



August 2021

FEDERAL DEBT MANAGEMENT

Treasury Quickly Financed Historic Government Response to the Pandemic and Is Assessing Risks to Market Functioning

Accessible Version



A Century of Non-Partisan Fact-Based Work

GAO Highlights

Highlights of [GAO-21-606](#), a report to congressional committees

Why GAO Did This Study

The federal government's fiscal response to the COVID-19 pandemic dramatically increased the government's borrowing needs. Treasury borrows money needed by issuing Treasury securities. The ability to borrow large amounts of money quickly and cheaply is especially important during a crisis, when government spending tends to increase and revenues tend to decrease. Any disruptions in investor demand for Treasury securities or the functioning of the Treasury market can have costly implications for the federal government and taxpayers.

The CARES Act includes a provision for GAO to report on its monitoring and oversight efforts related to the COVID-19 pandemic. This report examines (1) how the cost and liquidity of Treasury securities changed during COVID-19; (2) actions Treasury is taking to mitigate future disruptions; and (3) the actions Treasury took to finance the federal government's response to the pandemic.

GAO analyzed data on Treasury securities; reviewed agency and market research; and interviewed market participants across key financial sectors (e.g., broker-dealers, banks, mutual and money market funds), market experts, and Treasury and Federal Reserve officials.

What GAO Recommends

GAO recommends that Treasury clarify the department's policy for managing its operating cash balance to include all relevant factors it considers when determining the appropriate cash balance and communicate this policy to the public. Treasury agreed with the recommendation.

View [GAO-21-606](#). For more information, contact Yvonne Jones at (202) 512-6806 or jonesy@gao.gov.

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What GAO Found

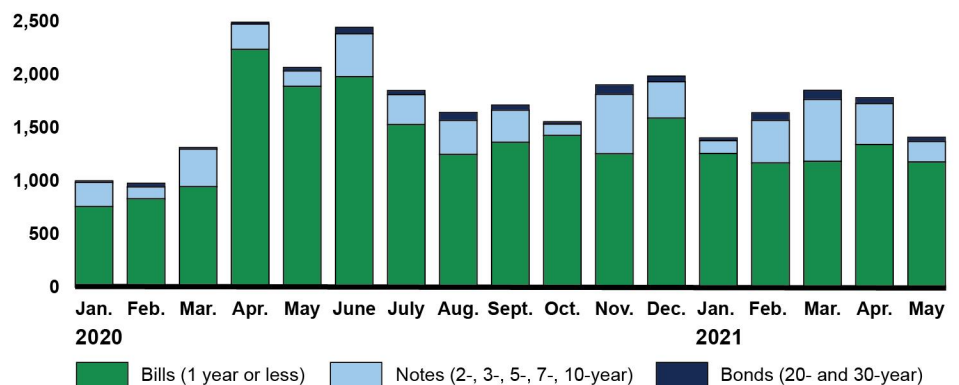
In response to COVID-19, in March 2020 many investors rapidly sold their Treasury securities for cash. This led to a severe liquidity disruption when prices fell and transaction costs rose for Treasury notes and bonds in the secondary market. The Federal Reserve acted quickly to support market functioning, including purchasing trillions of dollars of Treasury securities.

This market disruption highlighted risks to the Treasury market. For example, growth in federal debt and regulatory changes may reduce broker-dealers' willingness and ability to intermediate trades (facilitate purchases and sales) of Treasury securities for investors. In April 2021 Treasury initiated an interagency effort to examine options that could help mitigate future disruptions in the market.

Following the market disruption, Treasury quickly raised trillions of dollars to fund the federal response to COVID-19. It dramatically increased its issuance of bills—including adding regular, weekly auctions of cash management bills, which have historically been issued irregularly to cover near-term financing gaps. The bills were met with strong investor demand. For example, GAO found almost no difference between cash management bill and other bill yields during this time.

Monthly Gross Issuance of U.S. Treasury Bills, Notes, and Bonds

Dollars (in billions)
\$3,000



Source: GAO analysis of Department of the Treasury Daily Treasury Statement. | GAO-21-606

Data table for Monthly Gross Issuance of U.S. Treasury Bills, Notes, and Bonds

Month/Year	Bills (1 year or less) Dollars in billions	Notes (2-, 3-, 5-, 7-, 10-year) Dollars in billions	Bonds (20- and 30-year) Dollars in billions
Jan. 2020	758.61	226.2	16.5
Feb.	830.96	111.9	35.5
Mar.	945.99	351.9	16
Apr.	2236.5	238	17.1
May	1888.3	145.1	33.6

Month/Year	Bills (1 year or less) Dollars in billions	Notes (2-, 3-, 5-, 7-, 10-year) Dollars in billions	Bonds (20- and 30-year) Dollars in billions
June	1979.49	403.7	60.7
July	1530.4	280.9	39.6
Aug.	1248.35	320	76.2
Sept.	1363.76	300.4	49
Oct.	1427.35	106.4	23.6
Nov.	1254.48	559.1	89.5
Dec.	1591.09	342.1	52.7
Jan. 2021	1258.08	120.7	26.4
Feb.	1168.31	400.4	73
Mar.	1184.16	581.8	86.6
Apr.	1342.7	383.5	56.3
May	1178.2	190.5	41.3

Note: Notes and bonds includes Treasury Floating Rate Notes and Inflation Protected Securities.

Source: GAO analysis of Department of the Treasury Daily Treasury Statement. | GAO-21-606

Due to the uncertainty created by COVID-19, Treasury maintained a historically high operating cash balance of around \$1.6 trillion. Its stated policy is to hold a level of cash generally sufficient to cover one week of outflows. However, other factors not explicitly reflected in its policy informed how it managed the cash balance during COVID-19. Market participants told GAO that they were unclear about all of these factors. They said that understanding the level and trajectory of the cash balance is important because it affects market expectations for the size of Treasury issuance, supply of bank reserves, and short-term lending rates—all of which inform their business strategies and support market functioning. Additionally, uncertainty about the size of the cash balance can lead to volatility in financial markets. This, in turn, can affect Treasury's borrowing costs.

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Abbreviations

CMB	cash management bill
COVID-19	Coronavirus Disease 2019
Federal Reserve	the Federal Reserve System
FINRA	Financial Industry Regulatory Authority
GDP	gross domestic product
OIS	Overnight Indexed Swap
PTF	principal trading firms
Repo	repurchase agreement
SLR	Supplementary Leverage Ratio
TGA	Treasury General Account
TIPS	Treasury Inflation-Protected Securities
TRACE	Trade Reporting and Compliance Engine
WAM	weighted average maturity

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August 17, 2021

Congressional Committees

The Coronavirus Disease 2019 (COVID-19) pandemic substantially damaged the global economy and affected the stability of credit markets. In response to the unprecedented global crisis caused by COVID-19, Congress passed and the President signed legislation to fund recovery efforts.¹ Together, this legislation appropriated about \$4.5 trillion across the government to fund COVID-19 response and recovery efforts.

This fiscal response to the pandemic dramatically increased the size of the government's borrowing needs. From April through December 2020, the Department of the Treasury raised a historic \$3.8 trillion. In contrast, during the global financial crisis, Treasury borrowed \$3.1 trillion over a 2-year period.²

In times of crisis, such as the COVID-19 pandemic, the importance of a strong U.S. Treasury market is essential to fund federal response and recovery efforts. Treasury securities play a vital role in U.S. and global financial markets because of their deep and liquid market and because investors are confident that debt backed by the full faith and credit of the U.S. government will be honored. These features help Treasury issue debt at low cost to finance government operations. The ability to borrow large amounts of money quickly and cheaply is especially important during a crisis, when government spending tends to increase and revenues decrease. Any disruption in demand or market functioning can have costly implications for the government, taxpayers, and the economy.

¹See, Coronavirus Preparedness and Response Supplemental Appropriations Act, 2020, Pub. L. No. 116-123, 134 Stat. 146 (2020); Families First Coronavirus Response Act, Pub. L. No. 116-127, 134 Stat. 178 (2020); Coronavirus Aid, Relief, and Economic Security Act, Pub. L. No. 116-136, 134 Stat. 281 (2020); Paycheck Protection Program and Health Care Enhancement Act, Pub. L. No. 116-139, 134 Stat. 620 (2020); Consolidated Appropriations Act, 2021, Pub. L. No. 116-260, 134 Stat. 1182 (2020); American Rescue Plan Act of 2021, 117-2, 135 Stat. 4 (2021).

²This represents net borrowing between December 2007 and December 2009. See GAO, *Debt Management: Treasury Was Able to Fund Economic Stabilization and Recovery Expenditures in a Short Period of Time, but Debt Management Challenges Remain*, [GAO-10-498](#) (Washington, D.C.: May 18, 2010).

The CARES Act includes a provision for us to report on our monitoring and oversight efforts of the federal government’s response to the COVID-19 pandemic.³ This report examines: (1) how the cost and liquidity of Treasury securities changed during the pandemic; (2) actions Treasury is taking to mitigate future disruptions in the Treasury market; and (3) actions Treasury has taken to finance the federal government’s response to the COVID-19 pandemic.

To examine how the cost and liquidity of Treasury securities changed during the pandemic, we analyzed market data from Bloomberg, the Federal Reserve System (Federal Reserve), and Treasury, as well as data from the Financial Industry Regulatory Authority’s (FINRA) Trade Reporting and Compliance Engine (TRACE) provided by Treasury. We also reviewed analyses, reports, and other documentation on the March 2020 Treasury market disruption by market participants, academics, and Treasury and the Federal Reserve.

To describe actions Treasury is taking to mitigate future market disruptions, we first identified structural challenges to Treasury market functioning by reviewing assessments from Treasury and the Federal Reserve, the International Monetary Fund, academics, and market participants. We conducted further analysis of these challenges using market data from Bloomberg, the Federal Reserve, and Treasury. As part of this, we conducted a multivariate regression analysis to examine how certain structural factors, such as regulatory constraints, were associated with the interest rate that Treasury paid on Treasury securities relative to similar risk-free assets (see appendix I for more details). We interviewed Treasury officials to discuss these and other structural challenges and any actions that they were taking to address them.

To evaluate Treasury’s actions to finance the federal response to COVID-19, we analyzed Treasury’s debt issuance and cash management activity from January 2020 through May 2021. We also analyzed auction metrics and the scale, timing, term to maturity, and composition of Treasury borrowing during this time. To measure any premium associated with

³Pub. L. No. 116-136, § 19010, 134 Stat. at 579–581. We regularly issue government-wide reports on the federal response to COVID-19. For the latest report, see GAO, *COVID-19: Continued Attention Needed to Enhance Federal Preparedness, Response, Service Delivery, and Program Integrity*, [GAO-21-551](#) (Washington, D.C.: July 19, 2021). Our next government-wide report will be issued in October 2021 and will be available on GAO’s website at <https://www.gao.gov/coronavirus>.

Treasury's issuance of cash management bills (CMB) during COVID-19, we compared CMB yields to yields on benchmark bills with similar maturities (see appendix II for more details). We assessed Treasury's approach against International Monetary Fund and World Bank guidance for public debt management.⁴

For all of our objectives, we interviewed 18 market participants, including officials from 10 primary dealers and banks, six money market and mutual funds, and two hedge funds. We selected market participants to ensure a diversity of viewpoints, taking into consideration market sector, share of the Treasury market, and recommendations by market experts. We also interviewed 10 subject matter experts in Treasury markets and monetary policy from academia, think tanks, and private research and advisory firms. The views expressed in these interviews are not generalizable to all market participants. We also interviewed officials from Treasury's Office of Debt Management and the Federal Reserve Board of Governors. We reviewed reports, quarterly refunding materials, and other agency documents.⁵

To assess the reliability of data used in this study, we reviewed related documentation and traced data from source documents, where possible and appropriate. We also corroborated the results of our data analyses with interviews and other sources, when possible. We used data sets that are commonly used by Treasury, researchers, and other market analysts to examine Treasury markets and auction performance. On the basis of our assessment, we determined the data are sufficiently reliable for the purpose of this review.

We conducted this performance audit from July 2020 to August 2021 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

⁴The World Bank and International Monetary Fund, *Revised Guidelines for Public Debt Management* (Apr. 2014).

⁵Each quarter, Treasury releases a variety of documents and data relating to Treasury borrowing and debt management policy. See <https://home.treasury.gov/policy-issues/financing-the-government/quarterly-refunding>.

Background

Treasury borrows money to finance the federal deficit—which includes paying interest on outstanding debt—and to refinance maturing debt. It borrows from the public by issuing Treasury securities—specifically Treasury bills, notes, and bonds (see sidebar).⁶

Treasury’s primary debt management goal is to finance the government’s borrowing needs at the lowest cost over time (see sidebar). Treasury reports that it achieves this goal by

- issuing marketable debt within a regular and predictable framework—meaning Treasury debt managers provide the market clear and transparent information about planned issuance, and set a standard calendar of auctions for each security type;⁷
- managing its debt portfolio to mitigate rollover risk—the risk that it may have to refinance maturing debt at higher interest rates;
- fostering an efficient and liquid secondary market—the marketplace in which Treasury securities are traded; and
- promoting a broad and diverse investor base.

To this end, Treasury issues securities in a wide range of maturities to appeal to a broad range of investors, and in sufficient amounts to promote liquid markets so investors can easily buy and sell Treasury securities. Treasury’s regular and predictable auction framework also provides investors greater certainty and better information to plan their investments. The Treasury securities market is considered the most liquid, deepest, and safest fixed-income market in the world (see fig. 1).

Nominal Treasury Securities

Bills are short-term securities maturing in 1 year or less. Treasury regularly issues bills in 4-, 8-, 13-, 26-, and 52-week maturities.

Notes are interest-bearing securities that have a fixed maturity of not less than 1 year and not more than 10 years from their date of issue. Treasury currently issues notes in 2-, 3-, 5-, 7-, and 10-year maturities.

Bonds are interest-bearing securities with maturities over 10 years. Treasury currently issues 20- and 30-year bonds.

Source: GAO. | GAO 21-606

Treasury’s Borrowing Cost

The government’s cost of borrowing is determined by the interest rate—or the yield demanded by investors—that Treasury pays on the range of marketable securities that it issues. The interest cost associated with any issuance strategy depends on a variety of factors, including investor demand, the federal government’s fiscal policy, and monetary policy.

Source: GAO. | G AO 21-606

⁶Treasury also issues Treasury inflation-protected securities (TIPS) with 5-, 10-, and 30-year maturities and 2-year floating rate notes. An inflation-indexed security repays the principal adjusted for inflation at maturity. Treasury’s 2-year floating rate note pays interest quarterly at a rate that varies with changes in the indexed rate—the discount rate on the 13-week Treasury bill. Treasury reporting, such as the Daily Treasury Statement, combines the 5- and 10-year TIPS and the 2-year floating rate note with nominal notes and the 30-year TIPS with nominal bonds.

⁷Marketable securities constitute most debt held by the public and can be resold by whoever owns them. Treasury also issues a smaller amount of nonmarketable securities, such as savings securities and State and Local Government Series securities.

Figure 1: Liquidity, Depth, and Safety Are Key Characteristics of the Treasury Market



Source: GAO. | GAO-21-606

Text of Figure 1: Liquidity, Depth, and Safety Are Key Characteristics of the Treasury Market

- **Liquidity:** The ability to easily buy and sell securities without meaningfully affecting the price
- **Depth:** The ability to buy and sell large amounts
- **Safety:** The ability to rely on payments made on time and in full

Source: GAO. | GAO-21-606

Treasury securities are held by a wide range of private and public investors to support a variety of business practices and needs. For example, Treasury securities serve as a close substitute to cash for financial institutions and corporate treasurers. They are one of the most widely used forms of collateral for financial transactions. Treasury securities are used as a benchmark for pricing many other financial products, such as corporate bonds, derivatives, and mortgages. The Federal Reserve, the U.S. central bank, also buys and sells Treasury securities as one of its tools to influence interest rates and achieve its monetary policy goals.⁸

⁸The Federal Reserve System consists of the Board of Governors of the Federal Reserve System, 12 regional Reserve Banks, and the Federal Open Market Committee. The Federal Open Market Committee directs open market operations—the purchase and sale of securities in the secondary market by a central bank—to influence the total amount of money and credit available in the economy. The Federal Reserve remits any profits it earns, including any profits associated with interest received on Treasury securities, back to Treasury.

Investors' Initial Reactions to COVID-19 Led to Disruptions in the Treasury Market, Prompting Action by the Federal Reserve

Investors Rapidly Sold Treasury Securities to Raise Cash, Which Increased Volatility and Reduced Liquidity for Treasury Notes and Bonds

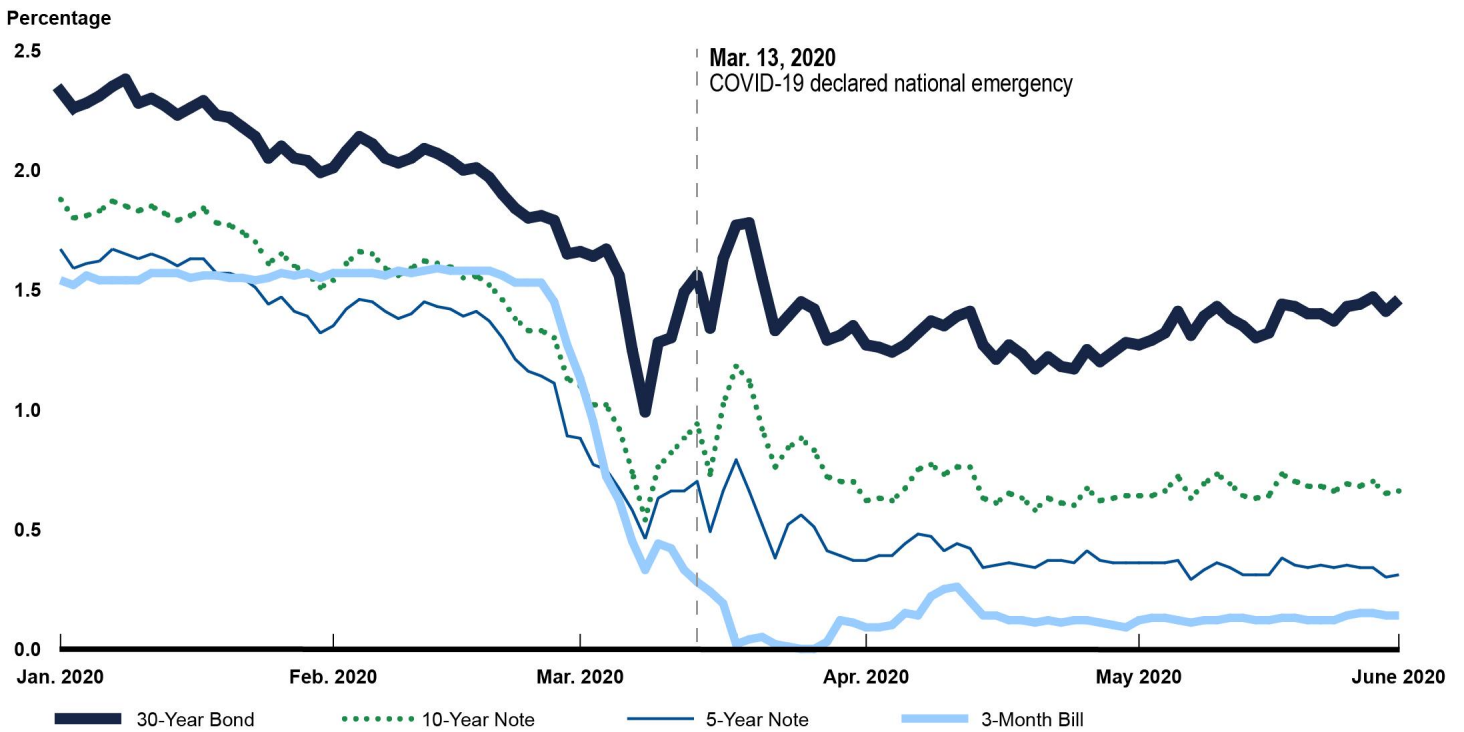
In March 2020, as fears about the economic effects of COVID-19 intensified across financial markets, many investors sold their longer-term Treasury securities to raise cash to manage the extraordinary uncertainty associated with the pandemic. This significant and widespread selling put pressure on Treasury market intermediaries and led to a severe deterioration in liquidity conditions over a short period.

Many investors value Treasury securities because they can be quickly and easily converted into cash in a variety of market conditions. However, this large and widespread rush by investors to sell their Treasury securities was unusual. Demand for Treasury securities normally increases during times of crisis as many investors move toward safer and more liquid financial assets—often referred to as a flight to quality. This was the case in early March as indicated by declining yields on Treasury securities (see fig. 2).⁹ Yields move lower as increasing demand drives up prices.

By mid-March 2020, however, some market participants' preferred to obtain cash rather than continue to hold certain longer-term Treasury securities. Investors began selling Treasury notes and bonds to raise cash, causing yields to temporarily spike for these securities. At the same time, many investors bought unprecedented amounts of Treasury bills, as discussed later in this report, contributing to declines in bill yields (see fig. 2).

⁹The Federal Open Market Committee also decided on March 3, 2020, to lower the target range for the federal funds rate, which generally also lowers yields on Treasury securities as investors adjust their expectations for lower interest rates.

Figure 2: Yields for Selected Treasury Securities, Jan. to June 2020



Source: GAO analysis of Department of the Treasury data. | GAO-21-606

Data table for Figure 2: Yields for Selected Treasury Securities, Jan. to June 2020

Date	3-Month Bill	2-Year Note	5-Year Note	10-Year Note	30-Year Bond
1/2/2020	1.54	1.58	1.67	1.88	2.33
1/3/2020	1.52	1.53	1.59	1.8	2.26
1/6/2020	1.56	1.54	1.61	1.81	2.28
1/7/2020	1.54	1.54	1.62	1.83	2.31
1/8/2020	1.54	1.58	1.67	1.87	2.35
1/9/2020	1.54	1.58	1.65	1.85	2.38
1/10/2020	1.54	1.56	1.63	1.83	2.28
1/13/2020	1.57	1.58	1.65	1.85	2.3
1/14/2020	1.57	1.58	1.63	1.82	2.27
1/15/2020	1.57	1.56	1.6	1.79	2.23
1/16/2020	1.55	1.58	1.63	1.81	2.26
1/17/2020	1.56	1.58	1.63	1.84	2.29
1/21/2020	1.56	1.53	1.57	1.78	2.23
1/22/2020	1.55	1.53	1.57	1.77	2.22

Letter

Date	3-Month Bill	2-Year Note	5-Year Note	10-Year Note	30-Year Bond
1/23/2020	1.55	1.51	1.55	1.74	2.18
1/24/2020	1.54	1.49	1.51	1.7	2.14
1/27/2020	1.55	1.44	1.44	1.61	2.05
1/28/2020	1.57	1.45	1.47	1.65	2.1
1/29/2020	1.56	1.42	1.41	1.6	2.05
1/30/2020	1.57	1.41	1.39	1.57	2.04
1/31/2020	1.55	1.33	1.32	1.51	1.99
2/3/2020	1.57	1.36	1.35	1.54	2.01
2/4/2020	1.57	1.41	1.42	1.61	2.08
2/5/2020	1.57	1.44	1.46	1.66	2.14
2/6/2020	1.57	1.44	1.45	1.65	2.11
2/7/2020	1.56	1.41	1.41	1.59	2.05
2/10/2020	1.58	1.37	1.38	1.56	2.03
2/11/2020	1.57	1.41	1.4	1.59	2.05
2/12/2020	1.58	1.44	1.45	1.62	2.09
2/13/2020	1.59	1.44	1.43	1.61	2.07
2/14/2020	1.58	1.42	1.42	1.59	2.04
2/18/2020	1.58	1.41	1.39	1.55	2
2/19/2020	1.58	1.42	1.41	1.56	2.01
2/20/2020	1.58	1.39	1.37	1.52	1.97
2/21/2020	1.56	1.34	1.3	1.46	1.9
2/24/2020	1.53	1.26	1.21	1.38	1.84
2/25/2020	1.53	1.2	1.16	1.33	1.8
2/26/2020	1.53	1.16	1.14	1.33	1.81
2/27/2020	1.45	1.11	1.11	1.3	1.79
2/28/2020	1.27	0.86	0.89	1.13	1.65
3/2/2020	1.13	0.84	0.88	1.1	1.66
3/3/2020	0.95	0.71	0.77	1.02	1.64
3/4/2020	0.72	0.67	0.75	1.02	1.67
3/5/2020	0.62	0.59	0.67	0.92	1.56
3/6/2020	0.45	0.49	0.58	0.74	1.25
3/9/2020	0.33	0.38	0.46	0.54	0.99
3/10/2020	0.44	0.5	0.63	0.76	1.28
3/11/2020	0.42	0.5	0.66	0.82	1.3
3/12/2020	0.33	0.5	0.66	0.88	1.49
3/13/2020	0.28	0.49	0.7	0.94	1.56
3/16/2020	0.24	0.36	0.49	0.73	1.34

Letter

Date	3-Month Bill	2-Year Note	5-Year Note	10-Year Note	30-Year Bond
3/17/2020	0.19	0.47	0.66	1.02	1.63
3/18/2020	0.02	0.54	0.79	1.18	1.77
3/19/2020	0.04	0.44	0.66	1.12	1.78
3/20/2020	0.05	0.37	0.52	0.92	1.55
3/23/2020	0.02	0.28	0.38	0.76	1.33
3/24/2020	0.01	0.38	0.52	0.84	1.39
3/25/2020	0	0.34	0.56	0.88	1.45
3/26/2020	0	0.3	0.51	0.83	1.42
3/27/2020	0.03	0.25	0.41	0.72	1.29
3/30/2020	0.12	0.23	0.39	0.7	1.31
3/31/2020	0.11	0.23	0.37	0.7	1.35
4/1/2020	0.09	0.23	0.37	0.62	1.27
4/2/2020	0.09	0.23	0.39	0.63	1.26
4/3/2020	0.1	0.23	0.39	0.62	1.24
4/6/2020	0.15	0.27	0.44	0.67	1.27
4/7/2020	0.14	0.28	0.48	0.75	1.32
4/8/2020	0.22	0.27	0.47	0.77	1.37
4/9/2020	0.25	0.23	0.41	0.73	1.35
4/13/2020	0.26	0.25	0.44	0.76	1.39
4/14/2020	0.2	0.23	0.42	0.76	1.41
4/15/2020	0.14	0.2	0.34	0.63	1.27
4/16/2020	0.14	0.2	0.35	0.61	1.21
4/17/2020	0.12	0.2	0.36	0.65	1.27
4/20/2020	0.12	0.2	0.35	0.63	1.23
4/21/2020	0.11	0.2	0.34	0.58	1.17
4/22/2020	0.12	0.22	0.37	0.63	1.22
4/23/2020	0.11	0.22	0.37	0.61	1.18
4/24/2020	0.12	0.22	0.36	0.6	1.17
4/27/2020	0.12	0.24	0.41	0.67	1.25
4/28/2020	0.11	0.2	0.37	0.62	1.2
4/29/2020	0.1	0.2	0.36	0.63	1.24
4/30/2020	0.09	0.2	0.36	0.64	1.28
5/1/2020	0.12	0.2	0.36	0.64	1.27
5/4/2020	0.13	0.19	0.36	0.64	1.29
5/5/2020	0.13	0.19	0.36	0.66	1.32
5/6/2020	0.12	0.17	0.37	0.72	1.41
5/7/2020	0.11	0.13	0.29	0.63	1.31

Letter

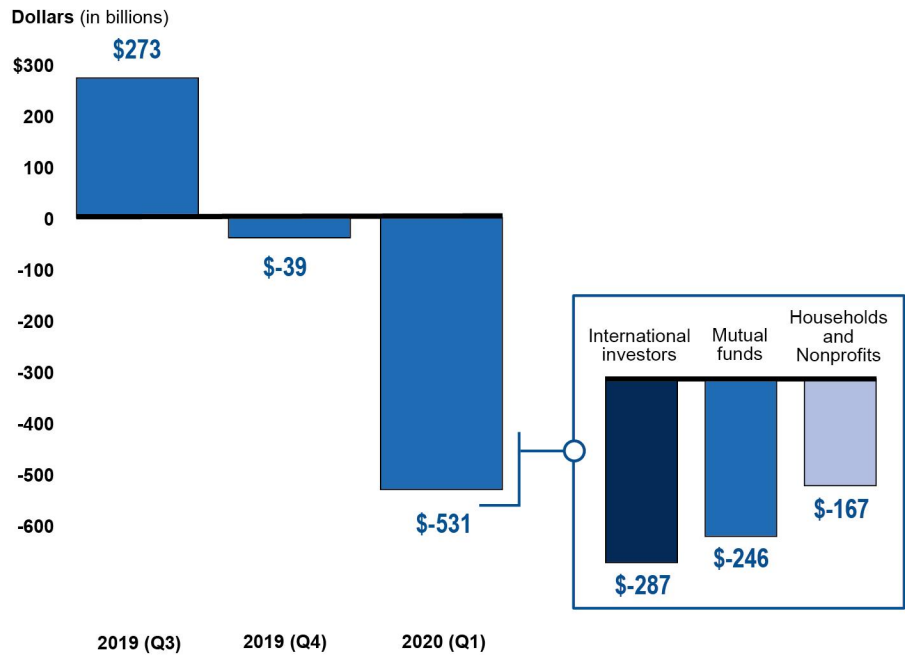
Date	3-Month Bill	2-Year Note	5-Year Note	10-Year Note	30-Year Bond
5/8/2020	0.12	0.16	0.33	0.69	1.39
5/11/2020	0.12	0.17	0.36	0.73	1.43
5/12/2020	0.13	0.17	0.34	0.69	1.38
5/13/2020	0.13	0.16	0.31	0.64	1.35
5/14/2020	0.12	0.16	0.31	0.63	1.3
5/15/2020	0.12	0.16	0.31	0.64	1.32
5/18/2020	0.13	0.18	0.38	0.73	1.44
5/19/2020	0.13	0.17	0.35	0.7	1.43
5/20/2020	0.12	0.16	0.34	0.68	1.4
5/21/2020	0.12	0.17	0.35	0.68	1.4
5/22/2020	0.12	0.17	0.34	0.66	1.37
5/26/2020	0.14	0.18	0.35	0.69	1.43
5/27/2020	0.15	0.19	0.34	0.68	1.44
5/28/2020	0.15	0.17	0.34	0.7	1.47
5/29/2020	0.14	0.16	0.3	0.65	1.41
6/1/2020	0.14	0.14	0.31	0.66	1.46

Source: GAO analysis of Dept. of State data. | GAO-21-606

Investors sold more than \$500 billion in Treasury securities in the first quarter of 2020 (see fig. 3). International investors, mutual funds, and the households and nonprofit sector—which includes other private investors, such as U.S.-based hedge funds—were the largest net sellers of Treasury securities during this period.¹⁰

¹⁰U.S.-based hedge fund activity appears in the households and nonprofit sector in the Federal Reserve data, which is a residual category. Foreign hedge fund activity is captured in the international investors sector. Some hedge funds classified as international may be domiciled abroad but operate primarily in U.S. financial markets.

Figure 3: Quarterly Value of Investor Net Transactions (Purchases and Sales) of Treasury Securities, Oct. 2019 to Mar. 2020



Source: GAO analysis of Federal Reserve Financial Accounts of the United States – Z.1. | GAO -21-606

Data table for Figure 3: Quarterly Value of Investor Net Transactions (Purchases and Sales) of Treasury Securities, Oct. 2019 to Mar. 2020

	2019 (Q3) Dollars (in billions)	2019 (Q4) Dollars (in billions)	2020 (Q1) Dollars (in billions)
Investors	\$ 273,109	\$ (39,070)	\$ (531,348)
International Investors	--	--	\$ (287,045)
Mutual Funds	--	--	\$ (245,988)
Households and Non-profits	--	--	\$ (166,953)

Notes: The dollar value of purchases and sales shown in this figure are estimated by the Federal Reserve based on changes in holdings of Treasury securities and interest rates from quarter to quarter.

Households and nonprofits is a residual data series that displays the value of transactions by all other investor types not captured elsewhere in the data. Transactions by households, nonprofit organizations, and other private investors, such as U.S.-based hedge funds, fall into this sector.

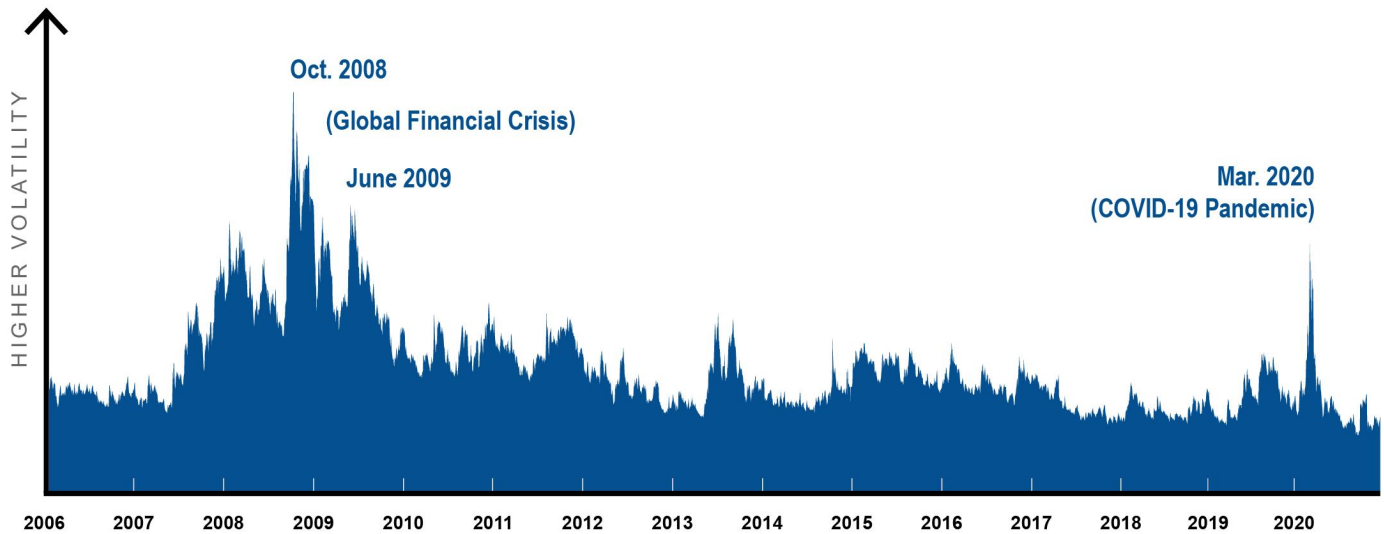
Source: GAO analysis of Federal Reserve Financial Accounts of the U.S. – Z.1. | GAO-21-606

According to Federal Reserve and Treasury reports and market participants we interviewed, investors faced different pressures that led to sales:

- **International investors**—including foreign official investors, such as foreign central banks, and foreign private investors—sold large amounts of Treasury securities. Foreign central banks, for example, sold Treasury securities to support the dollar needs of their domestic economies and to manage their exchange rates.
- **Mutual funds** sold their holdings of Treasury securities to prepare for or meet withdrawals or to rebalance their portfolios after large losses in equities.
- **Hedge funds** sold their holdings of Treasury securities as higher market volatility led to a need to reduce their exposure to certain trades involving Treasury securities.

The intense and widespread investor selling contributed to higher volatility in the Treasury market, reflecting increased uncertainty and less agreement on prices. Periods of moderate Treasury market volatility are common as investor expectations shift. However, the onset of the COVID-19 pandemic was an extraordinary shock to financial markets that resulted in exceptional volatility. For example, the Merrill Lynch Option Volatility Estimate index, which tracks overall volatility in the Treasury market, shows that conditions in March 2020 were the most volatile since June 2009 during the global financial crisis (see fig. 4).

Figure 4: A Daily Indicator of Volatility in the Treasury Market, 2006 to 2020



Source: GAO analysis of The Intercontinental Exchange (ICE) Bank of America Merrill Lynch Option Volatility Estimate (MOVE) Index, accessed via Bloomberg. | GAO-21-606

Note: The ICE Bank of America MOVE index tracks movements in the yield volatility of Treasury securities as implied by Treasury options. It is a weighted average of implied volatilities for 1-month options on the 2-, 5-, and 10-year note and 30-year bond.

Heavy sales and exceptional volatility put pressure on Treasury market intermediaries—which include both broker-dealers and principal trading firms—and affected their ability to support market liquidity (see text box).

Treasury Market Intermediaries

Broker-Dealers

Broker-dealers typically intermediate trading in Treasury securities by making markets for customers such as mutual funds, insurance companies, foreign central banks, and other investors. Intermediation generally involves broker-dealers buying and selling Treasury securities in large amounts to meet customer needs—holding some trading positions for multiple days—and maintaining a large inventory of Treasury securities.

Principal Trading Firms (PTF)

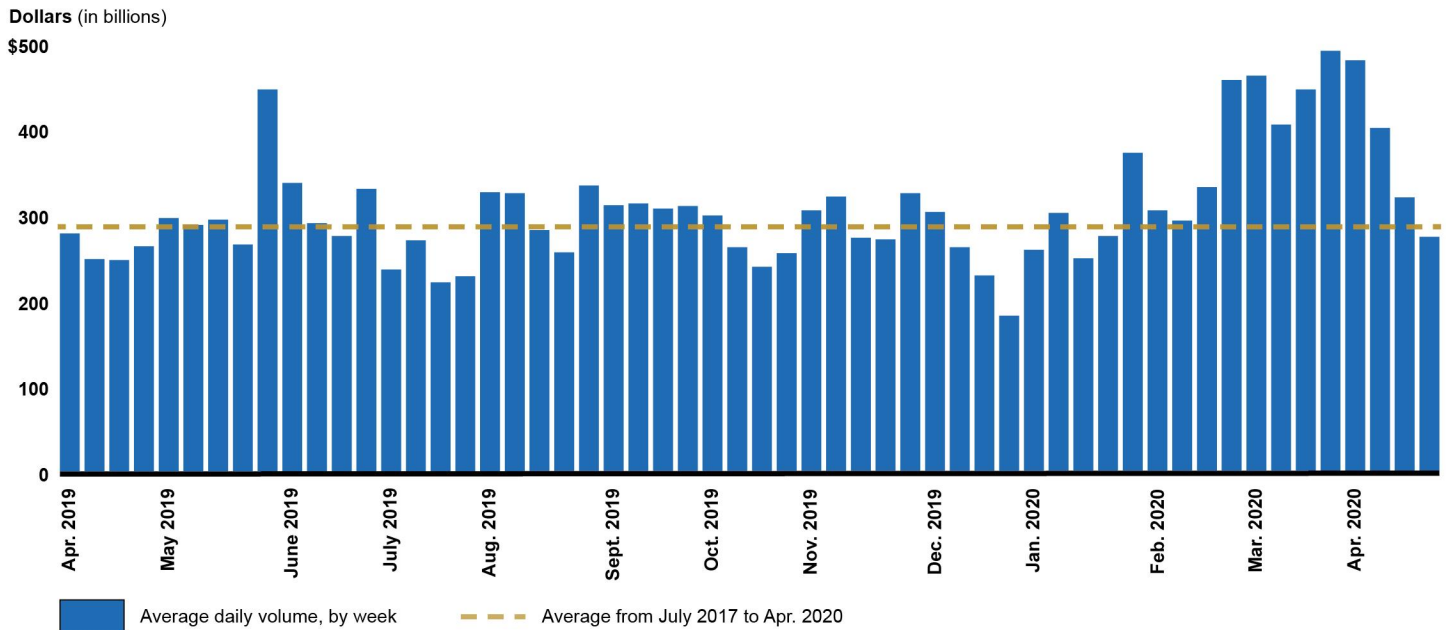
PTFs also make markets in Treasury securities, largely by facilitating trading among broker-dealers on electronic trading platforms. Broker-dealers use these platforms to internally manage their inventories of Treasury securities. PTFs largely use high-speed technology to quickly adapt their trading strategies to changes in market conditions. Unlike broker-dealers, PTFs trade using their own capital and not on behalf of clients. PTFs generally do not hold large positions for multiple days. Rather, they bid on and offer Treasury securities at competitive prices and use technology to complete transactions quickly.

Source: GAO. | GAO 21-606

Although broker-dealers facilitated record volumes of both client purchases and sales, overall, clients sold more Treasury securities to broker-dealers than they bought from them. This resulted in increased broker-dealers holdings of Treasury notes and bonds during March. Average daily trading volumes between broker-dealers and customers also reached their highest level since July 2017 (the earliest data available). They also were well above normal levels for multiple weeks as broker-dealers responded to the surge of customer selling (see fig. 5).¹¹

¹¹In July 2017, Treasury and other agencies gained access to data on secondary market transactions as reported to FINRA by its broker-dealer members to the TRACE database. We received aggregate TRACE data from Treasury to analyze for this report.

Figure 5: Average Daily Trading Volumes by Week between Broker-Dealers and Customers, Apr. 2019 to Apr. 2020



Source: GAO analysis of TRACE data provided by Department of the Treasury. | GAO-21-606

Data table for Figure 5: Average Daily Trading Volumes by Week between Broker-Dealers and Customers, Apr. 2019 to Apr. 2020

Week Ended	Average Daily Volume, by week	Average from Jul 2017 to Apr 2020
7/14/2017	222	290
7/21/2017	202	290
7/28/2017	257	290
8/4/2017	242	290
8/11/2017	229	290
8/18/2017	212	290
8/25/2017	184	290
9/1/2017	307	290
9/8/2017	245	290
9/15/2017	246	290
9/22/2017	213	290
9/29/2017	326	290
10/6/2017	216	290
10/13/2017	236	290
10/20/2017	226	290

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Week Ended	Average Daily Volume, by week	Average from Jul 2017 to Apr 2020
10/27/2017	267	290
11/3/2017	273	290
11/10/2017	274	290
11/17/2017	242	290
11/24/2017	213	290
12/1/2017	349	290
12/8/2017	248	290
12/15/2017	261	290
12/22/2017	225	290
12/29/2017	234	290
1/5/2018	268	290
1/12/2018	276	290
1/19/2018	287	290
1/26/2018	291	290
2/2/2018	362	290
2/9/2018	383	290
2/16/2018	315	290
2/23/2018	340	290
3/2/2018	343	290
3/9/2018	248	290
3/16/2018	298	290
3/23/2018	262	290
3/30/2018	333	290
4/6/2018	239	290
4/13/2018	223	290
4/20/2018	244	290
4/27/2018	306	290
5/4/2018	280	290
5/11/2018	251	290
5/18/2018	286	290
5/25/2018	281	290
6/1/2018	377	290
6/8/2018	235	290
6/15/2018	260	290
6/22/2018	231	290
6/29/2018	299	290

Letter

Week Ended	Average Daily Volume, by week	Average from Jul 2017 to Apr 2020
7/6/2018	205	290
7/13/2018	201	290
7/20/2018	229	290
7/27/2018	259	290
8/3/2018	270	290
8/10/2018	250	290
8/17/2018	237	290
8/24/2018	236	290
8/31/2018	310	290
9/7/2018	301	290
9/14/2018	287	290
9/21/2018	269	290
9/28/2018	321	290
10/5/2018	301	290
10/12/2018	303	290
10/19/2018	262	290
10/26/2018	301	290
11/2/2018	293	290
11/9/2018	286	290
11/16/2018	295	290
11/23/2018	226	290
11/30/2018	379	290
12/7/2018	292	290
12/14/2018	320	290
12/21/2018	276	290
12/28/2018	252	290
1/4/2019	323	290
1/11/2019	313	290
1/18/2019	279	290
1/25/2019	252	290
2/1/2019	381	290
2/8/2019	308	290
2/15/2019	273	290
2/22/2019	296	290
3/1/2019	404	290
3/8/2019	282	290

Letter

Week Ended	Average Daily Volume, by week	Average from Jul 2017 to Apr 2020
3/15/2019	277	290
3/22/2019	279	290
3/29/2019	386	290
4/5/2019	281	290
4/12/2019	251	290
4/19/2019	250	290
4/26/2019	266	290
5/3/2019	299	290
5/10/2019	291	290
5/17/2019	297	290
5/24/2019	268	290
5/31/2019	449	290
6/7/2019	340	290
6/14/2019	293	290
6/21/2019	278	290
6/28/2019	333	290
7/5/2019	239	290
7/12/2019	273	290
7/19/2019	224	290
7/26/2019	231	290
8/2/2019	329	290
8/9/2019	328	290
8/16/2019	285	290
8/23/2019	259	290
8/30/2019	337	290
9/6/2019	314	290
9/13/2019	316	290
9/20/2019	310	290
9/27/2019	313	290
10/4/2019	302	290
10/11/2019	265	290
10/18/2019	242	290
10/25/2019	258	290
11/1/2019	308	290
11/8/2019	324	290
11/15/2019	276	290

Week Ended	Average Daily Volume, by week	Average from Jul 2017 to Apr 2020
11/22/2019	274	290
11/29/2019	328	290
12/6/2019	306	290
12/13/2019	265	290
12/20/2019	232	290
12/27/2019	185	290
1/3/2020	262	290
1/10/2020	305	290
1/17/2020	252	290
1/24/2020	278	290
1/31/2020	375	290
2/7/2020	308	290
2/14/2020	296	290
2/21/2020	335	290
2/28/2020	460	290
3/6/2020	465	290
3/13/2020	408	290
3/20/2020	449	290
3/27/2020	494	290
4/3/2020	483	290
4/10/2020	404	290
4/17/2020	323	290
4/24/2020	277	290

Increased market volatility made intermediation riskier because it meant the prices of Treasury securities could move significantly between their purchase and sale, potentially resulting in large trading losses. Market participants we interviewed and Treasury and Federal Reserve documents indicate that as a result, some broker-dealers were constrained by internal risk limits on their trading activity. This, in turn, reduced their ability to conduct further transactions with clients. Several market participants and experts we spoke to also said that the transition by many financial firms to full-time telework arrangements during this time strained normal business procedures and communication channels, further complicating trading operations.

Furthermore, large flows of customer sales onto broker-dealer balance sheets likely moved some firms closer to a regulatory threshold called the supplementary leverage ratio (SLR). SLR is a 2018 balance sheet regulation on large bank holding companies that limits the amount of assets, regardless of their riskiness, that these firms can hold in proportion to their capital.¹² Broker-dealers whose holding companies were approaching their SLR thresholds may have become less willing to accept customer sales of Treasury securities to slow asset growth and conserve balance sheet space.¹³

These pressures—increased trading risk and declining balance sheet space—severely strained broker-dealers' capacity or willingness to serve as intermediaries in the Treasury market.¹⁴ Some asset managers told us that they could not find a broker-dealer to bid on certain Treasury securities that they wanted to sell. In addition, some broker-dealers said that they were hesitant to add more Treasury securities onto their balance sheets during this time.

Broker-dealers were either unable to expand their inventories of Treasury securities to fully meet the intermediation needs of their customers—the majority of whom wished to sell—or were only willing to do so at higher costs to their customers. For example, the bid-ask spread on Treasury notes and bonds—an indicator of transaction costs that measures the difference between the offered buying and selling price for a security—widened substantially during mid-March. This implies reduced liquidity for market participants.

As shown in figure 6, the bid-ask spreads on the 10-year Treasury note rose well above previous levels in March 2020 and reached their widest levels since the global financial crisis. This effect was larger for off-the-run Treasury securities, which are older securities that generally are less liquid. Many investors—such as bond mutual funds, pension funds, and

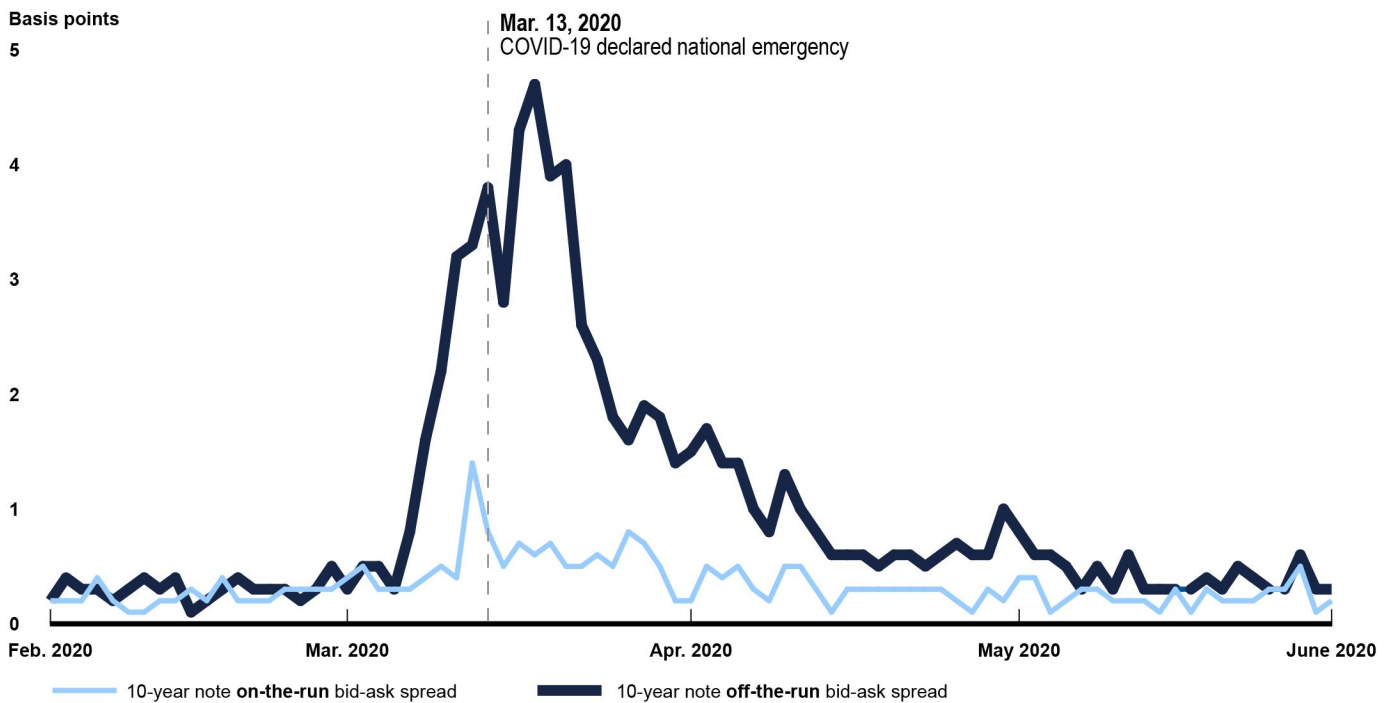
¹²The SLR is a risk-insensitive capital requirement that applies to large holding companies and requires such holding companies to hold capital for all on-balance sheet assets and certain off-balance sheet exposures. 12 C.F.R. § 217.10(c).

¹³Firms nearing their SLR threshold may also elect to raise additional capital, slow asset growth in other areas, or sell assets to avoid breaching regulatory minimum requirements or enhanced regulatory standards, as applicable.

¹⁴See Financial Stability Oversight Council, *2020 Annual Report* (Washington, D.C.: Dec. 3, 2020).

foreign central banks—sell off-the-run securities to raise cash when needed and did so in March 2020.

Figure 6: Bid-Ask Spreads for 10-Year Treasury Notes, Feb. to June 2020



Source: GAO analysis of Bloomberg data. | GAO-21-606

Data table for Figure 6: Bid-Ask Spreads for 10-Year Treasury Notes, Feb. to June 2020

Date	10-Year Note On-the-run	10-Year Note Off-the-run
2/3/2020	0.2	0.2
2/4/2020	0.2	0.4
2/5/2020	0.2	0.3
2/6/2020	0.4	0.3
2/7/2020	0.2	0.2
2/10/2020	0.1	0.3
2/11/2020	0.1	0.4
2/12/2020	0.2	0.3
2/13/2020	0.2	0.4
2/14/2020	0.3	0.1
2/18/2020	0.2	0.2

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Date	10-Year Note On-the-run	10-Year Note Off-the-run
2/19/2020	0.4	0.3
2/20/2020	0.2	0.4
2/21/2020	0.2	0.3
2/24/2020	0.2	0.3
2/25/2020	0.3	0.3
2/26/2020	0.3	0.2
2/27/2020	0.3	0.3
2/28/2020	0.3	0.5
3/2/2020	0.4	0.3
3/3/2020	0.5	0.5
3/4/2020	0.3	0.5
3/5/2020	0.3	0.3
3/6/2020	0.3	0.8
3/9/2020	0.4	1.6
3/10/2020	0.5	2.2
3/11/2020	0.4	3.2
3/12/2020	1.4	3.3
3/13/2020	0.8	3.8
3/16/2020	0.5	2.8
3/17/2020	0.7	4.3
3/18/2020	0.6	4.7
3/19/2020	0.7	3.9
3/20/2020	0.5	4
3/23/2020	0.5	2.6
3/24/2020	0.6	2.3
3/25/2020	0.5	1.8
3/26/2020	0.8	1.6
3/27/2020	0.7	1.9
3/30/2020	0.5	1.8
3/31/2020	0.2	1.4
4/1/2020	0.2	1.5
4/2/2020	0.5	1.7
4/3/2020	0.4	1.4
4/6/2020	0.5	1.4
4/7/2020	0.3	1
4/8/2020	0.2	0.8
4/9/2020	0.5	1.3

Letter

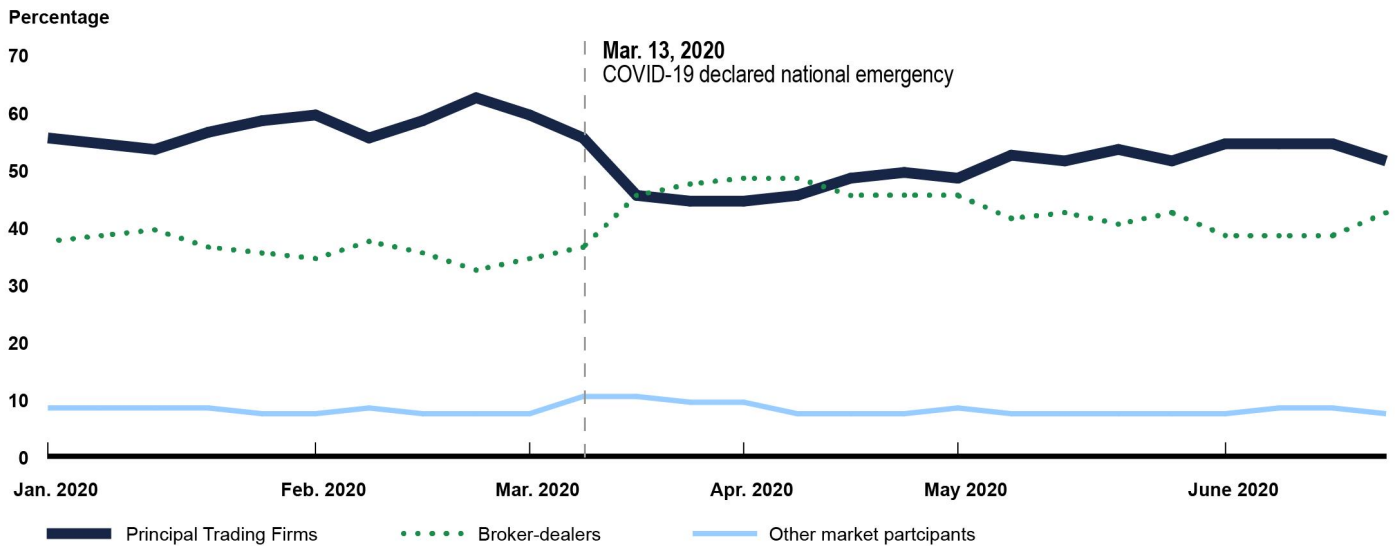
Date	10-Year Note On-the-run	10-Year Note Off-the-run
4/13/2020	0.5	1
4/14/2020	0.3	0.8
4/15/2020	0.1	0.6
4/16/2020	0.3	0.6
4/17/2020	0.3	0.6
4/20/2020	0.3	0.5
4/21/2020	0.3	0.6
4/22/2020	0.3	0.6
4/23/2020	0.3	0.5
4/24/2020	0.3	0.6
4/27/2020	0.2	0.7
4/28/2020	0.1	0.6
4/29/2020	0.3	0.6
4/30/2020	0.2	1
5/1/2020	0.4	0.8
5/4/2020	0.4	0.6
5/5/2020	0.1	0.6
5/6/2020	0.2	0.5
5/7/2020	0.3	0.3
5/8/2020	0.3	0.5
5/11/2020	0.2	0.3
5/12/2020	0.2	0.6
5/13/2020	0.2	0.3
5/14/2020	0.1	0.3
5/15/2020	0.3	0.3
5/18/2020	0.1	0.3
5/19/2020	0.3	0.4
5/20/2020	0.2	0.3
5/21/2020	0.2	0.5
5/22/2020	0.2	0.4
5/26/2020	0.3	0.3
5/27/2020	0.3	0.3
5/28/2020	0.5	0.6
5/29/2020	0.1	0.3
6/1/2020	0.2	0.3

Notes: On-the-run Treasury securities are those most recently auctioned by Treasury. Off-the-run securities refer to any securities that were auctioned prior to the most recent offering.

A basis point is equal to 1/100th of a percent, or 0.01 percent.

Principal trading firms initially increased their trading activity but later reacted to the volatile trading conditions and reduced their market-making activity. From March 16 to April 17, 2020, principal trading firms' share of trading volumes on certain electronic trading platforms averaged just 45 percent, compared to an average of 57 percent from January to March 13, 2020—the date COVID-19 was declared a national emergency (see fig. 7).

Figure 7: Share of Trading Volume on Electronic Interdealer Broker Platforms by Market Participant Type, Jan. to June 2020



Source: GAO analysis of TRACE data provided by the Department of the Treasury. | GAO-21-606

Data table for Figure 7: Share of Trading Volume on Electronic Interdealer Broker Platforms by Market Participant Type, Jan. to June 2020

Week Ended	Broker-Dealers	Other Market Participants	Principal Trading Firms
1/3/2020	37%	8%	55%
1/10/2020	38%	8%	54%
1/17/2020	39%	8%	53%
1/24/2020	36%	8%	56%
1/31/2020	35%	7%	58%
2/7/2020	34%	7%	59%
2/14/2020	37%	8%	55%
2/21/2020	35%	7%	58%
2/28/2020	32%	7%	62%

Week Ended	Broker-Dealers	Other Market Participants	Principal Trading Firms
3/6/2020	34%	7%	59%
3/13/2020	36%	10%	55%
3/20/2020	45%	10%	45%
3/27/2020	47%	9%	44%
4/3/2020	48%	9%	44%
4/10/2020	48%	7%	45%
4/17/2020	45%	7%	48%
4/24/2020	45%	7%	49%
5/1/2020	45%	8%	48%
5/8/2020	41%	7%	52%
5/15/2020	42%	7%	51%
5/22/2020	40%	7%	53%
5/29/2020	42%	7%	51%
6/5/2020	38%	7%	54%
6/12/2020	38%	8%	54%
6/19/2020	38%	8%	54%
6/26/2020	42%	7%	51%

Note: Other market participants is a residual category that includes trading volumes of all other firms that are not FINRA members. This includes hedge funds, asset managers, and foreign subsidiaries or affiliates of some broker-dealers.

Broker-dealers' inability or unwillingness to fully intermediate large client sales combined with a sharp reduction of principal trading firms' market-making contributed to the severe deterioration in overall liquidity conditions in the Treasury market. Many market participants we interviewed told us that Treasury market conditions in March 2020 were among the most dysfunctional that they had ever experienced.

The Federal Reserve Acted Quickly to Support Market Functioning, Including Purchasing Trillions of Dollars of Treasury Securities

Starting March 9, 2020, the Federal Reserve took several actions to support market functioning—or liquidity and efficient pricing—in Treasury securities.¹⁵

Primary Dealers

Certain broker-dealers who are trading counterparties of the Federal Reserve Bank of New York in its implementation of monetary policy, including repo operations and purchases of Treasury securities. Primary dealers are expected, among other things, to bid in all Treasury securities auctions at reasonably competitive prices. There are currently 24 primary dealers.

Source: GAO. | GAO-21-606

- **Expanding short-term lending facilities and operations.** From March 9 to March 17, 2020, the Federal Reserve expanded its repurchase agreement (repo) operations to offer large amounts of short-term financing to primary dealers (see sidebar) in exchange for collateral such as Treasury securities and agency mortgage-backed securities.¹⁶ Also on March 17, it established a primary dealer credit facility that likewise offered short-term financing to primary dealers, but accepted a broader range of collateral than its repo facility.¹⁷ Lastly, on March 31, 2020 the Federal Reserve also established a repo facility for foreign and international monetary authorities that provided these investors an alternative option to access U.S. dollar

¹⁵In addition to taking action across a range of financial markets, including in Treasury securities, the Federal Reserve established several emergency lending facilities to support the flow of credit to employers, consumers, businesses, state and local governments, and nonprofit organizations. See *Federal Reserve Lending Programs: Use of CARES Act-Supported Programs Has Been Limited and Flow of Credit Has Generally Improved*, GAO-21-180 (Washington, D.C.: Dec. 10, 2020).

¹⁶In July 2021, the Federal Reserve announced the establishment of a domestic standing repo facility. According to the Federal Reserve, the facility will serve as a backstop in money markets to support the effective implementation of monetary policy and smooth market functioning. The standing repo facility will offer overnight lending of U.S. dollars in exchange for Treasury securities, among other types of securities. The facility will initially be available to primary dealers and will be expanded over time to including additional depository institutions. See The Federal Reserve Board of Governors, *Statement Regarding Repurchase Agreement Arrangements* (July 28, 2021).

¹⁷The primary dealer credit facility offers credit to primary dealers for term funding with maturities up to 90 days. Whereas Federal Reserve repo facilities only accept Treasury securities, agency debt, and agency mortgage-backed securities as collateral, eligible collateral for the primary dealer credit facility included a broad range of investment grade debt securities, including commercial paper and municipal bonds, and a broad range of equity securities. The primary dealer credit facility expired on March 31, 2021.

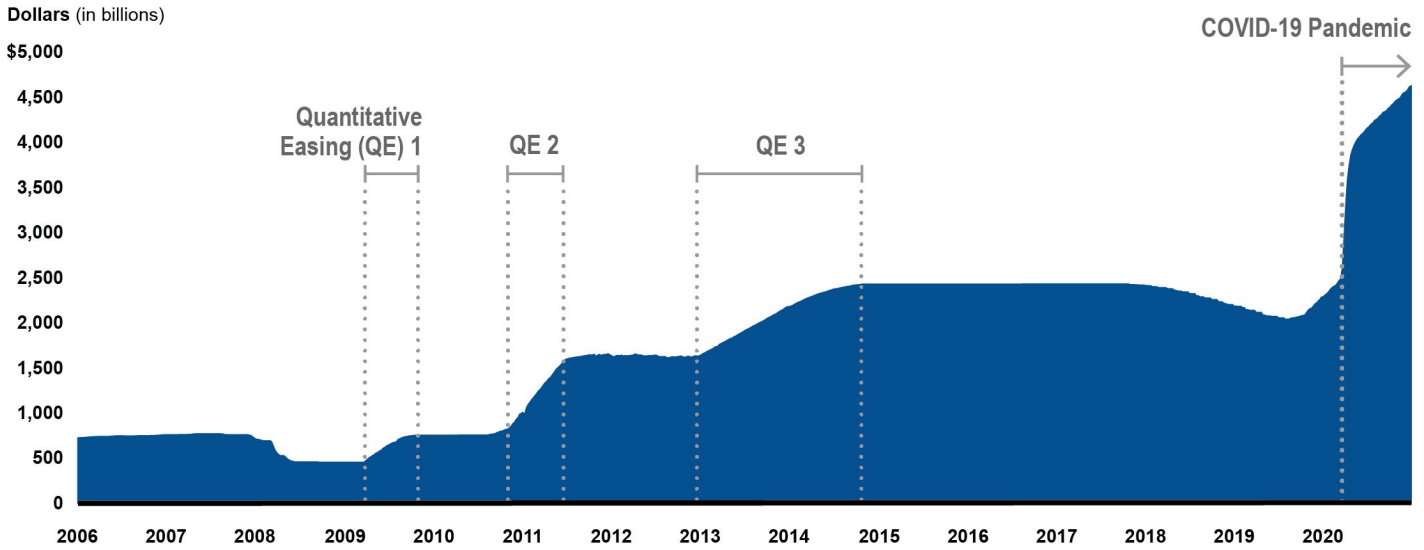
funding rather than selling their Treasury securities outright in the secondary market.¹⁸

- **Buying Treasury securities in the secondary market.** From March 16 to April 8, 2020, the Federal Reserve purchased \$1.1 trillion of Treasury securities and purchased a further \$1 trillion from April 9 to December 31, 2020, for a total of \$2.1 trillion.¹⁹ The Federal Reserve's purchases of Treasury securities from primary dealers helped these dealers resume intermediation activities because they could accept large customer sales and quickly sell them to the Federal Reserve, limiting the dealers' balance sheet exposure. Most Federal Reserve purchases were of Treasury notes and bonds, including off-the-run securities, which was the segment of the Treasury market with the most severe disruption in liquidity. The scale of these purchases was unprecedented and resulted in a larger increase in the Federal Reserve's holdings of Treasury securities than the combined effects of three previous large-scale asset purchase programs, commonly referred to as quantitative easing, or QE (see fig. 8).

¹⁸This repo facility allowed foreign central banks and foreign monetary authorities with accounts at the Federal Reserve Bank of New York to temporarily exchange their Treasury securities for U.S. dollars. In July 2021, the Federal Reserve announced the establishment of a standing repo facility for foreign and international monetary authorities to help address pressures in global dollar funding markets that could otherwise affect financial market conditions in the United States.

¹⁹These purchases are called open market operations, which is one of the Federal Reserve's instruments for implementing monetary policy. Open market operations involve the buying and selling of government securities. Open market operations are carried out by the Trading Desk of the Federal Reserve Bank of New York under direction from the Federal Open Market Committee. The transactions are conducted with primary dealers.

Figure 8: Federal Reserve Holdings of Treasury Securities, Jan. 2006 to Dec. 2020



Source: GAO analysis of Federal Reserve Board of Governors data. | GAO-21-606

Data table for Figure 8: Federal Reserve Holdings of Treasury Securities, Jan. 2006 to Dec. 2020

As of Date	Nominal U.S. Treasury Securities Holdings (excl. inflation compensation) in Billions of dollars
1/4/2006	739,527
1/11/2006	741,134
1/18/2006	742,383
1/25/2006	743,330
2/1/2006	745,630
2/8/2006	745,644
2/15/2006	748,168
2/22/2006	749,416
3/1/2006	751,565
3/8/2006	752,415
3/15/2006	753,965
3/22/2006	753,965
3/29/2006	755,193
4/5/2006	755,193
4/12/2006	755,193
4/19/2006	755,193
4/26/2006	756,289

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As of Date	Nominal U.S. Treasury Securities Holdings (excl. inflation compensation) in Billions of dollars
5/3/2006	756,289
5/10/2006	756,289
5/17/2006	756,171
5/24/2006	758,866
5/31/2006	758,866
6/7/2006	761,280
6/14/2006	762,596
6/21/2006	762,596
6/28/2006	762,596
7/5/2006	762,596
7/12/2006	762,596
7/19/2006	760,863
7/26/2006	760,863
8/2/2006	760,864
8/9/2006	760,864
8/16/2006	760,864
8/23/2006	760,864
8/30/2006	762,733
9/6/2006	762,733
9/13/2006	764,829
9/20/2006	764,829
9/27/2006	764,829
10/4/2006	764,829
10/11/2006	764,829
10/18/2006	762,507
10/25/2006	764,264
11/1/2006	765,695
11/8/2006	766,189
11/15/2006	765,854
11/22/2006	767,722
11/29/2006	768,492
12/6/2006	770,139
12/13/2006	771,569
12/20/2006	773,646
12/27/2006	774,988
1/3/2007	774,988

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As of Date	Nominal U.S. Treasury Securities Holdings (excl. inflation compensation) in Billions of dollars
1/10/2007	774,988
1/17/2007	775,470
1/24/2007	775,470
1/31/2007	775,470
2/7/2007	775,470
2/14/2007	775,470
2/21/2007	775,470
2/28/2007	777,348
3/7/2007	777,348
3/14/2007	777,348
3/21/2007	777,348
3/28/2007	777,348
4/4/2007	777,348
4/11/2007	779,194
4/18/2007	779,194
4/25/2007	783,414
5/2/2007	783,414
5/9/2007	786,150
5/16/2007	786,150
5/23/2007	786,150
5/30/2007	786,150
6/6/2007	786,150
6/13/2007	786,150
6/20/2007	786,150
6/27/2007	786,150
7/4/2007	786,150
7/11/2007	786,150
7/18/2007	786,150
7/25/2007	786,150
8/1/2007	786,150
8/8/2007	786,150
8/15/2007	784,914
8/22/2007	784,914
8/29/2007	779,914
9/5/2007	774,914
9/12/2007	774,914

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As of Date	Nominal U.S. Treasury Securities Holdings (excl. inflation compensation) in Billions of dollars
9/19/2007	774,914
9/26/2007	774,914
10/3/2007	774,914
10/10/2007	774,914
10/17/2007	774,914
10/24/2007	774,914
10/31/2007	774,914
11/7/2007	774,914
11/14/2007	774,914
11/21/2007	774,914
11/28/2007	774,914
12/5/2007	774,914
12/12/2007	769,914
12/19/2007	764,914
12/26/2007	749,751
1/2/2008	735,736
1/9/2008	723,255
1/16/2008	723,807
1/23/2008	718,807
1/30/2008	713,807
2/6/2008	708,807
2/13/2008	708,807
2/20/2008	708,807
2/27/2008	708,807
3/5/2008	708,807
3/12/2008	698,807
3/19/2008	655,807
3/26/2008	607,580
4/2/2008	576,472
4/9/2008	555,316
4/16/2008	543,805
4/23/2008	543,805
4/30/2008	543,805
5/7/2008	531,741
5/14/2008	510,597
5/21/2008	497,717

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As of Date	Nominal U.S. Treasury Securities Holdings (excl. inflation compensation) in Billions of dollars
5/28/2008	485,859
6/4/2008	481,632
6/11/2008	476,706
6/18/2008	473,303
6/25/2008	473,303
7/2/2008	473,303
7/9/2008	473,303
7/16/2008	473,303
7/23/2008	473,303
7/30/2008	473,303
8/6/2008	473,303
8/13/2008	473,303
8/20/2008	473,303
8/27/2008	473,303
9/3/2008	473,303
9/10/2008	473,303
9/17/2008	473,303
9/24/2008	469,986
10/1/2008	469,986
10/8/2008	469,986
10/15/2008	469,986
10/22/2008	469,986
10/29/2008	469,986
11/5/2008	469,985
11/12/2008	469,985
11/19/2008	469,985
11/26/2008	469,985
12/3/2008	469,985
12/10/2008	469,985
12/17/2008	469,985
12/24/2008	469,985
12/31/2008	469,985
1/7/2009	469,985
1/14/2009	469,985
1/21/2009	470,715
1/28/2009	470,715

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As of Date	Nominal U.S. Treasury Securities Holdings (excl. inflation compensation) in Billions of dollars
2/4/2009	470,715
2/11/2009	470,715
2/18/2009	470,715
2/25/2009	470,715
3/4/2009	470,715
3/11/2009	470,715
3/18/2009	470,715
3/25/2009	470,715
4/1/2009	488,255
4/8/2009	504,289
4/15/2009	521,928
4/22/2009	530,431
4/29/2009	544,456
5/6/2009	555,981
5/13/2009	572,446
5/20/2009	578,601
5/27/2009	595,248
6/3/2009	601,248
6/10/2009	623,742
6/17/2009	633,692
6/24/2009	648,189
7/1/2009	658,438
7/8/2009	668,437
7/15/2009	678,937
7/22/2009	687,436
7/29/2009	690,436
8/5/2009	699,930
8/12/2009	723,476
8/19/2009	730,492
8/26/2009	739,187
9/2/2009	747,086
9/9/2009	752,036
9/16/2009	754,085
9/23/2009	759,934
9/30/2009	763,479
10/7/2009	763,479

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As of Date	Nominal U.S. Treasury Securities Holdings (excl. inflation compensation) in Billions of dollars
10/14/2009	767,728
10/21/2009	767,729
10/28/2009	768,779
11/4/2009	770,715
11/11/2009	770,715
11/18/2009	770,715
11/25/2009	770,715
12/2/2009	770,715
12/9/2009	770,715
12/16/2009	770,715
12/23/2009	770,715
12/30/2009	770,715
1/6/2010	770,715
1/13/2010	770,715
1/20/2010	771,072
1/27/2010	771,072
2/3/2010	771,072
2/10/2010	771,072
2/17/2010	771,072
2/24/2010	771,072
3/3/2010	771,072
3/10/2010	771,072
3/17/2010	771,072
3/24/2010	771,072
3/31/2010	771,072
4/7/2010	771,072
4/14/2010	771,072
4/21/2010	771,572
4/28/2010	771,572
5/5/2010	771,571
5/12/2010	771,571
5/19/2010	771,571
5/26/2010	771,571
6/2/2010	771,571
6/9/2010	771,571
6/16/2010	771,571

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As of Date	Nominal U.S. Treasury Securities Holdings (excl. inflation compensation) in Billions of dollars
6/23/2010	771,571
6/30/2010	771,571
7/7/2010	771,571
7/14/2010	771,571
7/21/2010	771,572
7/28/2010	771,572
8/4/2010	771,572
8/11/2010	771,572
8/18/2010	774,123
8/25/2010	779,082
9/1/2010	780,856
9/8/2010	784,464
9/15/2010	789,214
9/22/2010	799,673
9/29/2010	806,183
10/6/2010	813,573
10/13/2010	815,642
10/20/2010	826,592
10/27/2010	832,242
11/3/2010	836,391
11/10/2010	847,416
11/17/2010	867,988
11/24/2010	895,425
12/1/2010	911,631
12/8/2010	943,778
12/15/2010	961,507
12/22/2010	1,001,075
12/29/2010	1,009,925
1/5/2011	1,024,720
1/12/2011	1,055,791
1/19/2011	1,073,534
1/26/2011	1,108,399
2/2/2011	1,132,004
2/9/2011	1,160,900
2/16/2011	1,183,971
2/23/2011	1,207,029

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As of Date	Nominal U.S. Treasury Securities Holdings (excl. inflation compensation) in Billions of dollars
3/2/2011	1,229,824
3/9/2011	1,259,520
3/16/2011	1,273,770
3/23/2011	1,298,537
3/30/2011	1,326,640
4/6/2011	1,351,324
4/13/2011	1,367,735
4/20/2011	1,395,789
4/27/2011	1,406,528
5/4/2011	1,434,803
5/11/2011	1,458,829
5/18/2011	1,487,425
5/25/2011	1,511,436
6/1/2011	1,524,181
6/8/2011	1,546,327
6/15/2011	1,567,499
6/22/2011	1,593,091
6/29/2011	1,608,077
7/6/2011	1,615,441
7/13/2011	1,621,261
7/20/2011	1,624,861
7/27/2011	1,628,850
8/3/2011	1,631,570
8/10/2011	1,635,314
8/17/2011	1,638,223
8/24/2011	1,639,043
8/31/2011	1,642,632
9/7/2011	1,646,102
9/14/2011	1,649,447
9/21/2011	1,653,576
9/28/2011	1,655,006
10/5/2011	1,662,097
10/12/2011	1,658,818
10/19/2011	1,660,559
10/26/2011	1,668,266
11/2/2011	1,644,398

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As of Date	Nominal U.S. Treasury Securities Holdings (excl. inflation compensation) in Billions of dollars
11/9/2011	1,658,120
11/16/2011	1,666,063
11/23/2011	1,654,991
11/30/2011	1,662,206
12/7/2011	1,665,238
12/14/2011	1,663,785
12/21/2011	1,674,596
12/28/2011	1,662,475
1/4/2012	1,653,845
1/11/2012	1,641,338
1/18/2012	1,642,041
1/25/2012	1,652,078
2/1/2012	1,653,028
2/8/2012	1,651,599
2/15/2012	1,657,912
2/22/2012	1,647,469
2/29/2012	1,652,535
3/7/2012	1,650,410
3/14/2012	1,650,823
3/21/2012	1,654,404
3/28/2012	1,655,754
4/4/2012	1,659,924
4/11/2012	1,671,887
4/18/2012	1,663,037
4/25/2012	1,658,584
5/2/2012	1,658,353
5/9/2012	1,656,771
5/16/2012	1,647,402
5/23/2012	1,647,301
5/30/2012	1,647,020
6/6/2012	1,654,572
6/13/2012	1,650,611
6/20/2012	1,653,797
6/27/2012	1,656,695
7/4/2012	1,656,528
7/11/2012	1,652,659

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As of Date	Nominal U.S. Treasury Securities Holdings (excl. inflation compensation) in Billions of dollars
7/18/2012	1,638,780
7/25/2012	1,641,539
8/1/2012	1,639,422
8/8/2012	1,642,570
8/15/2012	1,636,342
8/22/2012	1,627,161
8/29/2012	1,629,449
9/5/2012	1,638,927
9/12/2012	1,640,824
9/19/2012	1,636,102
9/26/2012	1,638,438
10/3/2012	1,642,953
10/10/2012	1,643,643
10/17/2012	1,648,730
10/24/2012	1,636,256
10/31/2012	1,634,963
11/7/2012	1,640,832
11/14/2012	1,646,158
11/21/2012	1,639,714
11/28/2012	1,635,796
12/5/2012	1,642,723
12/12/2012	1,649,854
12/19/2012	1,647,906
12/26/2012	1,645,992
1/2/2013	1,655,212
1/9/2013	1,665,492
1/16/2013	1,678,163
1/23/2013	1,685,949
1/30/2013	1,699,409
2/6/2013	1,706,597
2/13/2013	1,717,897
2/20/2013	1,725,935
2/27/2013	1,739,083
3/6/2013	1,751,260
3/13/2013	1,759,245
3/20/2013	1,773,851

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As of Date	Nominal U.S. Treasury Securities Holdings (excl. inflation compensation) in Billions of dollars
3/27/2013	1,783,598
4/3/2013	1,794,670
4/10/2013	1,802,942
4/17/2013	1,813,326
4/24/2013	1,824,337
5/1/2013	1,835,935
5/8/2013	1,842,231
5/15/2013	1,851,995
5/22/2013	1,864,585
5/29/2013	1,870,934
6/5/2013	1,885,386
6/12/2013	1,893,443
6/19/2013	1,906,093
6/26/2013	1,915,826
7/3/2013	1,930,080
7/10/2013	1,939,898
7/17/2013	1,948,811
7/24/2013	1,957,104
7/31/2013	1,969,469
8/7/2013	1,980,384
8/14/2013	1,988,020
8/21/2013	1,999,041
8/28/2013	2,010,428
9/4/2013	2,020,081
9/11/2013	2,027,776
9/18/2013	2,038,734
9/25/2013	2,048,674
10/2/2013	2,063,583
10/9/2013	2,073,370
10/16/2013	2,081,512
10/23/2013	2,092,925
10/30/2013	2,104,173
11/6/2013	2,111,947
11/13/2013	2,123,404
11/20/2013	2,137,244
11/27/2013	2,149,921

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As of Date	Nominal U.S. Treasury Securities Holdings (excl. inflation compensation) in Billions of dollars
12/4/2013	2,156,069
12/11/2013	2,172,019
12/18/2013	2,183,653
12/25/2013	2,195,251
1/1/2014	2,195,250
1/8/2014	2,199,454
1/15/2014	2,207,509
1/22/2014	2,218,035
1/29/2014	2,229,830
2/5/2014	2,239,643
2/12/2014	2,247,753
2/19/2014	2,254,528
2/26/2014	2,264,914
3/5/2014	2,275,047
3/12/2014	2,282,443
3/19/2014	2,291,990
3/26/2014	2,297,643
4/2/2014	2,306,665
4/9/2014	2,311,874
4/16/2014	2,321,686
4/23/2014	2,327,368
4/30/2014	2,335,778
5/7/2014	2,340,262
5/14/2014	2,346,440
5/21/2014	2,352,187
5/28/2014	2,355,514
6/4/2014	2,362,858
6/11/2014	2,370,388
6/18/2014	2,375,849
6/25/2014	2,381,258
7/2/2014	2,388,775
7/9/2014	2,392,616
7/16/2014	2,394,305
7/23/2014	2,397,493
7/30/2014	2,404,073
8/6/2014	2,406,300

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As of Date	Nominal U.S. Treasury Securities Holdings (excl. inflation compensation) in Billions of dollars
8/13/2014	2,411,333
8/20/2014	2,414,925
8/27/2014	2,419,414
9/3/2014	2,420,445
9/10/2014	2,424,106
9/17/2014	2,429,991
9/24/2014	2,432,055
10/1/2014	2,435,182
10/8/2014	2,437,930
10/15/2014	2,438,861
10/22/2014	2,442,756
10/29/2014	2,445,183
11/5/2014	2,445,182
11/12/2014	2,445,182
11/19/2014	2,445,182
11/26/2014	2,445,182
12/3/2014	2,445,182
12/10/2014	2,445,182
12/17/2014	2,445,181
12/24/2014	2,445,181
12/31/2014	2,445,181
1/7/2015	2,445,181
1/14/2015	2,445,181
1/21/2015	2,445,181
1/28/2015	2,445,181
2/4/2015	2,445,180
2/11/2015	2,445,180
2/18/2015	2,445,180
2/25/2015	2,445,180
3/4/2015	2,445,180
3/11/2015	2,445,180
3/18/2015	2,445,179
3/25/2015	2,445,179
4/1/2015	2,445,178
4/8/2015	2,445,178
4/15/2015	2,445,177

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As of Date	Nominal U.S. Treasury Securities Holdings (excl. inflation compensation) in Billions of dollars
4/22/2015	2,445,177
4/29/2015	2,445,177
5/6/2015	2,445,177
5/13/2015	2,445,177
5/20/2015	2,445,177
5/27/2015	2,445,177
6/3/2015	2,445,177
6/10/2015	2,445,177
6/17/2015	2,445,176
6/24/2015	2,445,176
7/1/2015	2,445,175
7/8/2015	2,445,175
7/15/2015	2,445,175
7/22/2015	2,445,175
7/29/2015	2,445,175
8/5/2015	2,445,175
8/12/2015	2,445,175
8/19/2015	2,445,175
8/26/2015	2,445,175
9/2/2015	2,445,174
9/9/2015	2,445,174
9/16/2015	2,445,174
9/23/2015	2,445,174
9/30/2015	2,445,173
10/7/2015	2,445,173
10/14/2015	2,445,173
10/21/2015	2,445,173
10/28/2015	2,445,173
11/4/2015	2,445,173
11/11/2015	2,445,173
11/18/2015	2,445,173
11/25/2015	2,445,173
12/2/2015	2,445,173
12/9/2015	2,445,173
12/16/2015	2,445,173
12/23/2015	2,445,173

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As of Date	Nominal U.S. Treasury Securities Holdings (excl. inflation compensation) in Billions of dollars
12/30/2015	2,445,173
1/6/2016	2,445,173
1/13/2016	2,445,173
1/20/2016	2,445,173
1/27/2016	2,445,173
2/3/2016	2,445,173
2/10/2016	2,445,173
2/17/2016	2,445,173
2/24/2016	2,445,399
3/2/2016	2,445,398
3/9/2016	2,445,398
3/16/2016	2,445,398
3/23/2016	2,445,398
3/30/2016	2,445,398
4/6/2016	2,445,399
4/13/2016	2,445,399
4/20/2016	2,445,426
4/27/2016	2,445,426
5/4/2016	2,445,426
5/11/2016	2,445,426
5/18/2016	2,445,426
5/25/2016	2,445,226
6/1/2016	2,445,225
6/8/2016	2,445,225
6/15/2016	2,445,225
6/22/2016	2,445,225
6/29/2016	2,445,225
7/6/2016	2,445,226
7/13/2016	2,445,226
7/20/2016	2,445,800
7/27/2016	2,445,800
8/3/2016	2,445,800
8/10/2016	2,445,800
8/17/2016	2,446,200
8/24/2016	2,446,200
8/31/2016	2,446,200

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As of Date	Nominal U.S. Treasury Securities Holdings (excl. inflation compensation) in Billions of dollars
9/7/2016	2,446,200
9/14/2016	2,446,200
9/21/2016	2,446,200
9/28/2016	2,446,200
10/5/2016	2,446,200
10/12/2016	2,446,200
10/19/2016	2,446,200
10/26/2016	2,446,200
11/2/2016	2,446,200
11/9/2016	2,446,200
11/16/2016	2,446,200
11/23/2016	2,446,200
11/30/2016	2,446,200
12/7/2016	2,445,800
12/14/2016	2,445,800
12/21/2016	2,445,800
12/28/2016	2,445,800
1/4/2017	2,445,800
1/11/2017	2,445,800
1/18/2017	2,446,312
1/25/2017	2,446,312
2/1/2017	2,446,312
2/8/2017	2,446,312
2/15/2017	2,446,312
2/22/2017	2,446,312
3/1/2017	2,446,312
3/8/2017	2,446,312
3/15/2017	2,446,312
3/22/2017	2,446,312
3/29/2017	2,446,512
4/5/2017	2,446,513
4/12/2017	2,446,513
4/19/2017	2,446,543
4/26/2017	2,446,543
5/3/2017	2,446,543
5/10/2017	2,446,543

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As of Date	Nominal U.S. Treasury Securities Holdings (excl. inflation compensation) in Billions of dollars
5/17/2017	2,446,343
5/24/2017	2,446,343
5/31/2017	2,446,342
6/7/2017	2,446,342
6/14/2017	2,446,342
6/21/2017	2,446,342
6/28/2017	2,446,342
7/5/2017	2,446,343
7/12/2017	2,446,343
7/19/2017	2,446,538
7/26/2017	2,446,538
8/2/2017	2,446,538
8/9/2017	2,446,538
8/16/2017	2,446,538
8/23/2017	2,446,538
8/30/2017	2,446,538
9/6/2017	2,446,538
9/13/2017	2,446,738
9/20/2017	2,446,738
9/27/2017	2,446,738
10/4/2017	2,446,738
10/11/2017	2,446,738
10/18/2017	2,446,738
10/25/2017	2,446,738
11/1/2017	2,440,738
11/8/2017	2,440,738
11/15/2017	2,437,235
11/22/2017	2,437,235
11/29/2017	2,437,235
12/6/2017	2,434,738
12/13/2017	2,434,538
12/20/2017	2,434,538
12/27/2017	2,434,538
1/3/2018	2,428,538
1/10/2018	2,428,538
1/17/2018	2,427,804

Letter

As of Date	Nominal U.S. Treasury Securities Holdings (excl. inflation compensation) in Billions of dollars
1/24/2018	2,427,804
1/31/2018	2,417,004
2/7/2018	2,417,004
2/14/2018	2,417,004
2/21/2018	2,412,916
2/28/2018	2,405,105
3/7/2018	2,405,105
3/14/2018	2,405,105
3/21/2018	2,405,105
3/28/2018	2,405,105
4/4/2018	2,393,105
4/11/2018	2,393,005
4/18/2018	2,392,902
4/25/2018	2,392,902
5/2/2018	2,375,021
5/9/2018	2,375,021
5/16/2018	2,366,391
5/23/2018	2,366,391
5/30/2018	2,366,391
6/6/2018	2,357,021
6/13/2018	2,357,021
6/20/2018	2,357,021
6/27/2018	2,357,021
7/4/2018	2,339,021
7/11/2018	2,339,021
7/18/2018	2,338,315
7/25/2018	2,338,315
8/1/2018	2,315,181
8/8/2018	2,315,181
8/15/2018	2,302,598
8/22/2018	2,302,698
8/29/2018	2,302,698
9/5/2018	2,291,281
9/12/2018	2,291,281
9/19/2018	2,291,281
9/26/2018	2,291,281

Letter

As of Date	Nominal U.S. Treasury Securities Holdings (excl. inflation compensation) in Billions of dollars
10/3/2018	2,272,274
10/10/2018	2,272,274
10/17/2018	2,272,274
10/24/2018	2,272,227
10/31/2018	2,248,394
11/7/2018	2,248,394
11/14/2018	2,248,341
11/21/2018	2,230,963
11/28/2018	2,230,963
12/5/2018	2,218,341
12/12/2018	2,218,341
12/19/2018	2,218,341
12/26/2018	2,218,341
1/2/2019	2,200,131
1/9/2019	2,200,131
1/16/2019	2,198,355
1/23/2019	2,198,355
1/30/2019	2,198,355
2/6/2019	2,184,165
2/13/2019	2,184,165
2/20/2019	2,160,871
2/27/2019	2,160,871
3/6/2019	2,154,165
3/13/2019	2,154,165
3/20/2019	2,154,165
3/27/2019	2,154,165
4/3/2019	2,131,786
4/10/2019	2,131,786
4/17/2019	2,131,618
4/24/2019	2,131,618
5/1/2019	2,101,886
5/8/2019	2,101,886
5/15/2019	2,092,026
5/22/2019	2,091,976
5/29/2019	2,091,976
6/5/2019	2,086,836

Letter

As of Date	Nominal U.S. Treasury Securities Holdings (excl. inflation compensation) in Billions of dollars
6/12/2019	2,086,836
6/19/2019	2,086,791
6/26/2019	2,086,791
7/3/2019	2,071,791
7/10/2019	2,071,788
7/17/2019	2,070,362
7/24/2019	2,070,362
7/31/2019	2,056,943
8/7/2019	2,056,941
8/14/2019	2,056,941
8/21/2019	2,065,145
8/28/2019	2,071,348
9/4/2019	2,071,348
9/11/2019	2,076,950
9/18/2019	2,081,552
9/25/2019	2,083,353
10/2/2019	2,092,758
10/9/2019	2,096,961
10/16/2019	2,098,562
10/23/2019	2,124,667
10/30/2019	2,150,972
11/6/2019	2,169,776
11/13/2019	2,176,579
11/20/2019	2,195,384
11/27/2019	2,223,490
12/4/2019	2,234,793
12/11/2019	2,256,949
12/18/2019	2,275,353
12/25/2019	2,303,459
1/1/2020	2,303,459
1/8/2020	2,322,261
1/15/2020	2,337,150
1/22/2020	2,355,554
1/29/2020	2,383,660
2/5/2020	2,402,462
2/12/2020	2,417,167

Letter

As of Date	Nominal U.S. Treasury Securities Holdings (excl. inflation compensation) in Billions of dollars
2/19/2020	2,426,269
2/26/2020	2,448,675
3/4/2020	2,477,175
3/11/2020	2,497,178
3/18/2020	2,614,192
3/25/2020	2,949,101
4/1/2020	3,309,629
4/8/2020	3,601,529
4/15/2020	3,754,880
4/22/2020	3,874,380
4/29/2020	3,935,381
5/6/2020	3,983,826
5/13/2020	4,020,676
5/20/2020	4,052,534
5/27/2020	4,072,669
6/3/2020	4,097,619
6/10/2020	4,113,969
6/17/2020	4,132,985
6/24/2020	4,161,520
7/1/2020	4,177,389
7/8/2020	4,195,523
7/15/2020	4,218,047
7/22/2020	4,230,582
7/29/2020	4,258,050
8/5/2020	4,269,785
8/12/2020	4,283,520
8/19/2020	4,308,586
8/26/2020	4,321,119
9/2/2020	4,348,588
9/9/2020	4,355,122
9/16/2020	4,367,657
9/23/2020	4,391,793
9/30/2020	4,405,257
10/7/2020	4,429,394
10/14/2020	4,444,059
10/21/2020	4,468,197

As of Date	Nominal U.S. Treasury Securities Holdings (excl. inflation compensation) in Billions of dollars
10/28/2020	4,485,269
11/4/2020	4,495,939
11/11/2020	4,510,473
11/18/2020	4,541,810
11/25/2020	4,563,521
12/2/2020	4,571,252
12/9/2020	4,587,122
12/16/2020	4,619,392
12/23/2020	4,639,260
12/30/2020	4,645,261

Note: Figure shows nominal holdings of U.S. Treasury securities. It excludes inflation compensation.

Nearly all market participants and experts we interviewed said that the Federal Reserve’s purchases of Treasury securities were an effective and important action that helped restore market functioning. The Federal Reserve implemented earlier asset purchase programs primarily to reduce long-term interest rates but initiated the COVID-19 purchases mainly to support Treasury market functioning. The Federal Reserve conducted these purchases to ensure that its other monetary policy actions would be effective and help support the broader economy, given the critical role of the Treasury market for other financial markets.

- Temporarily changing the Supplementary Leverage Ratio (SLR).**
 On April 1, 2020, the Federal Reserve Board announced a change to the SLR for large bank holding companies to temporarily exempt Treasury securities and deposits held at Federal Reserve Banks from the ratio calculation. This change reduced the costs to these entities of holding Treasury securities and central bank reserves on their balance sheets.²⁰ The exemption expired on March 31, 2021.

Federal Reserve officials told us that they made this decision to address: (1) a decline in market-making activities by the broker-dealers that reside within these holding companies; and (2) a rise in

²⁰The Federal Reserve temporarily exempted Treasury securities and deposits held at Federal Reserve Banks from the denominator of the SLR calculation. This means that affected bank holding companies were not required to hold capital in proportion to the value of these assets for the duration of the exemption. See 12 C.F.R. § 217.303.

these firms' cash reserves held at the Federal Reserve, due in part to its large-scale asset purchases.²¹

Our analysis of market data indicates that liquidity and volatility measures for Treasury notes and bonds quickly improved following the Federal Reserve's actions. Market participants we interviewed told us that the Federal Reserve's interventions helped restore market functioning to pre-pandemic conditions by summer 2020.

Despite this, several market participants and experts we interviewed expressed concerns about the extent to which the private market can mitigate future disruptions without continued support from the Federal Reserve. As we have previously reported, disruptions that significantly affect the combination of liquidity, depth, and safety of Treasury securities could lessen the unique advantages of the Treasury market and negatively affect the demand for Treasury securities.²²

Treasury Plans to Assess Structural Challenges to the Treasury Market

Intermediation Challenges Pose Risks to the Treasury Market

The March 2020 disruption highlighted risks to the Treasury securities market. An efficient and liquid secondary market for Treasury securities that is resilient to financial stress is important to Treasury's ability to finance government borrowing and helps support a stable financial system. Our analysis of market data, documents from federal agencies that monitor the Treasury market, and research by academics, private organizations, and market participants identified two key structural challenges that pose risks to Treasury market functioning: (1) pressures on broker-dealer intermediation, and (2) challenges introduced by principal trading firms during episodes of stress. In April 2021, Treasury

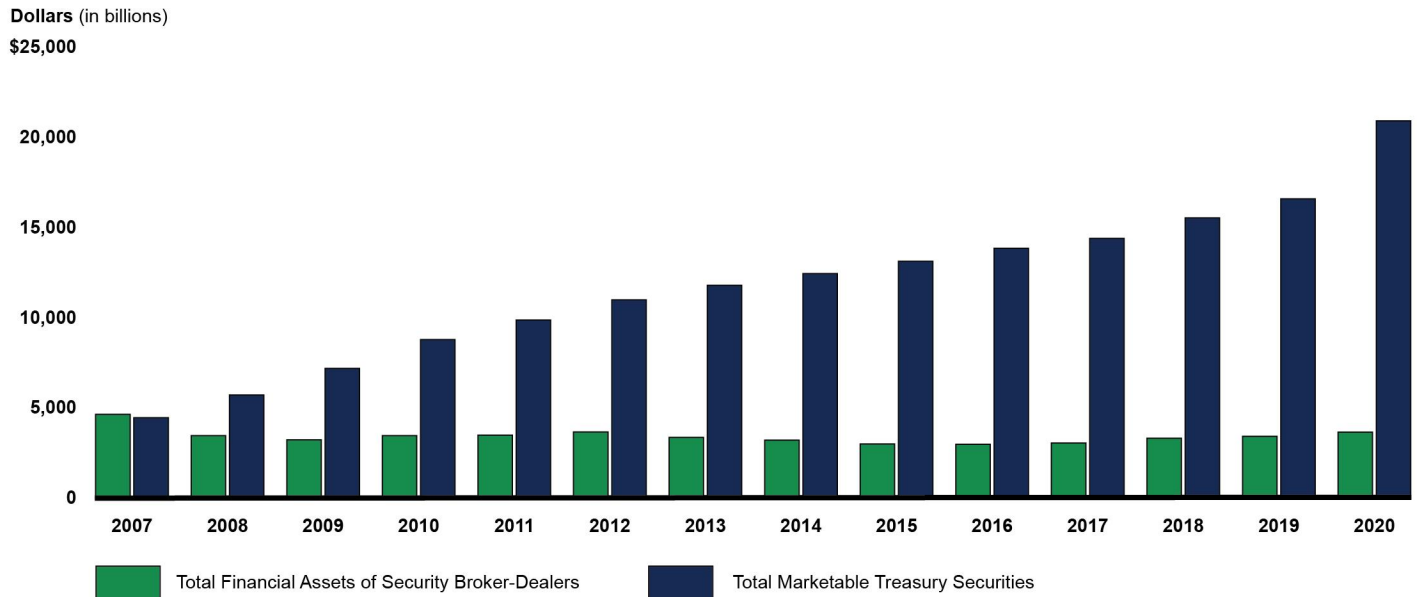
²¹When the Federal Reserve purchases Treasury securities from primary dealers in the secondary market, it pays for them by making a deposit in the primary dealers' accounts maintained at the Federal Reserve. This, in turn, increases the overall supply of reserves in the financial system.

²²GAO, *Federal Debt Management: Treasury Should Strengthen Policies for Market Outreach and Analysis to Maintain Broad-Based Demand for Securities*, [GAO-20-131](#), (Washington, D.C.: Dec. 5, 2019).

announced it will be coordinating an interagency analysis of the March 2020 disruption and evaluating options to enhance Treasury market resilience, as discussed later in this report.²³ This is an important initial step in addressing these structural challenges.

Pressures on broker-dealer intermediation—including those associated with the growth in outstanding marketable Treasury securities and compliance with the SLR—could continue to pose challenges for Treasury market liquidity. For example, since 2007, the size of the Treasury market has grown rapidly while the total financial assets that broker-dealers hold on their balance sheets, which is one measure of their intermediation capacity, has declined slightly. As of December 31, 2020, total outstanding marketable Treasury securities were \$20.9 trillion, compared to total broker-dealer financial assets of \$3.7 trillion (see fig. 9).

Figure 9: Total Marketable Treasury Securities Outstanding and Total Financial Assets of Security Broker-Dealers, 2007 to 2020



Source: GAO analysis of Federal Reserve Financial Accounts of the United States – Z.1. | GAO -21-606

²³Deputy Assistant Secretary for Federal Finance Brian Smith, *Remarks at the Federal Reserve Bank of New York’s Annual Primary Dealer Meeting* (Apr. 8, 2021). The interagency working group for Treasury Market Surveillance was formed in 1992 to strengthen monitoring, surveillance, and interagency coordination with respect to the Treasury market. It consists today of Treasury, the Federal Reserve Board of Governors, the Securities and Exchange Commission, the Commodity Futures Trading Commission, and the Federal Reserve Bank of New York.

Data table for Figure 9: Total Marketable Treasury Securities Outstanding and Total Financial Assets of Security Broker-Dealers, 2007 to 2020

Year	Total Financial assets of Security Broker-Dealers	Total Marketable Treasury Securities
2007	4685.92	4493.69
2008	3505.56	5757.06
2009	3269.27	7232.69
2010	3503.63	8822.66
2011	3532.76	9906.09
2012	3706.47	11027.9
2013	3408.37	11834.2
2014	3254.71	12480.9
2015	3044.04	13169.0
2016	3022.48	13880.2
2017	3097.17	14434.6
2018	3358.93	15566.2
2019	3468.64	16628.9
2020	3701.00	20946.2

The Congressional Budget Office projects that the annual budget deficit will average \$1.2 trillion over the next 10 fiscal years, requiring continued increases in debt issuance.²⁴ Without an increase in broker-dealers' capacity or willingness to intermediate Treasury securities, or additional intermediation provided by other market participants, disruptions could become more frequent. For example, future episodes of investor selling that are relatively modest in proportion to the overall size of the Treasury market could result in net sales that are at least as large as those seen in March 2020.

Fiscal policy and the strength of the economy determine the size of the deficit and the amount of Treasury securities outstanding. However, it is important for Treasury officials to understand how the growing supply of Treasury securities affects investor behavior, market functioning, and the resilience of the Treasury market. These factors have a meaningful effect on interest rates on Treasury securities and, ultimately, the government's cost of borrowing. Treasury officials told us that they view the large borrowing needs associated with the federal response to COVID-19 as a

²⁴The Congressional Budget Office, *The Budget and Economic Outlook: 2021 to 2031* (Feb. 2021).

significant challenge to meeting the agency's primary debt management goal.²⁵

In addition, the SLR may limit intermediation in Treasury securities by increasing the cost of holding Treasury securities for certain broker-dealers. The SLR was implemented as part of a set of post-financial crisis regulatory reforms to promote resilience in the financial system by strengthening bank capital and liquidity standards.²⁶ However, because the SLR requires large bank holding companies to hold a certain amount of capital in proportion to their total assets, including low-risk assets like Treasury securities, broker-dealers that reside within these holding companies may prefer to limit their inventories of Treasury securities that they use for making markets. Instead, they may concentrate on other business lines that generate higher returns.²⁷

As demonstrated by the March 2020 disruption, constrained intermediation in Treasury securities by broker-dealers negatively affected liquidity during a period of exceptionally large sales. Many market participants we interviewed, representing diverse investor sectors, told us that the SLR will continue to pose challenges to Treasury market liquidity against a backdrop of continued debt issuance, and increases in the amount of Treasury securities outstanding.

Our analysis and our assessment of related research provide additional evidence that the growth in Treasury securities outstanding and, to a lesser extent, compliance with the SLR, may have increased the yields investors required to hold Treasury securities relative to alternatives and

²⁵In March 2021, we reported that once the economy substantially recovers from the pandemic, Congress and the administration need to develop an approach to place the government on a sustainable long-term fiscal path. See GAO, *The Nation's Fiscal Health: After Pandemic Recovery, Focus Needed on Achieving Long-Term Fiscal Sustainability*, [GAO-21-275SP](#) (Washington, D.C.: Mar. 23, 2021).

²⁶See GAO, *Bank Capital Reforms: Initial Effects of Basel III on Capital, Credit, and International Competitiveness*, [GAO-15-67](#) (Washington, D.C.: Nov. 20, 2014)

²⁷See for example Dong Beom Choi, Michael R. Holcomb, and Donald P. Morgan, "Bank Leverage Limits and Regulatory Arbitrage: Old Question, New Evidence," *Federal Reserve Bank of New York Staff Reports*, no. 856, Dec. 2019.

could contribute to structural challenges in the Treasury market.²⁸ We analyzed the difference between the yield on a Treasury security and the yield on a fixed interest rate overnight indexed swap (OIS) contract—contracts which share certain key features with Treasury securities (see text box).

Overnight Indexed Swap (OIS)

OIS is an overnight indexed swap contract, a type of derivative used to acquire fixed interest payments that can be on the same payment schedule as Treasury securities, and with little risk of default. Because both OIS rates and Treasury rates are influenced by investor expectations of future short-term interest rates, changes in the spread between the two rates can reflect changes in the demand for Treasury securities relative to other options. As such, OIS interest rates make an informative comparison for interest rates on Treasury securities.

Source: GAO. | GAO 21-606

Since 2008, the difference between these yields—or the Treasury-OIS spread—has grown considerably. In early 2008, for example, the 5-year Treasury yield was generally almost 0.5 percent lower than a comparable OIS yield. However, in early 2019 the 5-year Treasury yield was about 0.2 percent higher than a comparable OIS yield—meaning that investors required higher returns to hold 5-year Treasury securities than to enter into a 5-year OIS contract.

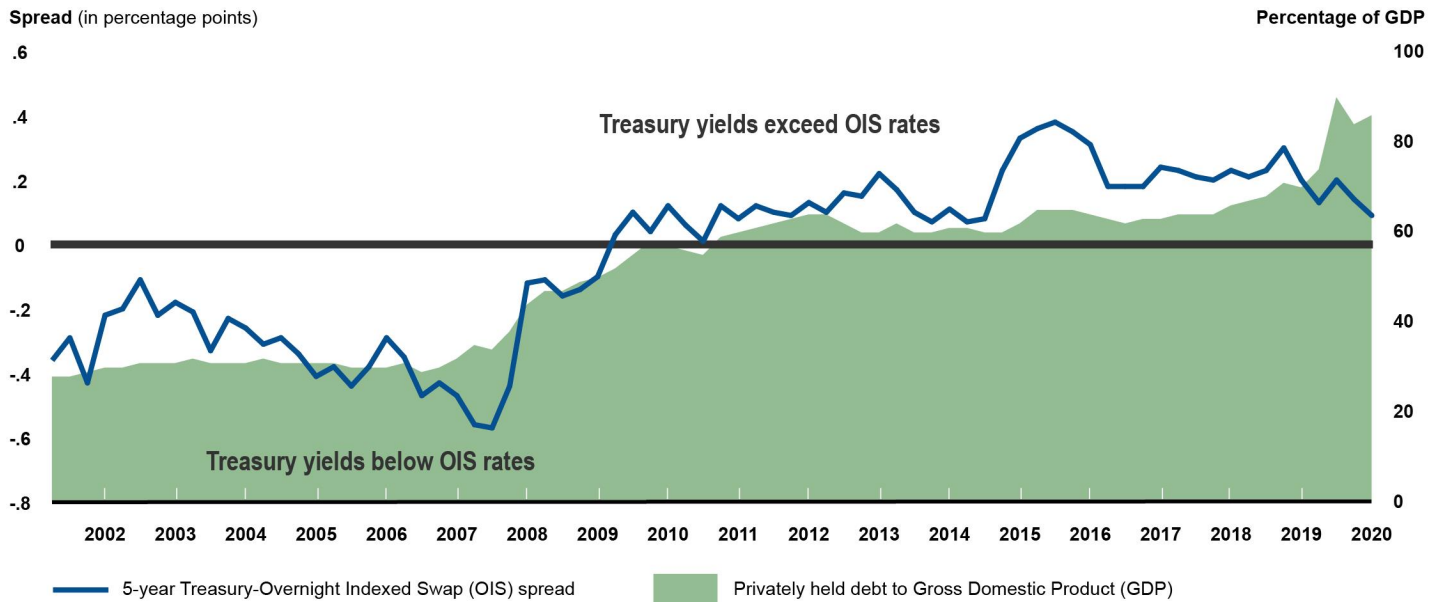
We developed a regression model of the 5-year Treasury-OIS spread. Our results suggest that the growth of Treasury securities outstanding has been associated with a large share of the increase in the spread. In addition, our analysis indicates the spread increased more than one

²⁸See Zhiguo He, Stefan Nagel, and Zhaogang Song, “Treasury Inconvenience Yields during the COVID-19 Crisis,” *NBER Working Paper*, No. 27416 (Nov. 2020), Edward Gamber and John Seliski, “The Effect of Government Debt on Interest Rates,” *Congressional Budget Office Working Paper Series*, Working Paper 2019-01 (Mar. 2019), Nina Boyarchenko, Pooja Gupta, Nick Steele, and Jacqueline Yen, “Negative Swap Spreads,” *Federal Reserve Bank of New York Economic Policy Review* 24, no. 2 (Oct. 2018), and Arvind Krishnamurthy and Annette Vissing-Jorgensen, “The Aggregate Demand for Treasury Debt,” *Journal of Political Economy* (2012).

would expect based on the growth of Treasury debt alone as federal banking agencies implemented the SLR.²⁹

As shown in figure 10, the widening of the 5-year Treasury-OIS spread between 2008 and 2019 largely coincided with the growth of privately held Treasury debt. In 2010, investors began requiring higher returns to hold a 5-year Treasury note than to enter into a comparable OIS contract. In 2020, the Federal Reserve temporarily exempted Treasury securities from the SLR from April onward and the Treasury-OIS spread fell in the second half of the year despite a significant rise in privately held Treasury debt over most of 2020.

Figure 10: Growth in 5-Year Treasury-Overnight Indexed Swap Spread and Privately Held Marketable Treasury Securities, 2002 to 2020



Source: GAO analysis of data from Bloomberg, Treasury, Federal Reserve Bank of Dallas, and Bureau of Economic Analysis. | GAO -21-606

²⁹We use a number of regression models to assess the extent to which maturity-matched Treasury-OIS spreads might be explained by the market value of Treasury debt outstanding scaled by gross domestic product and SLR implementation phases. This approach is designed to control for maturity, default risk, and underlying demand for safe assets. A number of other factors could also influence the Treasury-OIS spread, including factors that may not be captured by our analyses such as changes in the demand for swaps. As such, our analysis results do not, on their own, provide definitive evidence on the factors behind changes in the Treasury-OIS spread.

Data table for Figure 10: Growth in 5-Year Treasury-Overnight Indexed Swap Spread and Privately Held Marketable Treasury Securities, 2002 to 2020

Quarter Start	Five-Year Treasury-OIS (quarter end)	5-Year Treasury-Overnight Indexed Swap (OIS) spread	Privately Held Debt to Gross Domestic Product (GDP)
1/1/2002	-0.356	-0.4	28
4/1/2002	-0.294	-0.3	28
7/1/2002	-0.427	-0.4	29
10/1/2002	-0.216	-0.2	30
1/1/2003	-0.197	-0.2	30
4/1/2003	-0.106	-0.1	31
7/1/2003	-0.221	-0.2	31
10/1/2003	-0.177	-0.2	31
1/1/2004	-0.206	-0.2	32
4/1/2004	-0.328	-0.3	31
7/1/2004	-0.234	-0.2	31
10/1/2004	-0.262	-0.3	31
1/1/2005	-0.314	-0.3	32
4/1/2005	-0.2855	-0.3	31
7/1/2005	-0.341	-0.3	31
10/1/2005	-0.407	-0.4	31
1/1/2006	-0.3825	-0.4	31
4/1/2006	-0.442	-0.4	30
7/1/2006	-0.376	-0.4	30
10/1/2006	-0.2875	-0.3	30
1/1/2007	-0.348	-0.3	31
4/1/2007	-0.4685	-0.5	29
7/1/2007	-0.433	-0.4	30
10/1/2007	-0.474	-0.5	32
1/1/2008	-0.558	-0.6	35
4/1/2008	-0.572	-0.6	34
7/1/2008	-0.4365	-0.4	38
10/1/2008	-0.116	-0.1	44
1/1/2009	-0.1085	-0.1	47
4/1/2009	-0.155	-0.2	47
7/1/2009	-0.144	-0.1	49
10/1/2009	-0.104	-0.1	50
1/1/2010	0.0335	0.0	52
4/1/2010	0.099	0.1	55

Letter

Quarter Start	Five-Year Treasury-OIS (quarter end)	5-Year Treasury-Overnight Indexed Swap (OIS) spread	Privately Held Debt to Gross Domestic Product (GDP)
7/1/2010	0.0365	0.0	58
10/1/2010	0.12	0.1	57
1/1/2011	0.055	0.1	56
4/1/2011	0.011	0.0	55
7/1/2011	0.119	0.1	59
10/1/2011	0.077	0.1	60
1/1/2012	0.115	0.1	61
4/1/2012	0.099	0.1	62
7/1/2012	0.094	0.1	63
10/1/2012	0.132	0.1	64
1/1/2013	0.096	0.1	64
4/1/2013	0.156	0.2	62
7/1/2013	0.154	0.2	60
10/1/2013	0.217	0.2	60
1/1/2014	0.168	0.2	62
4/1/2014	0.104	0.1	60
7/1/2014	0.069	0.1	60
10/1/2014	0.105	0.1	61
1/1/2015	0.074	0.1	61
4/1/2015	0.082	0.1	60
7/1/2015	0.233	0.2	60
10/1/2015	0.332	0.3	62
1/1/2016	0.357	0.4	65
4/1/2016	0.376	0.4	65
7/1/2016	0.345	0.3	65
10/1/2016	0.313	0.3	64
1/1/2017	0.179	0.2	63
4/1/2017	0.176	0.2	62
7/1/2017	0.176	0.2	63
10/1/2017	0.237	0.2	63
1/1/2018	0.23	0.2	64
4/1/2018	0.208	0.2	64
7/1/2018	0.195	0.2	64
10/1/2018	0.227	0.2	66
1/1/2019	0.209	0.2	67
4/1/2019	0.231	0.2	68

Quarter Start	Five-Year Treasury-OIS (quarter end)	5-Year Treasury-Overnight Indexed Swap (OIS) spread	Privately Held Debt to Gross Domestic Product (GDP)
7/1/2019	0.302	0.3	71
10/1/2019	0.196	0.2	70
1/1/2020	0.134	0.1	74
4/1/2020	0.201	0.2	90
7/1/2020	0.137	0.1	84
10/1/2020	0.092	0.1	85.5

Notes: Treasury-OIS spread and privately held debt to GDP are displayed as end of quarter values. Privately held Treasury debt excludes marketable debt held by the Federal Reserve.

Principal trading firms—or firms that primarily use high-speed automated trading strategies and trade using their own capital rather than on behalf of clients—are active Treasury market participants that help support liquidity. However, during two notable episodes of elevated volatility, principal trading firms (PTF) made notable adjustments to their trading activity, which added to liquidity strains during these periods of stress. Certain aspects of PTFs, such as the trading strategies they use and the constraints under which they operate, are less well understood than those of regulated financial institutions.³⁰

Analyses of Treasury market trading volumes highlight the important role of PTFs in supporting liquidity. For example, we estimate that from July 2017 to February 2020, PTFs accounted for about 21 percent of all trading volume in the Treasury market and about 58 percent of the trading volume on electronic interdealer broker platforms (venues that facilitate trading among broker-dealers).³¹ In addition, Treasury and the Federal Reserve have suggested that the high-speed trading technology used by these firms helps keep bid-ask spreads narrow. This could, in principle, benefit market liquidity in both normal and stressed conditions.

However, according to the Financial Stability Oversight Council, the factors that drive PTF behavior during disruptions are not fully

³⁰This is in part because these firms are not subject to regulatory reporting requirements or detailed disclosures that other financial institutions, such as broker-dealers and investment companies, are required to report. Certain hedge funds and principal trading firms qualify for exemptions from certain securities laws and regulations, including the requirement to register as a broker-dealer or an investment company, as applicable. See 15 U.S.C. §§ 77d, 78J(g), 80b-3(b).

³¹July 2017 is the earliest data available through FINRA's TRACE database.

understood.³² During recent market disruptions, PTFs have made certain adjustments to their participation in the Treasury market that contributed to challenging liquidity conditions. For example, in March 2020, PTFs reduced their market-making activity and accounted for less total trading volume, despite remaining in the market throughout the disruption. In an earlier event on October 15, 2014 (also called the Flash Rally), PTFs trimmed the amount of Treasury securities that they made available for purchase or sale at any given time on electronic trading platforms—an important measure of liquidity known as market depth—but at the same time significantly increased their overall share of trading volumes.³³

After both events, federal agencies that monitor the Treasury market have recommended further study on these shifts in PTF activity. While the data available to Treasury and to other agencies on PTF activity have improved in recent years, the effect of PTF behavior on liquidity in periods of market stress raises concerns about the ongoing resilience of the Treasury market.³⁴

Treasury Is Coordinating with Interagency Partners to Assess Challenges to the Treasury Market

The federal government is examining and evaluating these and other structural challenges to the Treasury market. In December 2020, the Financial Stability Oversight Council recommended an interagency review of market structure issues that could contribute to volatility in the Treasury market and other key financial markets.³⁵

³²See Financial Stability Oversight Council, *2020 Annual Report*, (Washington, D.C.: Dec. 3, 2020).

³³A Joint Staff Report published by Treasury and its interagency working group partners after the Flash Rally found that PTFs tend to manage their exposure to volatility by reducing the volume of standing orders that they supply to the market, but replenish these orders quickly to sustain high trading volumes. See *Joint Staff Report: The U.S. Treasury Market on October 15, 2014* (Washington, D.C.: July 13, 2015).

³⁴Treasury and other agencies have access to FINRA TRACE data on Treasury securities trading volumes. These data include statistics on how much, in what security types, and in what segments of the market Treasury securities are traded. In April 2019, FINRA began requiring more detailed transaction reporting to better identify the types of firms that are trading with each other.

³⁵Financial Stability Oversight Council, *2020 Annual Report* (Washington, D.C.: Dec. 3, 2020).

In April 2021, Treasury officials announced that the Interagency Working Group for Treasury Market Surveillance will analyze the causes of the March 2020 disruption and consider ways to enhance Treasury market resilience.³⁶ Treasury officials identified several areas for further study—including the challenges we identified above. For example, Treasury plans on examining why broker-dealers could not fully intermediate customer sales during the disruption. It also will assess topics related to principal trading firms' activity, like the deterioration of liquidity on electronic trading platforms during the disruption and the transparency and oversight of electronic trading venues in general. In addition, the Federal Reserve announced it will be seeking public comment on measures to adjust the SLR regulation, which will contribute to ongoing discussions with Treasury on the resilience of the Treasury market.³⁷

These are important initial steps to inform efforts to address ongoing structural challenges to Treasury market functioning. An efficient and liquid Treasury secondary market supports Treasury's ability to fund government borrowing at a low cost—its primary debt management goal. We will monitor the progress of the working group and Treasury's actions to address the structural challenges outlined in this report.

Treasury Quickly Raised Trillions in 2020 to Finance Pandemic Response but Did Not Clearly Communicate Factors Affecting Its Cash Balance

Treasury Raised Trillions in 2020 Primarily through Bills

Treasury raised trillions of dollars quickly to meet the unexpected and unprecedented increases in financing needs—including issuing \$2.5 trillion in April alone.³⁸ Treasury exceeded \$2 trillion in gross issuance in

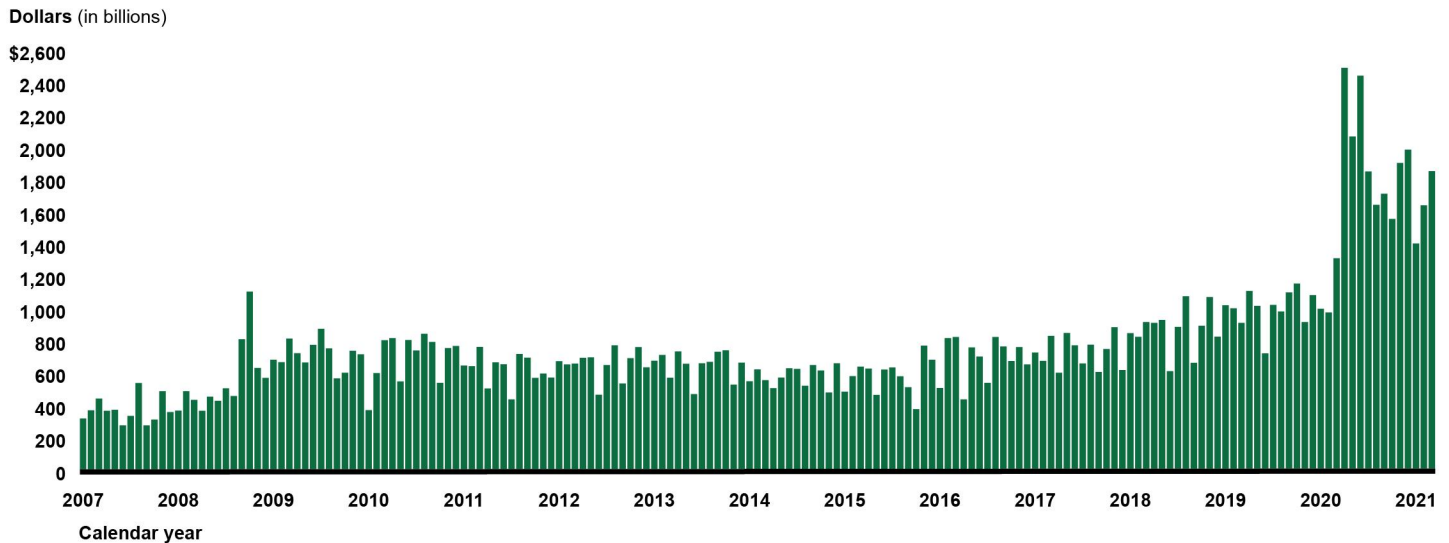
³⁶Deputy Assistant Secretary for Federal Finance Brian Smith, *Remarks at the Federal Reserve Bank of New York's Annual Primary Dealer Meeting* (Apr. 8, 2021).

³⁷The Federal Reserve Board of Governors, *Federal Reserve Board Announces That The Temporary Change To Its Supplementary Leverage Ratio (SLR) For Bank Holding Companies Will Expire As Scheduled On March 31* (Mar. 19, 2021).

³⁸This reflects gross issuance as reported in the Daily Treasury Statement.

April, May, and June 2020 and more than \$1.4 trillion each month through March 2021 (see fig. 11).

Figure 11: Monthly Gross Marketable Debt Issuance, Jan. 2007 to Mar. 2021



Source: GAO analysis of Department of the Treasury data. | GAO-21-606

Data table for Figure 11: Monthly Gross Marketable Debt Issuance, Jan. 2007 to Mar. 2021

Calendar Year-Month	Total gross monthly issuance (Dollars in billions)
2007-01	322.5
2007-02	372.9
2007-03	445.5
2007-04	369.6
2007-05	375.9
2007-06	279.3
2007-07	338.6
2007-08	541.7
2007-09	280.1
2007-10	315.5
2007-11	491.3
2007-12	361.7
2008-01	371.0
2008-02	491.1

Calendar Year-Month	Total gross monthly issuance (Dollars in billions)
2008-03	438.0
2008-04	370.1
2008-05	457.3
2008-06	431.3
2008-07	508.8
2008-08	461.0
2008-09	812.3
2008-10	1,107.1
2008-11	635.2
2008-12	573.9
2009-01	685.2
2009-02	670.8
2009-03	816.2
2009-04	726.5
2009-05	668.9
2009-06	777.5
2009-07	877.5
2009-08	756.3
2009-09	570.6
2009-10	604.8
2009-11	740.9
2009-12	719.6
2010-01	373.7
2010-02	603.5
2010-03	807.2
2010-04	819.6
2010-05	551.2
2010-06	807.5
2010-07	743.4
2010-08	846.0
2010-09	796.2
2010-10	543.0
2010-11	757.6
2010-12	770.7
2011-01	650.1

Calendar Year-Month	Total gross monthly issuance (Dollars in billions)
2011-02	646.0
2011-03	764.8
2011-04	507.7
2011-05	670.0
2011-06	657.8
2011-07	440.4
2011-08	721.0
2011-09	698.7
2011-10	573.5
2011-11	599.9
2011-12	575.2
2012-01	676.4
2012-02	656.7
2012-03	661.4
2012-04	697.9
2012-05	700.9
2012-06	469.1
2012-07	653.0
2012-08	775.0
2012-09	539.0
2012-10	696.0
2012-11	764.0
2012-12	639.0
2013-01	680.0
2013-02	715.0
2013-03	574.0
2013-04	737.0
2013-05	661.0
2013-06	473.0
2013-07	664.0
2013-08	673.0
2013-09	735.0
2013-10	744.0
2013-11	532.0
2013-12	668.0

Calendar Year-Month	Total gross monthly issuance (Dollars in billions)
2014-01	553.0
2014-02	626.3
2014-03	560.0
2014-04	510.0
2014-05	575.0
2014-06	633.0
2014-07	629.0
2014-08	525.0
2014-09	653.0
2014-10	619.0
2014-11	483.1
2014-12	664.0
2015-01	488.0
2015-02	584.0
2015-03	643.0
2015-04	631.4
2015-05	468.4
2015-06	625.0
2015-07	638.0
2015-08	583.3
2015-09	516.0
2015-10	380.0
2015-11	773.3
2015-12	686.0
2016-01	511.0
2016-02	819.6
2016-03	826.6
2016-04	440.4
2016-05	761.6
2016-06	705.5
2016-07	542.6
2016-08	826.5
2016-09	767.8
2016-10	677.5
2016-11	764.1

Calendar Year-Month	Total gross monthly issuance (Dollars in billions)
2016-12	657.0
2017-01	730.2
2017-02	678.3
2017-03	833.6
2017-04	605.5
2017-05	851.4
2017-06	774.9
2017-07	663.1
2017-08	778.8
2017-09	610.0
2017-10	752.6
2017-11	886.9
2017-12	622.0
2018-01	850.5
2018-02	827.6
2018-03	919.0
2018-04	913.8
2018-05	931.7
2018-06	615.0
2018-07	888.8
2018-08	1,079.0
2018-09	667.0
2018-10	896.0
2018-11	1,073.3
2018-12	829.0
2019-01	1,023.0
2019-02	1,004.0
2019-03	914.0
2019-04	1,111.9
2019-05	1,019.5
2019-06	725.0
2019-07	1,024.9
2019-08	984.8
2019-09	1,102.7
2019-10	1,156.8

Calendar Year-Month	Total gross monthly issuance (Dollars in billions)
2019-11	918.9
2019-12	1,085.5
2020-01	1,001.3
2020-02	978.3
2020-03	1,314.0
2020-04	2,491.7
2020-05	2,067.1
2020-06	2,443.9
2020-07	1,850.9
2020-08	1,644.6
2020-09	1,713.1
2020-10	1,557.4
2020-11	1,903.1
2020-12	1,985.8
2021-01	1,405.1
2021-02	1,641.8
2021-03	1,852.6
2021-04	1,782.5
2021-05	1,410.1

Bid-to-Cover ratio

The total amount of securities bid for in an auction divided by the total amount of securities awarded. A higher bid-to-cover ratio indicates stronger demand.

Source: GAO. | 21-606

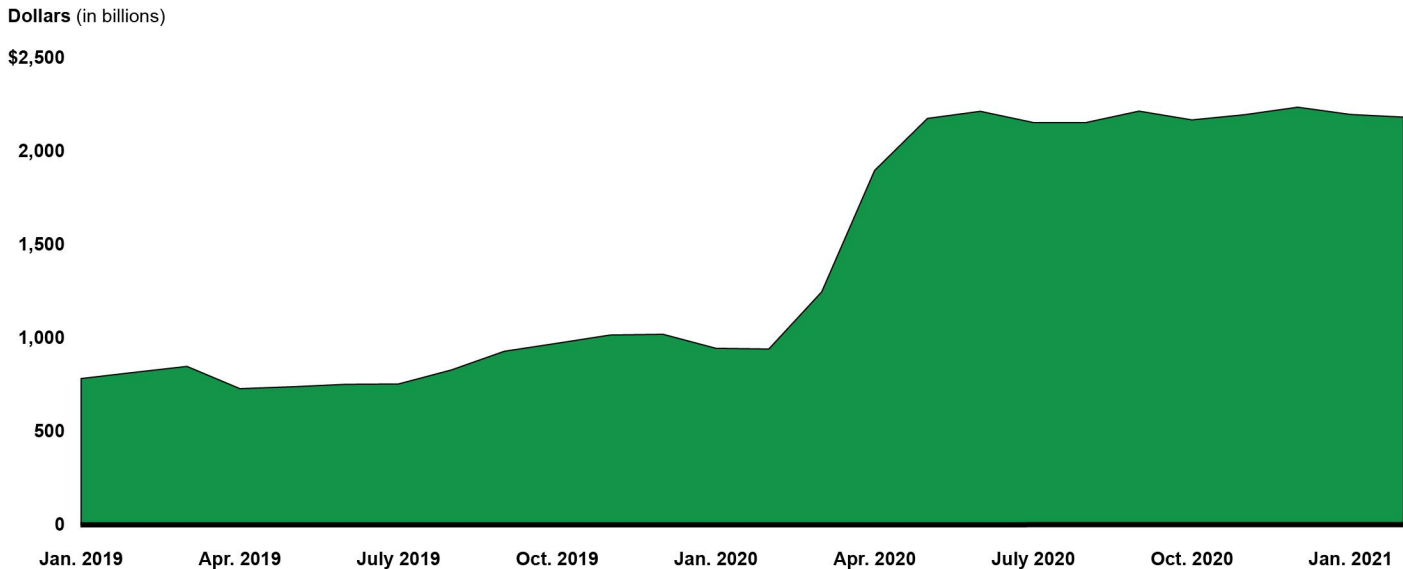
Treasury initially financed this historic borrowing largely through bills. Treasury officials told us that bills are often used to meet unexpected borrowing needs. This is because bills are the most efficient and least costly security type to raise large amounts quickly due to their shorter maturities.

Bills are usually in high demand during times of stress. A key indicator of investor demand—the bid-to-cover ratio—was 3.1 for bills from April to December 2020. This means that investors placed more than \$3 in bids for every dollar offered at auction (see sidebar).³⁹

³⁹This is the average bid-to-cover ratio for all Treasury bill and cash management bill auctions from April to December 2020, weighted by the offering amount for each auction. For comparison, in calendar year 2019, the average weighted bid-to-cover ratio for all Treasury bills was 2.9.

Our analysis of Treasury holdings and interviews with market participants indicate that Treasury’s increased bill issuance was met by exceptionally strong investor demand, especially by money market funds. As investors sold Treasury notes and bonds and other financial assets for cash early in the pandemic, they looked to government money market funds for safe and liquid investments of the cash. Government money market funds in turn invested those funds in Treasury bills.⁴⁰ Figure 12 shows that from February to June 2020, U.S. government money market funds increased their already substantial holdings of Treasury securities by 135 percent, from \$943 billion to more than \$2.2 trillion. These funds have sustained that level of holdings into 2021.

Figure 12: U.S. Government Money Market Funds’ Holdings of Treasury Securities, Jan. 2019 to Feb. 2021



Source: GAO analysis of Department of the Treasury Office of Financial Research Data. | GAO-21-606

⁴⁰Government money market funds are the largest type of money market fund and invest only in cash and U.S. government securities.

Data table for Figure 12: U.S. Government Money Market Funds' Holdings of Treasury Securities, Jan. 2019 to Feb. 2021

Date	U.S. Treasury Debt (Dollars in billions)
1/31/2019	784
2/28/2019	818
3/31/2019	850
4/30/2019	730
5/31/2019	741
6/30/2019	753
7/31/2019	755
8/31/2019	830
9/30/2019	931
10/31/2019	974
11/30/2019	1,018
12/31/2019	1,021
1/31/2020	946
2/29/2020	943
3/31/2020	1,249
4/30/2020	1,899
5/31/2020	2,178
6/30/2020	2,212
7/31/2020	2,153
8/31/2020	2,153
9/30/2020	2,214
10/31/2020	2,167
11/30/2020	2,194
12/31/2020	2,238
1/31/2021	2,198
2/28/2021	2,184

Refinancing and Rollover Risk

The risk associated with having to issue new securities—at a potentially higher interest rate—to pay off the principal that comes due when a Treasury security matures.

Source: GAO. | GAO-21-606

While the strategy of issuing shorter maturity securities in the onset of the crisis helped meet demand for short-term liquid assets, it also introduced refinancing and rollover risk (see sidebar).

In May 2020, Treasury officials announced plans to increase the size of auctions for notes and bonds to manage the maturity profile and limit

potential future issuance volatility.⁴¹ These longer-term securities offer more certainty for budget planning and help mitigate refinancing risk because they do not mature as frequently as bills, and the interest rates are set for the duration of the security.⁴² However, they tend to have higher interest rates than short-term bills.⁴³

As shown in figure 13, the increase in bill issuance starting in April 2020 caused the weighted average maturity (WAM) of the outstanding debt portfolio to drop to 62 months from its pre-pandemic average of 70 months.⁴⁴ The WAM—the average of the maturity of all debt outstanding weighted by the current face value of that debt—can be a helpful indicator for Treasury’s rollover risk. The shorter the WAM of debt outstanding, the sooner Treasury will need to refinance or roll over the debt at potentially higher interest rates. With the increase in notes and bonds issued, the WAM of the outstanding debt portfolio reached 67 months, or about 5.5 years, in March 2021, closer to the pre-pandemic average.

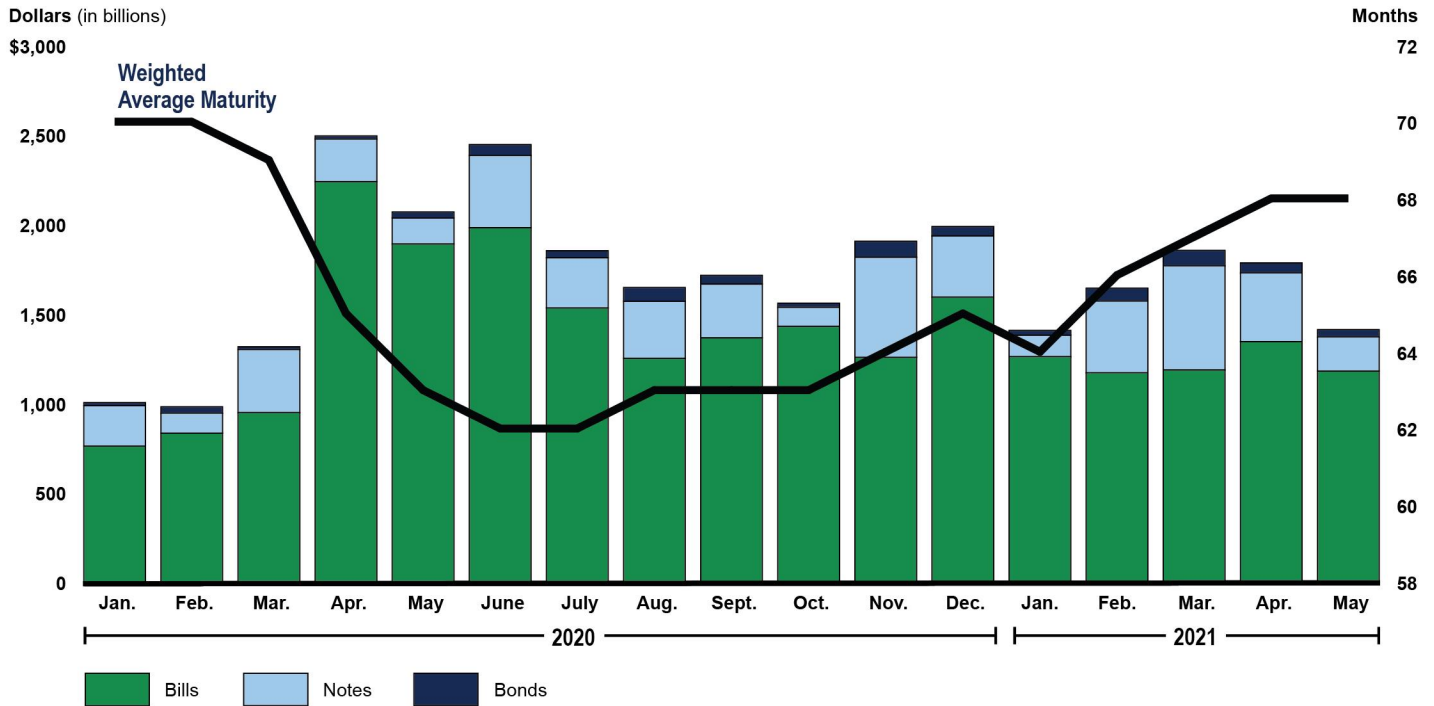
⁴¹Department of the Treasury, *Quarterly Refunding Statement of Deputy Assistant Secretary for Federal Finance Brian Smith* (Washington, D.C.: May 6, 2020).

⁴²The exception is Treasury’s floating rate note, which is a 2-year note but with interest payments that rise and fall based on the discount rates in auctions of 13-week Treasury bills.

⁴³Generally, Treasury must pay a higher interest rate for longer-term securities to compensate buyers for waiting longer for principal to be repaid and accepting increased risk due to uncertainty about future market conditions.

⁴⁴The 2020 low of about 62 months was still higher than during the global financial crisis when the WAM dropped to as low as 49 months (around 4 years) in late 2008 and early 2009.

Figure 13: Monthly Gross Issuance of Treasury Securities, by Security Type and Weighted Average Maturity of Outstanding Debt Portfolio, Jan. 2020 to May 2021



Source: GAO analysis of Department of the Treasury Daily Treasury Statement. | GAO-21-606

Data table for Figure 13: Monthly Gross Issuance of Treasury Securities, by Security Type and Weighted Average Maturity of Outstanding Debt Portfolio, Jan. 2020 to May 2021

Date	Bills (Dollars in billions)	Notes (Dollars in billions)	Bonds (Dollars in billions)	Weighted Average Maturity
Jan. 2020	758.6	226.2	16.5	70
Feb.	831.0	111.9	35.5	70
Mar.	946.0	351.9	16.0	69
Apr.	2,236.6	238.0	17.1	65
May	1,888.4	145.1	33.6	63
June	1,979.5	403.7	60.7	62
July	1,530.4	280.9	39.6	62
Aug.	1,248.3	320.0	76.2	63
Sept.	1,363.8	300.4	49.0	63
Oct.	1,427.4	106.4	23.6	63
Nov.	1,254.5	559.1	89.5	64
Dec.	1,591.1	342.1	52.7	65

Date	Bills (Dollars in billions)	Notes (Dollars in billions)	Bonds (Dollars in billions)	Weighted Average Maturity
Jan. 2021	1,258.1	120.7	26.4	64
Feb.	1,168.3	400.4	73.0	66
Mar.	1,184.2	581.8	86.6	67
Apr.	1,342.7	383.5	56.3	68
May	1,178.2	190.5	41.3	68

Notes: Bills include cash management bills. Treasury Floating Rate Notes and Inflation Protected Securities are included in the notes and bonds category. This is consistent with Treasury's reporting convention in its Daily Treasury Statement. The Weighted Average Maturity is the average of maturity of all debt outstanding weighted by the current face value of that debt.

Treasury Established Routine Cash Management Bill Auctions to Raise \$6.4 Trillion and Improve Predictability for Investors

Many of the bills Treasury issued to finance COVID-19 borrowing were cash management bills (CMB). Typically, CMBs are not auctioned on a regular schedule and are issued in variable maturities—usually a matter of days—to cover intra-month financing gaps. Our prior work found that CMBs have historically had higher yields compared to regularly issued bills, meaning that they carry a higher interest cost.⁴⁵

However, as the scope of the pandemic and the government's response began to take shape, Treasury's issuance strategy was to establish a regular and predictable CMB schedule to raise more than \$6 trillion, improve predictability for investors, and keep borrowing costs low. From March 13, 2020 to February 16, 2021, Treasury issued \$6.4 trillion from 197 CMB auctions, most of which was raised through regular weekly auctions of these four CMBs at set maturity points:⁴⁶

- Issuance of 15- and 22-week CMBs on Tuesdays

⁴⁵In 2006 and 2010 we reported that Treasury paid a premium for its use of CMBs. See [GAO-10-498](#) and *Debt Management: Treasury Has Refined Its Use of Cash Management Bills but Should Explore Options That May Reduce Cost Further*, [GAO-06-269](#) (Washington, D.C.: Mar. 30, 2006).

⁴⁶In contrast, during the global financial crisis, Treasury issued almost \$1.1 trillion in irregular CMBs over a three-year period (Jan. 1, 2008 to Dec. 31, 2010).

- Issuance of 6- and 17-week CMBs on Thursdays.⁴⁷

The regular and predictable approach was successful, according to Treasury officials and market participants we interviewed. Key metrics indicate that demand was strong for Treasury’s CMBs. Also, yields remained low and similar to other benchmark bills. Our analysis of CMB and bill yields during the COVID-19 response found almost no difference between the yields paid on CMBs and the yields paid on comparable benchmark bills.⁴⁸

According to Treasury debt management officials, its debt management strategy during the pandemic was guided by several considerations:

- **Maintaining a regular and predictable auction schedule.** Typically, CMBs are not auctioned on a regular schedule and are announced one to four days prior to the auction. However, Treasury officials know that market participants value a regular auction schedule as it allows investors to plan their purchases and broker-dealers to plan their distribution of securities to their clients.
- **Providing reinvestment opportunities.** Treasury structured issuance of the CMBs so that they matured on the same days each week as regularly scheduled—or benchmark—Treasury bills. This provides investors with more reinvestment options and adds to the liquidity of existing securities. For example, on the auction settlement date, the maturing Treasury securities can be exchanged for the newly issued Treasury securities.
- **Keeping benchmark bill auctions at manageable sizes.** Large swings in auction sizes can result in higher yields or disruptions in liquidity. Adding auctions to the schedule is one way Treasury can increase financing without disrupting the size of planned auctions. Several market participants we interviewed told us that the additional

⁴⁷Department of the Treasury, *Quarterly Refunding Statement of Deputy Assistant Secretary for Federal Finance Brian Smith* (Washington, D.C.: May 6, 2020). March 13, 2020 is the date that the federal government declared COVID-19 a national emergency, and February 16, 2021 was the last settlement date for two of the four regular CMBs that Treasury issued during the pandemic.

⁴⁸See appendix II for more information. Our analysis does not allow us to identify the causes of changes in yield differentials over time. For example, we do not control for factors that could affect the size of the CMB bill yield differential between the two periods, such as changes in the interest rate environment, the amount of marketable Treasury securities outstanding, and post-financial crisis reforms that may have structurally shifted demand for certain Treasury securities by different investor types.

CMB auctions helped to spread out Treasury's large bill issuance across more weekly auctions with a variety of maturity terms, which benefited market liquidity.

Treasury officials told us that their experience issuing CMBs outside of the regular auction framework during the global financial crisis informed its different strategy for using CMBs during COVID-19. Our analysis found that between 2008 and 2010, CMB yields were slightly higher on average than bills sold at the next auction or bills being traded on the secondary market.⁴⁹ As a result, we estimate that Treasury paid \$152 to \$288 million in extra interest costs for the \$1.1 trillion in CMBs it issued from 2008 to 2010—a 0.01 to 0.03 percent premium. See appendix II for more details.

If, during the government's COVID-19 response, investors had required a premium for CMBs similar to what we found between 2008 and 2010, Treasury would have paid about \$913 million to \$1.7 billion in additional borrowing costs for its issuance of \$6.4 trillion in CMBs.

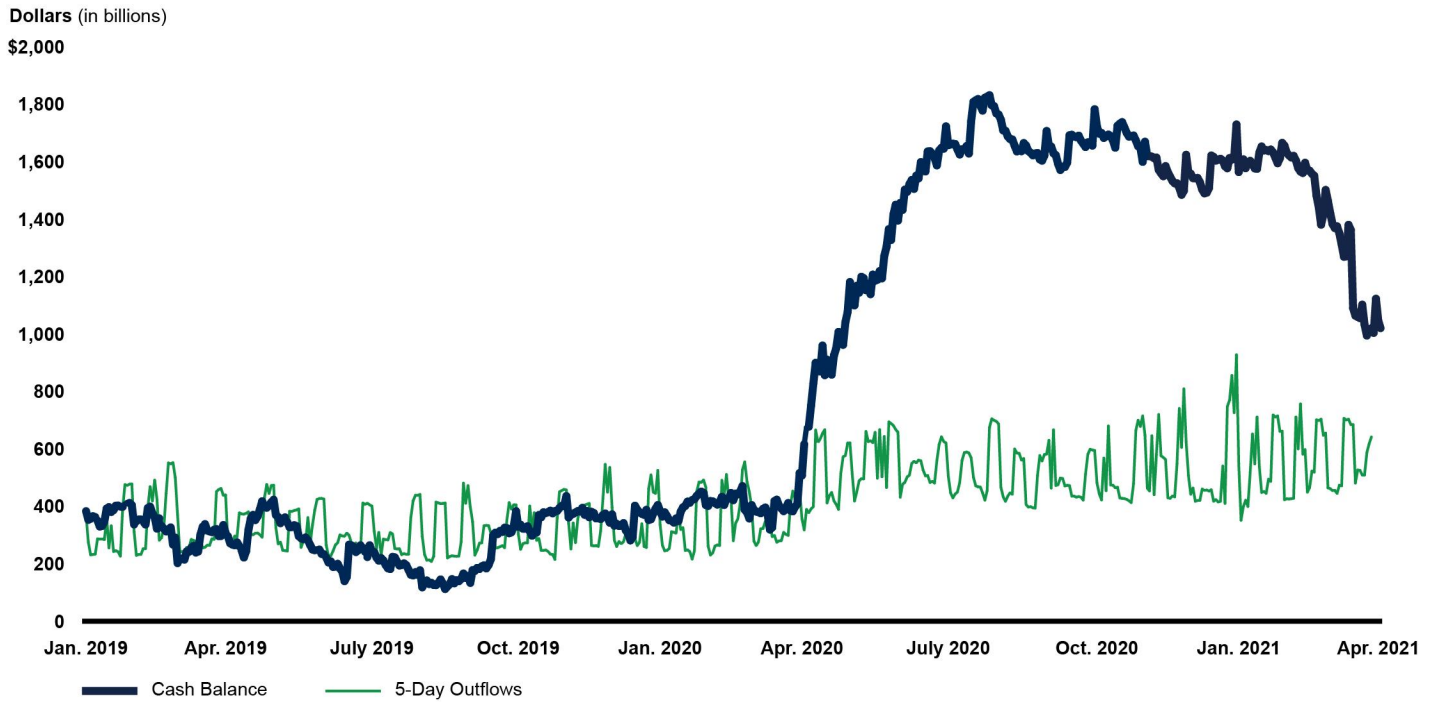
Treasury Added More than \$1 Trillion to Its Cash Balance to Manage Uncertainty but Market Participants Were Unclear What Factors Informed Decisions

Between March and June 2020, Treasury added more than \$1 trillion to its operating cash balance—held in the Treasury General Account (TGA) at the Federal Reserve—and maintained a historic level of around \$1.6 trillion from June 2020 through January 2021. This is more than three times larger than its pre-pandemic record-high of \$470 billion (see fig. 14). The TGA functions as Treasury's checking account and is used to deposit government receipts—such as tax payments and proceeds from auctions of Treasury securities—and to pay government obligations.⁵⁰

⁴⁹The CMB yields were 12 to 16 basis points higher than benchmark bills. The range is based on two methodologies analyzing CMBs and benchmark bill yields at auction and yields for bills trading in the secondary market.

⁵⁰Treasury manages the funds that flow through the federal government's accounts. These accounts are maintained across the 12 Federal Reserve Banks and rolled into one account, the TGA, at the end of each day.

Figure 14: Treasury’s Daily Cash Balance and 5-Day Average Outflows, Jan. 2019 to Apr. 2021



Source: GAO analysis of Department of the Treasury Daily Treasury Statements. | GAO-21-606

Data table for Figure 14: Treasury’s Daily Cash Balance and 5-Day Average Outflows, Jan. 2019 to Apr. 2021

Date	cash balance (Dollars in billions)	5-day outflows (Dollars in billions)
2019-01-02	382.62	367.1
2019-01-03	352.18	273.4
2019-01-04	356.12	230.8
2019-01-07	364.76	231.8
2019-01-08	362.16	233.1
2019-01-09	349.44	285.9
2019-01-10	329.20	285.6
2019-01-11	331.35	285.8
2019-01-14	346.99	284.0
2019-01-15	391.61	358.4
2019-01-16	396.41	254.8
2019-01-17	379.67	331.6

Date	cash balance (Dollars in billions)	5-day outflows (Dollars in billions)
2019-01-18	385.98	242.3
2019-01-22	401.58	244.9
2019-01-23	402.23	241.4
2019-01-24	398.33	225.8
2019-01-25	397.63	392.5
2019-01-28	407.39	474.9
2019-01-29	412.93	472.4
2019-01-30	411.38	476.6
2019-01-31	403.60	477.2
2019-02-01	336.15	311.2
2019-02-04	347.48	229.1
2019-02-05	353.20	232.0
2019-02-06	353.90	232.1
2019-02-07	338.55	252.2
2019-02-08	335.83	252.2
2019-02-11	394.02	397.2
2019-02-12	398.59	467.6
2019-02-13	375.12	418.2
2019-02-14	361.35	490.3
2019-02-15	321.81	424.2
2019-02-19	357.69	281.5
2019-02-20	331.00	290.2
2019-02-21	321.45	327.1
2019-02-22	311.88	444.1
2019-02-25	324.76	550.4
2019-02-26	326.15	547.2
2019-02-27	266.02	551.6
2019-02-28	290.67	499.5
2019-03-01	201.57	369.9
2019-03-04	213.03	239.2
2019-03-05	218.31	241.9
2019-03-06	213.61	240.8
2019-03-07	242.86	256.6
2019-03-08	240.93	257.0
2019-03-11	255.50	284.1

Date	cash balance (Dollars in billions)	5-day outflows (Dollars in billions)
2019-03-12	262.27	280.4
2019-03-13	238.38	277.9
2019-03-14	241.67	279.9
2019-03-15	300.83	280.9
2019-03-18	328.71	254.5
2019-03-19	337.76	257.0
2019-03-20	314.75	264.3
2019-03-21	311.88	263.6
2019-03-22	309.96	286.3
2019-03-25	318.20	284.8
2019-03-26	320.55	450.7
2019-03-27	295.59	458.3
2019-03-28	295.96	461.4
2019-03-29	334.01	438.2
2019-04-01	307.32	438.9
2019-04-02	295.52	273.5
2019-04-03	270.47	278.7
2019-04-04	265.83	272.2
2019-04-05	264.19	295.6
2019-04-08	273.80	292.7
2019-04-09	260.47	376.9
2019-04-10	245.66	373.0
2019-04-11	221.49	372.3
2019-04-12	243.94	375.2
2019-04-15	317.92	380.3
2019-04-16	356.27	301.2
2019-04-17	369.37	300.3
2019-04-18	351.85	305.9
2019-04-19	364.54	306.7
2019-04-22	388.84	300.5
2019-04-23	416.99	291.8
2019-04-24	398.92	430.6
2019-04-25	394.32	475.4
2019-04-26	401.16	444.4
2019-04-29	414.34	471.8

Date	cash balance (Dollars in billions)	5-day outflows (Dollars in billions)
2019-04-30	422.59	472.8
2019-05-01	368.76	324.3
2019-05-02	362.91	268.8
2019-05-03	340.56	274.5
2019-05-06	348.08	246.2
2019-05-07	361.38	245.2
2019-05-08	344.46	244.0
2019-05-09	326.72	382.2
2019-05-10	326.82	381.6
2019-05-13	333.92	384.9
2019-05-14	330.43	386.8
2019-05-15	294.97	390.5
2019-05-16	288.08	256.4
2019-05-17	285.01	278.3
2019-05-20	291.35	277.2
2019-05-21	281.01	360.0
2019-05-22	264.58	270.1
2019-05-23	249.02	334.9
2019-05-24	246.42	386.7
2019-05-28	250.73	423.3
2019-05-29	249.01	426.6
2019-05-30	233.81	427.1
2019-05-31	232.87	424.6
2019-06-03	221.32	264.3
2019-06-04	204.07	226.4
2019-06-05	207.65	227.0
2019-06-06	188.65	244.4
2019-06-07	189.66	264.8
2019-06-10	199.12	272.5
2019-06-11	183.10	300.1
2019-06-12	173.06	296.4
2019-06-13	139.17	295.4
2019-06-14	153.85	306.5
2019-06-17	265.79	298.6
2019-06-18	263.64	272.8

Date	cash balance (Dollars in billions)	5-day outflows (Dollars in billions)
2019-06-19	258.64	269.4
2019-06-20	240.05	271.4
2019-06-21	246.05	241.7
2019-06-24	263.92	245.7
2019-06-25	255.08	411.1
2019-06-26	240.91	406.2
2019-06-27	222.82	410.5
2019-06-28	263.71	404.5
2019-07-01	242.63	400.3
2019-07-02	239.65	311.9
2019-07-03	220.91	253.1
2019-07-05	210.52	308.6
2019-07-08	219.25	230.4
2019-07-09	210.86	285.5
2019-07-10	195.23	283.5
2019-07-11	183.74	282.8
2019-07-12	181.38	308.3
2019-07-15	223.38	303.4
2019-07-16	221.58	252.3
2019-07-17	206.20	251.1
2019-07-18	193.49	251.7
2019-07-19	195.44	231.4
2019-07-22	200.84	234.8
2019-07-23	194.65	232.4
2019-07-24	178.23	232.6
2019-07-25	161.32	360.7
2019-07-26	159.06	418.7
2019-07-29	170.08	437.9
2019-07-30	161.08	437.7
2019-07-31	176.66	440.6
2019-08-01	117.63	294.1
2019-08-02	133.67	231.8
2019-08-05	141.11	211.9
2019-08-06	129.11	213.1
2019-08-07	133.08	207.3

Date	cash balance (Dollars in billions)	5-day outflows (Dollars in billions)
2019-08-08	125.67	225.6
2019-08-09	125.21	414.0
2019-08-12	132.75	411.4
2019-08-13	144.67	408.9
2019-08-14	130.98	409.4
2019-08-15	111.77	411.0
2019-08-16	120.77	219.8
2019-08-19	128.67	224.6
2019-08-20	145.90	227.5
2019-08-21	131.45	225.9
2019-08-22	142.43	225.4
2019-08-23	139.04	226.4
2019-08-26	146.69	275.5
2019-08-27	165.33	480.0
2019-08-28	150.15	410.4
2019-08-29	156.86	471.5
2019-08-30	133.09	396.9
2019-09-03	177.18	346.0
2019-09-04	174.78	229.6
2019-09-05	184.90	247.0
2019-09-06	181.51	271.2
2019-09-09	190.40	272.2
2019-09-10	193.99	331.8
2019-09-11	183.58	333.1
2019-09-12	195.30	332.1
2019-09-13	215.58	306.0
2019-09-16	298.76	311.2
2019-09-17	307.73	254.1
2019-09-18	303.06	255.4
2019-09-19	313.80	258.9
2019-09-20	310.51	262.6
2019-09-23	324.73	255.3
2019-09-24	323.46	352.7
2019-09-25	305.81	412.1
2019-09-26	309.38	389.7

Date	cash balance (Dollars in billions)	5-day outflows (Dollars in billions)
2019-09-27	330.28	404.9
2019-09-30	382.48	404.3
2019-10-01	328.32	303.3
2019-10-02	335.19	250.0
2019-10-03	321.73	269.2
2019-10-04	321.69	272.4
2019-10-07	330.06	272.3
2019-10-08	313.11	400.4
2019-10-09	297.39	322.0
2019-10-10	307.70	377.2
2019-10-11	308.48	281.0
2019-10-15	369.11	287.2
2019-10-16	361.50	245.9
2019-10-17	378.57	245.8
2019-10-18	376.29	247.3
2019-10-21	379.07	242.5
2019-10-22	384.22	233.0
2019-10-23	375.17	231.8
2019-10-24	382.89	214.8
2019-10-25	383.66	359.5
2019-10-28	393.74	450.2
2019-10-29	400.91	454.4
2019-10-30	400.62	458.8
2019-10-31	434.94	456.2
2019-11-01	360.78	340.8
2019-11-04	370.08	251.4
2019-11-05	373.67	341.5
2019-11-06	378.18	273.3
2019-11-07	382.76	354.9
2019-11-08	381.73	398.3
2019-11-12	393.83	399.4
2019-11-13	370.19	403.9
2019-11-14	382.90	406.6
2019-11-15	361.70	409.2
2019-11-18	380.07	263.2

Date	cash balance (Dollars in billions)	5-day outflows (Dollars in billions)
2019-11-19	376.08	261.9
2019-11-20	357.55	262.5
2019-11-21	357.98	260.2
2019-11-22	355.42	314.0
2019-11-25	369.28	426.5
2019-11-26	374.17	545.4
2019-11-27	358.90	449.0
2019-11-29	342.62	534.7
2019-12-02	371.35	395.8
2019-12-03	332.25	281.0
2019-12-04	338.45	259.8
2019-12-05	331.25	276.9
2019-12-06	331.96	268.9
2019-12-09	340.76	276.2
2019-12-10	316.01	305.1
2019-12-11	304.16	304.2
2019-12-12	280.90	304.2
2019-12-13	293.22	287.8
2019-12-16	401.45	287.2
2019-12-17	387.58	262.8
2019-12-18	378.57	274.3
2019-12-19	373.41	338.6
2019-12-20	370.11	259.5
2019-12-23	387.13	256.2
2019-12-24	351.93	460.9
2019-12-26	354.66	508.5
2019-12-27	374.78	448.7
2019-12-30	391.18	444.5
2019-12-31	403.85	524.6
2020-01-02	382.34	335.7
2020-01-03	363.92	263.9
2020-01-06	378.42	244.6
2020-01-07	365.66	246.0
2020-01-08	350.84	252.8
2020-01-09	343.42	310.9

Date	cash balance (Dollars in billions)	5-day outflows (Dollars in billions)
2020-01-10	342.51	309.2
2020-01-13	357.14	305.3
2020-01-14	348.01	383.0
2020-01-15	380.80	318.5
2020-01-16	395.79	325.0
2020-01-17	401.05	245.6
2020-01-21	415.87	247.9
2020-01-22	411.71	241.4
2020-01-23	421.34	215.9
2020-01-24	424.55	244.7
2020-01-27	435.64	451.1
2020-01-28	443.25	483.7
2020-01-29	450.54	483.1
2020-01-30	445.93	491.1
2020-01-31	403.98	465.1
2020-02-03	401.01	261.1
2020-02-04	417.78	229.7
2020-02-05	416.59	237.4
2020-02-06	410.90	261.3
2020-02-07	405.66	264.8
2020-02-10	414.25	263.0
2020-02-11	432.19	489.8
2020-02-12	404.34	435.1
2020-02-13	425.47	510.0
2020-02-14	427.33	423.2
2020-02-18	445.81	425.2
2020-02-19	421.05	280.0
2020-02-20	443.49	340.6
2020-02-21	441.31	355.9
2020-02-24	450.80	410.1
2020-02-25	469.71	526.6
2020-02-26	387.62	554.1
2020-02-27	378.16	484.5
2020-02-28	357.25	450.0
2020-03-02	403.80	396.9

Date	cash balance (Dollars in billions)	5-day outflows (Dollars in billions)
2020-03-03	386.59	278.8
2020-03-04	381.30	262.5
2020-03-05	379.45	275.4
2020-03-06	375.46	321.4
2020-03-09	390.57	322.5
2020-03-10	395.13	347.2
2020-03-11	372.34	343.3
2020-03-12	318.83	341.2
2020-03-13	325.87	294.1
2020-03-16	417.80	298.0
2020-03-17	422.45	274.3
2020-03-18	401.35	279.1
2020-03-19	392.51	280.1
2020-03-20	382.90	309.0
2020-03-23	394.91	301.7
2020-03-24	410.77	298.5
2020-03-25	384.89	407.3
2020-03-26	382.10	452.1
2020-03-27	397.62	425.0
2020-03-30	407.73	450.2
2020-03-31	515.26	453.8
2020-04-01	506.93	356.3
2020-04-02	615.54	317.7
2020-04-03	673.49	388.9
2020-04-06	676.46	377.1
2020-04-07	750.41	390.7
2020-04-08	827.18	398.2
2020-04-09	898.91	665.4
2020-04-10	881.94	621.9
2020-04-13	868.88	633.5
2020-04-14	958.94	654.0
2020-04-15	856.16	666.1
2020-04-16	909.74	411.5
2020-04-17	889.04	436.7
2020-04-20	857.91	447.8

Date	cash balance (Dollars in billions)	5-day outflows (Dollars in billions)
2020-04-21	924.54	418.4
2020-04-22	950.00	406.2
2020-04-23	1006.55	388.9
2020-04-24	965.93	513.4
2020-04-27	961.80	572.0
2020-04-28	1040.17	576.1
2020-04-29	1076.23	619.6
2020-04-30	1180.04	620.2
2020-05-01	1100.96	511.9
2020-05-04	1099.18	418.1
2020-05-05	1167.08	450.4
2020-05-06	1143.27	488.2
2020-05-07	1198.46	495.7
2020-05-08	1193.61	495.0
2020-05-11	1152.00	659.8
2020-05-12	1172.99	625.0
2020-05-13	1138.17	627.8
2020-05-14	1206.01	621.2
2020-05-15	1185.01	656.9
2020-05-18	1188.33	497.6
2020-05-19	1218.21	666.2
2020-05-20	1193.30	502.5
2020-05-21	1270.89	642.2
2020-05-22	1302.82	465.1
2020-05-26	1364.38	693.6
2020-05-27	1326.90	687.7
2020-05-28	1414.98	680.8
2020-05-29	1449.13	666.7
2020-06-01	1394.44	657.3
2020-06-02	1455.49	431.4
2020-06-03	1431.46	476.3
2020-06-04	1501.73	482.8
2020-06-05	1494.49	501.6
2020-06-08	1520.81	507.9
2020-06-09	1535.31	548.3

Date	cash balance (Dollars in billions)	5-day outflows (Dollars in billions)
2020-06-10	1504.57	556.6
2020-06-11	1550.41	550.6
2020-06-12	1541.35	560.5
2020-06-15	1597.57	557.9
2020-06-16	1588.62	525.6
2020-06-17	1565.31	505.7
2020-06-18	1634.66	506.7
2020-06-19	1635.53	482.6
2020-06-22	1626.91	486.2
2020-06-23	1612.88	480.4
2020-06-24	1586.57	558.6
2020-06-25	1638.13	614.7
2020-06-26	1647.25	641.5
2020-06-29	1644.69	624.8
2020-06-30	1722.03	620.1
2020-07-01	1656.75	504.8
2020-07-02	1659.15	446.4
2020-07-03	1661.80	428.7
2020-07-06	1660.66	442.6
2020-07-07	1642.08	449.0
2020-07-08	1624.40	482.9
2020-07-09	1642.29	558.8
2020-07-10	1641.08	586.3
2020-07-13	1653.56	588.2
2020-07-14	1627.71	585.2
2020-07-15	1740.46	568.2
2020-07-16	1807.31	500.5
2020-07-17	1812.80	470.9
2020-07-20	1817.27	467.4
2020-07-21	1794.45	466.7
2020-07-22	1777.18	446.0
2020-07-23	1821.82	421.2
2020-07-24	1825.50	454.3
2020-07-27	1830.55	673.7
2020-07-28	1795.51	704.3

Date	cash balance (Dollars in billions)	5-day outflows (Dollars in billions)
2020-07-29	1792.43	698.8
2020-07-30	1767.34	695.4
2020-07-31	1763.09	686.2
2020-08-03	1745.14	465.9
2020-08-04	1708.21	432.7
2020-08-05	1706.64	416.8
2020-08-06	1687.23	434.7
2020-08-07	1678.14	446.6
2020-08-10	1676.46	441.5
2020-08-11	1654.87	599.3
2020-08-12	1635.14	584.8
2020-08-13	1641.13	583.7
2020-08-14	1635.89	560.5
2020-08-17	1663.88	565.9
2020-08-18	1655.47	405.7
2020-08-19	1636.39	396.8
2020-08-20	1630.31	398.0
2020-08-21	1621.39	394.4
2020-08-24	1627.63	393.4
2020-08-25	1629.28	506.4
2020-08-26	1607.45	576.2
2020-08-27	1602.82	557.6
2020-08-28	1620.19	579.6
2020-08-31	1705.98	581.5
2020-09-01	1652.93	629.0
2020-09-02	1651.82	463.1
2020-09-03	1628.42	665.7
2020-09-04	1621.79	472.1
2020-09-08	1591.49	474.9
2020-09-09	1570.53	497.8
2020-09-10	1580.97	496.2
2020-09-11	1581.02	470.5
2020-09-14	1596.09	472.5
2020-09-15	1691.06	471.6
2020-09-16	1692.81	434.9

Date	cash balance (Dollars in billions)	5-day outflows (Dollars in billions)
2020-09-17	1686.36	435.0
2020-09-18	1684.76	431.4
2020-09-21	1689.65	433.4
2020-09-22	1672.80	431.3
2020-09-23	1661.73	420.9
2020-09-24	1650.40	510.9
2020-09-25	1666.33	580.0
2020-09-28	1667.84	597.9
2020-09-29	1655.16	595.5
2020-09-30	1781.68	593.9
2020-10-01	1721.40	481.2
2020-10-02	1696.49	443.4
2020-10-05	1699.09	421.8
2020-10-06	1682.13	567.2
2020-10-07	1687.43	454.0
2020-10-08	1693.51	679.3
2020-10-09	1688.16	473.6
2020-10-13	1672.92	473.0
2020-10-14	1647.94	464.1
2020-10-15	1724.44	465.7
2020-10-16	1731.39	428.5
2020-10-19	1736.90	427.2
2020-10-20	1718.52	426.3
2020-10-21	1699.50	423.6
2020-10-22	1686.61	418.8
2020-10-23	1687.79	412.2
2020-10-26	1690.22	478.6
2020-10-27	1673.29	663.3
2020-10-28	1653.04	698.9
2020-10-29	1647.48	677.9
2020-10-30	1598.80	714.0
2020-11-02	1668.48	646.8
2020-11-03	1618.50	462.8
2020-11-04	1618.57	452.6
2020-11-05	1616.72	644.9

Date	cash balance (Dollars in billions)	5-day outflows (Dollars in billions)
2020-11-06	1611.36	440.2
2020-11-09	1613.53	579.2
2020-11-10	1570.77	719.0
2020-11-12	1559.10	575.4
2020-11-13	1548.70	569.7
2020-11-16	1583.70	562.7
2020-11-17	1562.44	429.2
2020-11-18	1546.92	427.2
2020-11-19	1532.20	435.3
2020-11-20	1523.95	432.5
2020-11-23	1524.04	547.7
2020-11-24	1508.39	739.8
2020-11-25	1484.04	604.7
2020-11-27	1497.73	808.3
2020-11-30	1622.99	623.5
2020-12-01	1559.91	506.9
2020-12-02	1557.24	441.8
2020-12-03	1542.06	462.7
2020-12-04	1541.55	417.1
2020-12-07	1542.51	419.7
2020-12-08	1528.11	420.0
2020-12-09	1502.36	459.7
2020-12-10	1489.11	454.9
2020-12-11	1491.53	456.1
2020-12-14	1507.69	452.5
2020-12-15	1620.61	457.2
2020-12-16	1615.87	417.1
2020-12-17	1603.00	423.4
2020-12-18	1605.92	414.5
2020-12-21	1609.29	417.1
2020-12-22	1603.48	539.3
2020-12-23	1583.31	410.0
2020-12-24	1576.37	746.3
2020-12-28	1611.76	769.7
2020-12-29	1606.63	855.0

Date	cash balance (Dollars in billions)	5-day outflows (Dollars in billions)
2020-12-30	1613.51	725.6
2020-12-31	1728.57	926.9
2021-01-04	1563.36	547.6
2021-01-05	1600.26	351.1
2021-01-06	1607.40	398.2
2021-01-07	1576.76	420.4
2021-01-08	1592.94	399.0
2021-01-11	1601.94	517.4
2021-01-12	1592.56	651.0
2021-01-13	1575.88	547.3
2021-01-14	1574.38	710.1
2021-01-15	1630.90	537.8
2021-01-19	1652.05	448.0
2021-01-20	1638.33	451.1
2021-01-21	1639.73	444.6
2021-01-22	1636.17	494.2
2021-01-25	1641.39	486.4
2021-01-26	1631.78	717.5
2021-01-27	1613.38	710.4
2021-01-28	1593.97	713.9
2021-01-29	1611.35	660.5
2021-02-01	1664.60	661.0
2021-02-02	1654.92	422.6
2021-02-03	1629.73	425.8
2021-02-04	1620.96	424.9
2021-02-05	1613.96	426.0
2021-02-08	1619.36	427.7
2021-02-09	1603.40	710.2
2021-02-10	1576.74	599.6
2021-02-11	1564.86	755.7
2021-02-12	1560.06	580.8
2021-02-16	1595.28	597.1
2021-02-17	1568.89	448.5
2021-02-18	1567.70	464.8
2021-02-19	1557.25	522.1

Date	cash balance (Dollars in billions)	5-day outflows (Dollars in billions)
2021-02-22	1550.12	518.6
2021-02-23	1480.61	700.6
2021-02-24	1439.65	698.0
2021-02-25	1379.96	703.0
2021-02-26	1414.47	646.4
2021-03-01	1500.69	654.7
2021-03-02	1462.56	463.7
2021-03-03	1420.24	461.0
2021-03-04	1382.25	454.3
2021-03-05	1368.27	455.1
2021-03-08	1373.95	444.3
2021-03-09	1349.17	473.3
2021-03-10	1310.27	470.9
2021-03-11	1268.21	705.8
2021-03-12	1269.98	700.1
2021-03-15	1379.15	702.5
2021-03-16	1361.27	684.2
2021-03-17	1089.50	683.8
2021-03-18	1063.29	480.4
2021-03-19	1058.91	525.7
2021-03-22	1054.77	524.8
2021-03-23	1101.26	508.1
2021-03-24	1031.91	508.4
2021-03-25	994.03	585.8
2021-03-26	1013.86	617.0
2021-03-29	1019.01	640.9
2021-03-30	1003.52	
2021-03-31	1121.95	
2021-04-01	1045.82	
2021-04-02	1019.80	

Note: Treasury's daily operating cash balance is the amount of cash remaining in the Treasury General Account after receipts and disbursements are accounted. Outflows includes outlays and redemptions of maturing debt and is a 5-day moving average.

The cash balance can serve as a risk management tool that Treasury can draw on to meet the government's financial obligations in the short term without having to raise additional money through debt auctions. Treasury's cash balance does interact with the financial system in important ways (see textbox).

Treasury's Cash Balance Interacts with the Financial System

The supply of bank reserves: Increases in Treasury's cash balance, all else equal, leads to a decline in the supply of reserves in the banking system. This is because money that flows into the Treasury General Account (TGA) is no longer circulating in the banking system and is, therefore, unavailable to banks to lend to consumers and businesses. Conversely, decreases in the TGA, all else equal, increase the supply of reserves in the banking system, as payments made to meet government obligations flow into the banking system. Decreases in the TGA also increase the overall funds available for banks to lend to consumers and businesses. The Federal Reserve manages the supply of banking reserves as part of its implementation of monetary policy.

The size of Treasury issuance: Treasury can increase the size of its cash balance by issuing more securities beyond what is needed to finance immediate government spending—for example, by increasing auction sizes—and keeping some of the extra money it raises in the TGA. This adds to the overall supply of Treasury securities. Similarly, Treasury can reduce its cash balance by issuing fewer securities, such as by lowering auction sizes and paying more obligations with cash from the TGA. Large or sudden changes to auction sizes may affect liquidity and market functioning.

Source: GAO. | GAO-21-606

Since 2015, Treasury's policy has been to hold a level of cash generally sufficient to cover one week of outflows in the TGA, subject to a minimum balance of roughly \$150 billion.⁵¹ The policy was designed to ensure that Treasury would be able to make government payments (including redemptions of maturing securities) in case of a temporary interruption to market access. Such an interruption would disrupt or delay Treasury's ability to raise new money through its debt auctions.⁵²

Treasury officials told us that the record-high cash balances during COVID-19 were consistent with this policy given the uncertainty of the pace and size of COVID-19 related outflows. However, we found that the policy does not reflect other factors that Treasury considers when

⁵¹See Department of the Treasury, *Quarterly Refunding Statement of Acting Assistant Secretary for Financial Markets, Seth B. Carpenter* (Washington, D.C.: May 5, 2015). Outflows include payments for maturing securities.

⁵²For example, Treasury lost market access for 3 days following the September 11, 2001, attacks and for 1.5 days following Superstorm Sandy in October 2012.

managing its cash balance. In addition, these factors were not clearly communicated publicly to market participants during COVID-19.

For example, in May 2020, Treasury announced that its cash balance would likely remain elevated over the next quarter as Treasury sought to maintain prudent liquidity in light of the size and relative uncertainty of COVID-19 outflows.⁵³ Treasury officials explained to us that, in practice, this meant pursuing a precautionary approach to the cash balance in which Treasury may hold more than a week's worth of outflows. It may build up the cash balance gradually in the near term in anticipation of potentially large outflows in future weeks or months. Therefore, when faced with a large outflow—like those related to the Paycheck Protection Program or the economic impact payments—Treasury would not have to increase auction sizes rapidly for that week.⁵⁴ Instead, it could draw on the cash balance to augment the money raised from auctions and meet the government's financing obligations.

Similarly, in August 2020, Treasury stated that part of its management of the cash balance included seeking to change auction sizes gradually to minimize any potential market disruption and anticipated enactment of legislation authorizing additional government spending.⁵⁵ However, market participants told us that even after Treasury's statements about the cash balance, they were still unclear about how Treasury makes decisions about the size and trajectory of the cash balance.

Treasury says that it uses a transparent decision-making process to meet its objectives of being regular and predictable, and fostering a liquid

⁵³Department of the Treasury, *Quarterly Refunding Statement of Deputy Assistant Secretary for Federal Finance Brian Smith* (Washington, D.C.: May 6, 2020).

⁵⁴In response to COVID-19, Congress and the President enacted number of programs to help individuals, industries, and businesses. The economic impact payments and the Paycheck Protection Program were among the largest of these programs. Sizable outflows occurred in the months immediately after the authorization of each round of economic impact payments and the authorization and expansion of the Paycheck Protection Program. Pub. L. No. 116-136, §§ 1102(b), 1107(a)(1), 1112, 2201, 134 Stat. at 286–294, 301, 309–310, 335–340; Pub. L. No. 116-139, § 101(a), 134 Stat. at 620; Paycheck Protection Program Flexibility Act of 2020, Pub. L. No. 116-142, §§ 2–3, 134 Stat. 641, 641–643 (2020); Pub. L. No. 116-260, div. N, §§ 272, 323, 134 Stat. at 1965–1976, 2018–2022; Pub. L. No. 117-2, § 9601, 135 Stat. at 138–144; PPP Extension Act of 2021, Pub. L. No. 117-6, § 2, 235 Stat. 250, 250 (2021).

⁵⁵Department of the Treasury, *Quarterly Refunding Statement of Deputy Assistant Secretary for Federal Finance Brian Smith* (Washington, D.C.: Aug. 5, 2020).

secondary market so it can finance government borrowing needs at the lowest cost over time.⁵⁶ World Bank-IMF guidelines for public debt management highlight the importance of transparent objectives for debt management as well as enhanced communication with investors, especially during periods of crisis.⁵⁷

Market participants told us they recognized the difficulty of forecasting government outflows in such uncertain times; however, they said they would have benefited from additional clarity and communication on how Treasury implements its cash balance policy. Understanding the factors that guide Treasury's decisions about the level and trajectory of the cash balance in future months is important because, according to market participants, it affects market expectations for the size of Treasury issuance, supply of bank reserves, and short-term lending rates—all of which inform their business strategies and support market functioning. Significant deviations from market expectations can lead to volatility in the Treasury and other financial markets. This, in turn, could affect demand for Treasury securities and Treasury's borrowing costs.

Conclusions

The shock of COVID-19 to financial markets led to a severe disruption in the Treasury market in March 2020, prompting a swift response by the Federal Reserve. The disruption exposed structural challenges in the market, such as pressures on broker-dealer intermediation and principal trading firms' activity during periods of stress. These challenges pose risks to the liquidity and efficiency of the U.S. Treasury market at a time when debt issuance—and the amount of Treasury securities outstanding—is expected to grow.

Disruptions in market functioning could reduce investor demand for Treasury securities and negatively affect Treasury's ability to borrow money at the lowest cost over time. Treasury's recent announcement of an interagency effort to analyze the March 2020 disruption and consider options to address structural challenges is an important initial step in

⁵⁶Department of the Treasury, *Overview of Treasury's Office of Debt Management*.

⁵⁷See Section 2.1 in the World Bank-International Monetary Fund, *Revised Guidelines for Public Debt Management* (Apr. 2014).

helping to mitigate future disruptions and support the long-term health of the Treasury market.

To help finance the federal response to the COVID-19 pandemic, Treasury successfully raised trillions of dollars in a very short time. Treasury dramatically increased its issuance of Treasury bills in April and May 2020 and established routine auctions of cash management bills (CMB). Treasury bills were met with strong demand by investors looking for liquid and safe assets. Our analysis of CMBs and benchmark bill yields during COVID-19 found that Treasury did not pay a premium—as it has in the past—for its use of CMBs to raise additional cash to help finance the government’s response to the pandemic.

However, Treasury could be more transparent about how it implements its cash management policy. Market participants that we spoke with from across multiple sectors said they were uncertain about the factors affecting the trajectory of the cash balance, which reached historically high levels as Treasury managed the uncertain fiscal outlook caused by COVID-19. Investors monitor the size of the cash balance to anticipate changes in the size of Treasury issuance, the supply of bank reserves, and short-term lending rates. Clear and transparent communication about how it manages its operating cash balance would help Treasury’s broader efforts to support liquidity and market functioning, which are fundamental to Treasury meeting its primary debt management goal to borrow at the lowest cost over time.

Recommendation for Executive Action

The Secretary of the Treasury should clarify the department’s policy for managing the operating cash balance to include all relevant factors it considers when determining the appropriate cash balance and communicate the policy to the public. (Recommendation 1)

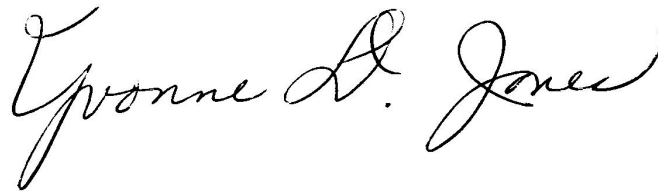
Agency Comment

We provided a draft of this report to Treasury and the Federal Reserve for review and comment. In its comments, reproduced in appendix III, Treasury agreed with our recommendation and said it would work to improve transparency and implement the recommendation. Treasury and the Federal Reserve also provided technical comments, which we incorporated as appropriate.

Letter

We are sending copies of this report to the appropriate congressional committees, the Secretary of the Treasury, Board of Governors of the Federal Reserve, and other interested parties. In addition, the report will be available at no charge on the GAO website at <http://www.gao.gov>.

For questions about this report, please contact Yvonne D. Jones at (202) 512-6806 or jonesy@gao.gov. Contact points for our Offices of Congressional Relations and Public Affairs may be found on the last page of this report. GAO staff who made key contributions to this report are listed in appendix IV.

A handwritten signature in black ink that reads "Yvonne D. Jones". The signature is written in a cursive style with a large initial "Y" and a long, sweeping tail on the "J".

Yvonne D. Jones,
Director, Strategic Issues

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Appendix I: Econometric Model of the Treasury-Overnight Indexed Swap Spread

Model Background

Treasury Convenience Yield

Measured as the difference between the yield on a Treasury security and another financial asset, for example a corporate bond. The difference between the yields corresponds to the premium investors are willing to pay in exchange for the conveniences they enjoy from holding a particular asset, for example the safety and liquidity of Treasury securities.

Source: GAO. | GAO-21-606

To better understand potential drivers of changes in the Treasury convenience yield (see sidebar) since the global financial crisis of 2007 to 2009, we developed and estimated a model of the Treasury-Overnight Indexed Swap (OIS) spread. We use this measure of the convenience yield following a recent academic paper on the March 2020 Treasury market disruption.¹ In this paper, the researchers note that in recent years investors have required higher yields on Treasury securities. They hypothesize that this change compensates for the inconvenience of holding Treasury securities in the current environment. Researchers have identified a number of potential explanations for the relative increase in Treasury yields. For example:

- The growth in Treasury securities outstanding could induce investors to demand higher yields to hold a growing portfolio of Treasury securities (i.e., there is a downward sloping demand curve for Treasury securities).²
- The Supplementary Leverage Ratio (SLR), a regulation which can increase the cost of holding Treasury securities for financial intermediaries that are part of certain large bank holding companies, could lead them to demand higher yields to compensate for increased costs.³

¹See Zhiguo He, Stefan Nagel, and Zhaogang Song, “Treasury Inconvenience Yields during the COVID-19 Crisis,” *NBER Working Paper*, No. 27416 (Nov. 2020).

²See Arvind Krishnamurthy and Annette Vissing-Jorgensen, “The Aggregate Demand for Treasury Debt,” *Journal of Political Economy* (2012), and Treasury Borrowing Advisory Committee, *TBAC Charge* (Feb. 2021).

³See Zhiguo He, Stefan Nagel, and Zhaogang Song, “Treasury Inconvenience Yields during the COVID-19 Crisis,” *NBER Working Paper*, No. 27416 (Nov. 2020), and Dong Beom Choi, Michael R. Holcomb, and Donald P. Morgan, “Bank Leverage Limits and Regulatory Arbitrage: Old Question, New Evidence,” *Federal Reserve Bank of New York Staff Reports*, no. 856 (Dec. 2019).

Model Specification and Results

We used a series of regression models to econometrically evaluate these potential explanations for the evolution of the convenience yield. Our analysis of the 5-year Treasury-OIS spread suggests that the growth of Treasury securities outstanding has been associated with a large share of the relative increase in yields at this maturity, while the implementation of the SLR has been associated with a smaller increase. Although we control for economic and regulatory conditions that are likely to affect the Treasury-OIS spread, a number of other factors could also influence the spread, including factors that may not be captured by our analysis, such as changes in demand for swaps. Therefore, on their own, our analysis results do not provide definitive evidence on the factors behind changes in the Treasury-OIS spread.

We model maturity-matched Treasury-OIS spreads, primarily at the 5-year maturity, as a function of Treasury debt outstanding scaled by gross domestic product (GDP) to control for changes in the supply of Treasury securities relative to the underlying demand for safe assets associated with changes in national income, and the timing of SLR implementation.⁴ The use of the spreads, rather than Treasury yields directly, controls for maturity and default risk (OIS contracts are considered essentially risk free). Importantly, the balance sheet cost of OIS contracts under the SLR is considerably smaller than for Treasury securities. As a result, the spread can be interpreted as the relative value investors place on the convenience of directly holding Treasuries versus the expense of holding them on their balance sheet. The use of the Treasury-OIS spread as the dependent variable and inclusion of SLR implementation periods as explanatory variables is consistent with He et al. (2020), while the

⁴The 5-year OIS contract involves swapping fixed interest payments for 5 years in exchange for the federal funds rate. We use the 5-year maturity because Treasury market stress during March 2020 was primarily in longer maturities and the 5-year OIS rates had a longer data history available in Bloomberg than 10-year OIS rates. Treasury officials told us that the 5-year OIS contract is not liquid or deeply traded. We reviewed the methodology underlying Bloomberg's OIS rates, which are informed by executable quotes from dealers that are provided to Bloomberg at high frequency, and determined that these data are sufficiently reliable for the purposes of our analysis of the Treasury-OIS spread.

inclusion of the market value of Treasury debt scaled by GDP is consistent with Krishnamurthy and Vissing-Jorgensen (2012).⁵

To construct the required variables, the model integrates data from Bloomberg (OIS interest rates), the Board of Governors of the Federal Reserve System (Treasury constant maturity interest rates), the Federal Reserve Bank of Dallas (measures of the market value of Treasury debt), the Bureau of Economic Analysis (GDP), and the Chicago Board Options Exchange (VIX). The model is estimated with quarterly data.

Our principle conclusions are reflected in the results of a version of the model in which the 5-year Treasury-OIS spread is a function of the market value of privately held Treasury debt as a share of GDP. Our model also includes indicator variables that divide the implementation of the SLR into two periods: (1) from SLR proposed rule in 2012 to rule finalization in 2014, and (2) from the beginning of SLR disclosure requirements in 2015 until Treasury securities were exempted from the SLR calculation in 2020.⁶

Model coefficient magnitudes and their statistical significance suggest that both the market value of privately held Treasury debt and SLR implementation timing have been associated with changes in the Treasury-OIS spread at this maturity (see table 1).⁷

⁵See Zhiguo He, Stefan Nagel, and Zhaogang Song, "Treasury Inconvenience Yields during the COVID-19 Crisis," *NBER Working Paper*, No. 27416 (Nov. 2020), and Arvind Krishnamurthy and Annette Vissing-Jorgensen, "The Aggregate Demand for Treasury Debt," *Journal of Political Economy* (2012).

⁶These phases are not intended to serve as a complete accounting of SLR rulemaking and implementation but rather to illustrate some key aspects of the SLR implementation timeline.

⁷Note that this model has a stronger conceptual logic and improved fit relative to a model of the 5-year Treasury-OIS spread that is based on total marketable debt outstanding, which would include debt held by the Federal Reserve not subject to private intermediation or ownership.

**Appendix I: Econometric Model of the
Treasury-Overnight Indexed Swap Spread**

Table 1: Regression Output from Model of the 5-Year Treasury-Overnight Indexed Swap Spread

Variable	Coefficient (standard error)	p-value
Supplementary Leverage Ratio (SLR) phase 1: SLR rule proposed through rule finalization (2012-2014)	0.115 (0.033)	0.001
SLR phase 2: Disclosure required under the SLR through Treasury security exemption (2015-first quarter 2020)	0.185 (0.037)	< 0.001
Market value of privately held Treasury debt to gross domestic product (GDP)	0.011 (0.001)	< 0.001
<i>Number of observations: 76</i>	—	—
<i>R-squared: 0.842</i>	—	—

Source: GAO analysis of data from Bloomberg, the Board of Governors of the Federal Reserve System, Federal Reserve Bank of Dallas, and Bureau of Economic Analysis. | GAO-21-606

Note: Results are reported based on robust standard errors. To interpret regression coefficients based on their units, every 1 percentage point increase in Treasury debt relative to GDP is associated with a 1.1 basis point (a basis point is 1/100 of a percentage point) increase in the 5-year Treasury-OIS spread, while the SLR phase 2 time period, for example, is associated with an 18.5-basis-point increase in the spread relative to a baseline prior to the implementation of the SLR or when Treasury securities were exempted from the SLR.

Table 1 shows that the coefficient from the SLR disclosure and compliance time period is meaningfully higher and statistically larger than the earlier rulemaking time period. In addition, both are higher than during periods prior to SLR introduction and after Treasury securities were exempted. However, because we model SLR implementation through indicator variables covering several quarters, we cannot be certain that the coefficients are measuring the effect of the SLR or some omitted, exogenous conditions that evolved contemporaneously with SLR implementation.

Sensitivity Analysis

We estimated a number of additional versions of the model to assess the sensitivity of results to alternative assumptions and to quantitatively assess the role of debt versus the SLR. For example, we estimated a model with the VIX volatility index to allow for market uncertainty to influence investors' relative preferences for Treasury securities versus fixed rate OIS contracts. The coefficient on the VIX is not statistically significant in this model. It is possible that market uncertainty generally increases demand for low-risk, fixed interest payment vehicles of all kinds, and thus does not bias investors toward Treasury over OIS or vice versa.

We also estimated a model in which the SLR implementation phases are combined into a single indicator variable to easily compare the magnitude of the association of the SLR and the role of debt with the growth of the Treasury-OIS spread. The point estimate from this model suggests that for every 1 percentage point increase in privately held debt relative to GDP, the Treasury-OIS spread increased 1.1 basis points, comparable to the coefficient estimate in table 1 above. Taking into account the uncertainty around coefficient estimates from this model and the growth in the market value of privately held debt from 2008 to 2020, the SLR was associated with an increase of 9 to 23 basis points in the 5-year Treasury-OIS spread, while the growth in privately-held Treasury debt relative to GDP was associated with a 43 to 66 basis points increase (based on a 95 percent confidence interval).

In addition, we estimated a model with the 2-year Treasury-OIS spread as the dependent variable—in this model, the estimated association with Treasury debt is similar in magnitude to the model with the 5-year spread but the coefficients on the SLR implementation periods are generally not statistically significant.

Our principal diagnostics are related to assessing whether the residuals in our model might exhibit a unit root, which would invalidate statistical inference (i.e., the regression would be spurious). Absent evidence of a unit root in the residuals, we estimate the degree of serial correlation in our residuals and then estimate a model with Newey-West standard errors which indicates that our principal results are robust to allowing for serial correlation.

Limitations

Our models may not capture other factors that influence the Treasury-OIS spread. In addition, variables included in the model may measure the underlying factors of interest with some error—for example, the SLR time period indicator variables discussed above which may capture other contemporaneous events. Also, model results may not extend to other maturities. As a result, some caution should be taken in interpreting the results, especially given the lack of strong quasi-experimental variation that might drive more confident identification of causal effects.

Cash management bills (CMB)—bills that are issued on an ad hoc basis with variable maturities—have historically had higher yields compared to regularly issued bills.¹ In recent years, the Department of the Treasury

Appendix II: Analysis of Cash Management Bill Yields

has significantly reduced its issuance of CMBs, in part as it added new bills to the regular auction schedule.²

However, in times of unexpected financing needs, Treasury has used CMBs to raise funds outside of the announced auction schedule. This was true during the global financial crisis and during the COVID-19 pandemic. To estimate any additional cost or premium associated with CMBs during these periods, we calculated the difference between the yields for CMBs and the yields of benchmark bills with similar maturities—or the yield differential. We apply the yield differential to the dollar amount of the CMBs issued during the time period to obtain an estimate of the cost of issuing a CMB instead of a regular Treasury bill—the CMB premium.

Methodology and Analysis

To estimate what premium, if any, Treasury paid for CMB issued during the pandemic, we calculated the differential between the yields on the CMBs that Treasury issued between March 13, 2020, and February 16, 2021, and the yields of benchmark bills with similar maturities.³

¹In 2006 and 2010 we reported that Treasury paid a premium for its use of CMBs. See [GAO-10-498](#) and *Debt Management: Treasury Has Refined Its Use of Cash Management Bills but Should Explore Options That May Reduce Cost Further*, [GAO-06-269](#) (Washington, D.C.: Mar. 30, 2006).

²Between January 1, 2017, and February 29, 2020, Treasury held only 23 CMB auctions. In 2018, Treasury added the 8-week bill to the regular auction schedule.

³March 13, 2020, is the date that the federal government declared COVID-19 a national emergency. After February 16, 2021, Treasury discontinued regular issuance of the 15- and 22-week CMBs and modified the issuance schedule for the 6- and 17-week CMBs. See Department of the Treasury, *Quarterly Refunding Statement of Deputy Assistant Secretary for Federal Finance, Brian Smith* (Washington, D.C.: Feb. 3, 2021).

For comparison, we also calculated yield differentials and the premium for CMBs auctioned from January 1, 2008, to December 31, 2010, during the global financial crisis.⁴

Calculating the Yield Differential

We used two different methodologies to calculate the yield differential:

- **Secondary market bill yields.** We compared CMB auction yields to the constant-maturity yields of similar-maturity bills derived from secondary market trading on that same day. This provides an estimate of the yields investors likely would have demanded if Treasury had held a comparable benchmark auction on the same day of the actual CMB auction. Constant maturity bill yields are calculated each day by Treasury.⁵ We use Treasury constant maturity yields at the 1-month, 2-month, 3-month, 6-month, and 1-year maturities to measure secondary market rates on benchmark bills.⁶
- **Closest following bill auction.** Using Treasury's Auction Query database, we compared yields on CMB auctions to the yields of bills with similar maturities that were auctioned most recently after the CMB auction. This allows us to estimate what Treasury would have likely paid if it had delayed raising funds until the closest following benchmark bill auction of similar maturity to the actual CMB auction. For both time periods, we compared the maturity length in days of each CMB to the yield of the benchmark bill with the closest maturity profile. If a CMB maturity was equidistant between two benchmark bill maturities, we compared the CMB yield to a simple average of the two benchmark bill yields. For the 2020-21 time frame, this methodology resulted in comparisons that included the following:

⁴We identified and omitted CMBs issued from 2008 to 2010 under the supplementary financing program, a temporary program created in September 2008 to provide cash for use in Federal Reserve initiatives to address heightened liquidity pressures in the financial markets. The supplementary financing program CMB auctions were accompanied by a special announcement.

⁵The Treasury yield curve rates are commonly referred to as Constant Maturity Treasury rates, or CMTs. Yields are interpolated by Treasury from the daily yield curve. This curve, which relates the yield on a security to its time to maturity is based on the closing market bid yields on actively traded Treasury securities in the over-the counter market. These market yields are calculated from composites of quotations obtained by the Federal Reserve Bank of New York. The CMT yield values are read from the yield curve at fixed maturities.

⁶We accessed the data at <https://www.treasury.gov/resource-center/data-chart-center/interest-rates/pages/textview.aspx?data=yield>.

-
- Six-week CMB yields were compared to a simple average of yields of the 4- and 8-week benchmark bill yields.
 - Fifteen-week CMB yields were compared to 13-week benchmark bill yields.
 - Seventeen-week CMB yields were compared to 13-week benchmark bill yields.
 - Twenty-two-week CMB yields were compared to 26-week benchmark bill yields.

In analyzing CMB and benchmark bills auctions, we neither account nor adjust for other factors that may affect the yield determined at auction, such as the size of the offering amount or the bill's specific settlement or maturity date (for example, if these occur near month-end, quarter-end, etc.).⁷

Estimating the CMB Premium

The CMB premium is an estimate of the additional cost of issuing CMBs, and is calculated by applying the yield differentials to the specific maturity of the CMB for the total CMB offering amount. For both methodologies, to obtain an estimate of the cost of issuing a CMB instead of a regular Treasury bill (the CMB premium), we took the following steps:

- We calculated the CMB yield differential for each auction by subtracting the comparison benchmark bill investment rate or coupon equivalent from the CMB investment rate.
- To calculate the cost (or savings) to Treasury for the duration of the CMB, we divided the annualized yield differential by 365 to obtain a daily yield differential. We multiplied the daily yield differential by the CMB term and the offering amount of the auction.
- We summed the costs (or savings) for all CMB auctions in the time period and divided by the sum of the offered amount for all CMB auctions in the time period.

This expresses, in percentage terms, the total CMB premium (or discount) to Treasury for the issuance time period compared to yields of benchmark bills of similar maturities (either at auction or in the secondary market).

⁷Offering amount is the value of securities Treasury offers to the public for purchase in an auction.

Results

For CMBs issued during COVID-19, our analysis showed that there was virtually no yield differential with bill yields at auction and traded on the secondary market (see table 2). We found that between 2008 and 2010, CMB yields were on average 0.12 to 0.16 percent (12 to 16 basis points) higher than bills sold at the next auction or bills being traded on the secondary market.

Table 2 also shows the premium that Treasury paid for CMB issuance using the two methods described above. Both methods show that Treasury paid a premium for its use of CMBs during the global financial crisis, ranging from 0.01 to 0.03 percent. In contrast, for the COVID-19 response, the premium was almost zero.

Table 2: Cash Management Bill (CMB) Yield Differential and Premium

	Total CMBs offered (dollars in billions)	Yield Differential (percentage)	Premium (percentage)
COVID-19 response ^a	6,415	0.00	0.00
Global financial crisis ^b	1,071	0.12 to 0.16	0.01 to 0.03

Source: GAO analysis of Department of the Treasury data. | GAO-21-606

Notes: Figures are rounded. The yield differential is an average (weighted by the auction size) of the difference between CMB and benchmark bill yields over the time period analyzed. The premium is a function of the yield differential, the size of the auction, and the duration of the CMB. The range reflects the two methods used to calculate the yield differential.

^aWe analyzed CMBs and bills issued between Mar. 13, 2020 to Feb. 16, 2021. The federal government declared COVID-19 a national emergency on Mar. 13, 2020 and Treasury stopped issuing two of its regular CMBs in Feb. 2021.

^bWe analyzed CMBs and bills issued between Jan. 1, 2008 to Dec. 31, 2010.

To estimate the additional interest costs associated with CMB issuance, we multiplied the premium percentage for the 2008 to 2010 period by the total offering amount of CMBs during that time. The resulting dollar amount is an estimate of the added interest cost that Treasury paid for CMBs. Therefore, Treasury's issuance of \$1.1 trillion in CMBs during 2008 to 2010 resulted in Treasury paying \$152 to \$288 million more interest relative to comparable bill costs (a 0.01 to 0.03 percent premium).

If, during the government's COVID-19 response, investors had required a premium for CMBs similar to what we found between 2008 and 2010, Treasury would have paid about \$913 million to \$1.7 billion in additional borrowing costs for its issuance of \$6.4 trillion in CMBs.

**Appendix II: Analysis of Cash Management Bill
Yields**

Our analysis does not allow us to identify the causes of changes in yield differentials over time. For example, we do not control for factors that could affect the size of the CMB yield differential between the two periods, such as changes in the interest rate environment, the amount of marketable Treasury securities outstanding, and post-financial crisis reforms that may have structurally shifted demand for certain Treasury securities by different investor types.

Appendix III: Comments from the Department of the Treasury



DEPARTMENT OF THE TREASURY
WASHINGTON, D.C.

July 23, 2021

Yvonne D. Jones
Director, Strategic Issues
U.S. Government Accountability Office
441 G Street, NW
Washington, DC 20548

Dear Ms. Jones:

Thank you for the opportunity to review the Government Accountability Office's (GAO) draft report, *Federal Debt Management: Treasury Quickly Financed Historic Government Response to the Pandemic and is Assessing Risks to Market Functioning* (GAO-21-606) (the Draft Report). The Draft Report discusses the effects of the COVID-19 pandemic on the Treasury market, Treasury's actions to finance the government's pandemic response, and the steps Treasury is taking to enhance Treasury market resilience.

As the Draft Report notes, Treasury successfully employed financing strategies that allowed it to borrow the funds needed for pandemic response in record time and at historically low interest costs, despite the pandemic-driven disruptions to Treasury market liquidity conditions.

One of Treasury's most critical responsibilities is ensuring that sufficient funds are available to meet the government's spending needs. Based on its cash balance policy, adopted in 2015 and informed by prudent risk management objectives, Treasury holds a cash balance that enables it to cover outflows in case of a temporary interruption to market access. The pandemic resulted in unprecedented uncertainty about the size and timing of cash flows related to the government's economic response. Accordingly, Treasury held elevated cash balances during the pandemic in order to ensure necessary funds would be available for pandemic response.

The Draft Report recommends that Treasury clarify its policy for managing its cash balance to include all relevant factors Treasury considers when determining the appropriate cash balance and communicate this policy to the public. Treasury communicated many factors affecting the cash balance to the public in its quarterly refunding statements in 2020, but we accept the Draft Report's push for further transparency and will work to implement its recommendation.

Thank you again for the opportunity to review the Draft Report. We appreciate GAO's engagement on these important issues.

Sincerely,

/s/ Brian Smith

Brian Smith
Deputy Assistant Secretary for Federal Finance

Text of Appendix III: Comments from the Department of the Treasury

July 23, 2021

Yvonne D. Jones Director, Strategic Issues

U.S. Government Accountability Office 441 G Street, NW

Washington, DC 20548

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**Appendix III: Comments from the Department
of the Treasury**

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Sincerely,

/s/ Brian Smith Brian Smith

Deputy Assistant Secretary for Federal Finance

GAO Contact

Appendix IV: GAO Contacts and Staff Acknowledgments

Yvonne D. Jones at (202) 512-6806 jonesy@gao.gov.

Staff Acknowledgments

In addition to the contact named above, Thomas J. McCabe (Assistant Director), Margaret M. Adams (Analyst-in-Charge), Abigail Brown, Michael Hoffman, Meredith Moles, and Bryan Sakakeeny made significant contributions to this report. Carole Cimitile, Jeff DeMarco, Robert Gebhart, Andrew J. Stephens, Risto Laboski, Melanie Magnotto, Susan Sato, Farrah Stone, Deirdre Sutula, and Alicia White also contributed to this report.

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