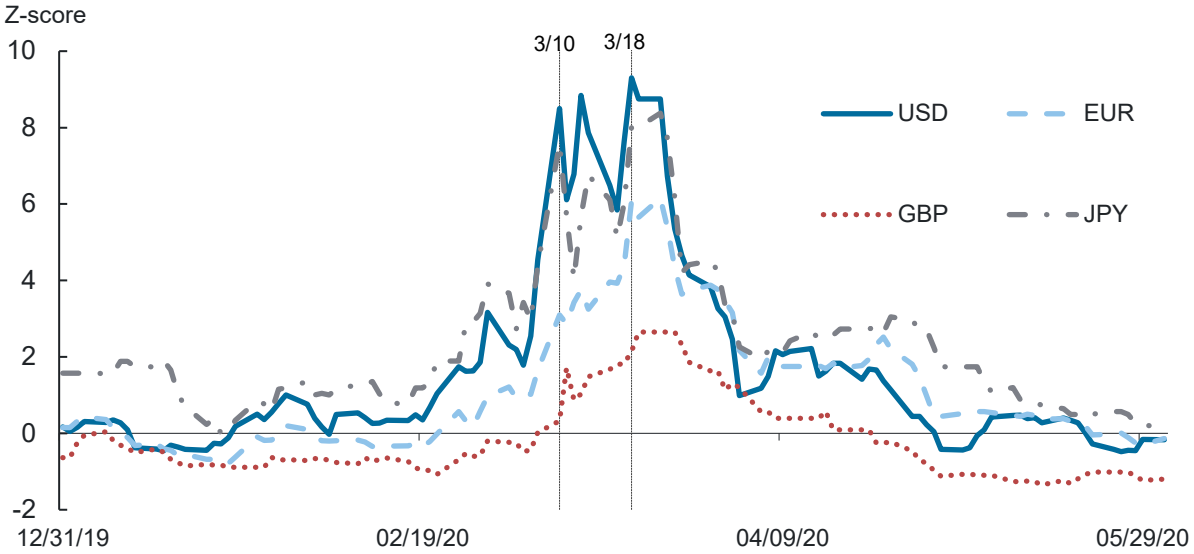


Note: This figure displays the cumulative yield changes for 10 year sovereign bonds, starting on January 1, 2020. U.S., Gernany, U.K., and Japan denote Treasury, Bund, Gilt, and Japanese Government Bond (JGB) securities, respectively.
Source: Bloomberg

In addition to the increase in yields in March 2020, there was an increase in the implied volatility of sovereign bond yields, reflecting in part investors' uncertainty over the global economic repercussions of the pandemic. Figure 2 charts a measure of this volatility and illustrates how, across a number of sovereign bonds, this volatility started increasing in late February 2020 and peaked in March 2020.

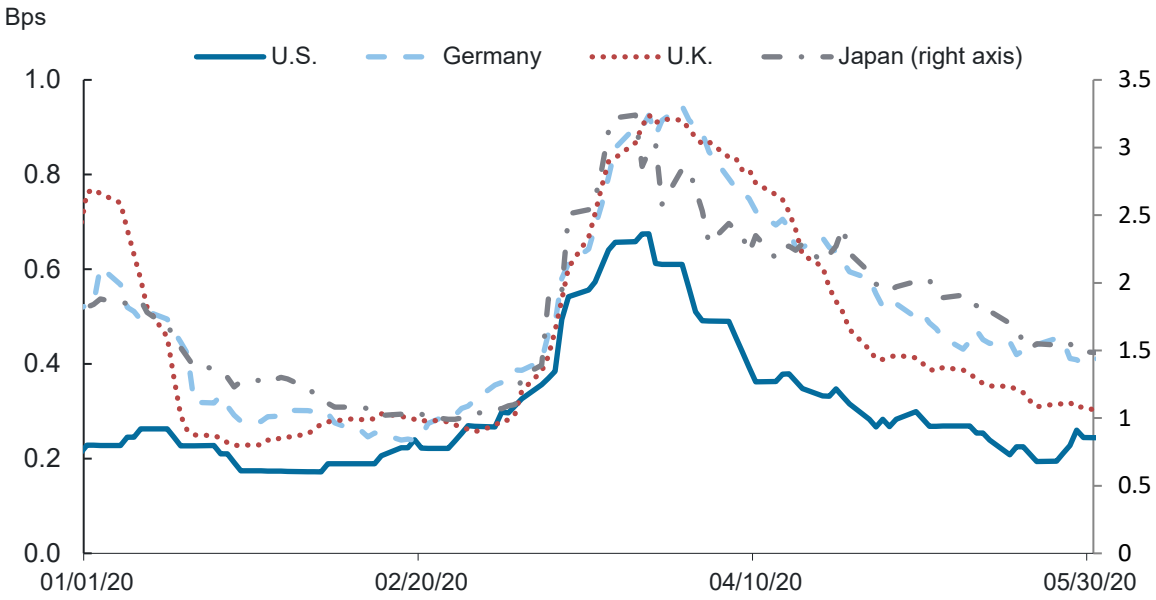
Alongside these changes in yields and volatility, sovereign bond liquidity deteriorated significantly in March 2020. A common measure of bond liquidity is the difference in prices that market makers offer to purchase and sell specific bonds, or the bid-ask spread. An increase in this bid-ask spread over late February and March 2020, for U.S., German, U.K., and Japan 10-year sovereign bonds is illustrated in Figure 3. This evidence, along with the aforementioned rise in volatility, suggests significant stress on trading conditions across sovereign bond markets.

Figure 2: Implied Volatility Across Sovereign Bond Markets



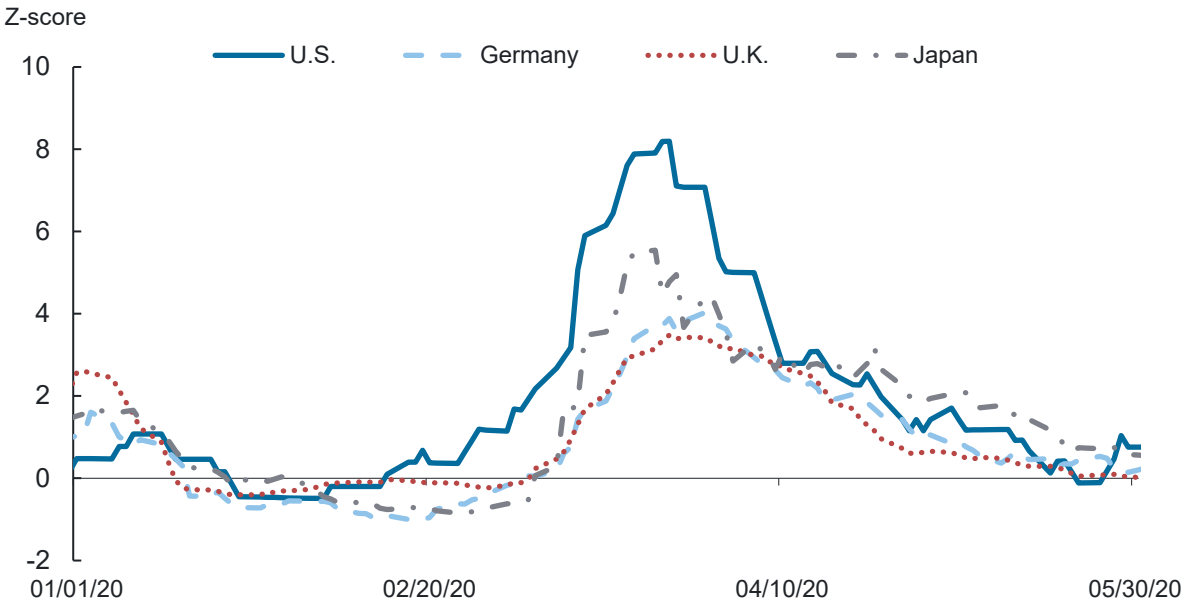
Note: This figure displays a measure of implied volatility of soverign bonds using a 3 month - 10 year swaption. A swaption consists of an option on a forward-settling interest rate swap. The implied volatility measures the magnitude of expected future fluctuations of the underlying swap rate, as priced into the option according to an option pricing model. For each soverign bond, the resulting measure is then normalized by its respective Z-score, where that Z-score is calculated on a 2017-2019 sample. USD is U.S. dollar, EUR is Euro, GBP is the British pound, and JPY is Yen.
Source: Bloomberg

Figure 3: The Spread between Bid and Ask Yields Across Sovereign Bond Markets



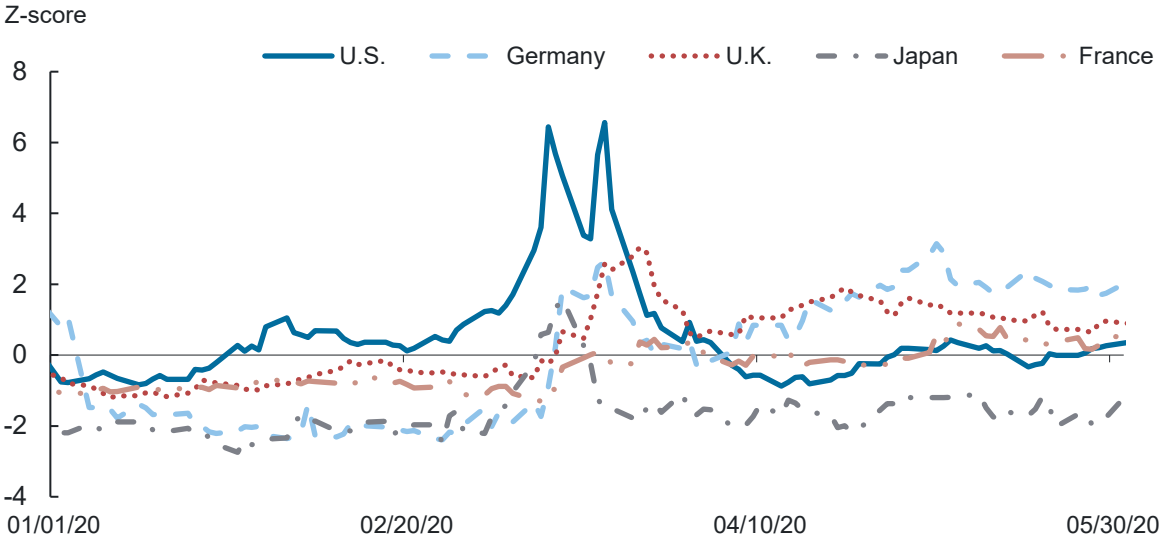
Note: This figure shows the spread between bid and ask yields for 10 year soveriegn bonds on a ten-day backward-looking moving average. U.S., Germany, U.K, and Japan are Treasury, Bund, Gilt, and Japanese Governemt Bond securities, respectively. The U.S., Germany, and U.K. time-series are plotted against the left axis and the Japan time-series uses the right axis.
Source: Bloomberg CBBT

Figure 4: The Normalized Spread between Bid and Ask Yields Across Sovereign Bond Markets



Note: This figure shows the spread between the ten-day backward-looking moving average of bid and ask yields for 10 year soveriegn bonds, normalized by their respective Z-score. Z scores are computed from a 10-day moving average of end-of-day bid-ask spreads using data from January 2017 to January 2019. U.S., Germany, U.K., and Japan are Treasury, Bund, Gilt, and Japanese Government Bond securities, respectively.
Source: Bloomberg CBBT

Figure 5: Deviations from Fair Value Pricing Across Soverign Bond Markets



Note: This figure displays the difference between investors' expectations of the fair value yield of a sovereign bond and actual yields, using average spline errors normalized by a Z-score. In normal times, this difference should be close to zero; large deviations from zero could indicate stressed liquidity conditions or dislocations in price discovery. Average spline errors are the average of security yield errors from a BBG fitted curve. Z-scores are calculated on a 2017-2019 sample. U.S., German, U.K., Japan, and France are Treasury, Bund, Gilt, Japanese Governement Bond (JGB) and Obligations assimilables du Trésor (OAT) securities, respectively.
Source: Bloomberg

Although selling pressures materialized across the board for sovereign bonds in March 2020, the impact on trading conditions for U.S. Treasuries was the largest. This can be seen when considering bid-ask yield spreads after they have been normalized by their historical averages. These normalized measures are illustrated in Figure 4 and demonstrate that the deterioration in sovereign bond liquidity was more pronounced in U.S. Treasuries, which during normal times have exhibited comparably lower and more stable bid-ask spreads, than in the German, U.K., and Japan sovereign bond markets.

The disproportionate adverse impact on trading conditions in U.S. Treasury markets is also seen by comparing the differences between actual yield curves and model-implied fitted curves across sovereign bond markets. This comparison is informative, because differences between the two could indicate stressed liquidity conditions and/or dislocations in price discovery. As illustrated in Figure 5, the difference between fitted and actual yield curves is significantly larger for U.S Treasuries relative to German, U.K., Japanese, and French sovereign bonds.

Section 2: Why Was the Deterioration More Pronounced in U.S. Treasuries?

In this section, we explore the likely drivers behind the disproportionate deterioration in U.S. Treasury market functioning during mid-March. We begin by considering differences in investors' selling pressures across sovereign bond markets. We then analyze differences in the pace of sovereign bond issuance leading up to the crisis and in the mix of investor types that were purchasing sovereign bonds at issuance. Finally, we consider differences in market microstructure across sovereign bond markets.

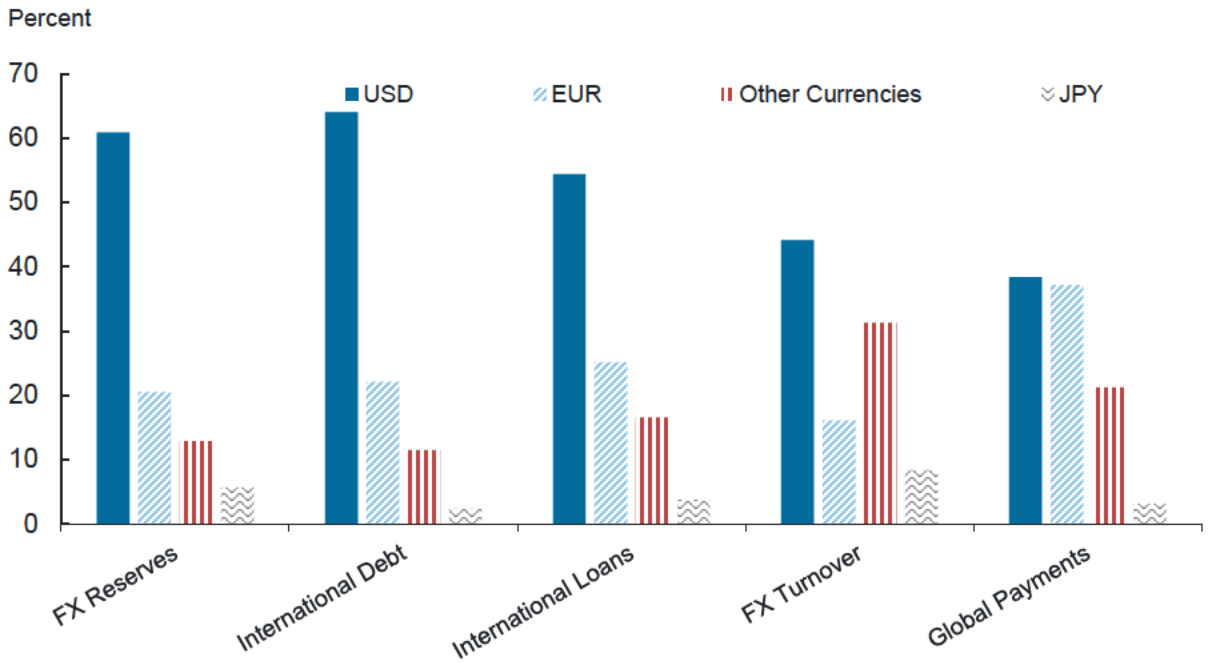
Subsection I. Differences in Depth and Breadth of Selling Pressures

We start by observing that the breadth and depth of selling pressures across investor types was more severe in U.S. Treasuries than in other major sovereign bond markets. A core reason is that the U.S. dollar is the world's dominant investment currency and U.S. Treasuries are generally viewed as the most liquid security in global portfolios.[7] Indeed, roughly 60 percent of central bank reserves are held as U.S. dollars, more than 50 percent of international debt and international loans are issued in U.S. dollars, and U.S. dollars dominate foreign exchange transactions and global payments flows (see Figure 6).[8] More analysis of the international role of the U.S. dollar can be found in Bertaut, Beschwitz, and Curcuru (2021), including an expanded discussion of various aspects presented in Figure 6.

[7] Czech et al (2021) argue that the U.S. dollar's global prominence was a major driver of spikes in U.K. Gilt yields over the COVID-19 crisis.

[8] The U.S. dollar is also the dominant currency for funding. Reflecting this fact, between the Federal Reserve and various central banks, U.S. dollar swap lines have been set up with the purpose of providing the foreign central banks with the capacity to deliver U.S. dollar funding to institutions in their jurisdictions during times of market stress. Indeed, with the arrival of the COVID-19 March 2020 shock, the U.S. dollar swap lines saw significant increase in demand for offshore dollar funding, peaking at almost $450 billion. For more details, see https://www.newyorkfed.org/markets/desk-operations/central-bank-liquidity-swap-operations .

Figure 6: U.S. Dollar Useage in the International Monetary System



Note: This figure reports shares of U.S. dollar use as foreign exchange reserves (FX Reserves), international debt, international loan foreign exchange turnover (FX turnover), and cross-border payments (Global payments). FX turnover is the total value of a particular currency traded over the total value of all currency traded. Because there are two currencies per FX trade, the maximum value of FX turnover for a given currency is 50 percent. USD is U.S. dollar, EUR is Euro, and JPY is Yen.
Source: ECB, BIS, IMF, SWIFT as of Feb. 2021. FX turnover data as of Apr 2019.

Sub-subsection A: Reserve Manager Sales

The disproportionate pressure to sell Treasuries can be seen in the use of foreign reserves by central banks. In general, central banks hold foreign reserves to help absorb external payment shocks, to contain currency volatility, and to bolster confidence in the country's ability to meet its external obligations. During the COVID-19 shock, some central banks liquidated their foreign currency reserves at a dramatic pace.[9] Key reasons for these sales were to contain currency depreciation pressures, channel foreign exchange liquidity to domestic institutions, offset revenue short-falls from collapsing commodity prices, cover maturing debt payments, and build precautionary liquidity buffers. The collapse in commodity prices, primarily in oil, also led some commodity exporters with exchange rates tied to the U.S. dollar to sell Treasuries to support their currencies.

While foreign central banks sold reserves denominated in all major currencies, sales of U.S. dollars dominated. Central banks sold roughly $170 billion in U.S dollar reserves, compared to around $25 billion in euro and less than $10 billion in yen assets over the first quarter of 2020, according to private

[9] See Weiss (2021) for more details on how reserve managers handled their Treasury holdings over the COVID-19 shock.

sector estimates.[10] These estimates imply that U.S. dollar reserves sales accounted for more than 80 percent of total reserve sales. This skew towards U.S. dollars is far in excess of U.S. dollar's roughly 60 percent share of foreign exchange reserves, consistent with the premise that U.S. Treasury markets faced disproportionate selling pressures relative to other sovereign bond markets.

Sub-subsection B: Sales from Private Investors

Available data also suggests that sales from private investors were more pronounced in U.S. Treasuries than in other sovereign bonds. Monthly data on investor transaction and holdings of sovereign bond holdings is available for Japan and Italy. In both markets, data suggest that bond selling pressures in March 2020 were dominated by foreign investors as domestic non-bank investors in Japan and Italy – including asset managers, insurers, and pension funds – appeared to either add to sovereign bond positions in March 2020 or remain roughly neutral (Figures 7 and 8).[11] In contrast, selling pressures in the U.S. Treasury market were broad-based. In addition to foreign investors, U.S. domestic mutual funds – whose share of marketable Treasury holdings more than doubled since the Global Financial Crisis – were significant net sellers of U.S. Treasuries in the first quarter of 2020 (Figure 9). A main reason for mutual fund sales of Treasuries was to raise cash to meet investor redemptions and rebalance portfolios (Logan (2020a), Ma, Xiao, and Zheng (2020)).

Meanwhile, banks in foreign jurisdictions appeared to play a much larger role in absorbing investor sales than in the U.S. Data from Japan and Italy show heavy net purchases from banks that helped offset foreign sales (Figures 7 and 8). In contrast, U.S. banks were modest net sellers of U.S. Treasuries in the first quarter of 2020 (Figure 9).[12]

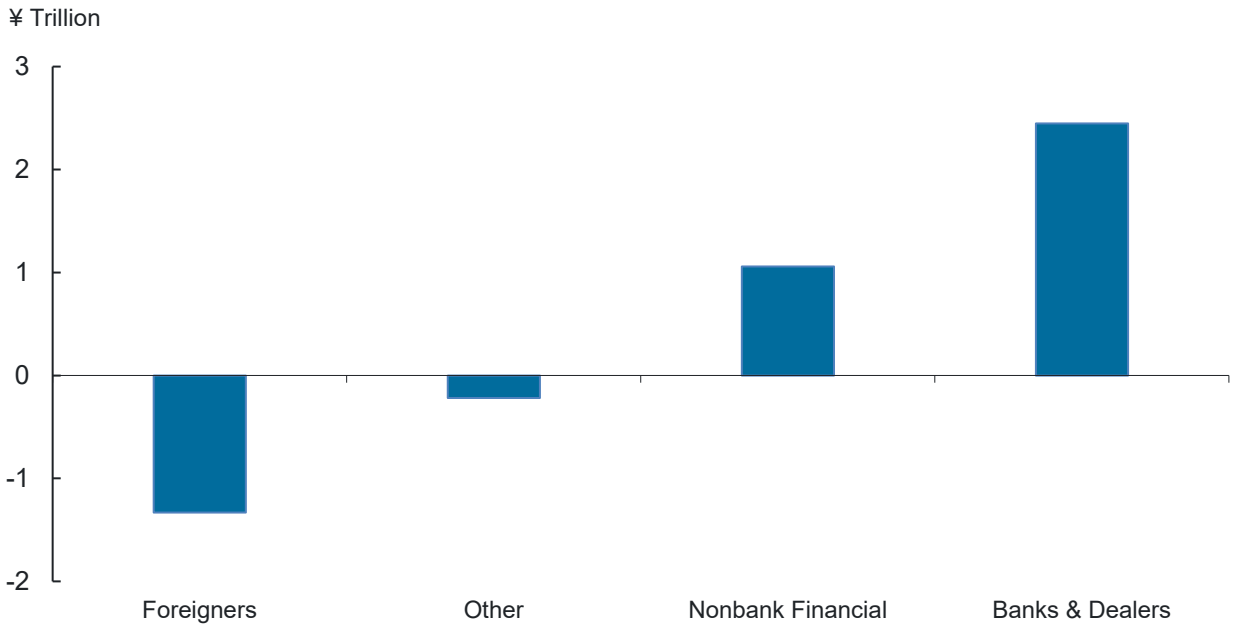
Reports from foreign market participants largely corroborated these divergences, though patterns of sales were not uniform across foreign jurisdictions. Market participants in Japan downplayed the scale and impact of reserve manager sales in the Japanese government bond (JBG) market, noting that foreign investors were net buyers of medium-term JGBs, a sector in which foreign central banks tend to be most active. Instead, market participants highlighted sales were concentrated in longer-dated JGBs and driven largely by foreign hedge fund and commodity trading advisors (CTAs). German market participants noted selling pressures from reserve managers and insurers, and highlighted other investors were net buyers.

[10] Despite central banks selling a substantial amount of U.S. dollar reserves, in the IMF's Official Foreign Exchange Reserves data the U.S. dollar share of global reserves edged higher in the first quarter of 2020. This increase, however, was driven entirely by large U.S. dollar and U.S. Treasury valuation gains. In Figure A2 in the appendix, we show that foreign official institutions decreased their holdings of U.S. Treasuries by roughly $150 billion in March 2020.

[11] According to Bank of Italy's November 2020 Financial Stability Report, foreign asset managers and hedge funds were particularly large sources of selling pressures.

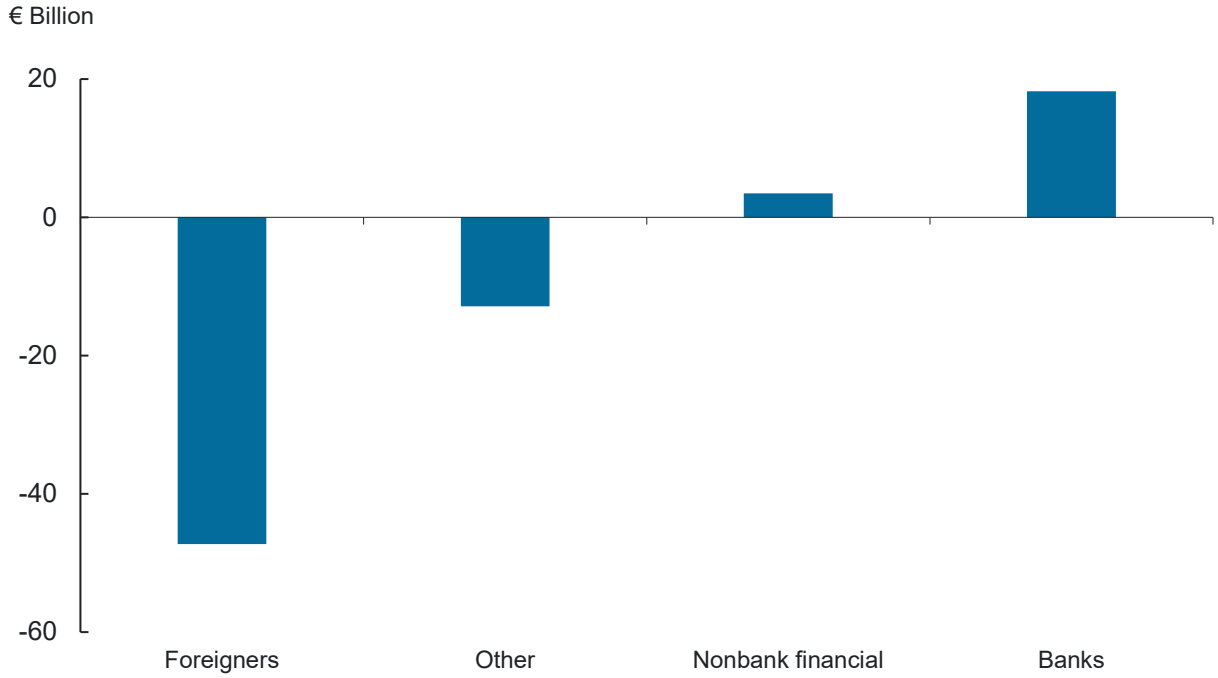
[12] Dealer net positions rose sharply in the first part of March 2020, absorbing client sales, but declined sharply by the end of March as the Fed commenced large scale purchases.

Figure 7: Net Purchases of Japanese Sovereign Bonds in March 2020



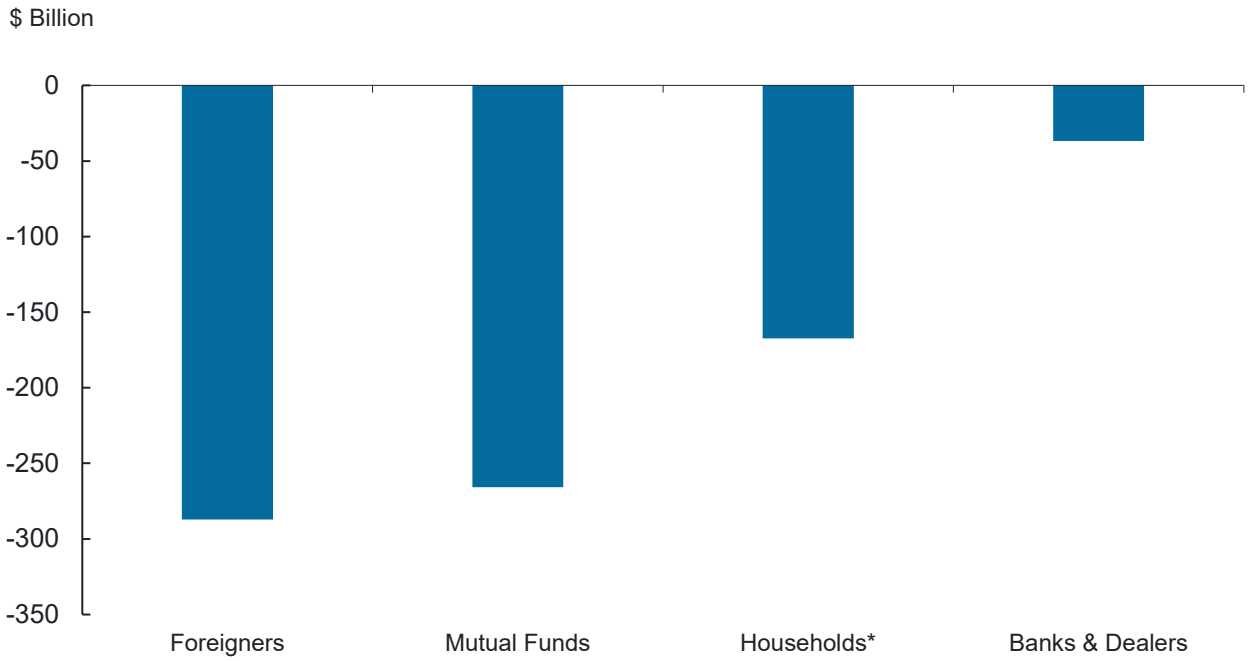
Note: This figure reports the net purchases of Japanese soverreign bonds (JGBs) in the secondary market, excluding bills, by investor type in March 2020. Nonbank Financial includes investment trusts and insurers.
Source: Japan Securities Dealer Association (JSDA).

Figure 8: Aggregate Change in Italian Sovereign Bond Holdings in March 2020



Note:This figure reports on the aggrgate change in holdings of Italian sovereign bonds (BTP) by investor type in March 2020.
Source: Banca d'Italia, Haver

Figure 9: Net Purchases of U.S. Treasuries by Investor Type in the First Quarter of 2020

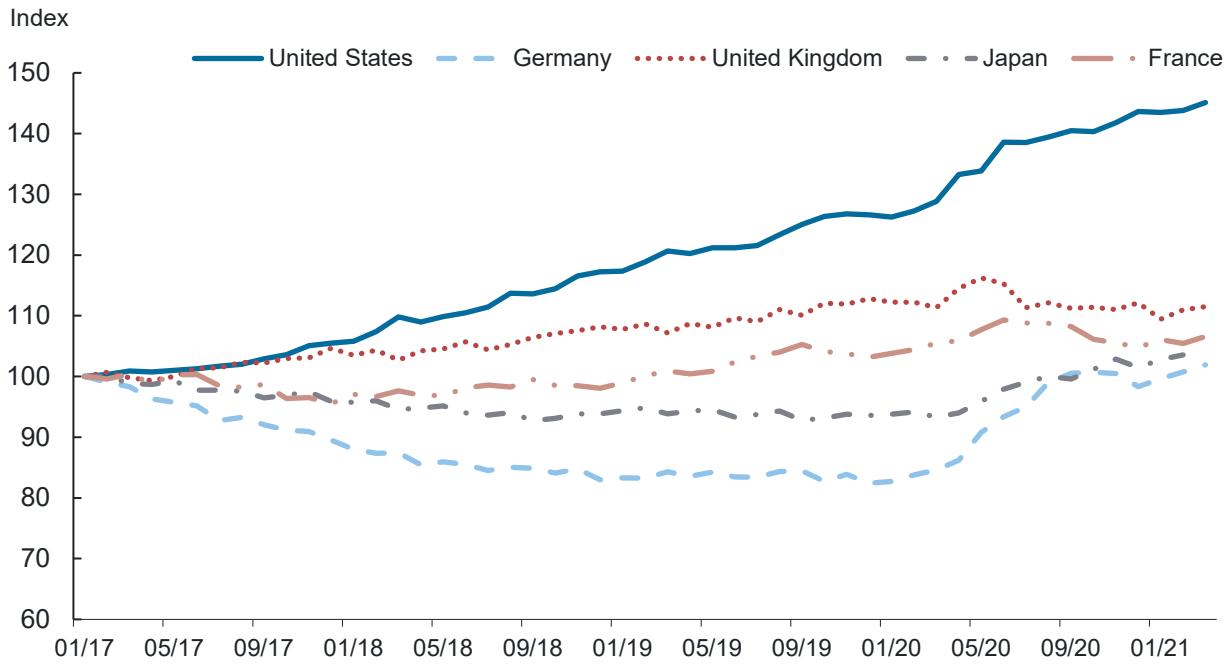


Note: The figure reports on the net purchases of U.S. Treasuries by main investor type in the first quarter of 2020. The household investor type includes hedge funds.
Source: U.S. Financial Accounts as published by the Federal Reserve Board

Subsection II. Differences in Supply and Leverage

We also identify differences in supply and leverage dynamics leading up to the onset of the COVID-19 shock as factors driving the disproportionate disruptions in Treasury markets. From the start of 2017 to right before the March 2020 shock, U.S. Treasury securities outstanding, excluding holdings by the central bank, increased by more than $3 trillion, while growth in other jurisdictions was either modest (U.K., France) or negative (Germany, Japan) (Figure 10). These differences in sovereign bond supply to the private sector matter as the large issuance of Treasury securities set the stage for the eventual amplification of Treasury strains through higher leverage and more limited bank and dealer capacity to absorb investor sales.

Figure 10: Total Outstanding Sovereign Bonds by Country



Note: This figure reports a time-series of the change in sovereign bonds outstanding measured in local currencies and excluding holdings by central banks. All amounts are indexed, where January 2017 is set to 100.
Source: Haver, European Central Bank, Fed H.4.1, and authors calculations.

Sub-subsection A: Leverage

Having a significant portion of highly leveraged investors active in a sovereign bond market can be problematic because in the face of large, unanticipated shocks, these levered investors often quickly de-lever by selling their securities. In the run-up to the COVID-19 shock, significantly more leverage underpinned the Treasury market than in other sovereign bond markets. As a result, the shock generated substantially more selling pressure in the Treasury market from leveraged investors, augmenting the market dislocations described earlier.

An important factor behind the leverage build-up in Treasuries leading up to the COVID-19 shock was that heavy Treasury issuance outstripped demand for Treasuries by typical end-user investors, such as asset managers, pension funds, and life insurers. This imbalance contributed to Treasuries trading cheap on the cash market relative to Treasury futures, creating a relative value opportunity between the two markets. Certain levered funds, such as relative value hedge funds, take bets on the convergence of prices in two similar markets, but to do so profitably typically assume significant leverage. In the time leading up to the COVID-19 shock, these specialized funds exploited the difference between prices in Treasury cash and futures markets, which was known as the cash-futures basis trade. This activity led to a significant build-up of leverage in the Treasury market and a rapid unwind at the onset of the COVID-19 shock.

In Treasury market outreach, market participants corroborated this increase in leverage and attributed this rise to attractive relative value opportunities.[13] In the appendix, we provide additional evidence of the increase in leverage in Treasury markets up until March 2020, followed by a rapid decrease. Similar points and evidence can also be found in the Inter-Agency Working Group on Treasury Market Surveillance (IAWG) Treasury Report (Nov 8, 2021), Schrimpf, Shin and Sushko (2020), and Barth and Kahn (2021).[14]

Because other sovereign bond markets did not experience similar increases in leverage leading to the COVID-19 shock, these markets did not face the same magnitude of selling pressures from rapidly de-levering investors. To compare the build-up of leverage across sovereign bond markets, we use data on the volume of repurchase agreements (repos). Because repos are a main way that levered funds raise cash to purchase sovereign bonds, increases and decreases in leverage can be indirectly observed by comparing repo volumes.

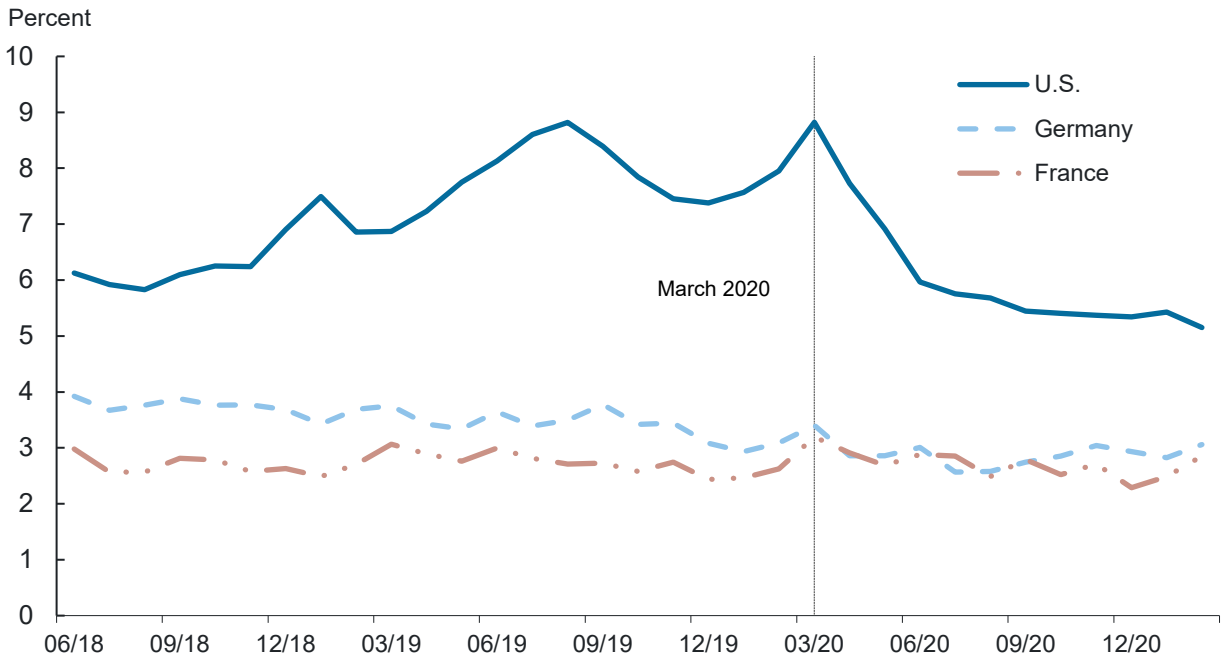
The larger presence of levered activity in the U.S. Treasury market is observed in Figure 11, which plots the share of repo volumes to outstanding government securities for U.S., French, and German sovereign bond markets. The fact that this normalized measure of repo volumes was highest for Treasuries is consistent with the idea that investors in Treasuries are more highly levered. Further, this measure increased up until the COVID-19 shock for Treasuries, whereas this measure declined for French and German sovereign bond markets. Finally, there was a marked decline in the share of repo volumes relative to outstanding government securities for U.S. Treasuries after the COVID-19 shock, consistent with rapid de-levering by levered funds.

The outsized de-levering and subsequent deterioration in market functioning in the Treasury market can be seen in disruptions in the implied rate of return of the cash-futures basis trade. In Figure 12, we compare the cash-futures basis across sovereign bond markets, noting that this return should be close to zero in the absence of frictions and shocks. The increase in this rate in March 2020 reflects the pronounced selling pressures in cash Treasuries, including de-leveraging by relative value funds. As illustrated in Figure 12, the Treasury market faced the largest disruptions across sovereign bond markets along this measure, reflecting in part the larger amount of de-levering in the Treasury market.

[13] Specifically, market participants largely attributed the leverage increase to attractive relative value opportunities, especially in the cash-futures basis, which in turn were underpinned by increasing Treasury supply, real money demand for long-Treasury futures exposure, and favorable financing conditions, including generally subdued Treasury and repo volatility and low levels of margins and repo haircuts.

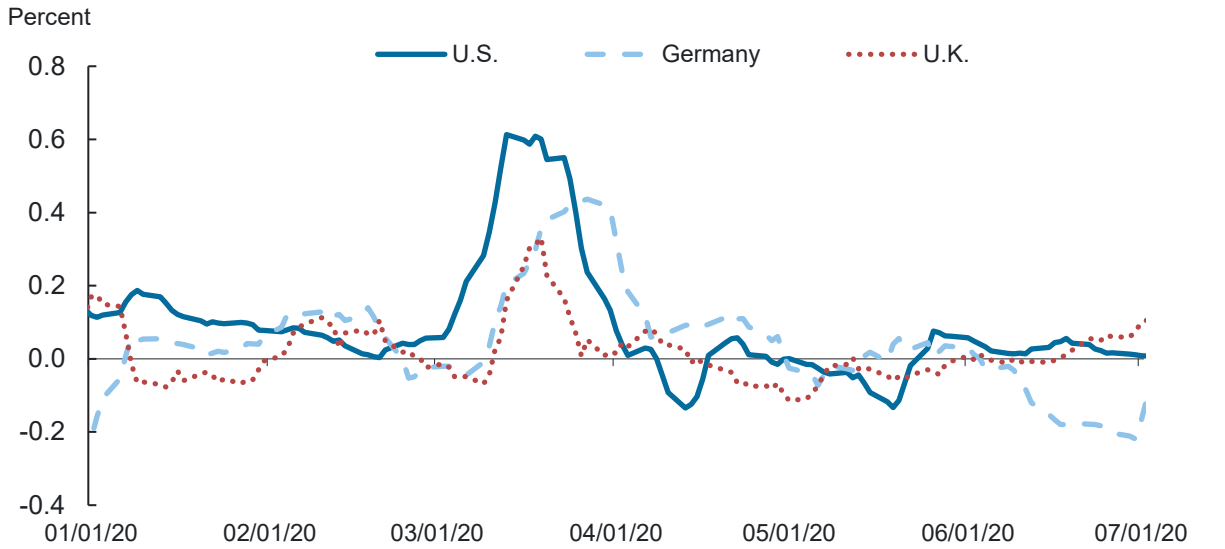
[14] The IAWG Treasury Report can be found at: https://home.treasury.gov/system/files/136/IAWG-Treasury-Report.pdf

Figure 11: Repo Volumes as a Percent of Total Outstanding



Note: This figure reports the ratio of repo volumes involving a sovereign bond over the total amount outstanding of that sovereign bond. U.S., Germany, and France are Treasury, Bund, and Obligations assimilables du Trésor (OAT) securities, respectively
Source: Bloomberg, RFR, Haver

Figure 12: Return on the Cash-Futures Basis across Sovereign Bond Markets



Note: This figure displays the return of the cash-futures basis across sovereign bond markets. For a given sovereign bond, this return is equal to the implied repo rate minus the 3 month yield. The implied repo rate is calculated by Bloomberg from a combination of the first and second futures contracts. As the first contract nears its maturity date and open interest begins to materially decline, the calculation sources the implied rate from the second contract as it rolls to become the active contract. For the U.S. and Germany, the 5 year Treasury and Bund security yields are used, and for the U.K. the 10 year Gilt security yield is used. A three-day moving average is shown.
Source: Bloomberg

Feedback from foreign market participants corroborated that leveraged funds' participation in the cash-futures basis trade was not as large in other sovereign bond markets in the run-up to the crisis. For instance, the Bank of England's August Financial Stability Report indicated significantly lower participation of hedge funds in gilt cash-futures trades – though declining hedge fund gilt repo volumes after March 2020 did point to some deleveraging. Likewise, Italian market participants noted that the Italian government bond cash-futures basis– which often spikes during shocks – faced limited pressure in March 2020.

Market participants acknowledged effects from unwinds of other levered trading strategies, though this deleveraging was not viewed as consequential as in the U.S. In Japan, while cash-futures basis positions were not accumulated in size prior to March, calendar spread trades – in which CTAs and hedge funds sell a Japanese sovereign bond future with a near-dated expiry and buy the same future with a longer-dated expiry -- were negatively impacted when the March-June calendar spread went deeply negative, according to market participants. In addition, some market participants familiar with the March 2020 episode in the Japanese sovereign bond market noted that an unwind of swap spread arbitrage trades contributed to strains in the Japanese sovereign bond market functioning.[15] The ECB's May Financial Stability Review also noted the impact of deleveraging of volatility-targeting strategies, including risk parity funds, on European sovereign bonds market functioning in March, a dynamic that also impacted U.S. Treasuries.

Sub-subsection B: Bank and Dealer Activity

Relative to other jurisdictions, the heavier run-up in Treasury supply likely contributed to stronger growth in dealers' Treasury inventories ahead of the COVID-19 shock. This growth subsequently left dealers with less room to accommodate clients' selling pressures during the dash-for-cash. Indeed, from 2017 to the eve of the crisis, dealer inventories of U.S. Treasuries tripled. Although positions rose by an additional $40 billion in the first two weeks of March, it is possible that already-elevated inventories helped limit further warehousing of securities.[16] As a contrast, U.S. primary dealer net positions rose by roughly $150 billion during the GFC.

Although data on other sovereign bond markets are more limited, available evidence points to stronger capacity or willingness among some foreign banking sectors to add to sovereign bond positions in March. Indeed, in the U.K., gilt dealer net purchases (as a share of outstanding securities) during the first

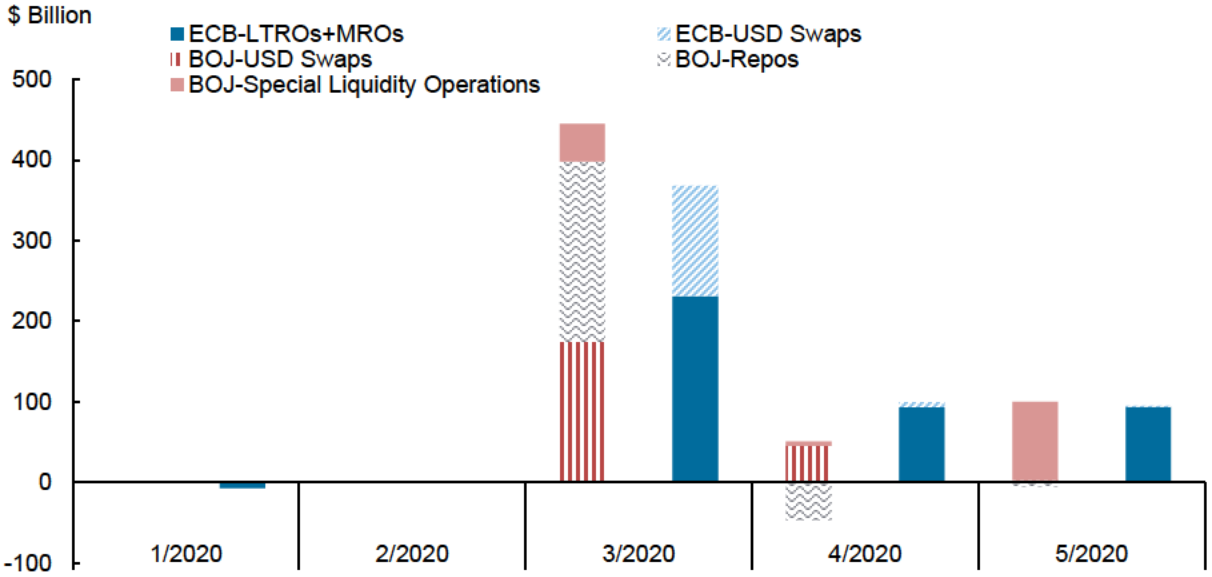
[15] Leveraged swap spread trades exploit differences in the pricing of cash bonds and interest rate swaps. When swap spreads are negative (cash bonds trading cheap to swaps), relative value funds may initiate a long spread position by paying fixed in swaps while assuming a repo-funded long cash bond position of comparable maturity.
[16] There were other, perhaps more important, factors that constrained dealer intermediation. Bank holding companies typically seek to optimize allocations across a number of constraints, including risk management, client needs and franchise value, and regulatory considerations such as capital or liquidity requirements. During the COVID-19 March 2020 event, bank dealers noted an interplay of internally imposed constraints, such as profitability and risk tolerance, as well as external factors, such as a lack of efficient hedging options and regulatory considerations, created frictions for dealers that reduced willingness to intermediate markets.

two weeks of the March shock were considerably larger than what we observed in the U.S (Hall 2021). Moreover, banks in some other jurisdictions – including Japan and Italy – played a significantly bigger role in absorbing investor sales.

Furthermore, the larger purchases by foreign banks in March may have also reflected the use of these sovereign bonds as collateral to obtain funding from central bank liquidity facilities. Japan market participants note that banks used Japanese government bonds as collateral to obtain U.S. dollar liquidity through the Bank of Japan's U.S. dollar swap line and other liquidity facilities (Figure 13).

Market participants in Germany hypothesized that increased demand for German government bond ("bunds") collateral during the March shock may have been partly a byproduct of the European Central Bank's (ECB) long-term refinancing operations (Figure 13). While the ECB accepts a broad range of collateral, the scale of the liquidity-providing operations may have caused some banks to exhaust their lower quality collateral, leading to greater use of bunds. They also noted that some clearinghouses began to request higher quality collateral – such as bunds and French sovereign bond securities ("OATs") – during the shock.[17]

Figure 13: Monthly Net Changes in Liquidity Provision by the European Central Bank and Bank of Japan



Note: This figure displays the net amount of liquidity provided on an end-of-month over end-of-month basis by the European Central Bank (ECB) and Bank of Japan (BOJ) from January to May 2020. ECB-LTROs+MROs is the ECB's Long Term Refinancing Operations and Main Refinancing Operations, ECB-USD Swaps is the US dollar swap line between the ECB and Federal Reserve, BOJ-USD Swaps is the US dollar swap line between the BOJ and Federal Reserve, BOJ-Repos are the BOJ's repo operations and BOJ-Special Liquidity Operations include the BOJ's Special Funds-Supplying Operations to Facilitate Financing in Response to the Novel Coronavirus, Fund-Provisioning Measure to Stimulate Bank Lending, and Fund-Provisioning Measure to Support Strengthening the Foundations for Economic Growth.
Source: Bloomberg, Bank of Japan

[17] Moench, Pelizzon, and Schneider (2021) also note that there was increase in demand for German and French sovereign bonds over the COVID-19 shock.

Subsection III. Differences in Market Microstructure

Lastly, we explore whether the disproportionate effects of the COVID-19 shock on Treasury markets relative to other sovereign bond markets might be due to key differences in bond market structures. On the margin, some market participants noted that market structure differences may have played a modest role, but in general, structural factors were not identified as major sources of differentiation in March 2020.

Sub-subsection A: Market-maker obligations

A potential difference across sovereign bond markets could be the obligations of market makers to quote a bid and ask spread, especially during times of stress. Market participants, however, reported that these quoting obligations likely were not a major mitigant in March 2020. Market-makers in all surveyed foreign jurisdictions except for Germany are subject to requirements – either by debt management offices or by electronic trading platforms – to support secondary market trading (Table 1). However, these obligations tend to have weak enforcement mechanisms, can change dynamically with trading conditions, and are typically averaged over monthly or longer windows, making them less stringent in periods of transitory stress.[18] Indeed, in at least one jurisdiction, participants noted that the benefits of being tapped to manage a syndication can provide a stronger incentive to perform on market-making criteria than penalties for non-compliance.

Sub-subsection B: Degree of central vs. bilateral clearing

Another difference across sovereign bond markets that could be related to the differences in market deterioration during the COVID-19 shock is the degree of central versus bilateral clearing.[19] Across all jurisdictions, for example, liquidity tended to be better in futures markets, which are centrally cleared, both during the March shock and more generally. According to the outreach however, superior futures liquidity was viewed as largely due to the much smaller number of traded instruments – especially in the euro area, where the cash market is highly segmented – as well as scarcity of cash securities in some jurisdictions.[20] Of note, Inoue (2020) provides evidence that price discovery takes place mainly in futures markets across U.K., French, German, Italian, and Japanese sovereign bond markets, while in the U.S. price discovery may be evenly split, with limited lags for price movements in cash and futures markets.

[18] Italian rate traders noted that in the pre-GFC period, MTS (the main trading platform for Italian government bonds) used to impose a quantitative limit on bid-ask spreads, but over the course of multiple crises, they had to soften the requirement and now only require a "best effort," while maintaining a ranking. The more stringent requirement is now from the Italian Treasury.

[19] Duffie (2020) reviews how the secondary market for Treasuries performed during the COVID 19 March 2020 shock and argues that mandatory central clearing will significantly improve market functioning during times of crisis.

[20] An exception was Italy, where BTP traders noted that the centrally cleared interdealer cash market was more liquid in normal times than the futures market, though these roles reversed in times of stress.

Table 1: Secondary Market Requirements for Market Makers

Country	Obligation from: Trading Platform	Obligation from: Official Sector	Obligation
Japan	No	Yes	Responsibility on the secondary market: The Special Participants shall provide sufficient liquidity to the JGB secondary market
United Kingdom	No	Yes	Gilt-edged Market Makers (GEMMs) are "expected to make effective two-way prices … in order to provide continuous liquidity, and to achieve a minimum market share of at least 2.0% on a six-month rolling average basis."
Germany	No	No	None
France	No	Yes	PDs must participant in auctions, place securities, and maintain a liquid secondary market. PDs ensure a consistent coverage of products issued by AFT by quoting firm bid and ask prices on a continuous basis. 2% share of the secondary market is considered a reasonable minimum.
Italy	Yes	Yes	PDs must fulfill the quoting obligations set by MTS: it requires quoting full coverage of BTPs having at least 45 days of residual maturity (each PD is assigned a subset of the outstanding securities). Italian Treasury conducts an overall assessment of PDs' performance on an annual basis, with an ongoing monitoring of individual performance (also on the repo market). Non-compliance can lead to PD losing its status, and by meeting the requirements, PDs can access reserved re-openings of bond auctions and be selected to manage syndications.
United States	No	Yes	A prospective PD must demonstrate a substantial presence as a market maker in cash and repo operations for at least one year prior to application – maintain at least 0.25% share. PDs have a "pro-rata" auction bidding requirement in the primary market.

Note: JGB is Japanese Government Bond, PD is primary dealer and denotes a securities dealer with market maker status, AFT is Agence France Trésor, MTS is the main trading platform for Italian government bonds, and BTP is Buoni del Tesoro Poliennali.
Source: Ministry of Finance Japan (MoF), UK Debt Management Office (DMO), Federal Reserve, Association for Financial Markets in Europe (AFME), Italian Ministry of the Economy and Finance.

The degree of central clearing in cash and repo markets varied widely across jurisdictions. In the cash markets, the share of centrally cleared transactions range from roughly over 80 percent in Japan to none in the UK (Table 2). In repo markets, the range was a touch narrower, with market participants in most jurisdictions estimating a share of centrally cleared repo transactions of somewhere between 25 to 75 percent. Of note, central clearing, where it exists across regions, is mandated by the exchange or brokerage platform, not by monetary or regulatory authorities. Nevertheless, market participants didn't highlight divergent market functioning impacts as stemming from these differences.

Sub-subsection C: Electronic vs voice trading

Market participants noted varying degrees of electronic trading across jurisdictions – in particular, more electronically executed trades in Germany, France, and Italy than in the U.K. and Japan (Table 2). However, these differences were not cited as driving any meaningful differences in liquidity conditions in March despite the shift towards a working from home environment.

Table 2: Commentary on Features of Secondary Market Trading Across Sovereign Bond Markets

	Central vs Bilateral Clearing	Electronic vs Voice
Germany	Almost all cash bunds cleared bilaterally. Roughly 75% of repo is cleared bilaterally.	Platforms are more dominant than voice. Typically see more voice trading in stress, but no change was observed in March 2020, possibly due to the transition to work-from-home.
Japan	Vast majority (roughly over 80 percent) of cash JGB activity is via CCP (JSCC).[21]	Share of electronic trading is low, maybe over 10%, but has been increasing over time. Electronic trading is fragmented and used mainly by asset management firms and trust banks.
UK	No cash gilts are cleared centrally. Repo is mixed, with roughly 40% traded on CCPs.	Dealers intermediate about 90% of the cash market using both voice and electronic platforms. Less than 10% is electronic matching systems (as of 2016)
Italy	Almost all interdealer cash BTPs are centrally cleared (roughly 60% of total primary dealer activity). Majority of repos negotiated on the MTS market are centrally cleared.	Trading is mostly done on electronic platforms (roughly split 70-30 on platforms vs OTC in 2020); OTC transactions are more common in the dealer-to-customer segment.
US	Roughly 10 percent of Treasury cash transactions are centrally cleared; 70 percent are bilaterally cleared; and 20 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 (TMPG). Non-centrally cleared bilateral repo represents a significant portion of the Treasury market, roughly equal in size to centrally cleared repo trades.	Roughly 50 percent of cash trading volume occurs on high speed electronic IDB venues, while dealer-to-customer trading accounts for the other half of activity and takes place across a mix of venues including voice, electronic streaming, and request- for-quote (RFQ) protocols. Similarly, repo trading occurs across a similar mix of voice request for quote and IDB platforms.

Note: JGB is Japanese Government Bonds, BTP is Buoni del Tesoro Poliennali, CCP is central counterparty, JSCC is the Japan Securities Clearing Corporation, OTC is over-the-counter, TMPG is Treasury Market Practices Group, and IDB is interdealer broker.
Source: FRBNY Staff Outreach

[21] This percentage shows the share of the JSCC in delivery versus payments (DVP) settlements of JGBs – calculated by dividing the total value of JGB DVP settlement in which the JSCC delivers or receives JGBs by the total value of JGB DVP settlement via the BOJ-NET, the Bank of Japan Financial Network System.

Discussion & Conclusion

The COVID-19 related shocks in early March 2020 induced a global dash-for-cash by investors. Although investors sold a wide variety of assets, among sovereign bonds markets there was disproportionate deterioration in market functioning for U.S. Treasuries. Based on a review of the empirical evidence as well as discussions with market participants, the authors find that the greater decline in Treasury market functioning relative to other sovereign bonds was mainly driven by more pronounced and broad-based selling pressures, reflecting in part the U.S. dollar's dominant currency status. Furthermore, we argue that a greater amount of Treasury issuance leading up to the COVID-19 March disruptions as well as a heavier build-up of leverage in this market were major factors in explaining the larger sell-off pressures in Treasuries versus other sovereign bonds. Less important for the impact of the "dash for cash" were differences in the market microstructure of various sovereign bond markets at that time.

Questions remain about how well the Treasury market will absorb future selling pressures from a broad base of investors. A significant change in the Treasury market since March 2020 is the introduction of the Standing Repo and FIMA Repo Facilities by the Federal Reserve.[22] These liquidity facilities allow eligible counterparties to exchange Treasuries for cash at an administered rate. As a stable source of funding, this facility could reduce uncertainty over the costs of holding inventories for dealers and so may help smooth market functioning during future adverse events.

Furthermore, the Treasury market may undergo significant changes. The IAWG report (Nov 8, 2021) lays out specific policy areas where action could be taken to strengthen the resilience of the Treasury market. Building on this report as well as past efforts, in a recent speech, Chair Gensler of the U.S. Securities and Exchange Commission (SEC) stated his staff was looking into making recommendations to enhance Treasury market functioning, integrity, and resiliency. This includes evaluating whether principal trading firms that engage in purchasing and selling Treasuries should be registered as dealers with the SEC, considering whether oversight of trading platforms should be enhanced, whether the quality of data reporting can be improved, and examining whether central clearing should be expanded (Gensler 2021b).

Further, there are calls for money market fund reforms with the goal of mitigating systemic risk to the U.S. money markets (for example, see McCabe, Cipriani, Holscher, and Martin (2013), McCabe, Cirpriani, and Martin (2022) and Jin et al (forthcoming)). Indeed, the SEC recently proposed amendments to the rules that govern money market funds with the goal of reducing the likelihood of runs on these funds during times of stress (see SEC press release on December 15, 2021 as well as Gensler (2021c)). Finally, SEC staff have noted the recent significant growth in open-ended bond funds and their role in the Treasury market, and as such are exploring whether the resiliency of these funds during times of stress can be enhanced (Gensler (2021a)).

[22] Ennis and Hunter (2021) provide a brief description of the Federal Reserve's Standing Repo Facility and how this facility complements existing tools used by the Federal Reserve. Logan (2021) describes how both facilities fit into and enhance the ability of the Federal Reserve to implement monetary policy, particularly during times of stress.

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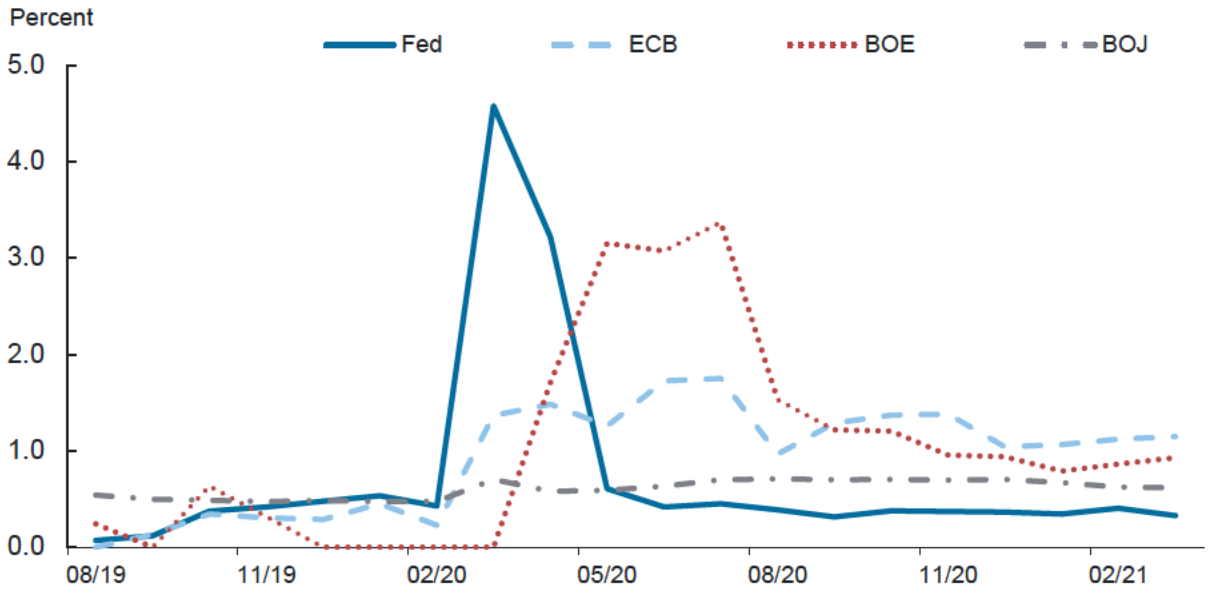
Appendix

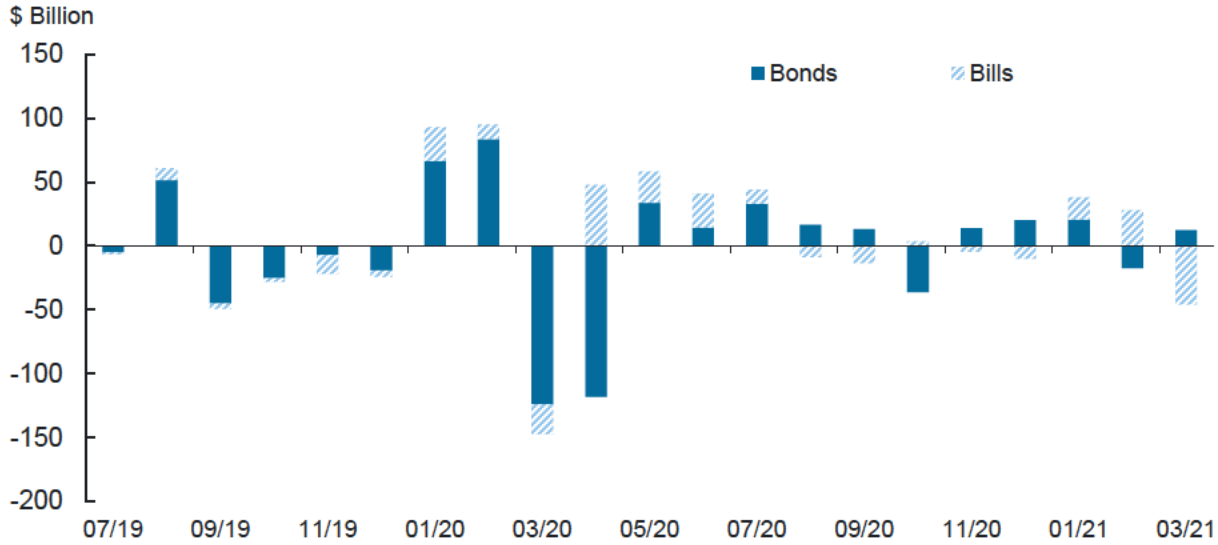
Additional charts

Figure A1: Central Bank Gross Monthly Purchases as Percent of Outstanding



Note: This figure shows the central bank purchases of domestic sovereign bonds as a percent of the total amount outstanding, where the end of 2019 outstanding figures are used. Fed is Federal Reserve, ECB is European Central Bank, BOE is Bank of England, and BOJ is Bank of Japan. ECB purchases includes the Public Sector Purchase Programme (PSPP) and public sector purchases under the Pandemic Emergency Purchase Programme (PEPP).
Source: Bloomberg, ECB, BOJ, Federal Reserve, BOE

Figure A2: Monthly Changes in US Treasury Holdings of Foreign Official Institutions



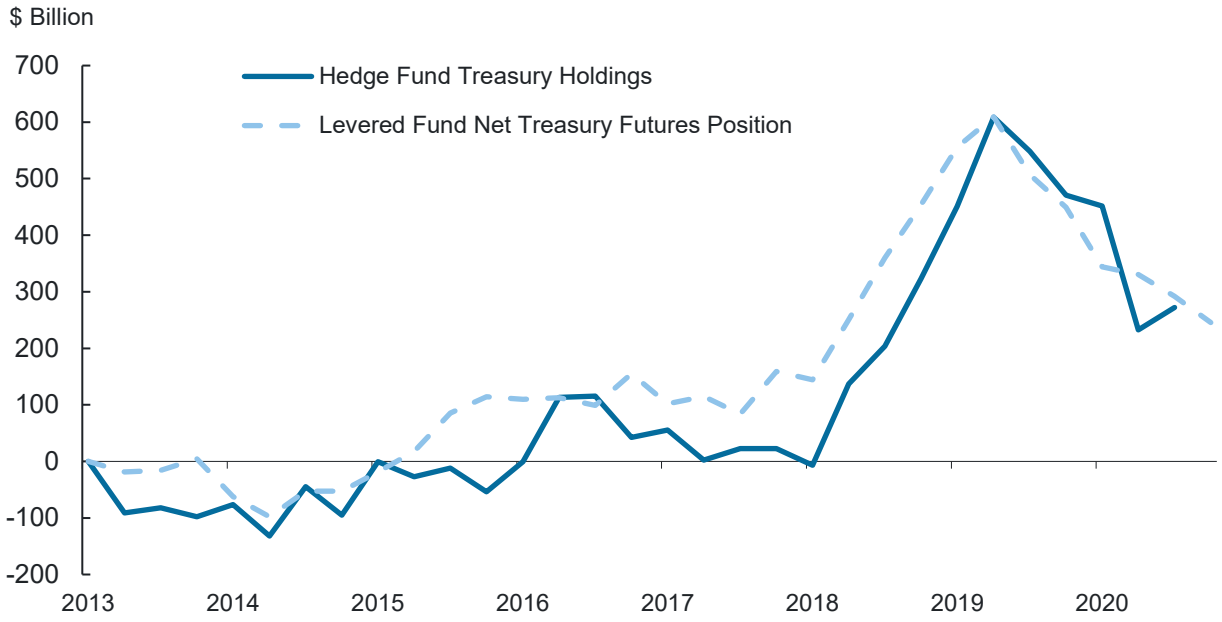
Note: This figure shows the monthly changes in Treasury bond and bill holdings of Foreign Organizations..
Source: TIC, Haver

Evidence of leverage activity in the Treasury market

In this section, we look for direct evidence of the role of leveraged investors in the U.S. Treasury market by looking for evidence of hedge funds executing long cash-futures basis trades. This trading strategy typically entails a leveraged account shorting (or selling) a government bond future, buying the corresponding "cheapest-to-deliver" (CTD) cash security, and then delivering the cash security into the future at expiry.[23]

We observe that hedge funds executed this trading strategy more leading up to the COVID-19 shock, as evidenced by their increased holdings of cash Treasuries as well as larger net-short positions in Treasury futures (see Figure A3). Both cash Treasury holdings and net-short Treasury futures positions then declined, consistent with hedge funds de-levering and exiting the long cash-futures basis trade. This trading strategy appeared to comprise the bulk of the rise and fall of Treasury leverage, evidenced by the similar size and timing of changes in both hedge funds' cash Treasury holdings and in their short-Treasury futures positions (Figure A3).

Figure A3: Evidence of Hedge Funds Engaging in the Treasury Cash-Futures Basis



Note: This figure provides evidence of hedge funds engaging in the cash-futures basis strategy leading up to the March 2020 COVID-19 event. To implement the cash-futures basis trade, a levered fund both increases its Treasury holdings and futures position, both of which are displayed.
Source: CFTC, Enhanced Financial Accounts, Bloomberg

[23] "The cheapest-to-deliver" cash security is the cash bond with the lowest residual maturity that is eligible to be delivered at the expiry of a futures contract at a given tenor. For example, for a 10-year futures contract, the securities that usually have the lowest value and are still eligible for delivery at the expiry of the contract will be off-the run securities with approximately 7 years of residual maturity.