

REPORT OF THE COVID-19  
MARKET IMPACT WORKING GROUP

# The Impact of COVID-19 on Economies and Financial Markets

OCTOBER 2020

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# The Impact of COVID-19 on Economies and Financial Markets

## Key Points

- » Turmoil in the financial markets in early 2020 was the direct outcome of the coronavirus disease, COVID-19. The unprecedented but necessary actions taken by governments to control the virus, as well as the social distancing approaches voluntarily adopted by others such as businesses and schools, effectively shut down large portions of economies across the globe.
- » The reaction in the financial markets was swift and deep. Stock prices fell as much in 30 days as they did in one year during the global financial crisis of 2007–2009. Reflecting the great uncertainty about how the economy might fare, investors became increasingly risk averse and volatility exceeded levels observed during the global financial crisis.
- » In March, fixed-income markets became dislocated. Investors and companies, seeking to defend themselves against the falling markets and uncertainty from the economic shutdown, stampeded to cash and drew down bank lines. Dislocations were first seen in the US Treasury market, normally a safe haven during periods of stress.
- » By mid-March, the turmoil struck the commercial paper, corporate bond, and municipal debt markets. In the “dash for cash,” sellers found it difficult, if not impossible, to find buyers in any reasonable size for even high-quality credits. Other normally liquid sectors saw big drops in liquidity—for example, off-the-run Treasury securities.
- » A complex array of factors has been suggested as amplifying these events. These factors include investors rebalancing their positions, margin calls, deleveraging, work-from-home (WFH) arrangements, bank capital standards, dealers’ internal risk limits, and regulatory requirements (e.g., supplementary leverage ratio, liquidity coverage ratio) that may have limited dealers’ balance sheet capacity.
- » As a result, by mid-March, liquidity dried up, short- and long-term credit markets ceased to function, and the flow of credit to the economy evaporated. To prevent economic and financial collapse, governments intervened. In the United States, the Federal Reserve, with financial capital provided by the US Treasury under the Coronavirus Aid, Relief, and Economic Security Act of 2020 (CARES Act), created a broad array of lending facilities. These programs were necessary, appropriate, and broad-based, helping virtually every sector of the economy. Taken together, they helped calm markets and restore liquidity and the flow of credit to the economy.
- » The COVID-19 crisis and global financial crisis were very different—at root, one was a liquidity crisis and the other was a credit crisis. The global financial crisis was a credit crisis caused by a housing bubble—a crisis that led to failures of dealers and banks, spilled over into the real economy, and played out over two years. In contrast, the COVID-19 crisis was a public health crisis, the response to which damaged the real economy and spilled over into the financial sector in just a few short weeks. The defining features were the virus itself, expectations of collapse in the real economy that fed back into financial markets, a sharp and fast decline in financial markets, and a vast, immediate demand for cash and liquidity fueled by uncertainty, fear, and the need to pay bills.
- » An understanding of these events, which are summarized on page 4, is a prerequisite to understanding the experiences of US-registered investment companies (RICs) in early 2020. The specific experiences of different types of RICs—money market funds, bond mutual funds, and exchange-traded funds (ETFs)—will be discussed in forthcoming papers.

## About the Report of the COVID-19 Market Impact Working Group

The *Report of the COVID-19 Market Impact Working Group* is being issued under the auspices of the Investment Company Institute's COVID-19 Market Impact Working Group. This group of senior industry executives is examining the causes of the 2020 market turmoil and the experiences of regulated funds. The report is intended to provide a sound, data-based foundation for any future regulatory discussions or other responses that could affect regulated funds and their investors. The report was written by a team from ICI's Research, Law, Industry Operations, and ICI Global groups.

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## Forthcoming Publications of the Report of the COVID-19 Market Impact Working Group

- » "Experiences of US Exchange-Traded Funds During the COVID-19 Crisis"
- » "Experiences of US Money Market Funds During the COVID-19 Crisis"
- » "Experiences of European Markets, UCITS, and European ETFs During the COVID-19 Crisis"
- » "Experiences of US Bond Mutual Funds During the COVID-19 Crisis"

## Introduction

The key to understanding financial market developments in early 2020, and in turn to understanding flows to RICs, is to recognize that the COVID-19 pandemic is first and foremost a public health crisis. Governments sought to contain the spread of the severe acute respiratory syndrome coronavirus-2 (SARS CoV-2, the virus that causes COVID-19) through massive, mandated social distancing that effectively shut down a large portion of economies across the globe.

From those decisions, financial market developments flowed directly. Financial market participants anticipated that businesses were likely to suffer revenue losses, unemployment would rise, households would be unable to pay their bills, the finances of state and local governments would deteriorate sharply, and the global economy faced the probability of a deep, and perhaps prolonged, recession.

These predictions and developments, which were quickly manifested in the data, made a financial shock inevitable. Thus, understanding them is a necessary backdrop to understanding developments in RICs in spring 2020 (which will be discussed in forthcoming papers).

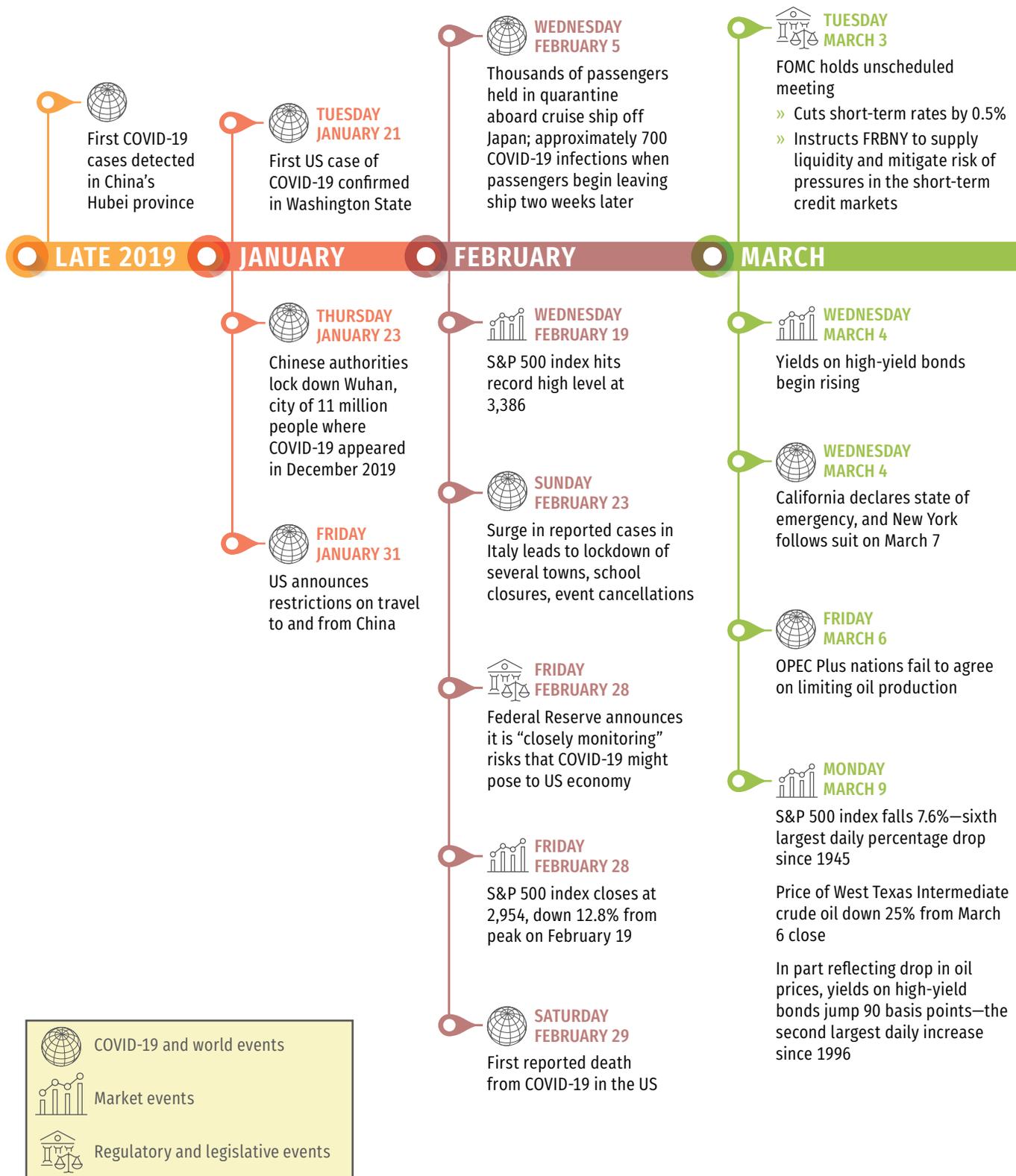
Given these dire circumstances, it was hardly surprising that financial markets reacted as they did. In the equity markets, stock prices fell sharply and volatility spiked. In the fixed-income markets, demand for liquidity escalated rapidly, as many investors sought to protect or bolster their cash positions in the face of tremendous uncertainty. Demand for liquidity also was intensified by investors who sought to sell assets to get cash to meet margin calls or to deleverage their balance sheets. At the same time, the supply of liquidity in the fixed-income markets contracted. Securities dealers were either unable or unwilling to commit capital to make markets, including in corporate bonds deemed to be of pristine credit, and, at times, even in certain Treasury securities. Ultimately, by mid-March, liquidity dried up, money and credit markets ceased to function, and the flow of credit to the economy evaporated. This complex array of factors arose entirely as a response to circumstances caused by the virus.

The speed with which these events developed separate this crisis from the global financial crisis, which gathered steam for at least a year before Lehman Brothers failed in September 2008. And although many elements of the global financial crisis were not foreseen, its origins were—for example, some analysts were warning by early 2007 that the housing market was an accident waiting to happen. In contrast, the financial market crisis triggered by COVID-19 evolved extremely rapidly—the most crucial elements progressed in about 15 days, and it was fully developed in no more than 30 days.

During this fast-moving crisis, governments intervened to protect their economies. In the United States, the Federal Reserve, with the support of Congress and financial capital provided by the US Treasury Department, took powerful steps to provide liquidity and restore the flow of credit. The Federal Reserve acted flexibly by creating, monitoring, and adjusting an array of programs intended to add liquidity to the money and credit markets. And the US Securities and Exchange Commission (SEC) and Commodity Futures Trading Commission (CFTC) worked to ensure that the equity markets and derivatives markets, respectively, continued to function smoothly. These actions, taken together, helped calm markets and restore liquidity and the flow of credit to the economy.<sup>1</sup>

In the aftermath of the COVID-19 crisis, policymakers will no doubt consider whether and how to bolster the financial sector's resilience to massive shocks. But solutions must be relevant to the problems they seek to address. Reforms relevant to the global financial crisis—which stemmed from a credit crisis caused by the collapse of a housing market bubble—may or may not be appropriate for a financial crisis that stems from a global pandemic.<sup>2</sup>

# TIMELINE OF SELECTED EVENTS



 **MONDAY  
MARCH 9**

Federal Reserve and other banking supervisors issue bulletin encouraging financial institutions to meet financial needs of customers affected by COVID-19

Federal Reserve injects more liquidity into short-term credit markets by increasing the maximum amount of its overnight and term repo transactions to \$195 billion

 **THURSDAY  
MARCH 12**

Federal Reserve ramps up liquidity support to the short-term credit markets by increasing its maximum amount of term repo to \$595 billion

 **SUNDAY  
MARCH 15**

New York City announces closure of nation's largest public school system  
CDC advises against gatherings of 50 persons or more (e.g., parades, weddings, sporting events) for the next eight weeks

**MARCH**



 **TUESDAY  
MARCH 10**

Dislocation in Treasury bond market begins: yield on 10-year Treasury note rises 22 basis points—the largest daily increase since October 2008

 **WEDNESDAY  
MARCH 11**

WHO declares COVID-19 a global pandemic  
US imposes 30-day ban on travel from Europe  
Saudi Arabia, UAE announce increases in oil production

 **WEDNESDAY  
MARCH 11**

S&P 500 index falls 4.9%

 **THURSDAY  
MARCH 12**

S&P 500 index falls 9.5%—third largest daily percentage drop since 1945

Bid-ask spread on “on-the-run” 10-year Treasury note widens to 13 basis points—more than four times wider than mid-February levels

Yields on high-yield bonds increase 81 basis points—fourth largest daily increase since 1996

 **FRIDAY  
MARCH 13**

US declares COVID-19 a national emergency

 **FRIDAY  
MARCH 13**

Bloomberg forecast for Q2 GDP growth falls from 1.85% to 0.8%

 **SUNDAY  
MARCH 15**

Federal Reserve takes aggressive actions to support the flow of credit to households and businesses

- » Holds unscheduled FOMC meeting and cuts the federal funds rate 100 basis points to near zero
- » Announces planned purchases of \$700 billion in Treasury and agency MBS securities
- » Determines to reinvest all principal and interest from its holdings of agency MBS securities
- » Eases discount window terms of lending to banks
- » Lowers required reserve ratio for banks to zero

Federal Reserve and other major central banks ease terms on US dollar swap lines to alleviate strains in US dollar global funding markets

 **MONDAY  
MARCH 16**

S&P 500 index falls 12%—second largest daily percentage drop since 1945

VIX exceeds levels seen during global financial crisis

Yields on high-yield bonds increase 86 basis points—third largest daily increase since 1996

# TIMELINE OF SELECTED EVENTS, *continued*

 **MONDAY  
MARCH 16**

Bank regulators, including the Federal Reserve, issue joint statement encouraging banks to borrow from the discount window to meet households' and businesses' demands for credit

Federal Reserve raises maximum amount of overnight repo to \$500 billion and term repo to \$1.6 trillion

 **WEDNESDAY  
MARCH 18**

Federal Reserve announces third facility (MMLF) to provide further liquidity to the commercial paper market

 **FRIDAY  
MARCH 20**

Federal Reserve and other major central banks change swap line operations from weekly to daily

Federal Reserve expands MMLF to allow purchases of short-term municipal debt

## ← MARCH

 **TUESDAY  
MARCH 17**

Yield on 10-year Treasury note rises 29 basis points—the largest daily increase since March 1996

 **TUESDAY  
MARCH 17**

Federal Reserve announces two facilities (CPFF, PDCF) to support commercial paper and bond markets

Treasury Department defers federal tax payments for 90 days without penalty

 **WEDNESDAY  
MARCH 18**

Treasury market under intense stress

- » Yield on 10-year Treasury note up 64 basis points since March 9 (largest 7-day increase since November 2001)
- » Bid-ask spread on most recent off-the-run 10-year Treasury note widens to 42 basis points

S&P 500 index falls 5.2% and is down 12.7% since March 9

Yields on high-yield bonds increase 81 basis points—fourth largest daily increase since 1996

 **THURSDAY  
MARCH 19**

Federal Reserve establishes US dollar swap lines with nine additional global central banks to provide up to \$450 billion to help lessen strains in global US dollar funding markets

 **FRIDAY  
MARCH 20**

Pressures in Treasury market starting to ease

- » Yield on 10-year Treasury note down 26 basis points since March 18
- » Bid-ask spread on on-the-run 10-year Treasury note down to 4 basis points

 **FRIDAY  
MARCH 20**

New York State orders all nonessential businesses closed statewide. Other states follow with similar lockdown orders

 **FRIDAY  
MARCH 20**

Initial unemployment claims spike by 3 million during the week ending March 31, the highest level recorded by US DOL

	COVID-19 and world events
	Market events
	Regulatory and legislative events

**MONDAY  
MARCH 23**

S&P 500 index has plummeted to 2,237, down 33.9% from February high

Bloomberg forecast for Q2 GDP growth again falls—to zero

Yields on high-yield bonds reach 11.4 percent—up from 5 percent in mid-February

**THURSDAY  
MARCH 26**

Financial regulators encourage banks, savings associations, and credit unions to offer small-dollar loans to consumers and small businesses

**WEDNESDAY  
APRIL 1**

Federal Reserve announces temporary change to banks' supplementary leverage ratio to ease strains in Treasury market and increase banks' lending and market making capacities

**FRIDAY  
MAY 8**

Total nonfarm payroll employment fell by 20.5 million in April, the largest monthly decline in the history of the data

## APRIL

## MAY

**MONDAY  
MARCH 23**

Federal Reserve announces plans to take further aggressive actions

- » Establishment of three additional facilities to support the flow of credit to businesses (PMCCF, SMCCF, and TALF)
- » Removal of limit on its purchases of Treasury and agency MBS securities
- » Expansion of terms of MMLF to purchase bank CDs and clarification that VRDNs qualify as short-term municipal debt
- » Expansion of terms of CPFF to purchase commercial paper issued by state and local governments

By 96–0 vote, Senate approves \$2 trillion to support financial system and the economy. Signed into law on March 27, the CARES Act is the largest grant of fiscal relief in US history

**THURSDAY  
MARCH 26**

US leads the world in reported cases of COVID-19

**THURSDAY  
MARCH 26**

Stock market turning around—S&P 500 index closes at 2,630, up 17.6% from March 23 low

**TUESDAY  
MARCH 31**

Federal Reserve establishes FIMA Repo Facility to smooth functioning of US Treasury market

**FRIDAY  
APRIL 3**

Total nonfarm payroll employment fell by 701,000 in March

**MONDAY  
APRIL 6**

Federal Reserve announces establishment of the PPP, a CARES Act program that lends to qualifying small businesses

**THURSDAY  
APRIL 9**

Q2 GDP expected to decline 25.3%

Yields on high-yield bonds drop 91 basis points—second largest daily decline since 1996

S&P 500 index up 24.7% from March 23 low

**THURSDAY  
APRIL 9**

Federal Reserve announces loans of up to \$2.3 trillion to households, employers of all sizes, and state and local governments through PPP, new Main Street Lending Program, PMCCF, SMCCF, TALF, and new MLF

Federal Reserve Chair Jerome Powell: “As a result of the economic dislocations caused by the virus, some essential financial markets had begun to sink into dysfunction....We acted forcefully to get our markets working again, and, as a result, market conditions have generally improved.”

## COVID-19: Its Epidemiology in Brief

Because the disruptions to the global economy and financial markets originated from a health crisis, and not a financial one, it is helpful to discuss how the crisis unfolded.

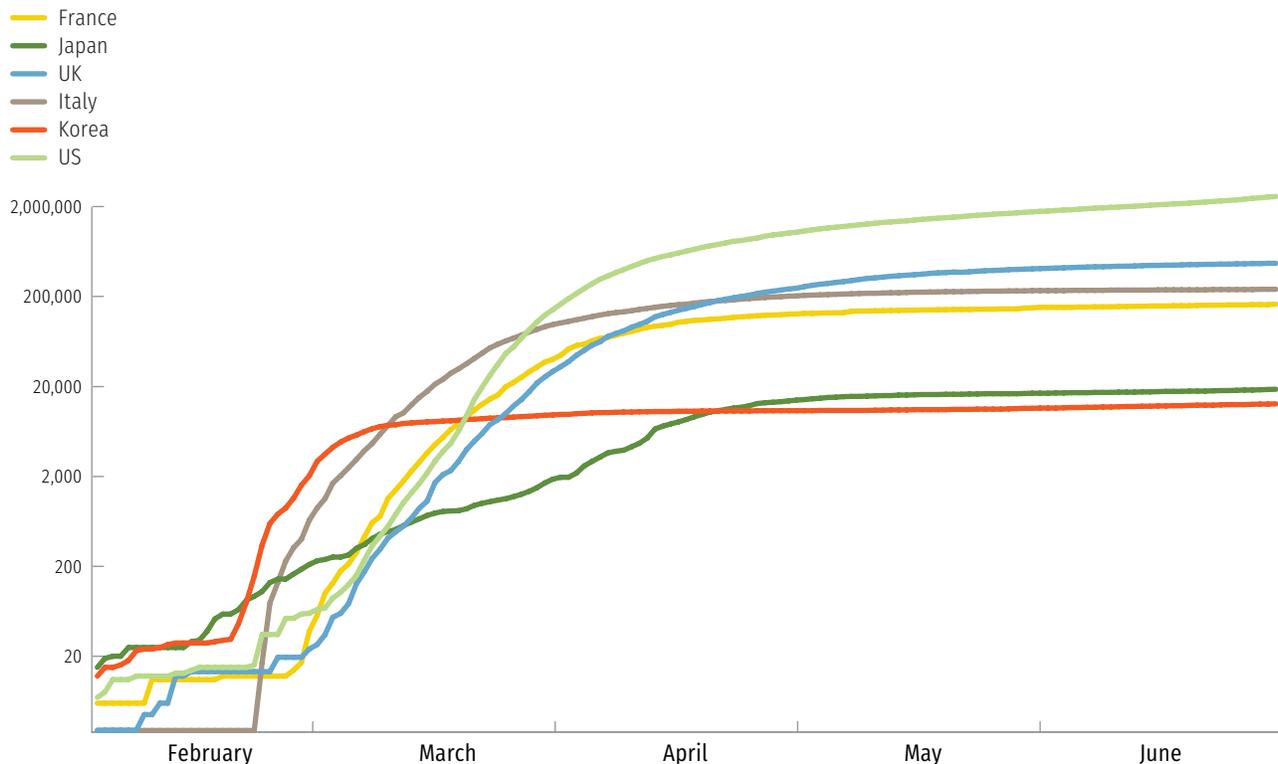
SARS CoV-2 is a highly transmittable and pathogenic virus that emerged in Wuhan, China, in late 2019. From early 2020 onward, the virus spread from China to other countries, although at uneven rates (Figure 1.1). Cumulative confirmed cases of the virus increased in the second half of February in countries in the Asia-Pacific region, including Japan and the Republic of Korea. In Korea (red line), cumulative confirmed cases accelerated rapidly in the second half of February, but flattened out fairly early in March, as its government imposed quarantines and social distancing measures.

From late February to mid-March, the virus spread rapidly in Europe, first in Italy (brown line), then to other countries such as France (gold line), Spain, and Germany, and eventually to the United Kingdom (blue line). Beginning on March 3, Italy imposed an array of social distancing and containment measures, including closing schools, restricting mass gatherings, requiring businesses to close, issuing stay-at-home orders, recommending telecommuting, and restricting cross-border travel. Other European countries adopted similar measures, generally by mid-March.

FIGURE 1.1

### COVID-19 Virus Hit Countries at Different Times

Cumulative confirmed cases for selected countries,\* daily, February 4–June 30, 2020 (log scale)



\* Consistent with common practice, the figure excludes data on China.

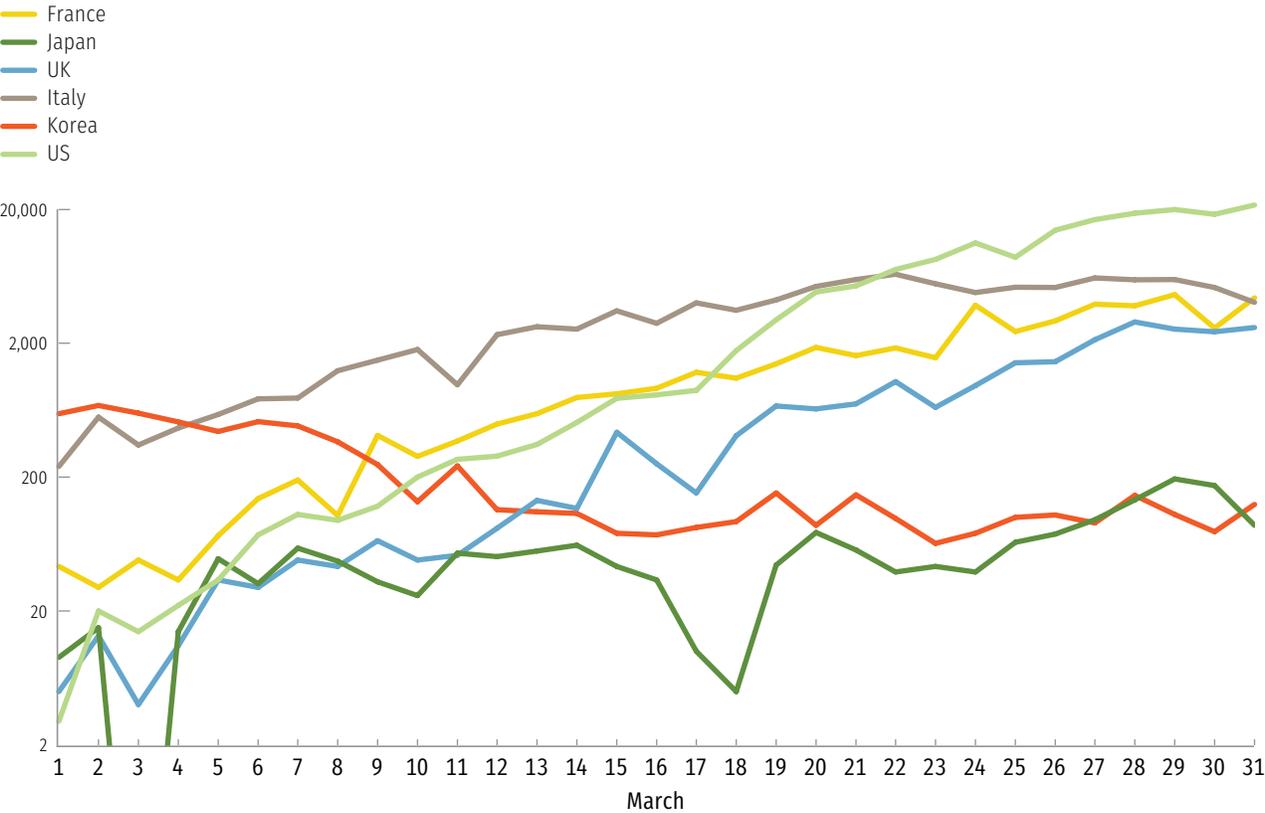
Source: European Centre for Disease Prevention and Control

In the United States, cumulative cases were initially small—only 66 by the end of February. In fact, cumulative US cases remained below those of France and Korea until well into March. Not until March 31 did cumulative confirmed cases in the United States (85,991) exceed those of Italy (80,539).

To understand what happened in financial markets, it is helpful to have in mind the daily pace at which the virus was spreading throughout the world in March 2020 (Figure 1.2). Newly reported cases fell in Korea and remained relatively low and stable in Japan. The number of new daily cases continued to rise throughout the first few weeks of March in Italy and throughout the entire month in France and the United Kingdom. The number of daily new reported cases remained fairly small in the United States in early March. But new US daily cases jumped rapidly after March 16, and by March 22, the United States was leading the world in terms of new daily reported cases.

**FIGURE 1.2**  
**New Daily COVID-19 Cases in the United States Surpassed Other Countries on March 22, 2020**

Daily new confirmed cases, March 1–March 31, 2020 (log scale)



Source: European Centre for Disease Prevention and Control

A review of the measures that US authorities undertook to contain the virus is critical to understanding the *depth* of financial market stresses in March 2020.

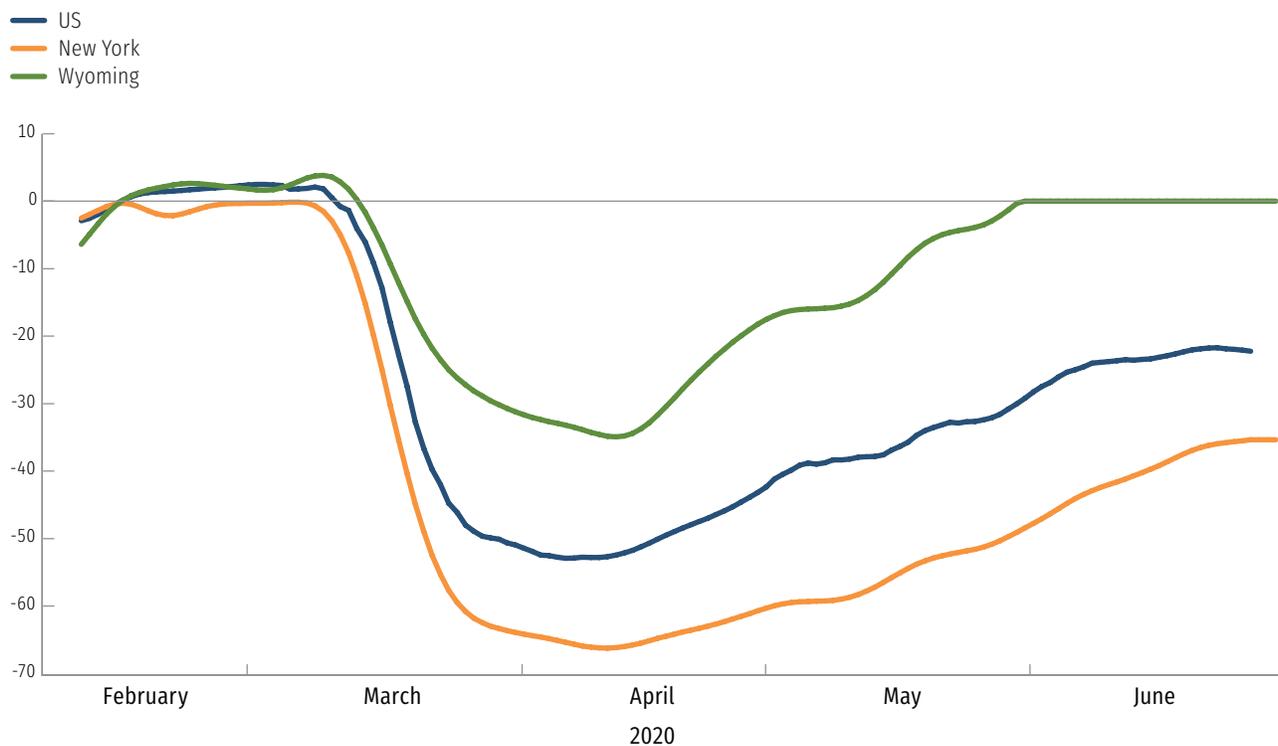
Like governments elsewhere in the world, US authorities reacted to the outbreak with health mandates and social distancing measures. Such measures included imposing restrictions on travelers arriving in the United States from certain Asia-Pacific and European countries; ordering the closure of schools, universities, restaurants, bars, and recreational and entertainment facilities; imposing stay-at-home orders for employees who could work from home or whose work was not deemed essential; and prohibiting large social gatherings.

In addition, US businesses and institutions voluntarily undertook such additional measures as prohibiting employees from engaging in foreign or domestic travel and cancelling or postponing significant numbers of large conferences. Universities, public and private, sent students home. Households sharply curtailed dining out and, recognizing that travel would be difficult if not impossible, cancelled vacation plans and sought refunds from airlines and hotels.

The effects of social distancing and mandated closures were readily apparent. Measures of social distancing indicate that the mobility of US residents dropped very rapidly in March (Figure 1.3) relative to normal levels (“normal” is shown as zero in the figure).<sup>3</sup> Individual mobility declined, especially in populous coastal states. This was particularly significant because New York City, the nation’s financial hub, closed down swiftly, bringing with it the challenge of keeping the financial system running under new and untried WFH arrangements.

**FIGURE 1.3**  
**US Mobility Dropped Rapidly in March Due to Social Distancing and Health Mandates**

Index of social mobility,\* daily, February 8–June 30, 2020



\*“Normal” conditions are represented as a zero value for the index.

Source: Institute for Health Metrics and Evaluation (IHME), University of Washington

# Macroeconomic Effects of COVID-19 and Social Distancing

Health mandates imposed by governments, and the social distancing approaches voluntarily adopted by others such as businesses and schools, effectively shut down large portions of the US economy.

Markets anticipated—and subsequent data confirmed—that gross domestic product (GDP) and business revenues would plummet, unemployment would skyrocket, the finances of municipalities and households would deteriorate, and all sectors would face challenges paying their bills. But there was vast uncertainty about the extent of the damage, causing businesses, households, and financial market participants to become extremely risk averse.

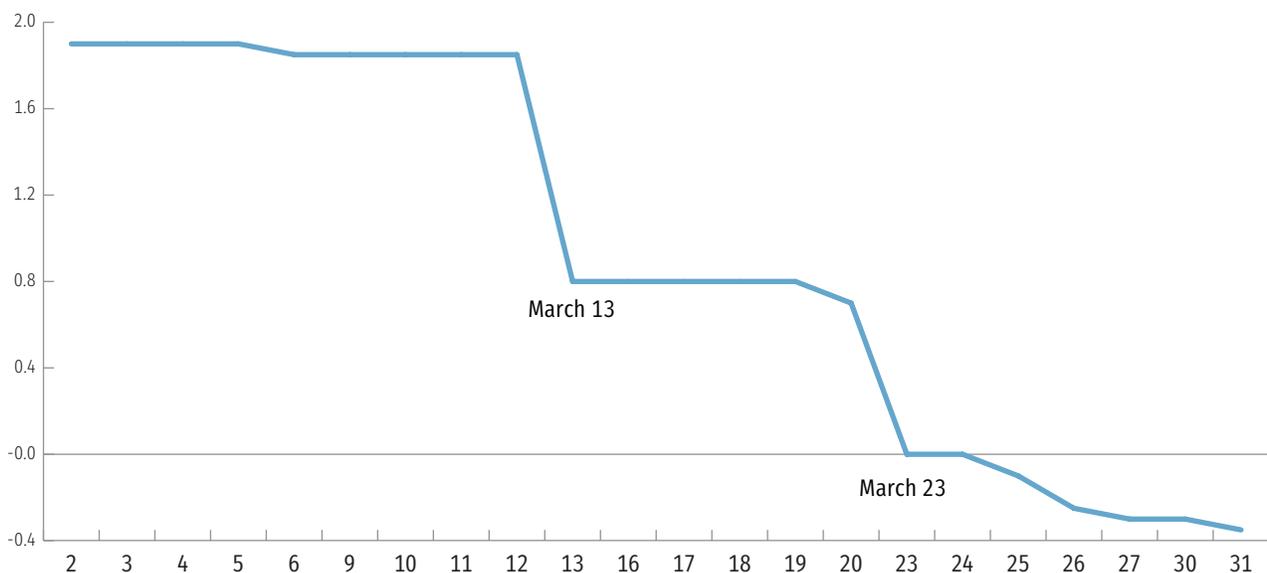
The COVID-19 crisis differs in many respects from the global financial crisis. The global financial crisis was, at root, a financial crisis that spilled over into the real economy. The COVID-19 crisis, in contrast, is a shock to the real economy that rebounded into financial markets. This is key to understanding financial market developments and the experience of funds.

Government efforts to control the healthcare crisis by imposing strict mandates and social distancing effectively shut down large portions of the economy, with the expectation that US economy was headed for a recession, that unemployment could spike, and that large numbers of businesses would face challenges.

In light of these stresses, economists increasingly slashed their forecasts for economic growth in the United States through March. For example, on March 13, Bloomberg’s survey of economists’ forecasts pared the outlook for US GDP growth for the second quarter of 2020 by more than half, from 1.85 percent to 0.80 percent at an annual rate (Figure 1.4). Between the key dates of Friday, March 20 and Monday, March 23, the Bloomberg consensus forecast for GDP growth for 2020:Q2 again dropped, this time to 0.0 percent. Just two days later, its forecast was revised down into negative territory.

**FIGURE 1.4**  
**Forecasts for Growth Rate of US Real GDP for 2020:Q2**

Annualized rate, forecasts for economists surveyed March 2–March 31, 2020

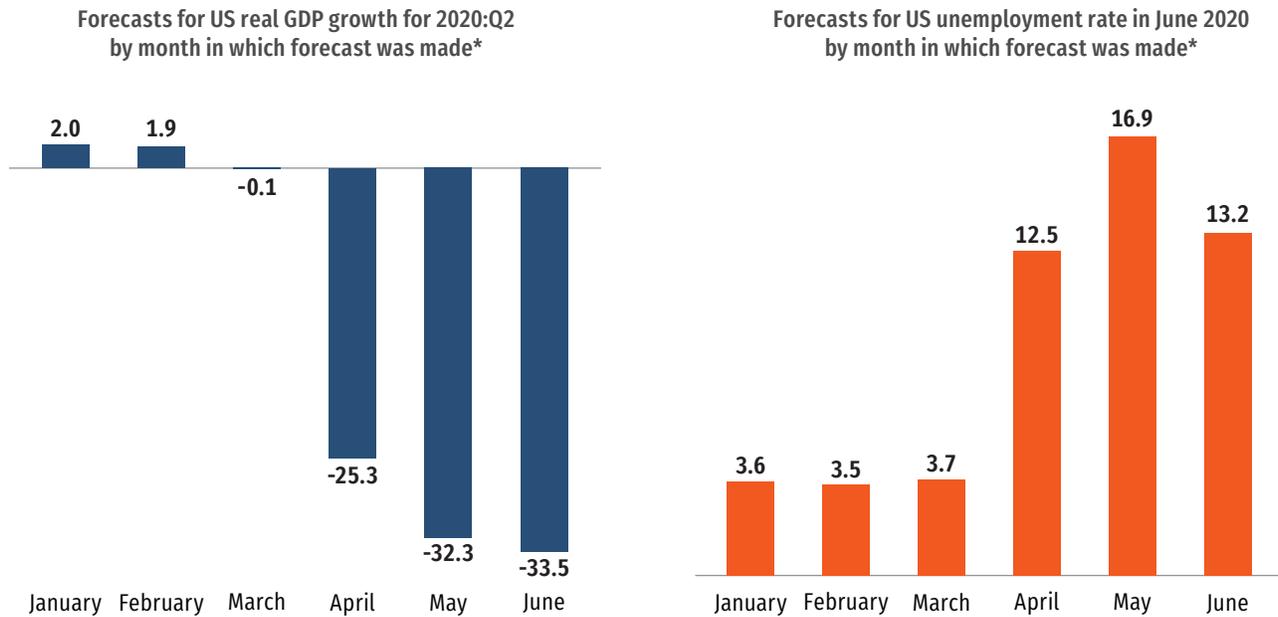


Source: Bloomberg

FIGURE 1.5

## Forecasts for US GDP and Unemployment Reflected COVID-19 and Social Distancing

Percent, January–June 2020



\* Forecasts are an average of forecasts made by more than 70 economists on a monthly basis, as surveyed by the *Wall Street Journal's Economic Forecasting Survey*. Surveys are typically conducted during the first or second week of the indicated month.

Source: *Wall Street Journal*

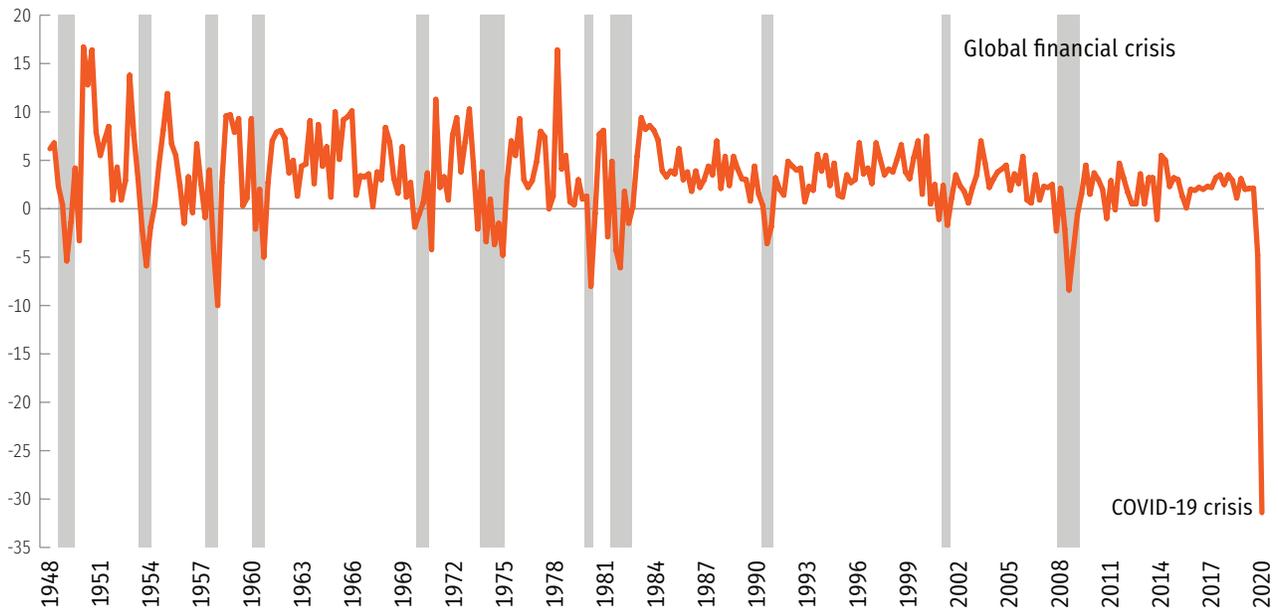
By early April, forecasts predicted that the US economy would fall off a cliff (Figure 1.5). For example, an early April survey of economists predicted that second quarter GDP would shrink at a 25.3 percent annual rate (left panel). Between March and April, economists also changed their predictions about the unemployment rate that would prevail in June 2020 from a rate of 3.7 percent, effectively full employment, to 12.5 percent, a level typically seen in a recession.

These forecasts were largely borne out. The most recent estimate puts the growth rate of US real GDP for 2020:Q2 at -31.4 percent (Figure 1.6).<sup>4</sup> This drop-off far outstrips the downturn in economic activity during the global financial crisis, when GDP fell at an annual rate of 8.4 percent in the fourth quarter of 2008. In fact, GDP fell at a far faster rate in the second quarter of 2020 than in any other quarter in the post-World War II era. In addition, the estimate of the unemployment rate for June 2020 is 11.1 percent.<sup>5</sup>

FIGURE 1.6

### Reflecting Health Mandates and Social Distancing, GDP Saw Its Biggest Drop Since World War II

Percent change in US real GDP, seasonally adjusted annual rate, quarterly, 1948:Q1-2020:Q2



Source: Federal Reserve Bank of St. Louis FRED database

## Stock Market Reaction

Financial markets around the globe generally took the earliest COVID-19 developments in stride. This seems to be, at least in part, because even as late as February 21, market participants still had little idea how severe the public health crisis would become.<sup>6</sup>

The situation changed, however, over the weekend of February 22–23. The number of confirmed cases spiked in Japan, South Korea, Iran, and Italy. As noted earlier, Italy imposed stringent quarantines and social distancing mandates in some regions. As concerns arose that the virus could spread rapidly to other parts of Europe, many countries imposed restrictions against incoming air passengers.

Given these events, world stock markets began falling in the third week of February and continued to decline through the third week of March (Figure 1.7). Overall contractions in stock prices varied by country—for example, Germany and France saw larger overall declines while Japan saw a smaller overall decline.

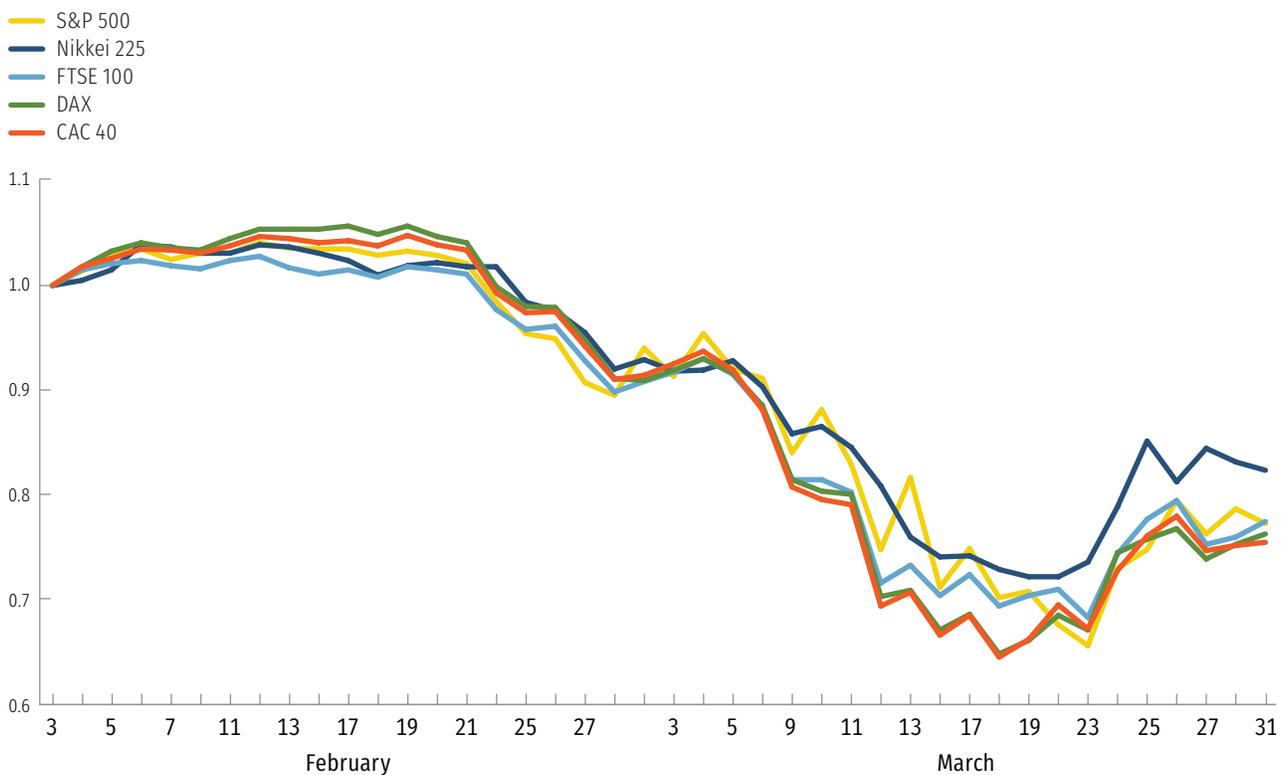
The United States had very few confirmed cases of COVID-19 by the end of February.<sup>7</sup> Nonetheless, investors anticipated that the virus was likely to disrupt global trade and supply chains. They began to expect the virus to hit the United States hard, which would perhaps require US authorities to impose the same kinds of mandates on social distancing that other countries were adopting, therefore slowing the US economy.<sup>8</sup>

Investors' expectations were clear from the data. There is a striking correlation between the S&P 500 index and a social distancing index for the United States (Figure 1.8). The social distancing index is shifted left by 15 days to account for the fact that markets most likely anticipated the placement of mandates and social distancing measures and their effects. The sharp fall in the stock market and its rebound closely track the social distancing measure (correlation = 0.92). This correlation underscores the fact that the financial market developments in February and March were being driven by concerns about the real side of the economy, which in turn reflected actions being taken by all levels of government, and voluntarily by the public, to fight the coronavirus by shuttering large parts of the US economy.

FIGURE 1.7

### World Stock Markets Declined Sharply in February and March 2020

Selected stock indexes,\* daily, February 3–March 31, 2020



\*Indexes are scaled to 1.0 on February 3, 2020.

Source: Bloomberg

FIGURE 1.8

### Stock Markets Anticipated Effects of Social Distancing

S&P 500 index and social distancing index for the United States,\* daily, December 2, 2019–June 30, 2020



\*The social distancing index is shifted left by 15 days (i.e., a 15-day lead). “Normal” conditions are represented as a zero value for the index.

Source: ICI calculations using data from Federal Reserve Bank of St. Louis FRED website and Institute for Health Metrics and Evaluation (IHME), University of Washington

By historical standards, the drop in the US stock market was swift (Figure 1.9). The S&P 500 index reached an all-time high on February 19; by the end of February, it had dropped nearly 13 percent. By March 23, the index hit a low point, 34 percent below its all-time peak in February. All told, this precipitous drop occurred in only 23 trading days. By comparison, during the global financial crisis, it took the S&P 500 index one full year to fall the same amount—34 percent—from its all-time high on October 9, 2007.<sup>9</sup>

FIGURE 1.9

**During the COVID-19 Crisis, the US Stock Market Dropped Swiftly**

S&P 500 index,\* days after peak on October 9, 2007, and on February 19, 2020



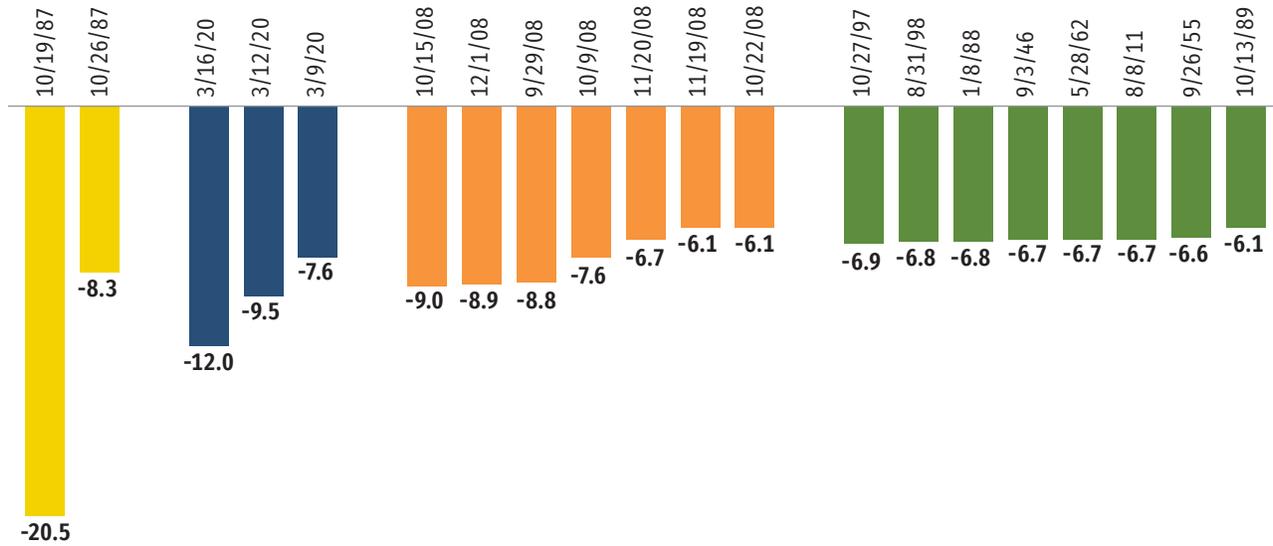
\*Index is scaled to 1.0 on stock market peak on October 9, 2007, for the global financial crisis and on February 19, 2020, for the COVID-19 crisis.

Source: ICI calculations using Bloomberg data

FIGURE 1.10

### COVID-19 Produced Some of the Largest One-Day Stock Market Declines Since 1945

Top 20 largest one-day percent declines in S&P 500 index from 1946 to 2020



Source: ICI calculations using Bloomberg data

The early weeks of the COVID-19 crisis in the United States also produced some of the largest one-day stock market declines in the post-World War II era. Figure 1.10 shows the 20 largest one-day declines in the S&P 500 index from January 1, 1946, to September 24, 2020. Of those 20 days, three occurred in March 2020 (blue bars). Moreover, the March 2020 declines were larger on average than declines seen during the global financial crisis (orange bars). The 12.0 percent decline on March 16, 2020, was exceeded only once, on Black Monday, October 19, 1987.

This is relevant because fast, sharp declines in asset prices can fuel market dislocations as investors rush to adjust their positions, reduce exposures, meet margin or collateral calls, and deleverage. These reactions were at the heart of the dislocations seen during March 2020 in the fixed-income market.

Nevertheless, the stock markets functioned remarkably smoothly in February and March 2020. Markets encountered a few hiccups, such as those days when trading was temporarily halted because equity markets hit limit-up or limit-down circuit breakers. But these trading halts worked as intended, creating timeout periods that enabled market participants to make more-informed decisions.

Stock exchanges remained open and functioning, as did trading in other exchange-traded products, such as certain derivatives and ETFs. Despite unprecedented market volatility in March 2020, the ETF ecosystem—generally thought of as ETFs, authorized participants (APs), and ETF liquidity providers—proved resilient (ICI will provide more details on this issue in a forthcoming paper).

## Volatility Hit Extreme Levels

Key to understanding financial market developments in spring 2020, and hence, what RICs experienced, is the tremendous uncertainty the virus engendered. There was—and still is—apprehension around such questions as:

- » How is the virus transmitted?
- » Will mandates and social distancing work and how long must they be in place?
- » How long can businesses, nonprofits, municipalities, and households survive in this environment without going bankrupt?
- » How long can businesses operate with broken supply chains?
- » Will the virus require long-term structural changes in how businesses (such as airlines) and institutions (such as schools and universities) must operate?
- » When will employees return to their workplaces and what liabilities will employers face if returning employees get sick?
- » How large will government support programs be and how long will they last?
- » When will a vaccine be available and what factors might complicate its broad distribution?

Given these and myriad other unknowns, risk aversion—fear—spiked dramatically in March. Among other things, fear reflected concerns about raw materials and other manufacturing and service inputs, which resulted in anomalies, including massive shortages of toilet paper, hand sanitizer, personal protective equipment (e.g., masks, gloves), cleaning supplies, and specific food items.

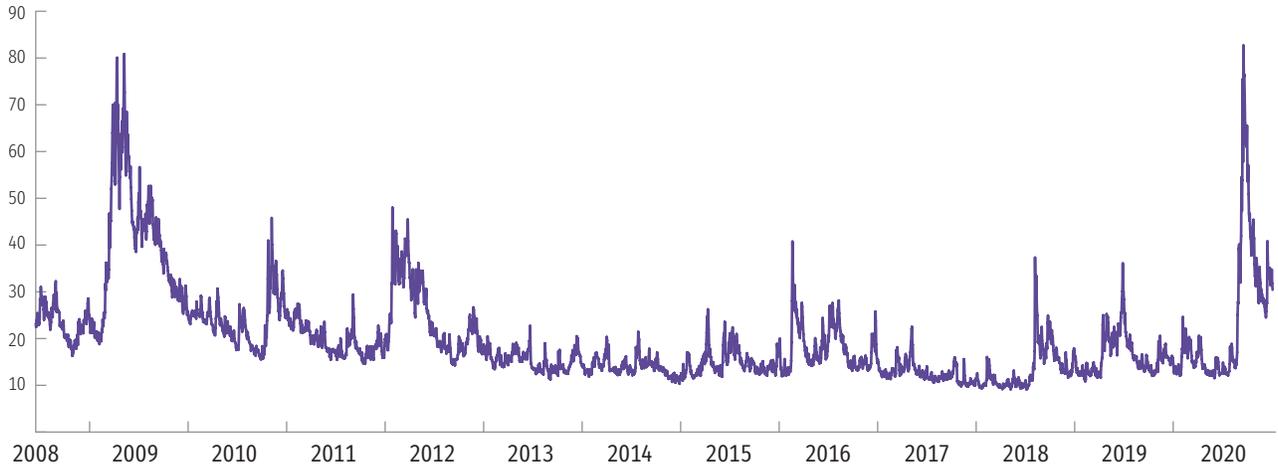
Measures of the implied volatility of stock prices, which are often described as fear indexes, jumped to levels exceeding those seen during the global financial crisis (Figure 1.11), peaking on March 16, 2020.

Volatility measures declined after March 16, but nevertheless remained elevated (Figure 1.12) relative to historical averages. In addition, since mid-March volatility has spiked from time to time with some jumps reflecting upticks in the numbers of new COVID-19 cases or the re-imposition of containment measures and health mandates.

FIGURE 1.11

### Stock Market Volatility Surpassed Levels Seen During the Global Financial Crisis

Level of VIX,\* daily, January 2, 2008–June 30, 2020



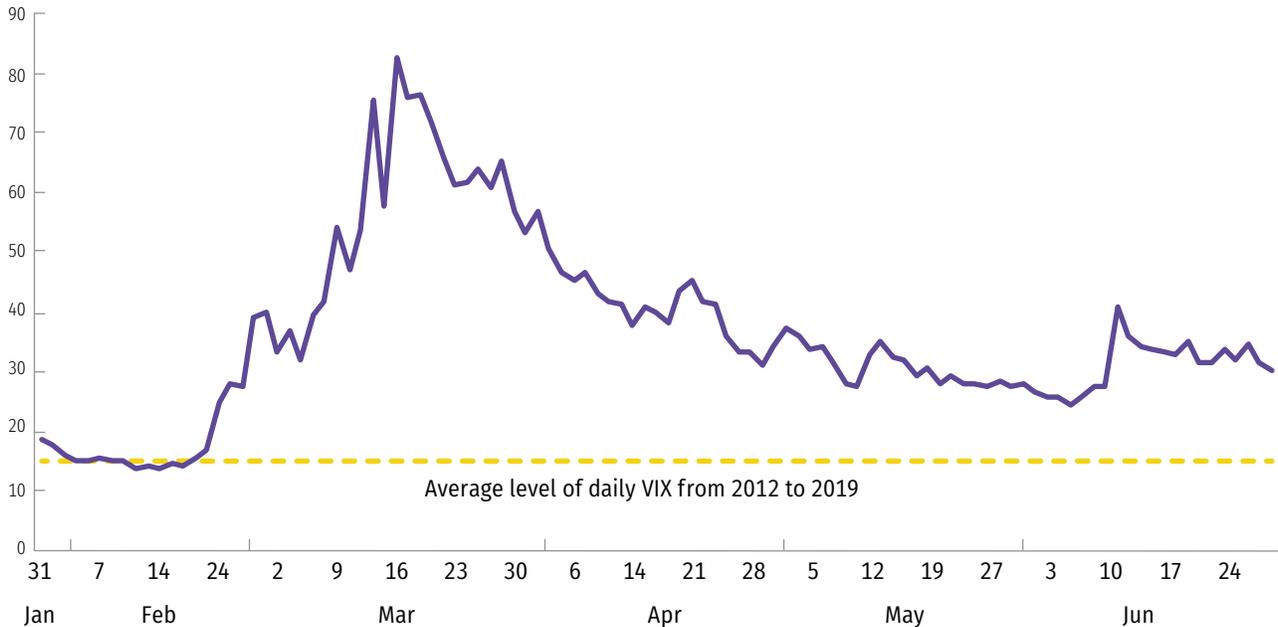
\*The Chicago Board Options Exchange Volatility Index (VIX), which is derived from price inputs on S&P 500 index options, represents the market's expectation of 30-day forward looking volatility. The VIX provides a measure of market risk and investors' sentiments—values greater than 30 typically reflect a high degree of investor fear and values less than 20 are associated with a period of market calm.

Source: Federal Reserve Bank of St. Louis FRED database

FIGURE 1.12

### Volatility Has Declined Since Mid-March, but Remains Elevated

Level of VIX,\* daily, January 31–June 30, 2020



\*The Chicago Board Options Exchange Volatility Index (VIX), which is derived from price inputs on S&P 500 index options, represents the market's expectation of 30-day forward looking volatility. The VIX provides a measure of market risk and investors' sentiments—values greater than 30 typically reflect a high degree of investor fear and values less than 20 are associated with a period of market calm.

Source: Federal Reserve Bank of St. Louis FRED database

## Reaction of Money and Bond Markets

The early effects of the COVID-19 health crisis, and of shuttering parts of the economy, were reflected most dramatically in the bond and short-term credit markets in March. These markets came under severe stress, which resulted in widespread dislocations, beginning in the Treasury market—normally a safe haven in times of market stress. These pressures migrated to mortgage backed securities (MBS) and short-term funding markets, and finally spilled over into the other credit markets (commercial paper, investment grade bonds, municipal securities, securitized debt, and high-yield bonds).

The impetus for these stresses was a tremendous demand for liquidity—cash—in the face of uncertainty about how devastating the virus would be and how the economy would fare. Short- and long-term credit markets froze. Sellers seeking liquidity found it difficult, if not impossible, to find buyers in any reasonable size for even very high-quality credits.

At root, these developments were a reaction to the pandemic and the strains that social distancing and government mandates put on the real economy. Market observers correctly note that these strains were amplified by varied and complex interactions and factors in the financial markets. This section reviews factors that are especially germane to the experiences of RICs in March.

### Government Bond Market Responded to Crisis First

The timing of events in spring 2020 can provide insight into how stress spread in the financial markets—shedding light on the links between events and their consequences. Evidence suggests that problems arose first in the market for US Treasury securities.

In part because the market for US Treasury securities is very deep and liquid, market participants (including foreign governments) almost universally consider Treasuries the safe haven during periods of market stress. Thus, during such times, demand for Treasury securities typically would drive prices up and yields down (bond prices and yields are inversely related). In other words, during crises, when stock prices are falling, Treasury yields also normally are falling. True to form, from February 12 to March 9, Treasury bond yields dropped almost in lockstep with stock markets (Figure 1.13). As the stock market declined, yields on 10-year Treasury bonds dropped 108 basis points. While some of the rally in Treasury bond prices was due to a migration into Treasury securities, actual and anticipated cuts in the federal funds rate by the Federal Reserve also contributed to the increase in Treasury prices.

Then, from March 9 to March 18, Treasury yields broke with their usual pattern, as the yield on the 10-year Treasury bond rose 64 basis points (a drop in price of 6.4 percent) even while stock prices fell. In the last 30 years, only one other seven-day period had such a large increase in 10-year Treasury bond yields (the seven days ending November 16, 2001).

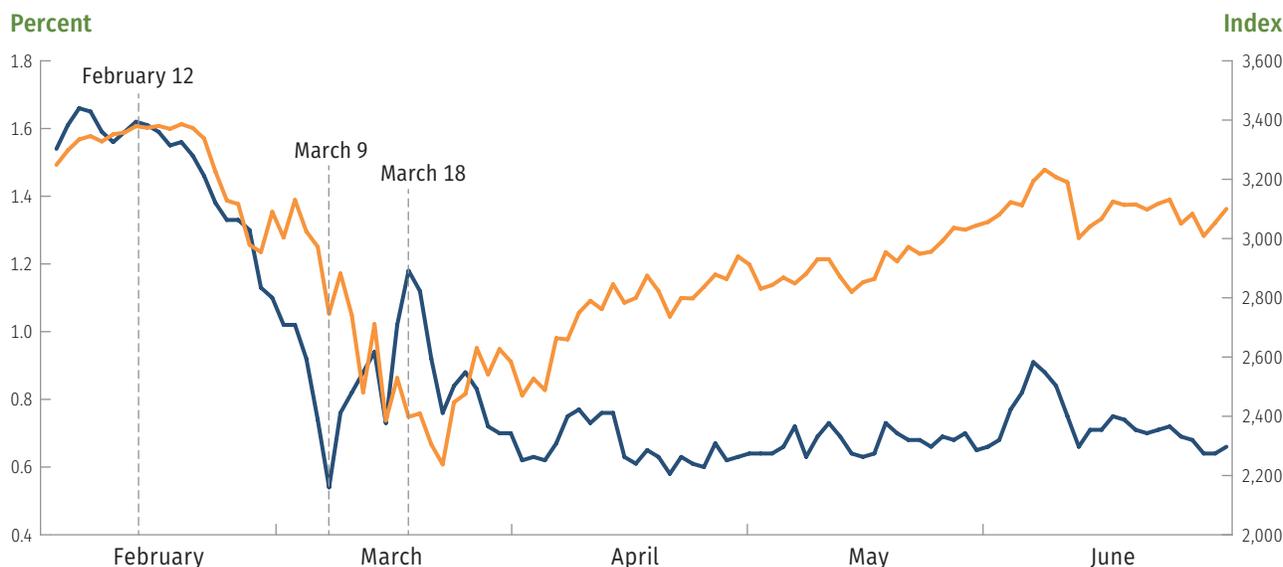
The abnormal correlation between Treasury yields and stock prices between March 9 and March 18 indicates that the Treasury markets were becoming dislocated. The movement in 10-year Treasury yields was due, in part, to some market participants who wanted to raise a significant amount of cash quickly and turned to selling Treasury bonds. Normally, during periods of stress, investors would try to buy Treasuries. Instead, because of the high demand for liquidity during this time, investors wanted to *sell* Treasuries.

FIGURE 1.13

## Treasury Bond Market Behaved Abnormally

Daily, February 3–June 30, 2020

— Yield on 10-year Treasury note (left scale)  
 — S&P 500 index (right scale)



Source: Federal Reserve Bank of St. Louis FRED database

### Bid-Ask Spreads on Treasury Bonds Leapt, Signaling Dislocations

Evidence of dislocations in the Treasury bond market also appeared in bid-ask spreads and differences in prices between on-the-run and off-the-run Treasury bonds.<sup>10</sup>

Normally, bid-ask spreads on Treasury bonds are quite narrow, in the range of 1 to 3 basis points, indicating that the market is deep and liquid and that Treasury bonds can be bought or sold promptly with low transaction costs. The difference between bid-ask spreads for on-the-run versus off-the-run Treasury securities also is normally quite small.<sup>11</sup> In rare circumstances, when fixed-income markets are under considerable strain, these patterns may break down, warning that fixed-income markets are becoming dislocated.

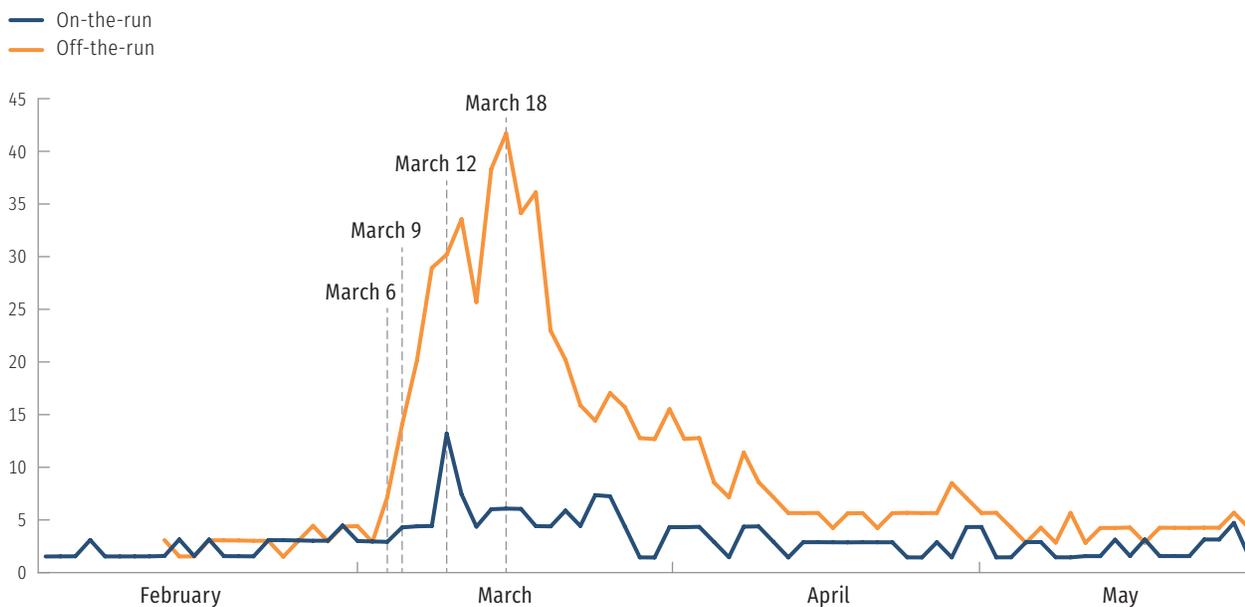
The warning light began flashing red in early March, indicating stress and dislocations in the Treasury market. For example, Figure 1.14 shows that bid-ask spreads for on-the-run Treasuries were quite narrow—the normal pattern—in February, but then jumped to 13 basis points on March 12. Although falling somewhat in the following days, the bid-ask spread for on-the-run Treasuries remained elevated until the end of March.

This same pattern was even more dramatic for off-the-run Treasuries. The bid-ask spread for “first off-the-run” 10-year Treasury bonds began rising on March 6 and ultimately increased by a factor of 14, from an average level of about 3 basis points before March 6 to a peak of 42 basis points on March 18. This points to dislocation—illiquidity—in the Treasury market. These events commenced before money market funds and bond funds began seeing meaningful outflows (which will be demonstrated in forthcoming ICI papers).

FIGURE 1.14

### Bid-Ask Spreads on Treasury Bonds Widened Substantially

Bid-ask spreads for 10-year Treasury note,\* basis points, daily, February 3–May 29, 2020



\*The bid-ask spread for on-the-run is calculated using the bid and offer prices on the most recently issued 10-year Treasury note. The off-the-run spread is calculated using the bid and offer prices on the next most recently issued 10-year Treasury note.

Source: ICI calculations based on Bloomberg data

## Treasury Market Volatility Also Spiked

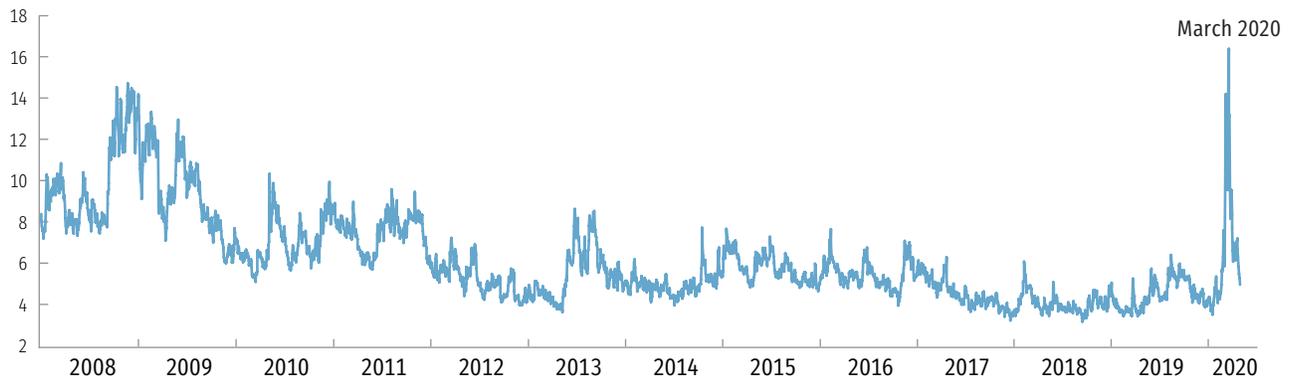
Stress in the Treasury market also was evident in volatility measures, which increased sharply. Volatility in Treasury futures markets, as measured by the TYVIX index, jumped fourfold in March 2020, to levels exceeding those seen during the global financial crisis (Figure 1.15, top panel). The bottom panel focuses on the first four months of 2020, showing how volatility spiked to very high levels on March 9, 12, and 19—indicative of dislocations in the Treasury market.

FIGURE 1.15

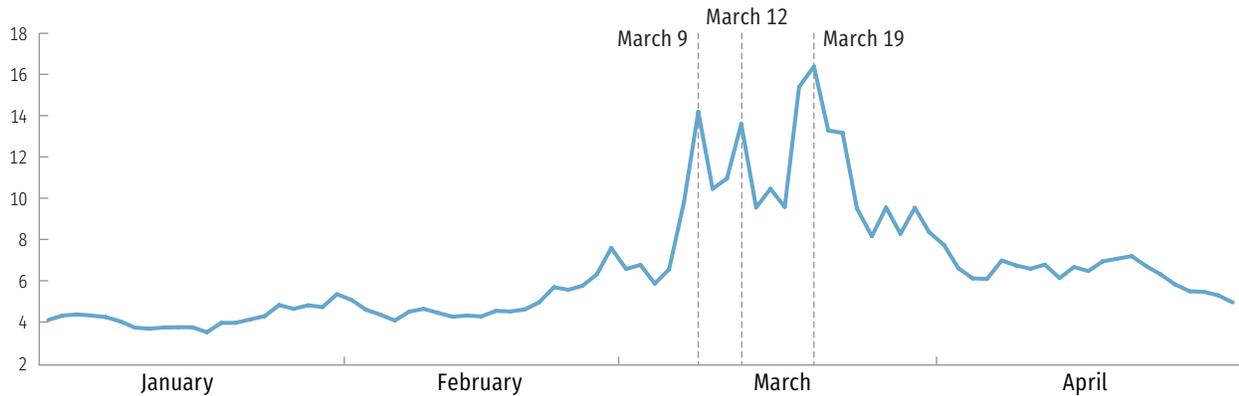
### Expected Volatility of Treasury Bond Market Also Jumped

TYVIX index,\* daily, selected periods

January 1, 2008–March 31, 2020



January 2, 2020–April 30, 2020



\*The TYVIX index measures expected percent changes over a one-month period in the Chicago Board of Trade futures on 10-year Treasury notes. Source: Chicago Board Options Exchange (Cboe)

## Why Did the Treasury Bond Market Behave Abnormally?

According to market observers, strains in the Treasury market reflected a wide array of factors, involving varied and complex interactions in the equity, bond, and short-term credit markets. Among factors that have been cited are:<sup>12</sup>

- » Selling Treasuries to meet the demand for cash in the face of vast uncertainty
- » Selling Treasuries to meet margin calls
- » Rebalancing positions in light of market conditions
- » Unwinding leveraged trades
- » Drawdowns of credit lines by corporate borrowers
- » Concerns that WFH arrangements could impair market making
- » Dealer balance sheets becoming bloated with Treasury securities
- » Dealers' difficulty intermediating trades in various credit instruments as a result of internal risk limits and regulatory requirements, which were implemented in the wake of the global financial crisis to limit risk taking (e.g., supplementary leverage ratio, liquidity coverage ratio) and may have constrained dealers' balance sheet capacity<sup>13</sup>

The deputy secretary of the US Treasury described events in the Treasury market in March and April as “not an ordinary blip in liquidity conditions” but rather “a nearly unprecedented disruption.”<sup>14</sup> This official summed up the causes as “really a combination of two broad developments: first, a rush for liquidity and safety by nearly all categories of investors and, second, a significant reduction in liquidity provision by both dealers and principal trading firms.”<sup>15</sup>

It is beyond the scope of this paper to analyze all of these factors in detail. But some discussion is helpful to understanding what RICs experienced during March and why.

## Selling Treasuries to Meet the Extraordinary Demands for Cash

As the COVID-19 crisis progressed, questions naturally arose about whether businesses, households, and municipalities would be able to pay their bills. Commonly, during financial or economic crises, investors seek to counterbalance uncertainty by flocking to “cash.” Businesses, households, and municipalities are more likely to pay their bills if they have a reservoir of cash. In March, therefore, “cash was king.” Normally, Treasury securities—even longer-dated ones—would be considered safe investments from a credit perspective, and investors generally are more willing to hold them during a crisis. But longer-dated Treasuries are not cash; their value will fluctuate with changes in interest rates. When interest rates on longer-dated Treasuries rose in early to mid-March, the value of these Treasury securities fell, which may have prompted selling by some market participants looking to lock in profits.

Various institutional arrangements also may have fueled heavy selling of US Treasury securities. For example, foreign central banks were among the heavy sellers of Treasuries, including to obtain cash to lend to banks domiciled in their countries.<sup>16</sup> To understand why this might be necessary, consider that foreign banks lend, often through their “branches and agencies” in the United States, to American businesses, households, and other US entities. Foreign banks often fund loans by selling commercial paper to US investors. If investors, during a period of stress, become unwilling to purchase that commercial paper, foreign banks must find the US dollars elsewhere. One possibility is to borrow US dollars from the central banks in their home countries. If those central banks do not have US dollars, they may seek to obtain US dollars by selling Treasury bonds.<sup>17</sup>

## Margin Requirements on Futures Positions

To help manage and mitigate risks, national exchanges typically require investors who take positions in derivatives to post margin. When markets are volatile, exchanges may raise margin requirements to compensate for the additional risk.<sup>18</sup> Exchanges began raising required margins on Treasury futures in early March. For example, from March 1 to March 13, the Chicago Mercantile Exchange raised the maintenance margin on long-dated Treasury futures by more than 100 percent (Figure 1.16, top panel). By the end of March, the level had more than tripled (bottom panel),<sup>19</sup> by far and away the highest level since January 8, 2010.

This development likely had two effects. First, by raising the cost of maintaining Treasury futures positions when longer-term Treasury rates were rising in March, investors were incentivized to close out their long positions.<sup>20</sup> These closeouts added downward pressure on Treasury bond prices because futures prices and the prices of the bonds on which the futures are based tend to track one another. Second, investors who wanted to maintain their long futures positions may have been forced to obtain cash to meet margin calls by selling Treasury securities. That selling also would have added to the pressures in the Treasury market.

## Rebalancing Positions

Rebalancing may have added to pressures in the Treasury market in March.<sup>21</sup> Many investors, both retail and institutional, typically rebalance their holdings as market conditions evolve. As discussed earlier, from mid-February through the first week in March, there was a big change in market conditions—stock prices fell while bond prices rose. Investors who were looking to bring their portfolio allocations back in line from these asset price movements may have bought stocks and sold bonds, including perhaps Treasury bonds, just as Treasury bond prices started falling early in the second week of March. Although Treasury bond prices continued to decline through the third week in March, investors rebalancing during this time also would have wanted to sell bonds because stock prices were falling by substantially more than bond prices.

## Unwinding of Levered Positions

When markets are falling and volatility is rising, investors may be forced to unwind positions. For example, when an investor borrows money to fund a long position and posts collateral with the lender, the lender may ask for additional collateral if the value of the posted collateral declines. If the borrower cannot provide the additional collateral, the lender calls in the loan, causing the borrower to unwind its position. Alternatively, the falling market and rising volatility may render the position economically untenable, causing the borrower to voluntarily unwind the trade.

Unwinding positions is not necessarily problematic, but it may lead to forced sales of securities in an already stressed market, creating so-called leverage or margin spirals. In March, examples of this involved mortgage real estate investment trusts (mREITs) and hedge funds.<sup>22</sup>

### *mREITs*

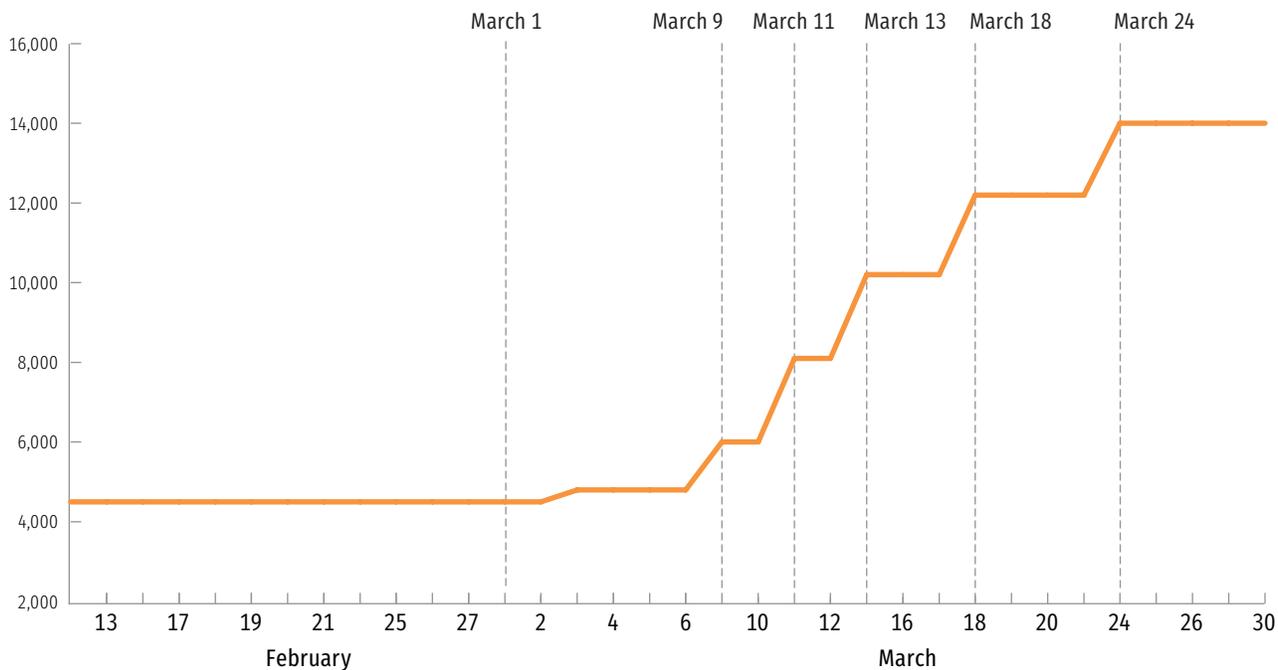
mREITs invest in securities backed by residential and commercial real estate mortgages, generally MBS issued by Fannie Mae, Freddie Mac, or Ginnie Mae (agency MBS). In normal times, changes in prices for agency MBS track closely changes in prices of Treasury bonds of similar maturity. And, like Treasuries, agency MBS are generally quite liquid. mREITs typically fund their purchases of agency MBS by borrowing (i.e., using leverage) in the market for repurchase agreements (repo market). When Treasury bond yields started rising in early March, so did yields on agency MBS, implying losses on these securities. Repo lenders reportedly called for mREITs to pledge additional collateral and refused to accept agency commercial MBS as collateral, raising the likelihood that some mREITs would be forced to sell agency MBS into a falling market. This development may have added stresses in the US government bond markets.<sup>23</sup>

FIGURE 1.16

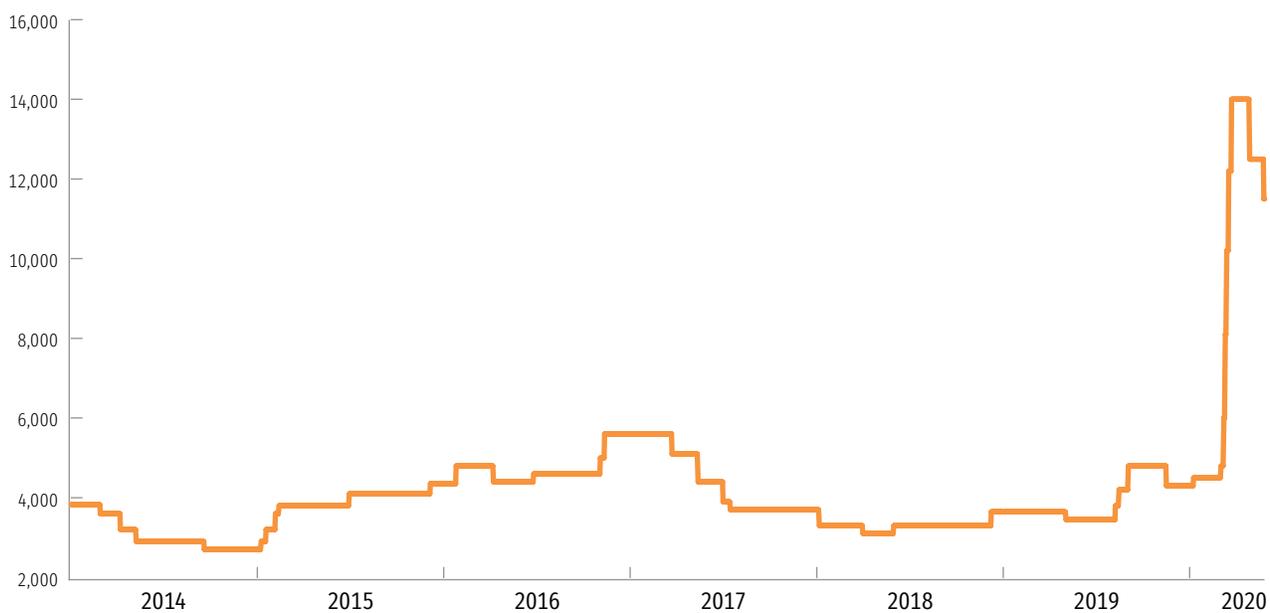
### Margins on Treasury Bond Futures Rose

Maintenance margin on long-term Treasury bond futures, dollars, daily, selected periods

#### February 12–March 30, 2020



#### January 2, 2014–May 27, 2020



## Hedge Funds

Commentators have suggested that certain types of hedge funds may have been unwinding cash/futures basis trades.<sup>24</sup> These trades monitor price differences between the market for the physical Treasury bonds (cash market) and the market for the Treasury bond futures, and help keep prices in the two markets from diverging too far from one another, which in turn helps promote efficiency in the Treasury market. Because differences in cash and futures market prices are normally small (in part because of this monitoring), cash/futures basis trades are generally profitable only when funded by borrowing through the repo market.

In these cash/futures basis trades, investors take short positions in Treasury futures and long positions in Treasury bonds. They finance purchases of Treasury bonds by borrowing from dealers through the repo market using the Treasury bonds as collateral. When investors unwind cash/futures basis trades, they close out their short futures positions and pay off their loans (i.e., unwind their repo positions with dealers) by selling their Treasury bonds (normally to a dealer).

Cash/futures basis trades have reportedly become much more popular since 2017. One indication, for example, is the net short positions in Treasury futures reported by leveraged funds to the CFTC. These positions grew by several hundred billion dollars from the start of 2016 to the end of 2019.

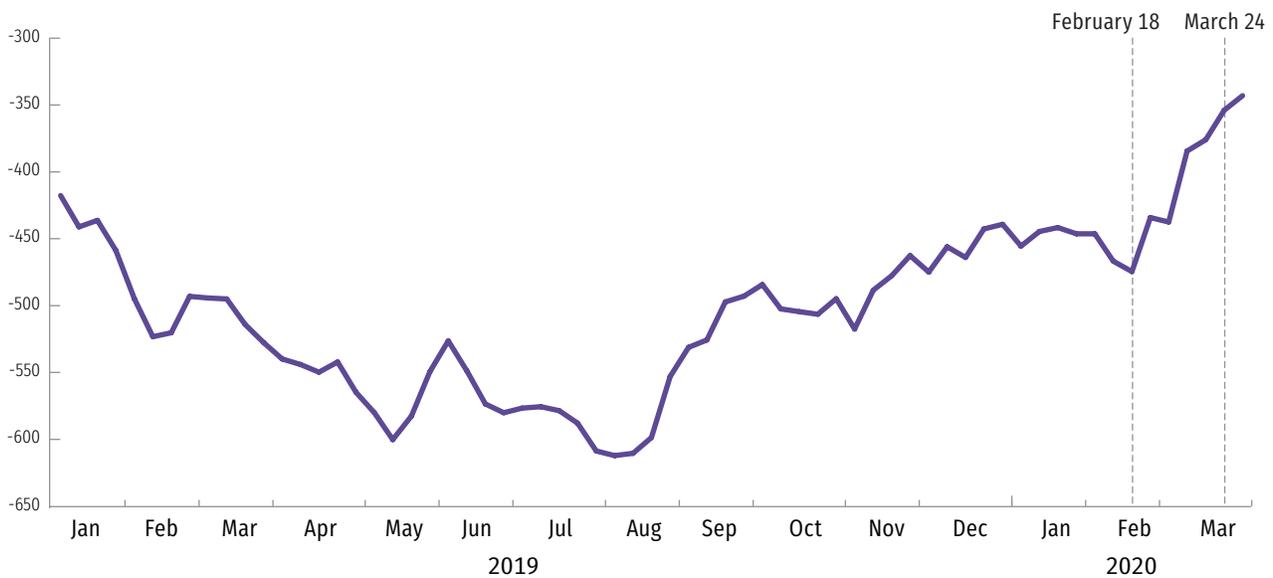
From February 18 to March 24, 2020, however, leveraged funds reduced their net short positions from -\$475 billion to -\$354 billion, suggesting they were unwinding cash/futures basis trades (Figure 1.17). Treasury bond sales from unwinding the repo part of these trades may have added to the rise in Treasury yields in early to mid-March and reflected, in part, limited capacity on dealers' balance sheets from regulatory capital requirements (see page 31 for more detail).<sup>25</sup>

These observations about hedge funds and mREITs are consistent with survey responses provided by banks. According to the Federal Reserve's June 2020 Senior Credit Officer Opinion Survey on Dealer Financing Terms, a large majority of banks reported a reduction in leverage by hedge funds and "trading" real estate investment trusts (REITs) in the first quarter of 2020 (Figure 1.18).

FIGURE 1.17

### Net Short Positions in Treasury Futures Reported by Leveraged Funds

Billions of dollars, weekly, January 8, 2019–March 31, 2020

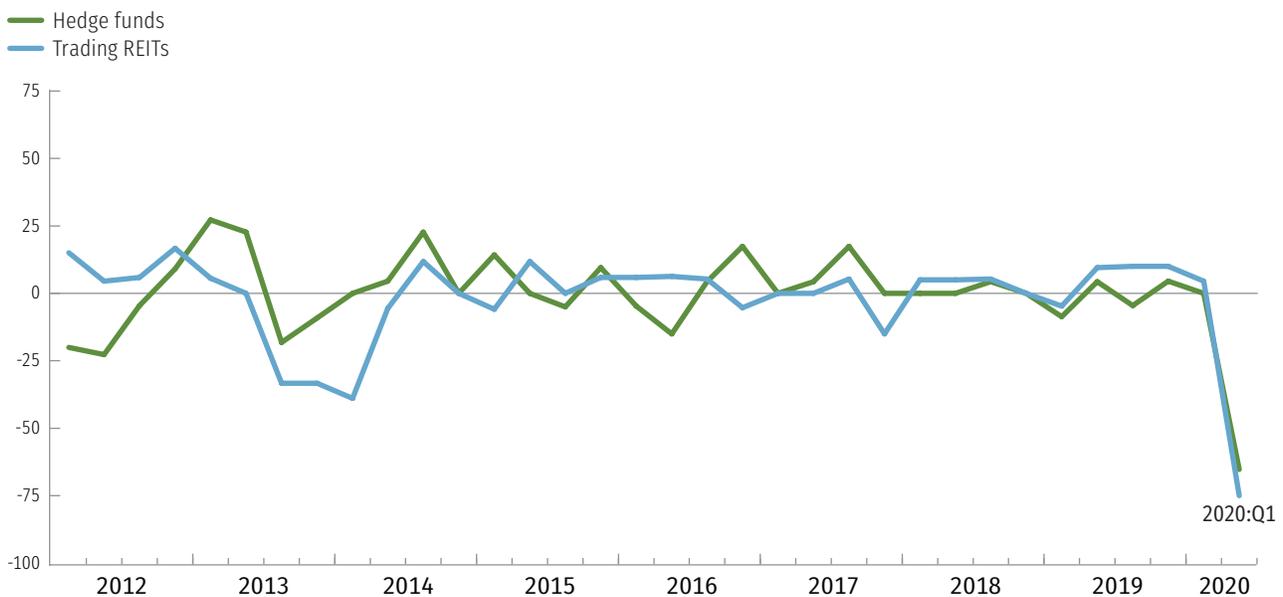


Source: Commodity Futures Trading Commission

FIGURE 1.18

### Hedge Funds and REITs Reduced Leverage

Net percentage of respondent banks reporting increased use of leverage by hedge funds and trading REITs, quarterly, 2009:Q4–2020:Q1\*



\*The survey—which is published in March, June, September, and December—is generally conducted over a two-week period in February, May, August, and November and collects information pertaining to the previous three months. For example, the June 2020 survey was conducted in May 2020 and covered the period between February 2020 and May 2020. As a result, ICI has labeled this point 2020:Q1 in the chart.

Source: Federal Reserve Board's Senior Credit Officer Opinion Survey on Dealer Financing Terms

## Dealer Inventories of Treasuries and Other Securities Expanded

Dealers are in the business of connecting bond sellers and buyers (and vice versa). When there is not an immediate match between a bond seller and buyer, a dealer may be willing to buy the bond from a seller and temporarily hold the security in the dealer's own inventory until a buyer can be found. Dealers often take bonds into inventory by deploying leverage.

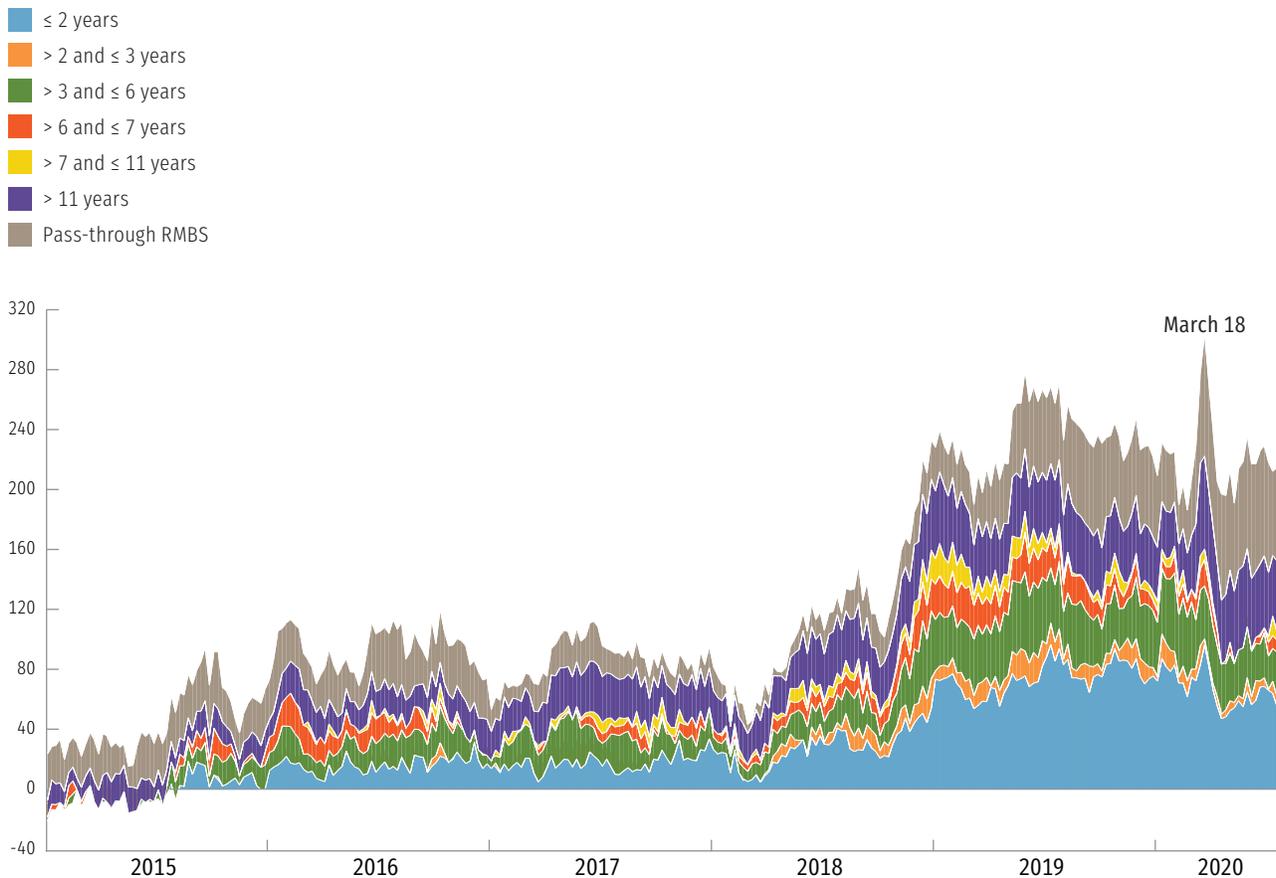
Adding securities to a dealer's inventory poses investment risks (which they control through internal limits on inventories) and increases costs because the dealer's parent (often a bank holding company) must hold additional capital against the securities. As a result, dealers must be compensated typically through a wider bid-ask spread for the extra risk and costs of adding securities to their inventories.

Dealers' inventories of Treasury bonds and MBS have been rising since late 2018, in part because the US Treasury issued debt to finance the mounting US fiscal deficit (Figure 1.19).

FIGURE 1.19

### Dealers' Balance Sheets Became Clogged with Treasuries and MBS

Primary dealers' net positions in Treasury securities by maturity in years and agency pass-through RMBS, billions of dollars, weekly, January 7, 2015–July 22, 2020



Source: Federal Reserve Bank of New York

In late February and March 2020, as dealers tried to intermediate the increased sales of Treasury bonds and MBS, their net inventories of Treasury bonds and agency pass-through residential mortgage backed securities (RMBS) spiked, rising by \$120 billion. Most of this increase was in longer-dated Treasury bonds and RMBS, consistent with a view that investors, in a rush toward cash, were selling longer-dated securities—even those normally considered liquid and safe.

The collision of investors trying to sell Treasury and agency bonds to obtain liquidity and dealers holding increasingly heavy inventories of Treasuries likely contributed to widening bid-ask spreads—pressure—in the Treasury and agency markets.

### **Dealers Had Less Flexibility to Intermediate Trades in Other Credit Instruments**

Dealers, especially the largest ones, are typically subsidiaries of bank holding companies (BHCs). BHCs are required to hold capital against their assets, including securities held by their dealer subsidiaries. As a result, any growth in the assets held by a dealer that is a subsidiary of a BHC will require the BHC on a consolidated basis to raise additional capital or to reduce assets elsewhere in the organization.

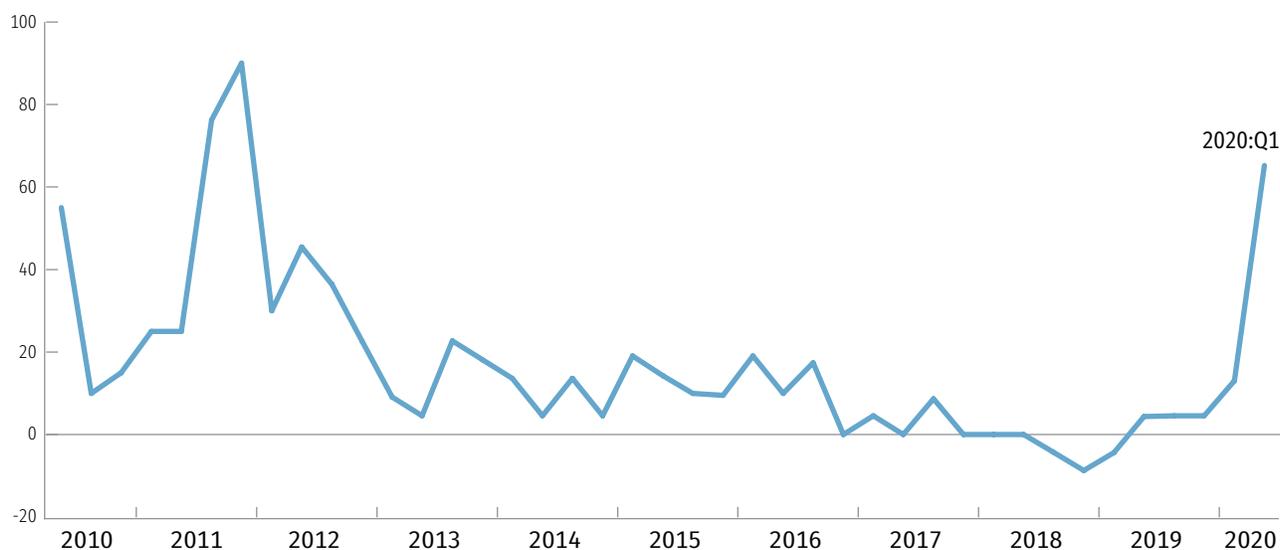
Dealers' balance sheets were already becoming heavy with Treasuries, which, like other holdings, are subject to dealers' internal risk limits. Many observers have indicated that bank regulatory requirements (such as the supplementary leverage ratio [SLR]<sup>26</sup> and liquidity coverage ratio [LCR])<sup>27</sup> further restricted dealers' flexibility in intermediating trading in Treasuries in March.<sup>28</sup> At a minimum, banks report having devoted more resources and attention to managing concentrated exposures to dealers during the COVID-19 crisis in March (Figure 1.20).

Dealers' limited flexibility in intermediating trades in the Treasury market may have created knock-on pressures in other types of fixed-income products, such as commercial paper and corporate bonds. The commercial paper, corporate bond, and municipal debt markets would have surely faced challenges in March 2020 regardless. But dealers' increased holdings of Treasury and MBS likely limited their ability to intermediate trades in other fixed-income assets.<sup>29</sup> As one example, ICI members indicated they found it difficult, if not impossible, to sell credit market securities to get cash to buy deeply discounted (and thus attractive) securities elsewhere.

FIGURE 1.20

## Banks Devoted More Resources to Managing Concentrated Exposures to Dealers

Net percentage of respondent banks increasing resources and attention to exposures to dealers,<sup>1</sup> quarterly, 2009:Q4–2020:Q1<sup>2</sup>



<sup>1</sup> The survey asked: “Over the past three months, how has the amount of resources and attention your firm devotes to management of concentrated credit exposures to dealers and other financial intermediaries (such as large banking institutions) changed?”

<sup>2</sup> The survey—which is published in March, June, September, and December—is generally conducted over a two-week period in February, May, August, and November and collects information pertaining to the previous three months. For example, the June 2020 survey was conducted in May 2020 and covered the period between February 2020 and May 2020. As a result, ICI has labeled this point 2020:Q1 in the chart.

Source: Federal Reserve Board’s Senior Credit Officer Opinion Survey on Dealer Financing Terms

### WFH Arrangements

In early March, as dealers hastily began to transition staff to WFH arrangements, concerns were voiced that operationally intensive activities, notably trading of repos, could be disrupted.<sup>30</sup> With cash/futures basis trades dependent on repo financing, hedge funds may have begun unwinding these trades to limit operational risks that WFH arrangements might pose.<sup>31</sup>

ICI members confirm that WFH arrangements added to market difficulties. They note that the state of New York’s WFH order created challenges for dealers as they tried to coordinate traders and manage fixed-income inventories and balance sheets, during a period in which events were developing quickly. As a result, especially for smaller trade sizes, dealers were less likely to provide price quotes. ICI members indicate that these challenges, although present across the markets, were most significant for trading in physical fixed-income securities (cash market), which requires close coordination between a dealers’ funding desk and its separate trading desk. With personnel on both desks working in different locations, the potential for trading to break down increased.

## Crisis Spread to Short-Term Credit Markets

Dislocations in the Treasury market spread to the interbank lending, commercial paper, wholesale deposits, and short-term municipal debt markets. Once again, the fundamental reason was the virus and the fear and uncertainty it created. As noted earlier, when investors are fearful, they flock to cash. In normal times, high-quality investments—consisting of short-term Treasury and agency debt, commercial paper, and other instruments with a maturity of less than 90 to 360 days, in addition to some overnight holdings—are often considered to be sufficient to maintain appropriate levels of liquidity. During March, however, investors’ perceptions of what constituted liquid investments were far narrower: only true “cash”—securities that mature overnight, or perhaps within seven days—was acceptable. This posed additional challenges for borrowers in terms of “rollover risk,” especially in the commercial paper market.

### Interbank Lending

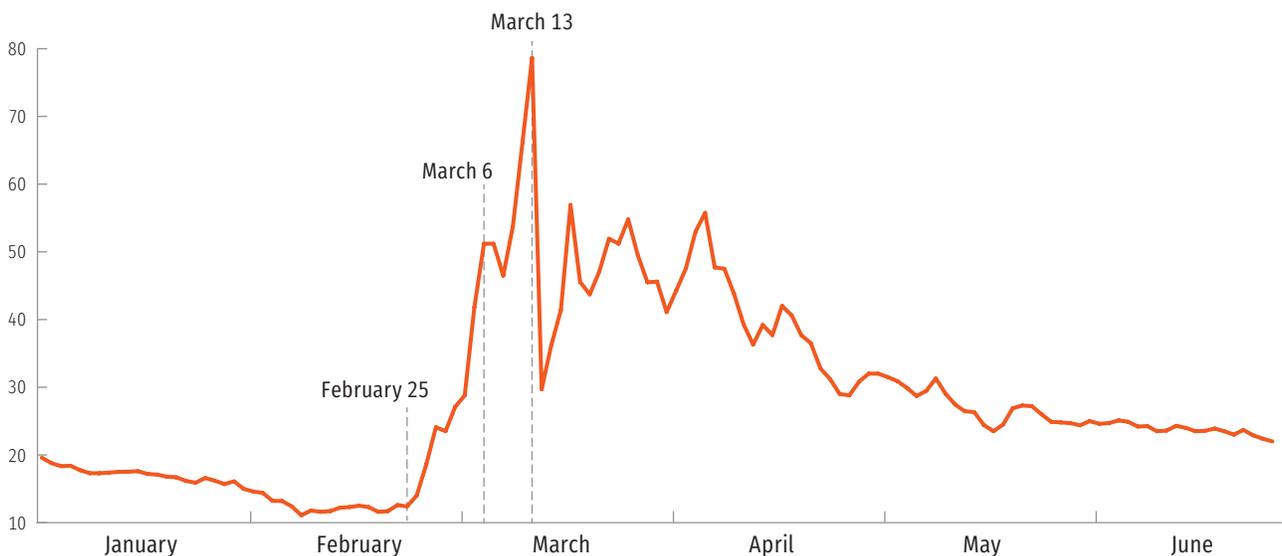
Evidence of the flight to cash in March was apparent in banks’ short-term funding costs. The FRA-OIS spread<sup>32</sup> measures the interest rates banks charge one another for short-term loans (also known as interbank loans) relative to the interest rates on risk-free overnight loans. As such, it is widely seen as a measure of stress in the banking sector.

Normally, this spread is small. For example, in January 2020, the FRA-OIS spread averaged less than 20 basis points, and in the first half of February averaged around 10 basis points (Figure 1.21). The spread began widening in late February, jumping from 12 basis points on February 25 to 51 basis points on March 6. It eventually peaked at almost 80 basis points on March 13, its highest level since the global financial crisis.

FIGURE 1.21

### Banks’ Short-Term Funding Costs Rose Sharply in the First Half of March

FRA-OIS spread, basis points, daily, January 2–June 30, 2020



Source: Bloomberg

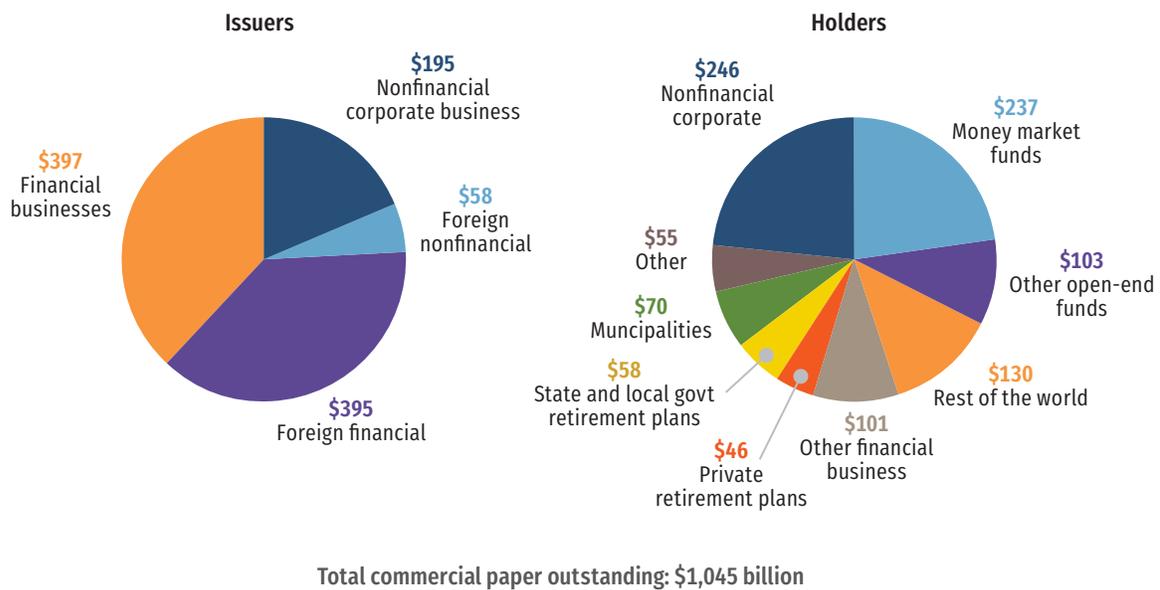
## Commercial Paper Market

The commercial paper market is an important source of short-term credit for a range of financial and nonfinancial businesses. Commercial paper is generally very high quality and can either be unsecured or, in the case of asset-backed commercial paper (ABCP), secured with other debt such as credit card receivables or auto loans. At year-end 2019, commercial paper outstanding in the United States totaled a little more than \$1 trillion (Figure 1.22).

FIGURE 1.22

### The US Commercial Paper Market: Issuers and Holders

Billions of dollars, year-end 2019



Source: Federal Reserve Board

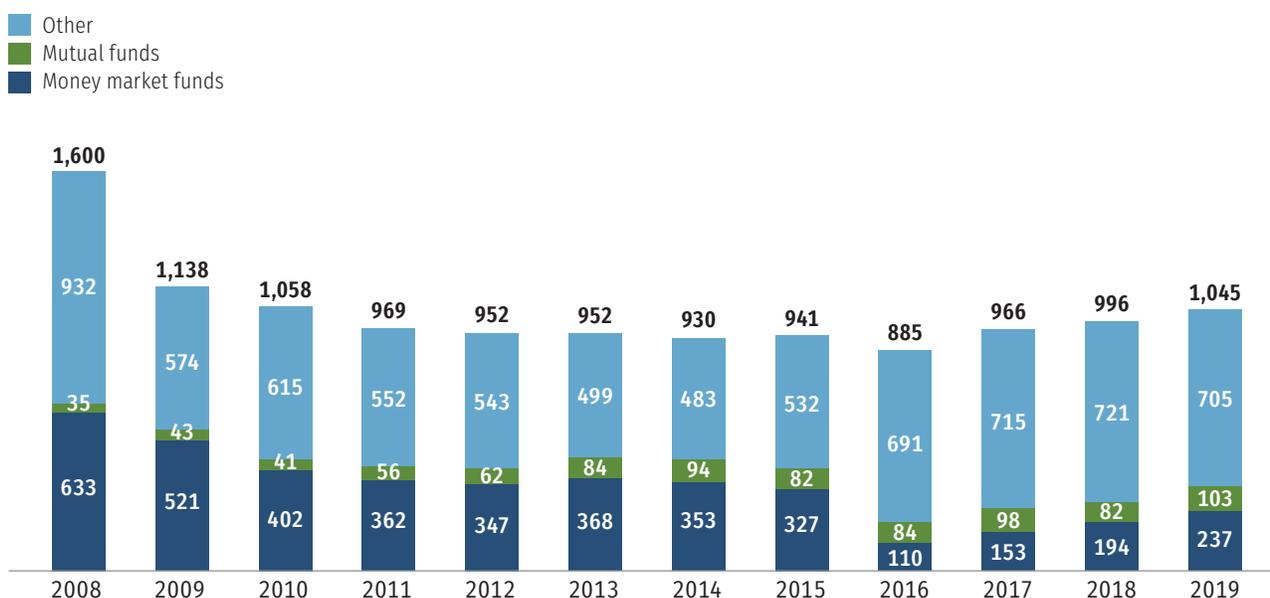
The left panel of Figure 1.22 shows the four main issuers of commercial paper. Nonfinancial firms, whether based in the United States or abroad, may use the proceeds of commercial paper sales to finance inventories, meet payrolls and accounts payable, or address other needs. Financial firms such as banks, especially foreign banks doing business in the United States, issue commercial paper to raise funds that are then loaned to US businesses or to meet other funding needs. Financial issuers also may issue commercial paper to fund auto, credit card, or home-equity lending to US consumers.

A range of entities purchase commercial paper (Figure 1.22, right panel). Nonfinancial corporations are the largest single holders at \$246 billion (24 percent). Money market funds hold \$237 billion (23 percent), and other open-end funds (mutual funds and ETFs) hold \$103 billion (10 percent). Thus, RICs (money market funds, mutual funds, and ETFs) in total account for about one-third of the market. Other large holders include foreign entities (rest of the world, \$130 billion, 12 percent), and other financial businesses (\$101 billion, 10 percent). Municipalities (state and local governments) and state and local retirement plans hold a combined \$128 billion (12 percent).

The commercial paper market has changed considerably and shrunk since the global financial crisis. In 2008, commercial paper outstanding totaled \$1.6 trillion, compared to roughly \$1 trillion in 2019 (Figure 1.23); during the same period, the share held by money market funds has fallen substantially. For example, in 2008–2009, money market funds held between 40 and 46 percent of commercial paper outstanding. That amount had fallen to 23 percent by 2019.

**FIGURE 1.23**  
**The US Commercial Paper Market Has Changed**

Billions of dollars, year-end



Source: Federal Reserve Board

Investors other than money market funds hold the great majority of commercial paper outstanding. While the share held by mutual funds has grown, more than two-thirds of commercial paper outstanding is now held by investors other than RICs. Among these other investors, nonfinancial corporate businesses had the largest increase in market share, rising from 4 percent (\$57 billion) in 2008 to 24 percent (\$246 billion) in 2019.

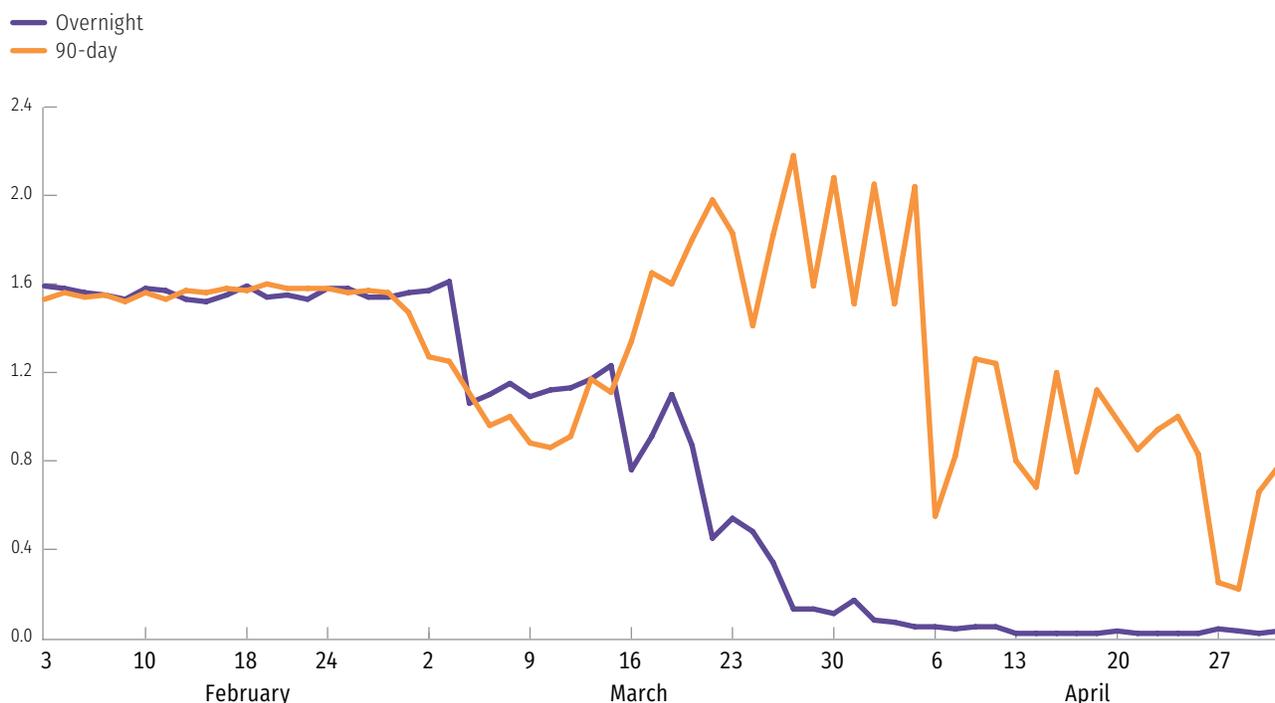
### Pressures Arose in the Commercial Paper Market in March 2020

As in other fixed-income markets, intense pressures arose in the commercial paper market in March. In normal times, yields on commercial paper maturing at longer horizons (such as one week or 90 days) are very close to, although typically a bit higher than, yields on commercial paper maturing overnight (i.e., paper that is issued today and matures tomorrow). That relationship broke down in mid-March. The yield on 90-day nonfinancial commercial paper rose from 0.91 percent on March 11 to 2.18 percent on March 26 (Figure 1.24), while the yield on overnight nonfinancial commercial paper dropped sharply. In other words, consistent with a flight to cash, investors demanded a substantial premium to lend at horizons of more than one day.

FIGURE 1.24

## Yields on 90-Day Commercial Paper Leapt in March 2020

Yields on overnight and 90-day nonfinancial commercial paper, percent, daily, February 3–April 30, 2020



Source: Federal Reserve Board

Dislocations in the Treasury market seem to have spilled over into the commercial paper market. Figure 1.25 provides some evidence of this. The figure compares the yield on 90-day nonfinancial commercial paper with the bid-ask spread on off-the-run Treasury bonds. The bid-ask spread had been widening (as seen in the shaded area) for several days before yields on 90-day commercial paper began to rise.

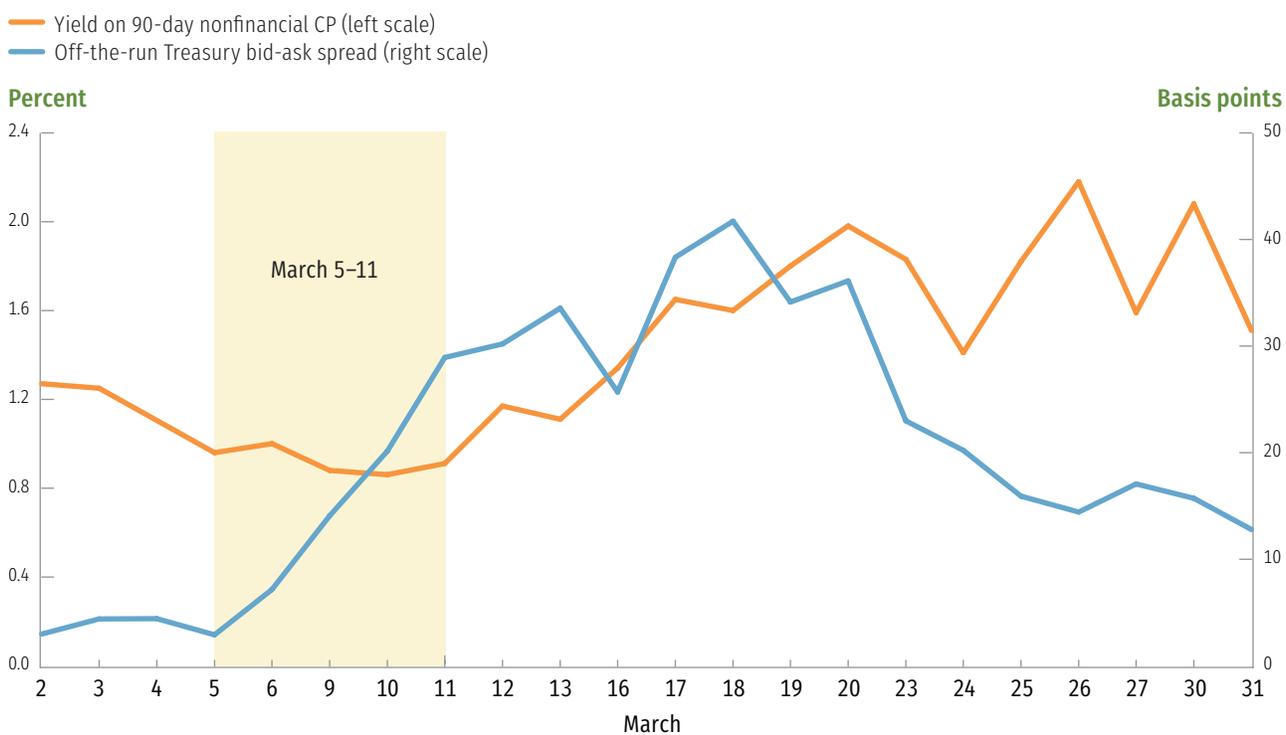
Concerns about investors' willingness to buy newly issued commercial paper added to pressures in the commercial paper market. Most commercial paper is of very short maturity, typically 90 days or less. When these short-term loans mature, issuers often replace, or roll over, the maturing paper with newly issued commercial paper. This generally works well in normal times. During periods of stress, however, if there are no buyers for newly issued commercial paper, the issuer may have to tap bank lines of credit, issue term corporate bonds—which have higher interest expense than commercial paper—or even sell assets in order to have an appropriate level of cash on hand.

Market participants' concerns were evident in March. Discussions with ICI members indicate that RICs holding commercial paper maturing in more than seven days could not find buyers for that paper, even if the issuers were of the highest quality. At the same time, issuers could only roll over overnight or perhaps seven-day commercial paper, adding to the mounting pressure in the commercial paper market. In such circumstances, it would not be surprising for investors (including RICs) to demand higher yields on longer-dated commercial paper.

FIGURE 1.25

### Treasury Market Showed Distress Before Commercial Paper Market

Yields on 90-day nonfinancial commercial paper versus Treasury bond bid-ask spreads,\* daily, March 2–March 31, 2020



\*The off-the-run spread is calculated using the bid and offer prices on the next most recently issued 10-year Treasury note.

Sources: Federal Reserve Board and Bloomberg

In addition, ICI member firms believe that banks’ needs to preserve their own cash may have contributed to difficulties in the commercial paper market. In early to mid-March, banks faced increasing draws on committed credit lines by their business clients. At first, businesses drawing on these credit lines were those hit first and hardest by the COVID-19 restrictions, such as airlines and cruise ship companies. Anticipating a need for cash to pay bills as travel halted and revenues fell, they drew on lines of credit at banks. Banks, in turn, anticipated that they could face widespread demands for draws on credit lines and so, sought to preserve their own cash positions.

A desire to preserve cash also may have limited banks’ ability to repurchase their own commercial paper. Banks are important issuers of commercial paper (Figure 1.22); in fact, as Figure 1.26 shows, of the top 15 issuers of commercial paper held by prime money market funds, all but one (Toyota Motor Corporation) are banks. In normal times, banks typically stand ready to buy back their own commercial paper from a holder. Some ICI members, however, report that issuing banks were unwilling to repurchase their own commercial paper during this time frame.

Banks’ actions are understandable, given the stresses they faced, notably the need to preserve cash to support draws on credit lines. But difficulties in the commercial paper market in March reflected complex interactions and interconnections in the financial system, rather than the actions of any particular group of market participants.

FIGURE 1.26

## Banks Are Important Issuers of Commercial Paper

Issuers of commercial paper held by prime money market funds, billions of dollars, February 28, 2020

Issuer	Amount
Royal Bank of Canada	\$18.7
Toronto-Dominion Bank	10.8
Bank of Nova Scotia	9.9
J.P. Morgan Chase & Company	9.2
Groupe BPCE SA	9.0
Canadian Imperial Bank of Commerce	7.9
National Australia Bank	7.1
Depfa Bank	6.8
Australia & New Zealand Banking Group Ltd	5.8
Barclays PLC	5.7
ING Groep NV	5.6
BNP Paribas SA	5.4
HSBC Holdings PLC	5.2
Toyota Motor Corporation	5.1
Credit Suisse	5.0
All other issuers	120.3

Source: ICI calculations using SEC Form N-MFP data

### Short-Term Municipal Debt Market

The short-term municipal debt market is dominated by variable-rate demand notes (VRDNs). VRDNs are floating-rate, long-term (e.g., 20 to 30 years) municipal instruments whose rates are normally reset daily or weekly to reflect the current costs of borrowing. VRDNs also typically have a demand feature or put option that allows a holder to put the security back to a financial intermediary (typically a bank) at par with one- or seven-days' notice, respectively. The put feature qualifies VRDNs to be considered liquid short-term municipal debt.<sup>33</sup>

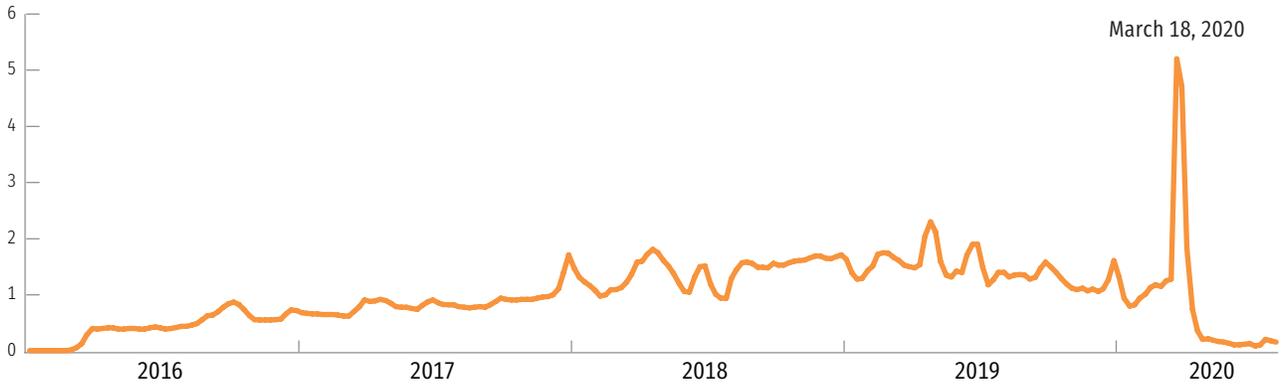
Like the commercial paper market, dislocations occurred in the market for short-term municipal debt. For example, the SIFMA Swap Index, which measures the current yield that municipal borrowers pay on VRDNs, rose to a high of 5.2 percent (Figure 1.27, top panel) on March 18. That was nearly 4 percentage points higher than its level just one week earlier on March 11 (bottom panel).

FIGURE 1.27

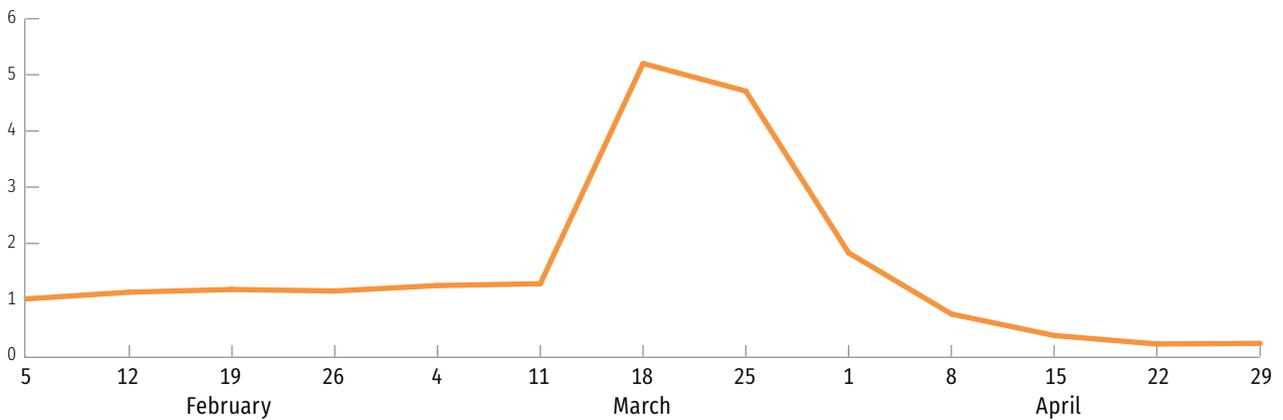
## Costs of Short-Term Borrowing in the Municipal Market Rose to Very High Levels

SIFMA Swap Index,\* weekly, selected periods

January 6, 2016–July 29, 2020



February 5–April 29, 2020



\*The SIFMA Swap Index measures the current yield that municipal borrowers pay on variable-rate demand notes.

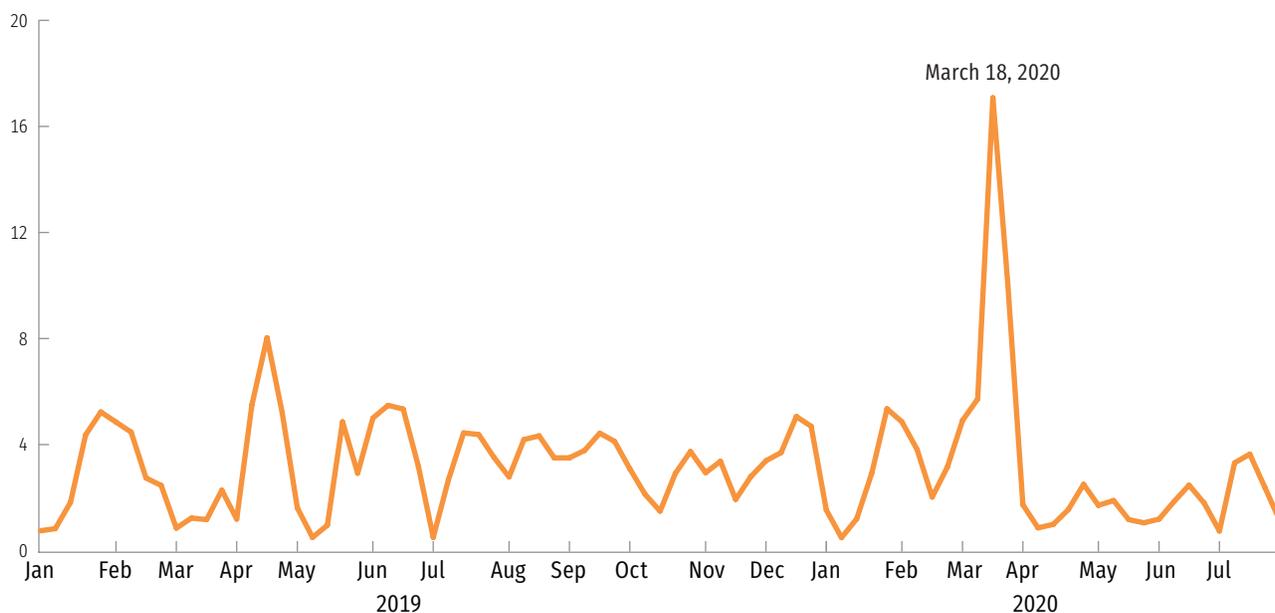
Source: Securities Industry and Financial Markets Association

The size of the increase in the SIFMA index no doubt reflected deep concerns about how the fiscal positions of state and local governments would be affected by the health mandates and social distancing measures that were, in effect, shutting down the US economy. Rapidly rising unemployment was expected to reduce state income taxes. Sales and property taxes also could be expected to fall. At the same time, state and local governments were likely to face sharply rising healthcare expenditures.

FIGURE 1.28

### Primary Dealers' Holdings of VRDNs Increased

Billions of dollars, weekly, January 2, 2019–July 29, 2020



Source: Federal Reserve Bank of New York

Dealers' holdings of VRDNs, like their increased inventories of Treasury securities, may have added additional market stress. When an investor puts back a VRDN to a bank, or its dealer subsidiary, the bank may seek to resell the VRDN to another investor. If it cannot find a buyer, it will take the VRDN into its inventory. Federal Reserve data indicate that primary dealers<sup>34</sup> took large amounts of VRDNs onto their balance sheets in mid-March as investors exercised demand features (Figure 1.28).

This apparently created knock-on pressures in the market for longer-term municipal debt. As with other securities, dealers must allocate capital to hold VRDNs in inventory. In addition, dealers may have internal risk limits that restrict the total amount of municipal debt, both short- and long-term, that they can hold. With dealers' inventories of VRDNs rising, their ability to intermediate trading in longer-term municipal debt may have been restricted. Consistent with this, some ICI members were told by dealers that they could not bid on, or buy, municipal bonds, even those of the highest quality.<sup>35</sup>

### Crisis Jumped to the Corporate Bond Market

Pressures also arose in the corporate bond market in March 2020. Yields on corporate bonds jumped in March to levels not seen since 2008–2009. Yields rose (prices fell) across the credit quality spectrum, consistent with investors selling long-term bonds in order to move to the very shortest and most liquid part of the yield curve. This is further evidence that March 2020 was a flight to cash in the face of the tremendous uncertainty arising from the virus.

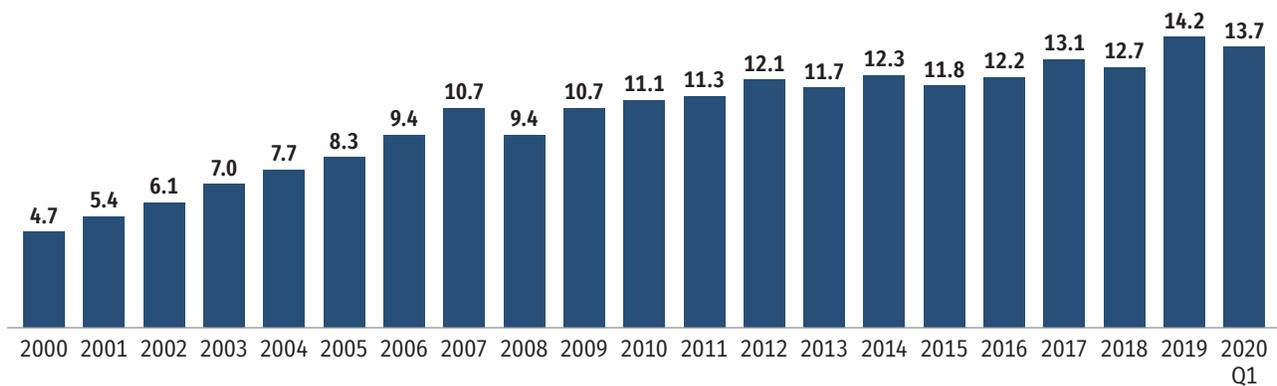
Corporate bonds are an important source of long-term funding for businesses, along with sales of stock and loans from banks. A corporation may issue bonds to finance a particular project, expand operations, or help fund new business lines.

Corporate bonds are rated by credit rating agencies. These ratings broadly classify bonds as either investment grade or below investment grade (also known as high-yield bonds). The rating a bond receives depends on the creditworthiness of the company. Companies that are judged as having the best ability to repay receive the highest credit ratings and consequently pay lower interest rates for borrowing.<sup>36</sup> High-yield bonds are issued by companies that are less creditworthy (or that have covenants that mean even a creditworthy borrower is less likely to repay on the particular bond).

The corporate bond market has grown significantly since the global financial crisis. By the first quarter of 2020, corporate debt outstanding totaled \$13.7 trillion, up from \$11.1 trillion at year-end 2010 (Figure 1.29, top panel). This represented a compound annual growth rate of 2.1 percent. As can be seen, however, the corporate bond sector grew much faster from 2000 to 2007 (the year before the full onset of the global financial crisis), expanding at a rate of more than 12 percent per year.

**FIGURE 1.29**  
**US Corporate Bond Market Has Grown Since the Global Financial Crisis...**

Trillions of dollars, 2000–2020

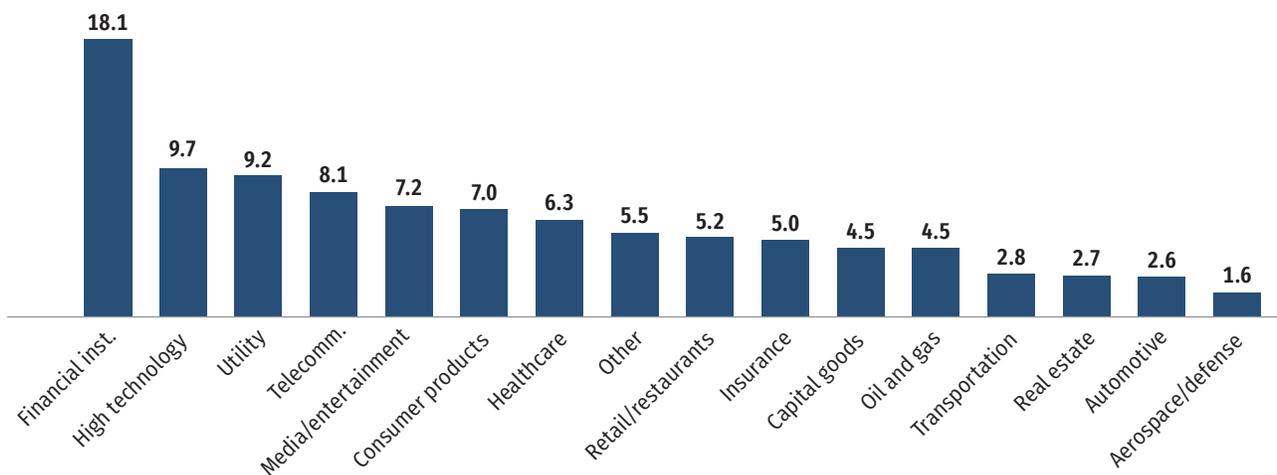


Note: The data include holdings of foreign issues held by US residents. Data from 2000 to 2019 are year-end.

Source: Federal Reserve Board

**...And Is an Important Source of Funding for the US Economy**

Percentage of corporate debt outstanding by selected industry, January 2019



Source: ICI calculations based on S&P Global data

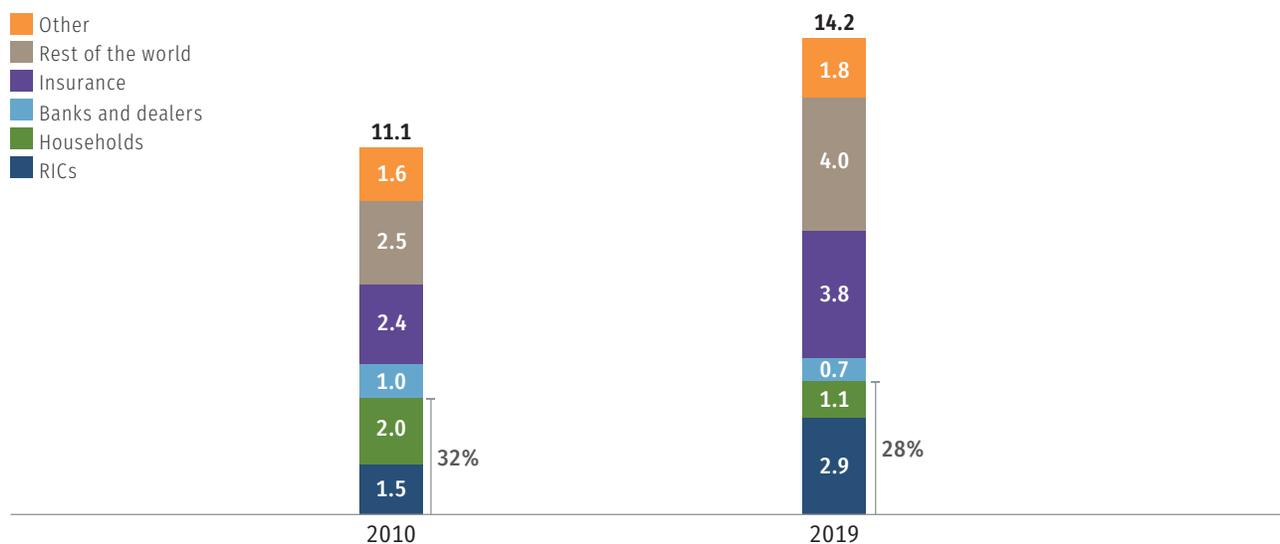
A wide range of firms issue corporate bonds in the United States to build fixed capital or inventories, undertake research and development, fund acquisitions, or support operations. According to S&P Global, as of May 2019, financial firms accounted for the largest share of corporate bond issuance at more than 18 percent (Figure 1.29, bottom panel). The next largest shares were attributable to high-tech firms, utilities, telecommunications firms, and media and entertainment companies.

Corporate bonds are held by a wide range of entities (Figure 1.30). Households hold corporate bonds directly, as well as indirectly through RICs, which include money market funds, mutual funds, ETFs, and closed-end funds. Other major holders are banks and dealers, insurance companies, non-US residents (rest of the world), and various other entities such as defined benefit pension plans.

The share of US corporate bonds held by the various entities has changed since the global financial crisis. For example, a number of observers have noted that corporate bonds held by RICs rose substantially over this period, from \$1.5 trillion in 2010 to \$2.9 trillion at the end of 2019. What is often missed, however, is that this may, in part, reflect a substitution by retail investors from holding bonds directly to holding them indirectly through RICs, which can be more efficient and diversified. Households' and RICs' combined holdings of corporate bonds rose \$500 billion from 2010 to 2019, but their combined share of total corporate bonds outstanding fell from 32 to 28 percent. The lion's share of the \$3.1 trillion growth in the corporate bond market from 2010 to 2019 was absorbed by insurance companies and foreign investors (rest of the world).<sup>37</sup>

**FIGURE 1.30**  
**Who Holds US Corporate Bonds?**

Trillions of dollars, year-end



Note: Every category except *rest of the world* includes holdings of foreign issues by US residents; *banks and dealers* includes US-chartered depositories, foreign banking offices in the United States and banks in US-affiliated areas, and securities brokers and dealers. Components may not add to the totals because of rounding.

Source: Federal Reserve Board

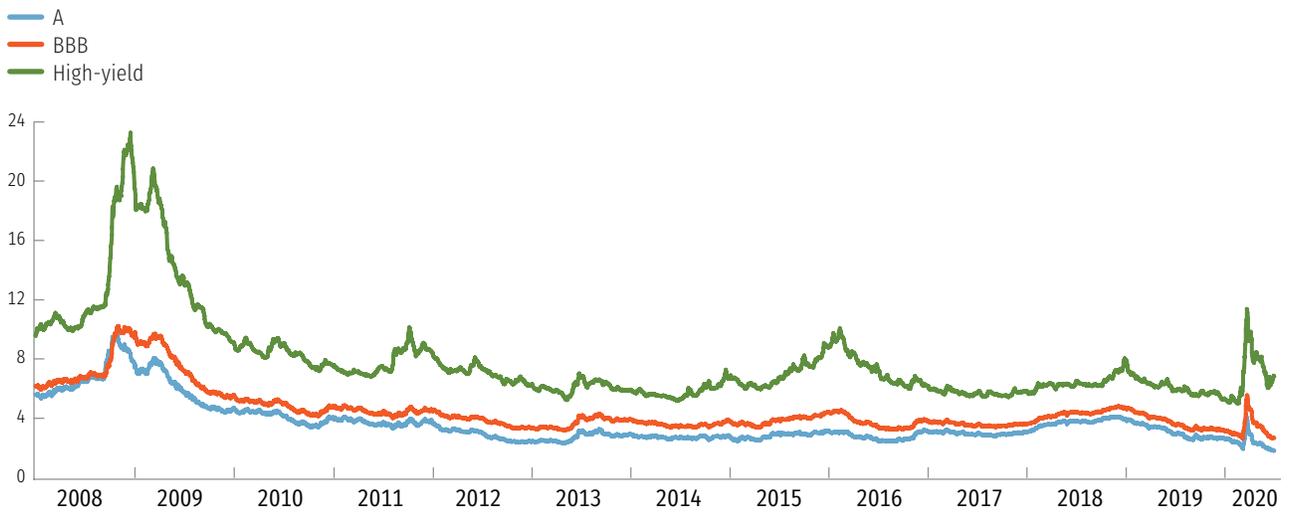
As with the Treasury, agency, and short-term credit markets, the market for corporate bonds came under intense stress in March 2020. This is evidenced by rising yields on corporate bonds. Figure 1.31 plots yields on investment grade corporate bonds rated A and BBB, as well as yields on high-yield bonds. As the top panel indicates, yields on these bonds spiked to levels as high as any seen since the global financial crisis.

The bottom panel focuses on February through April 2020. In March, yields on high-yield corporate bonds rose considerably more than those on investment grade corporate bonds. Note, however, that because high-yield bonds tend to have shorter durations (in part reflecting their high interest payments), the greater rise in yields can overstate the decline in prices of high-yield bonds relative to investment grade bonds.<sup>38</sup>

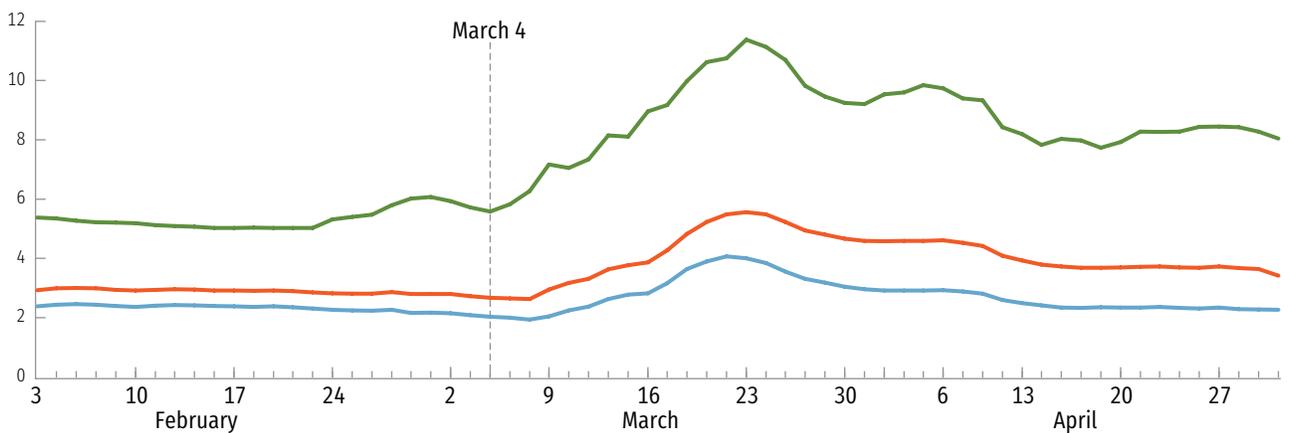
**FIGURE 1.31**  
**Yields on Corporate Bonds**

Percent, selected bond rating categories, daily

January 2, 2008–June 30, 2020



February 3–April 30, 2020



Source: Federal Reserve Bank of St. Louis FRED database

Yields on high-yield bonds also began rising a bit sooner (March 4) than those on investment grade bonds (March 9). High-yield bonds tend to have a risk-return profile more similar to equity, and respond more strongly than investment grade bonds to changes in the overall health of the US economy—which are generally reflected in stock price movements. The stock market had been falling since mid-February and media reports indicate that the high-yield bond market finally woke up to that, especially in sectors that could be hit hard by the spread of the virus (e.g., travel and energy).<sup>39</sup>

## Oil Market Developments and High-Yield Bonds

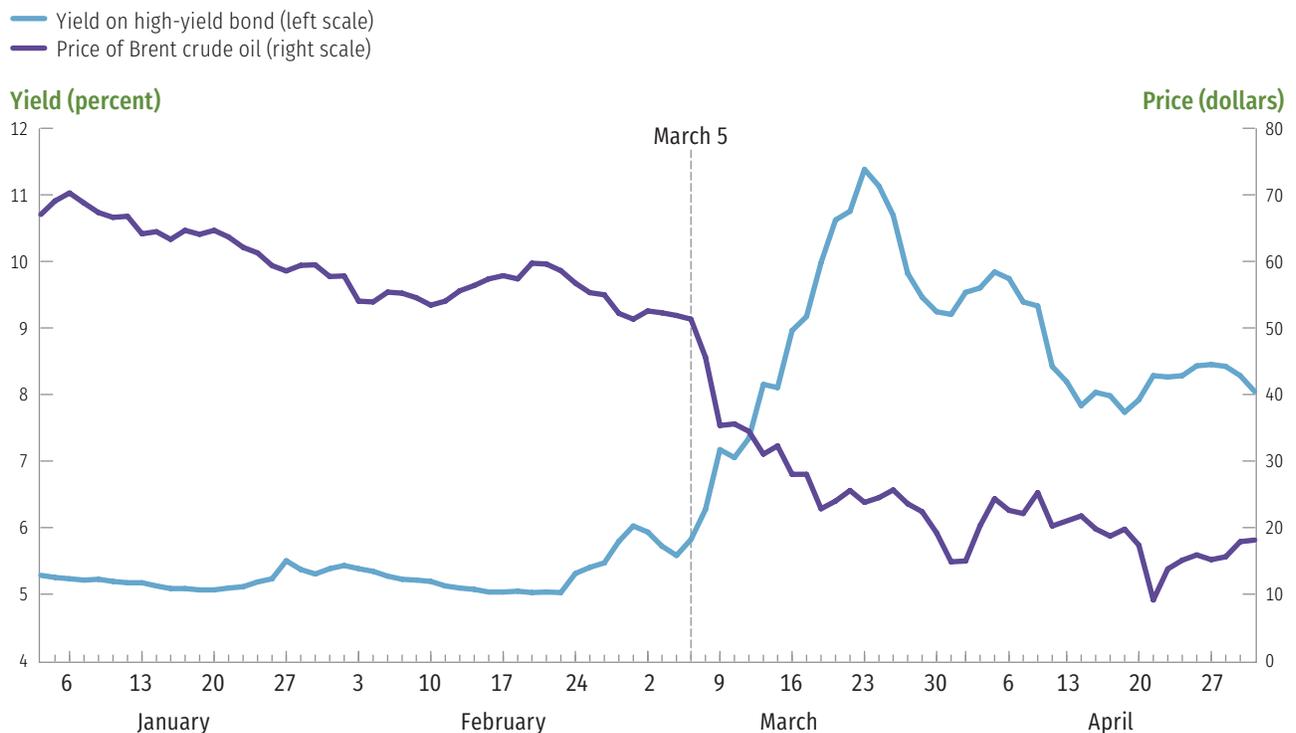
Oil market developments also reportedly added to the upward pressure on yields on corporate bonds, especially for high-yield bonds. Energy companies, such as oil exploration and oil pipeline firms, often obtain financing by issuing high-yield bonds. The prices of these high-yield bonds are, not surprisingly, correlated with oil prices. When oil prices fall, the expected profitability of energy firms falls, reducing their ability to meet their obligations and causing a drop in the value of the bonds they issued.

Oil prices had declined slowly from January to late February (Figure 1.32). The Organization of the Petroleum Exporting Countries (OPEC), anticipating a further drop in prices because of an expected fall in demand associated with the virus, had been discussing cutting oil supply to bolster oil prices. On March 6, however, discussions halted because Saudi Arabia and Russia were unable to reach an agreement on production cuts. As a result, crude oil spot and futures prices dropped sharply, falling 31 percent over March 6 and the following business day, March 9. Over the same two days, yields on high-yield bonds jumped 135 basis points.

FIGURE 1.32

### Yields on High-Yield Bonds and Oil Prices

Daily, January 2–April 30, 2020



Source: Federal Reserve Bank of St. Louis FRED database

## Long-Term Municipal Bond Market

Long-term yields also rose sharply on municipal bonds. This was to be expected given concerns about the deteriorating fiscal positions of state and local governments. Figure 1.33 shows that the costs of insuring against defaults on municipal debt began rising in mid-March and continued to rise until late May (orange line), nearly quadrupling (from 74 basis points at the end of February to 260 basis points by late May). Although this cost has drifted down since then, it remains elevated. In contrast, the rise in the cost of insuring against defaults on investment grade debt of North American companies (blue line) was far smaller and occurred earlier.

FIGURE 1.33

### Cost of Insuring Against Default on Investment Grade and Municipal Debt

Cost of insuring against default,\* basis points, daily, January 2–August 11, 2020



\* Measured by Markit CDX indexes, tradable credit default swap indexes covering North America.

Source: Bloomberg

## By Mid-March Fixed-Income Markets Were Severely Impaired

The social distancing and containment measures used to help curtail the spread of the coronavirus were the key factors driving the wave of fear, volatility, and rush to cash during March. By mid-March fixed-income markets were severely impaired, lacking liquidity and preventing the normal flow of credit to the economy. This left little choice but for central banks to fulfill their role as lenders-of-last-resort, providing liquidity to the markets in order to reignite the flow of credit to the economy.

## Federal Government Took Steps to Restore Liquidity and Flow of Credit

As illustrated by the discussion above, it became increasingly clear that economic growth was likely to fall sharply. As financial markets spiraled downward and fixed-income markets were having difficulties meeting investors' demand for cash, US authorities took increasingly powerful measures to prevent economic and financial collapse.<sup>40</sup>

Although a comprehensive discussion of all such measures is beyond the scope of this paper, it is worth briefly mentioning key actions taken across the US government, including:

- » Congressional adoption of the CARES Act.<sup>41</sup> The CARES Act was enacted to support the financial system and broader economy, including by providing up to \$454 billion in funding for Federal Reserve facilities and directing the Treasury secretary to “endeavor to seek the implementation of a program or facility...that provides liquidity to the financial system that supports lending to states and municipalities.”
- » SEC actions to add stability to the markets and support financial markets and market participants during this time frame, including by monitoring the real and potential effects of COVID-19 on securities markets and public companies and providing support and guidance to RICs and other market participants affected by COVID-19.<sup>42</sup>
- » CFTC actions to facilitate orderly trading and liquidity in the US derivatives markets, as well as to allow market participants to implement social distancing measures.<sup>43</sup>

In addition, the Federal Reserve's strong actions beginning on March 3, 2020, formed the backbone of the US response to the COVID-19 financial market crisis and are discussed in further detail below. Although some of these actions were novel, the Federal Reserve was able to draw from its global financial crisis “playbook” to identify potentially effective responses to use during this crisis.

Notably, throughout this period, the goals of the Federal Reserve's actions were often advanced by statements from its officials (including announcements of the actions). Indeed, although it is difficult to measure, these statements may have had calming effects as substantial as the actions themselves.<sup>44</sup>

### *March 3: Federal Reserve cuts short-term interest rates*

On February 24, two Federal Reserve Bank presidents indicated they were watching the COVID-19 situation but were comfortable with the Federal Reserve's current policy stance.<sup>45</sup>

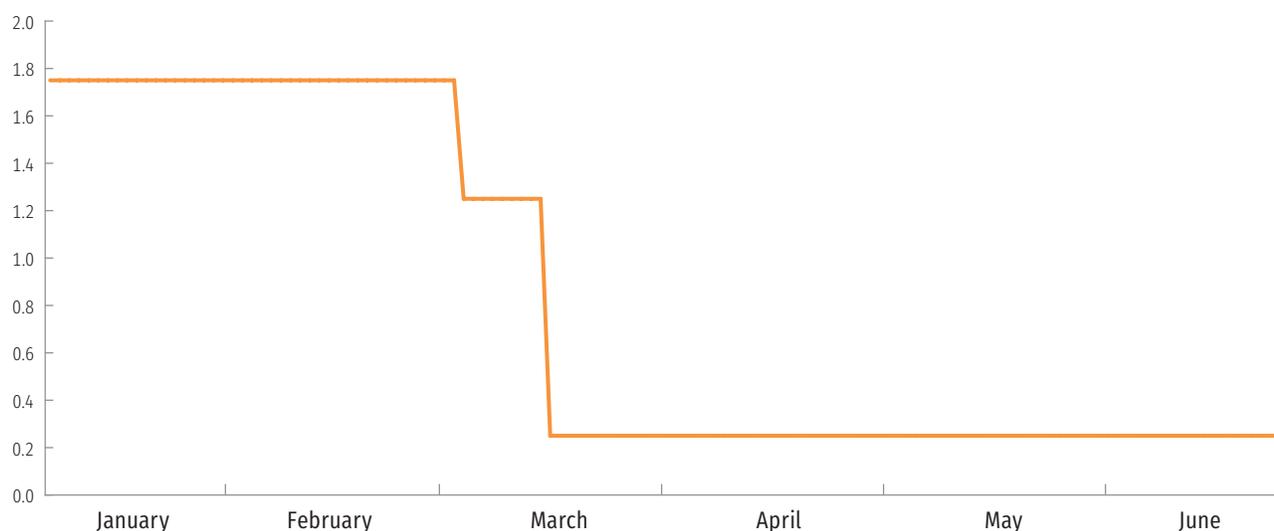
But, underscoring the increasing uncertainty and speed with which the crisis evolved, within four days, the Federal Reserve had reassessed the situation. On Friday, February 28, Federal Reserve Board Chair Jerome H. Powell issued a press statement indicating that the Federal Reserve was closely monitoring the risks the coronavirus might pose to the economy and that the central bank would use its “tools and act as appropriate to support the economy.”<sup>46</sup>

The Federal Reserve waited only until the following Tuesday, March 3, before acting. That day, the Federal Open Market Committee (FOMC), the Federal Reserve body responsible for monetary policy, held an unscheduled meeting, an event generally reserved for periods of stress. That day, the FOMC cut the short-term policy interest rate (the federal funds rate) by 0.5 percent (Figure 1.34). It also directed the Federal Reserve Bank of New York to use open market operations to ensure a sufficient supply of liquidity to the financial system and to mitigate risks of pressures in the short-term credit markets.<sup>47</sup>

FIGURE 1.34

## Federal Funds Rate Target

Percent, daily, January 1–June 30, 2020



Source: Federal Reserve Bank of St. Louis FRED database

As it turned out, the interest rate cut was a temporary salve, good for only one day. On Wednesday, March 4, the US stock market rose by more than 4 percent. But over the two following days, March 5 and 6, the stock market dropped 5 percent. Economists began predicting that the Federal Reserve would need to do more, with some suggesting that it could cut interest rates to zero within the coming year; one brave economist suggested the Federal Reserve might do so “as early as next month” (i.e., in April).<sup>48</sup> These predictions, although forecasting considerable monetary policy easing, underestimated the scale and speed of ensuing Federal Reserve policy moves, once again illustrating how rapidly the crisis evolved.

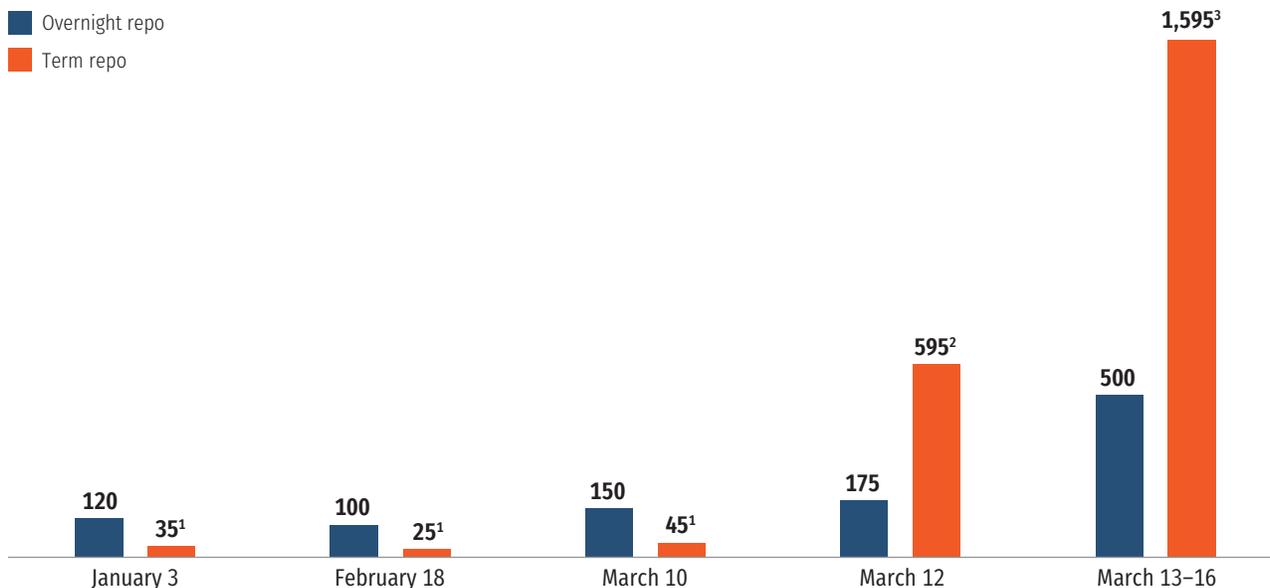
### *March 9: Federal Reserve injects liquidity into financial markets*

Beginning on March 9, as conditions in the short-term credit markets—notably in the Treasury market—continued to deteriorate, the Federal Reserve began injecting increasingly large amounts of liquidity into the system. First, the Federal Reserve raised its internal limit on overnight repo by 50 percent, from \$100 billion to \$150 billion, and on term repo from \$25 billion to \$45 billion (Figure 1.35). On March 12, it again raised the maximum amounts, which in the case of term repo amounted to \$595 billion. By March 16, the Federal Reserve had gone all-in, raising the overnight repo limit to a \$500 billion per day, and the maximum on term repo to \$1.6 trillion. Thus, within one week, the Federal Reserve boosted enormously the amount of liquidity it was willing to provide through the repo market.

FIGURE 1.35

### Federal Reserve Injected Liquidity into Short-Term Credit Markets

Aggregate limits of least amounts shown for Federal Reserve’s repurchase agreement (repo) operations, billions of dollars, selected dates



<sup>1</sup> Includes two-week term repo operations, twice weekly.

<sup>2</sup> Includes two-week term repo of at least \$40 billion, 25-day term repo of at least \$50 billion, and 84-day term repo of \$500 billion.

<sup>3</sup> Includes amounts for March 12, plus \$1 trillion in 28-day and 31-day term repo.

Source: Federal Reserve Bank of New York

Figure 1.35 emphasizes yet again just how quickly the crisis evolved, with the Federal Reserve responding (to its great credit) almost in real time. According to official reports and statements, these operations were primarily a response to difficulties in the Treasury market.<sup>49</sup> At the time, media reports had noted that, among other factors, cash/futures basis trades may have had an impact on the Treasury market.<sup>50</sup>

Second, the Federal Reserve, in conjunction with other banking and financial regulators and the Conference of State Bank Supervisors, took the unusual step of issuing a joint press release encouraging banks to “work constructively with borrowers and other customers in affected communities.”<sup>51</sup> To underscore that banks’ actions would not be second-guessed by federal and state bank supervisors, the release went further, stating that “[p]rudent efforts that are consistent with safe and sound lending practices should not be subject to examiner criticism.”<sup>52</sup>

#### *March 15: Federal Reserve announces a range of exceptional measures to support the flow of credit to households and businesses*

As the virus continued to spread, on March 11, the World Health Organization (WHO) declared COVID-19 a global pandemic and the US government placed a 30-day ban on travel from Europe. Shortly thereafter, on Friday, March 13, the state of New York declared a ban on gatherings of more than 500 people and New York City declared a state of emergency. Federal agencies (including bank and securities regulators) also began advising or requiring workers to work from home.

Although the measures the Federal Reserve had taken so far were appropriate, timely, and necessary, the central bank quickly realized it would have to do much more to restore liquidity to financial markets and the flow of credit to the economy. Working over the weekend to act before markets opened on Monday, the Federal Reserve announced substantial new measures on Sunday, March 15. These included:

- » Cutting the federal funds rate another percentage point to near zero (Figure 1.34)
- » Easing the terms at which banks could borrow from the Federal Reserve's discount window and encouraging banks to do so to meet demands for credit from businesses and households
- » Lowering to zero the amount of reserves banks must hold (known as required reserves) with the Federal Reserve to give banks more flexibility to use their balance sheets to lend to businesses and households
- » Encouraging banks to use their capital and liquidity buffers to lend to households and businesses affected by COVID-19
- » Reinvesting principal and interest from the Federal Reserve's holdings of agency securities to bolster the market for MBS
- » Announcing that the Federal Reserve would purchase at least \$500 billion in Treasury securities and \$200 billion in agency MBS in coming months to support the smooth functioning of those markets
- » In conjunction with other major central banks, easing the terms on inter-central bank liquidity arrangements, or swap lines, to help lessen strains in global US dollar funding markets

### **March 17: Federal Reserve establishes PDCF and CPFF to provide liquidity to commercial paper and bond markets**

On March 17, the Federal Reserve created two facilities to support the flow of credit to households and businesses.

One facility, the Primary Dealer Credit Facility (PDCF), would lend to primary dealers against “eligible collateral,” which included investment grade corporate debt, commercial paper, municipal securities, MBS, asset-backed securities, and equities.<sup>53</sup>

Although the PDCF was intended to add liquidity to the fixed-income markets, its structure posed challenges. Under its terms, primary dealers had limited incentives to borrow from the PDCF. For example, the PDCF offered no relief from bank capital standards. As a result, if a primary dealer acquired commercial paper from a customer and funded that acquisition by borrowing from the PDCF, banking regulations would require the primary dealer's parent bank to pledge additional (costly) capital. Moreover, the terms of the PDCF allowed the Federal Reserve recourse *beyond* the collateral the primary dealer pledged against the loan (in this example, the commercial paper it purchased from its customer).<sup>54</sup> Market participants conveyed to the Treasury Department and Federal Reserve that the PDCF would likely be more effective in helping restore liquidity and the flow of credit if its terms were amended.

The other facility, the Commercial Paper Funding Facility (CPFF), would purchase highly rated commercial paper directly from issuers. The goal was to reduce or eliminate concerns that issuers might not be able to repay investors by rolling over their maturing commercial paper, which was reportedly a factor contributing to illiquidity in the commercial paper market.

The CPFF eventually provided liquidity to the commercial paper market, but it also had limitations. The facility could only inject liquidity into the *primary market* for commercial paper—this helped issuers, but did little to assist directly those already holding commercial paper who wanted to sell it in the *secondary market*. Finally, the Federal Reserve initially set the cost of borrowing through the CPFF relatively high (roughly 2 percent), which posed a disincentive to borrowing under the program.<sup>55</sup>

### *March 18: Federal Reserve establishes MMLF to provide liquidity to commercial paper market*

Recognizing that further measures were necessary to provide liquidity to the short-term credit markets, on March 18 the Federal Reserve established the Money Market Mutual Fund Lending Facility (MMLF). This facility, which began operating on March 23, would lend to banks that acquired US Treasury and agency securities and highly rated commercial paper from money market funds, including those that banks purchased beginning on March 18.

As the Federal Reserve stated at the time, the MMLF would “assist money market funds in meeting the demands for redemptions by households and other investors, enhancing overall market functioning and credit provision to the broader economy.”<sup>56</sup> In part, the MMLF would achieve this by ensuring that prime money market funds would be able to meet their investors’ redemption requests, thus giving investors the confidence to leave their cash in funds in the first place.<sup>57</sup>

The terms of the MMLF were flexible, increasing the chances that the facility would strongly supplement the PDCF and CPFF. The cost of borrowing was about 1.25 percent, significantly lower than the CPFF’s rate. In addition, the program was non-recourse, meaning banks would not be required to make the Federal Reserve whole if a security eventually defaulted. Additionally, on March 19, the Federal Reserve provided relief from certain regulatory capital requirements to banks that borrowed under the MMLF, indicating that the Federal Reserve recognized that bank capital standards were indeed restricting the flow of credit.

Nevertheless, market participants, including fund industry members, conveyed that the MMLF would be much more effective if its terms were amended further. Two changes were recommended.

First, according to the initial MMLF terms, banks were unable to borrow against municipal securities purchased from municipal money market funds. Given the strains in the municipal credit markets—both the short- and long-term markets—fund market participants believed this was an oversight, albeit entirely understandable given the rapid pace of developments and the speed with which the Federal Reserve was acting.

Second, the MMLF initially excluded certificates of deposit (CDs) as eligible collateral. This was significant because banks, both domestic and foreign, borrow dollars from prime money market funds and other investors through CDs. Unless CDs were included as eligible collateral, prime money market funds would be unwilling to roll over this funding for banks, requiring banks to turn elsewhere. Since branches and agencies of foreign banks rely to a significant extent on borrowing through CDs, this could have added to pressures in US dollar funding markets abroad.

Over the next several days, the Federal Reserve, in conjunction with the US Treasury, worked to adjust the terms of the facilities to make them more effective. For example, on March 20, the Federal Reserve supplemented the terms of the MMLF, giving it the ability to accept certain municipal securities from municipal money market funds. On March 23, it expanded the list of eligible municipal securities further, and added CDs to the list of MMLF-eligible securities.

On March 23, to further enhance the ability of state and local governments to finance their activities, the Federal Reserve expanded the list of CPFF eligible securities to include high-quality tax-exempt commercial paper. It also lowered the cost of borrowing through the CPFF facility.

These facilities helped restore liquidity and the flow of credit to the short-term credit markets, but the adjustments to the facilities were crucial to making this happen. As Figure 1.36 shows, short-term borrowing costs, both taxable (top panel) and tax-exempt (bottom panel), continued to rise after March 18. It was not until after the Federal Reserve adjusted the terms on the CPFF and MMLF that short-term borrowing costs began falling.

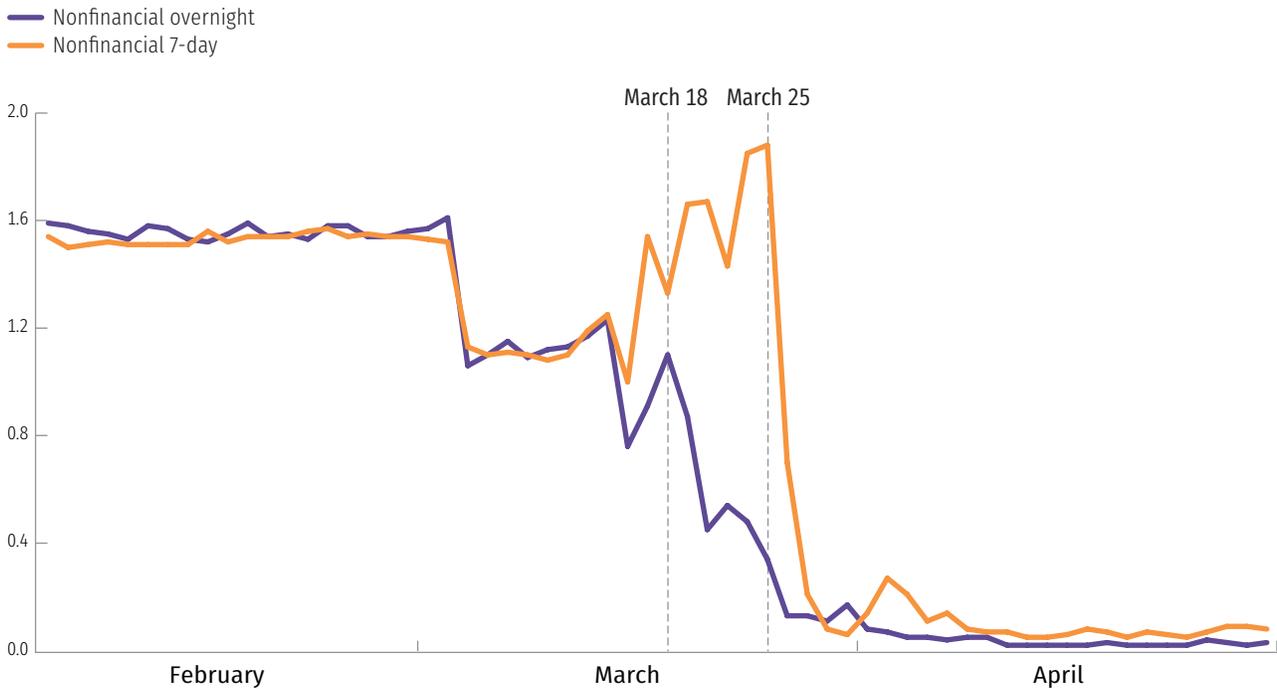
FIGURE 1.36

### Costs of Short-Term Borrowing Began Falling After March 23

Percent

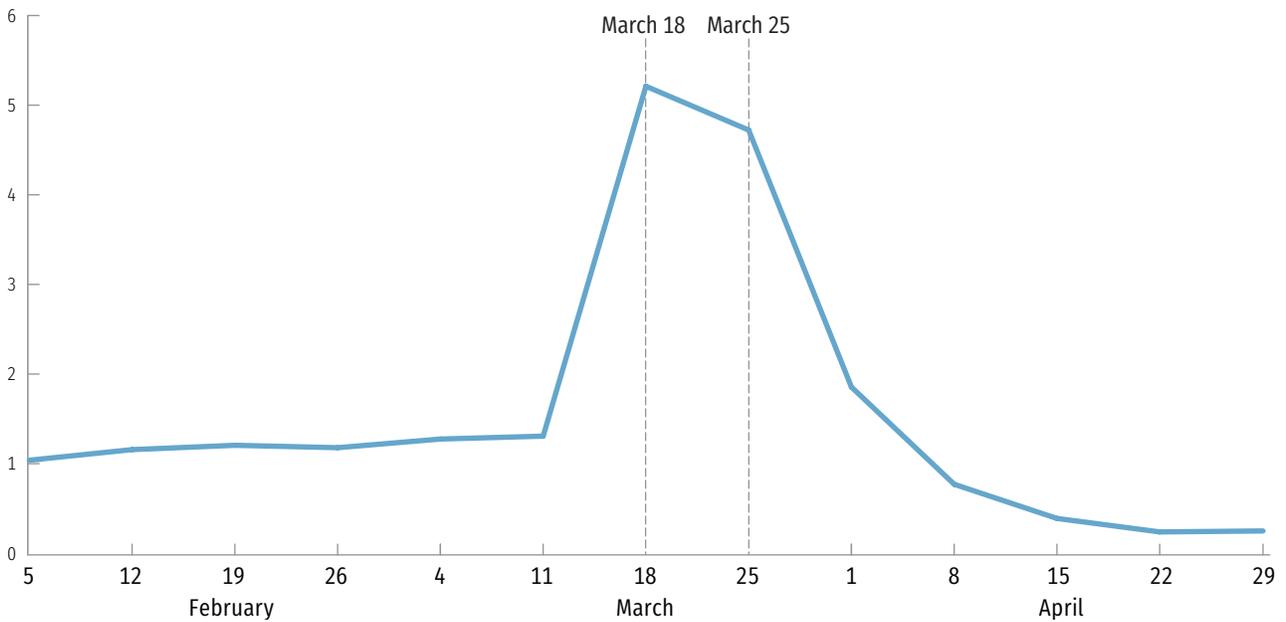
#### Yields on nonfinancial commercial paper

Daily, February 3–April 30, 2020



#### SIFMA index\*

Weekly, February 5–April 29, 2020



\*The SIFMA Swap Index measures the current yield that municipal borrowers pay on variable-rate demand notes.

Sources: Federal Reserve Board and SIFMA

### March 19: Federal Reserve expands dollar swap lines to nine additional global central banks

Despite its announcement on March 15 that it was easing the terms at which major central banks could borrow dollars from the Federal Reserve, global US dollar funding markets continued to show significant strains.<sup>58</sup> To help address that concern, on March 19, the Federal Reserve announced that it was establishing temporary swap lines with nine additional central banks, enabling them to obtain dollar funding from the Federal Reserve up to a combined limit of \$450 billion.<sup>59</sup>

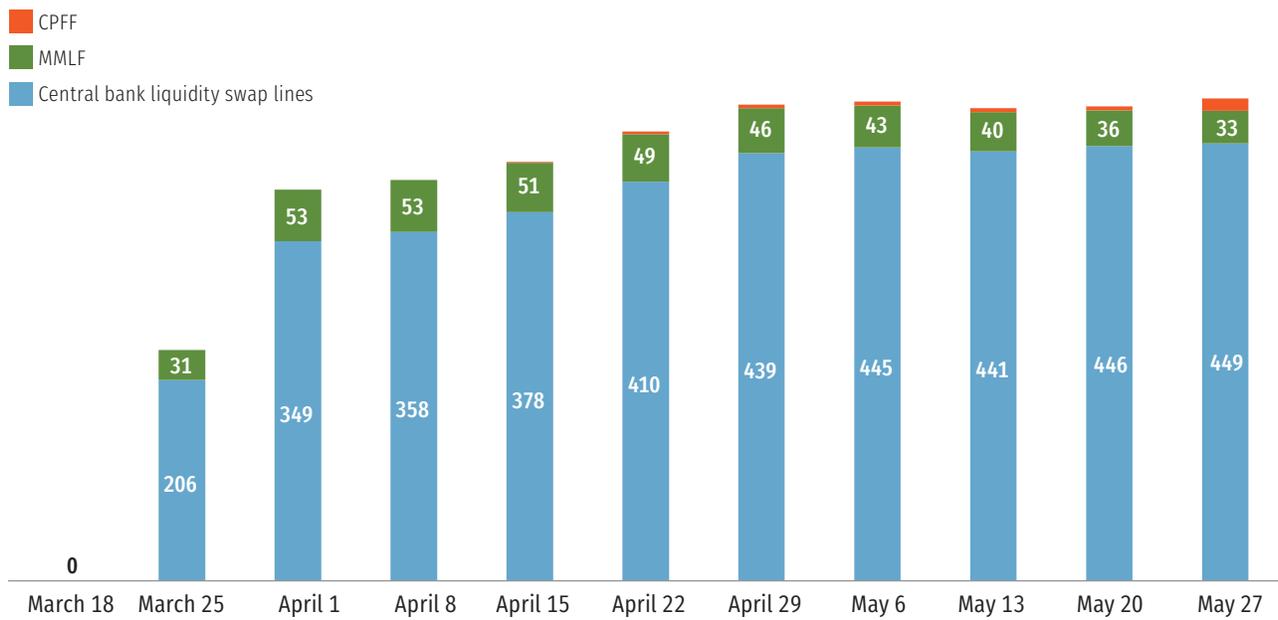
To further address stresses in the global dollar funding markets, on March 20, other major central banks, in coordination with the Federal Reserve, announced that they would move from auctioning dollars in their countries on a weekly basis to conducting such auctions on a daily basis.<sup>60</sup>

Massive international demand for US dollars can be put into perspective by examining the effect on the Federal Reserve's balance sheet. From March 18 to March 25, the Federal Reserve's balance sheet had grown by \$206 billion due to increased use of the swap lines by foreign central banks (Figure 1.37). Within two weeks, the total US dollars lent to foreign central banks under these swap lines had grown to \$349 billion; it would eventually peak on May 27 at almost \$450 billion. In contrast, the MMLF and CPFF topped out at \$53 billion on April 8.

FIGURE 1.37

### Massive International Demand for Dollar Liquidity Boosted Size of Fed's Balance Sheet

Billions of dollars, weekly, March 18–May 27, 2020



Source: Federal Reserve Board

### ***March 23: Fed creates additional lending facilities and undertakes quantitative easing***

On March 23, with backing from Congress and the US Treasury, the Federal Reserve established three additional lending facilities; the Primary Market Corporate Credit Facility (PMCCF), the Secondary Market Corporate Credit Facility (SMCCF), and the Term Asset-Backed Securities Lending Facility (TALF).

The PMCCF and SMCCF would support the flow of credit to large businesses. The PMCCF would do that by purchasing newly issued bonds directly from corporations with investment grade bond ratings. The SMCCF would buy investment grade corporate bonds directly in the secondary market, helping provide liquidity to the longer end of the corporate bond market. One novel aspect of the SMCCF is that it also would purchase shares of corporate bond ETFs in the secondary market.<sup>61</sup> Although the Federal Reserve did not state this, market participants assumed that the two facilities, in combination, would provide up to \$200 billion in financing.<sup>62</sup>

In addition, the Federal Reserve reiterated that it would continue purchasing Treasury and agency MBS and that it also would begin purchasing AAA-rated commercial MBS, all in amounts sufficient to support smooth market functioning. The Federal Reserve did not specify a dollar limit on purchases of these securities and, as a result, this announcement was widely interpreted as indicating that the Federal Reserve would buy unlimited amounts of government securities.<sup>63</sup> The Federal Reserve Bank of New York stated that it would purchase \$625 billion in such securities in the coming week alone.<sup>64</sup>

### ***March 31: Federal Reserve establishes FIMA Repo Facility***

On March 31, the Federal Reserve took yet another step to quench the offshore thirst for dollar liquidity, establishing the FIMA Repo Facility, a temporary facility to undertake repos with foreign central banks and international monetary authorities.<sup>65</sup> Under this arrangement, foreign central banks could temporarily exchange their US Treasury securities with the Federal Reserve for dollars that could then be lent to foreign banks.

### ***April 1: Federal Reserve temporarily eases bank capital standards***

The Federal Reserve nevertheless recognized that the efficacy of its programs would be enhanced by adjusting bank capital standards. On April 1, the Federal Reserve announced that it would temporarily alter the SLR capital standard for banks by excluding US Treasury securities and deposits at Federal Reserve Banks from the calculation of bank capital under the SLR.<sup>66</sup>

This change was deemed important in helping enhance the ability of dealers to intermediate fixed-income trading, including in Treasury and agency securities. For example, in the press release announcing the change, the Federal Reserve stated that it was “providing the temporary exclusion...to allow banking organizations to expand their balance sheets as appropriate to continue to serve as financial intermediaries.”<sup>67</sup>

### *April 9: Fed announces it will lend up to \$2.3 trillion to households, employers, and state and local governments through various facilities*

On April 9, the Federal Reserve took additional actions to provide up to \$2.3 trillion in loans to support the economy. These actions included:

- » Expanding the size and scope of the PMCCF, SMCCF, and TALF programs by allowing these programs to support loans of up to \$850 billion.<sup>68</sup>
- » Establishing the Main Street Lending Program, which would provide up to \$600 billion in loans to small- and midsize businesses, on the condition that each borrower make reasonable efforts to maintain its payroll and retain workers.
- » Establishing the Municipal Liquidity Facility (MLF), which would offer up to \$500 billion to state and local governments to enable them to continue serving households and businesses in their communities.
- » Bolstering the effectiveness of the Small Business Administration's Paycheck Protection Program (PPP) by establishing a liquidity facility, the PPPLF, that would extend loans to banks or other financial institutions originating loans to small businesses under the PPP.

In his first detailed public remarks regarding the public health crisis and its impact on the economy, Federal Reserve Chair Powell spoke about the various steps by the Federal Reserve to “build a bridge from the solid economic foundation on which we entered this crisis to a position of regained economic strength on the other side.”<sup>69</sup> In describing the Federal Reserve's exercise of its emergency lending powers, Powell stated:

[W]e have acted to safeguard financial markets in order to provide stability to the financial system and support the flow of credit in the economy. As a result of the economic dislocations caused by the virus, some essential financial markets had begun to sink into dysfunction, and many channels that households, businesses, and state and local governments rely on for credit had simply stopped working. We acted forcefully to get our markets working again, and, as a result, market conditions have generally improved.

Responding to questions, Powell said the Federal Reserve had to develop these programs at “high speed” even if in hindsight “we may see we could have done it differently.” He stated that “investors struggled to assess the meaning” of the crisis for the economy, that there was a flight to safety, and that lending had stopped functioning, adding that “this is what [the emergency lending powers] are intended to address.” Powell noted that the programs are targeted to “areas of priority for the economy” and that the Federal Reserve will watch and adapt the programs as needed. He said that “the principal focus of the lending programs is to make sure credit flows” to households, businesses, and state and local governments. In his prepared remarks, Powell pledged that the Federal Reserve “will continue to use these powers forcefully, proactively, and aggressively until we are confident that we are solidly on the road to recovery.”

## Effects of Various Programs on Federal Reserve's Balance Sheet

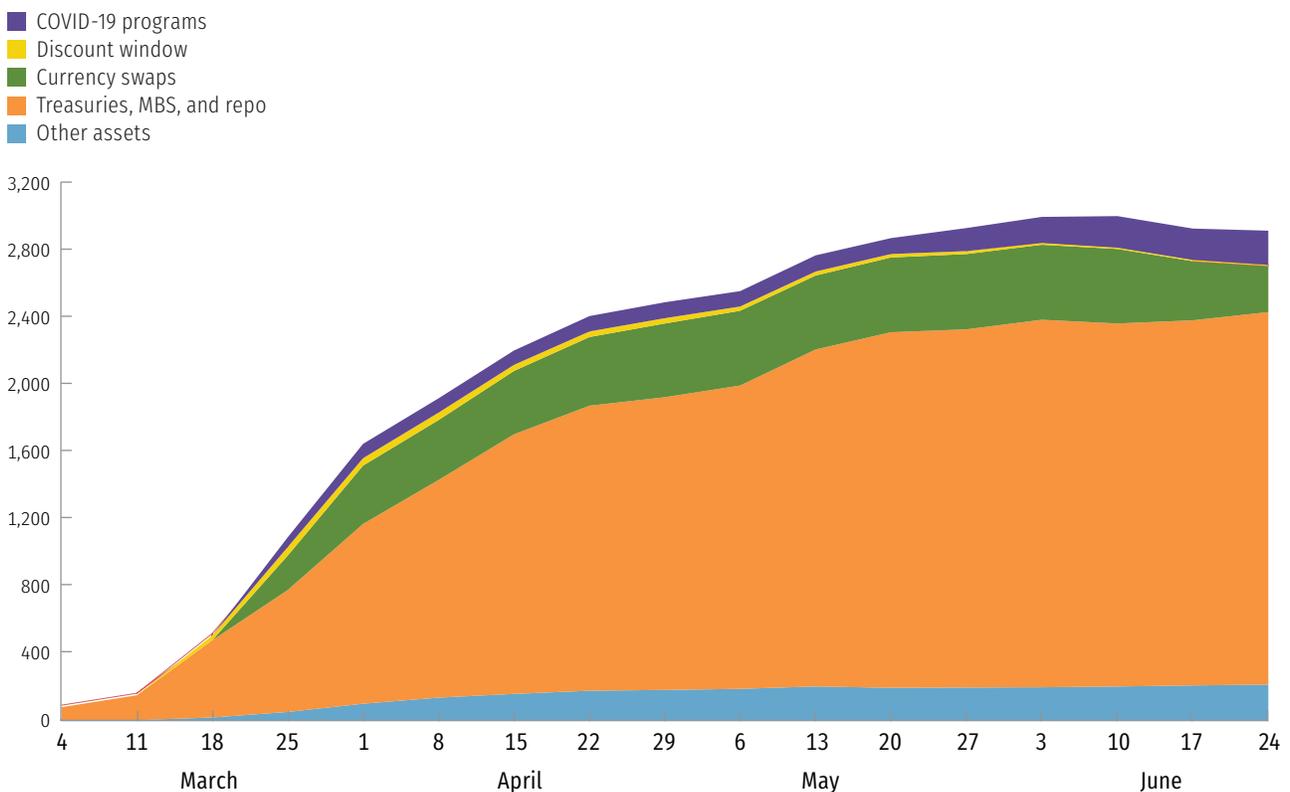
In combination, the actions the Federal Reserve undertook added significantly to its balance sheet (Figure 1.38). Over the four months from March through June 2020, the Federal Reserve's balance sheet grew by almost \$3 trillion, a 70 percent increase relative to its level at the end of February.<sup>70</sup>

As Figure 1.38 shows, the vast majority of this growth stemmed from purchases of Treasury securities and MBS, with repos contributing relatively modestly through March. Currency swaps arrangements with foreign central banks also contributed very significantly, peaking at \$450 billion at the end of May. Loans advanced through the Federal Reserve's discount window totaled \$51 billion at the end of March and have since declined.

FIGURE 1.38

### Purchases of Treasury Securities and MBS Boosted Fed's Balance Sheet

Cumulative change to Federal Reserve's balance sheet since February 26, 2020, billions of dollars, March 4–June 24, 2020



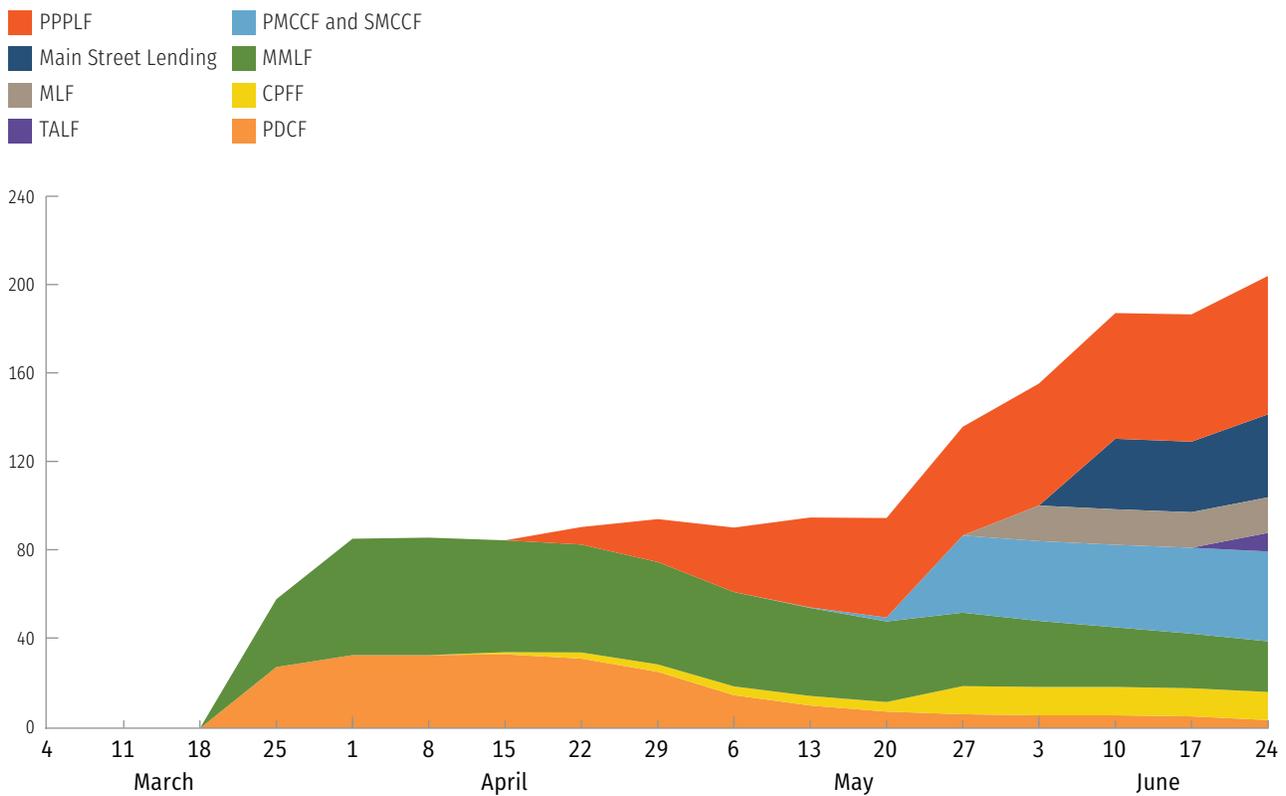
Source: ICI calculations based on Federal Reserve Board data

Figure 1.39 focuses on the Federal Reserve’s assets attributable to the COVID-19 programs established in March and early April (PDCF, MMLF, CPFF, PMCCF, SMCCF, MLF, Main Street Lending, and PPPLF). Early on, the PDCF and MMLF accounted for most of the growth in COVID-19 related assets on the Federal Reserve’s balance sheet: about \$72 billion of the \$95 billion lent in the first few weeks. Although balances attributable to those facilities soon began falling, total assets in COVID-19 programs continued to grow through the end of June. That growth was attributable to the programs that lend to businesses for operations, to employers to support employees, and to state and local governments (PMCCF, SMCCF, MLF, Main Street Lending, and PPPLF).

FIGURE 1.39

### How Much Did COVID-19 Facilities Add to the Federal Reserve’s Balance Sheet?

Contributions of COVID-19 facilities to Fed’s balance sheet since February 26, 2020, billions of dollars, March 4–June 24, 2020



Source: ICI calculations based on Federal Reserve Board data

## Federal Reserve Facilities Restored Liquidity to Financial Markets

The combined weight of the Federal Reserve’s wide array of facilities helped restore order and liquidity to the fixed-income markets. Short-term borrowing costs in both the taxable and tax-exempt markets began falling soon after the Federal Reserve announced (on March 18) and then quickly adjusted (on March 23) the CPFF and MMLF.

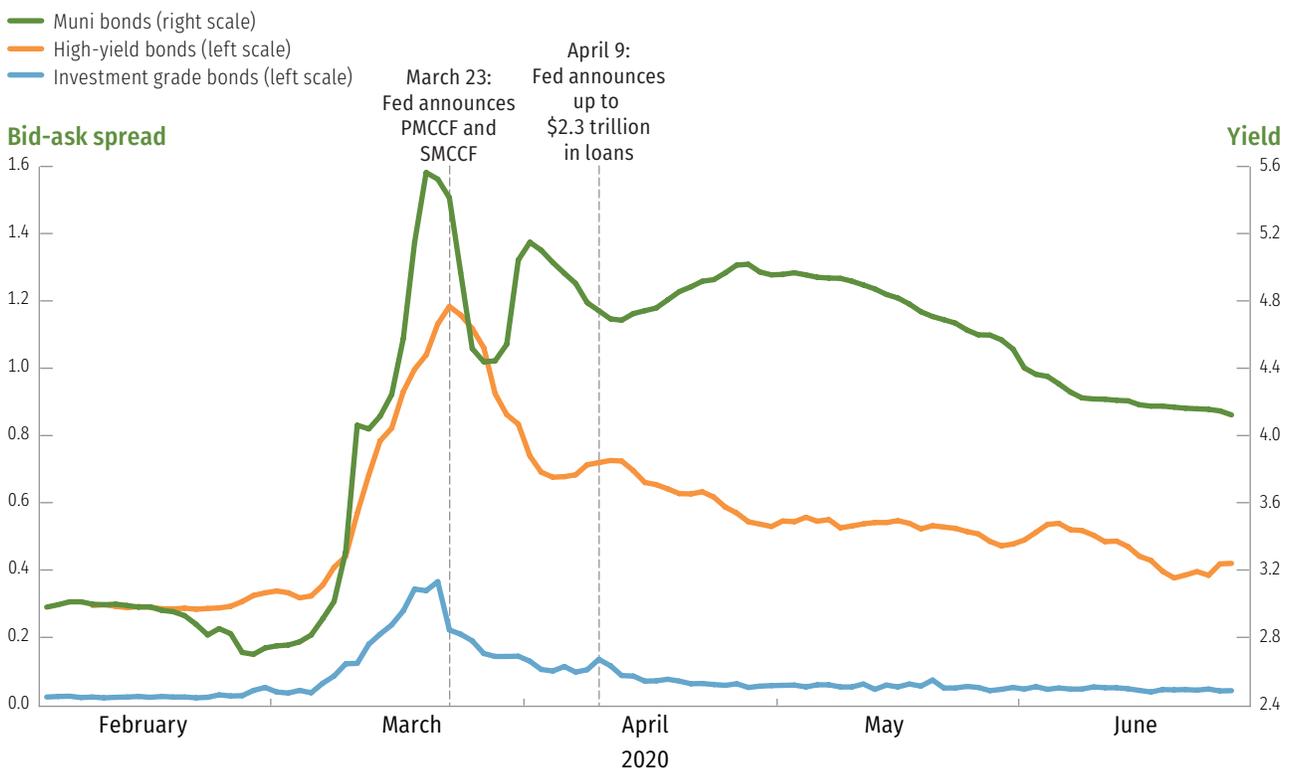
Borrowing costs in longer-term fixed-income markets also began falling after the Federal Reserve’s announcement of the PMCCF and SMCCF programs on March 23. For example, as Figure 1.40 shows, bid-ask spreads on investment grade bonds (blue line, left scale) and high-yield bonds (orange line, left scale) began dropping sharply after March 23.

Longer-term borrowing costs for state and local governments (green line, right scale) also began dropping sharply after March 23 but have not returned to pre-COVID-19 levels, no doubt reflecting lingering concerns about municipal finances. For example, by the end of June, yields on municipal bonds had fallen to 4.12 percent, still elevated relative to the level prevailing before March 2020.

FIGURE 1.40

### Federal Reserve Actions Restored Liquidity and Flow of Credit

Bid-ask spreads on investment grade and high-yield bonds and yield on municipal debt,\* percent, daily, February 3–June 30, 2020



\*Yield on municipal debt is the S&P Dow Jones municipal index yield-to-worst index.

Sources: MarketAxess and S&P Dow Jones Indices

The Federal Reserve's actions were timely, creative, flexible, and necessary. The probability was high that had the Federal Reserve (with the support of Congress and backing from the US Treasury) not undertaken these actions, the financial markets, and thus, the economy would have collapsed. In recent remarks, Federal Reserve Bank of New York President and CEO John C. Williams underscored this very point.

Despite our best efforts, we should not fool ourselves that we can design a system that is bulletproof against every circumstance. The events of the past year have demonstrated the critical role central banks can and must play in extraordinary times when market stress and dysfunction threaten to spill over into the economy. No private institution has the ability to provide liquidity at the speed or scale that the Federal Reserve and other central banks have this year. Although we often talk about the Fed in terms of monetary policy and interest rates, the Federal Reserve System was originally created to ensure the stability of the financial system. That role is as relevant today as it was 107 years ago and will continue to be in the future.<sup>71</sup>

Under the circumstances—namely the widespread dash to cash sparked by concerns about the economy and the vast uncertainty about how events would progress—the Federal Reserve (in conjunction with other major central banks) was the only entity capable of providing the necessary liquidity.

# Appendix

## Table of Abbreviations

<b>ABCP</b>	Asset-backed commercial paper
<b>AP</b>	Authorized participants
<b>CARES Act</b>	Coronavirus Aid, Relief, and Economic Security Act of 2020
<b>Cboe</b>	Chicago Board Options Exchange
<b>CD</b>	Certificates of deposit
<b>CFTC</b>	Commodity Futures Trading Commission
<b>CME</b>	Chicago Mercantile Exchange
<b>COVID-19</b>	Coronavirus-19 disease
<b>CPFF</b>	Commercial Paper Funding Facility
<b>ETF</b>	Exchange-traded funds
<b>FIMA</b>	Foreign and international monetary authorities
<b>FOMC</b>	Federal Open Market Committee
<b>FRBNY</b>	Federal Reserve Bank of New York
<b>FRED</b>	Federal Reserve Economic Data
<b>GDP</b>	Gross domestic product
<b>IHME</b>	Institute for Health Metrics and Evaluation
<b>LCR</b>	Liquidity coverage ratio
<b>MBS</b>	Mortgage backed securities
<b>MLF</b>	Municipal Liquidity Facility
<b>MMLF</b>	Market Mutual Fund Lending Facility
<b>mREITs</b>	mortgage real estate investment trusts
<b>OPEC</b>	Organization of the Petroleum Exporting Countries
<b>PDCF</b>	Primary Dealer Credit Facility
<b>PMCCF</b>	Primary Market Corporate Credit Facility

<b>PPP</b>	Paycheck Protection Program
<b>PPPLF</b>	Paycheck Protection Program Liquidity Facility
<b>REIT</b>	Real estate investment trusts
<b>RIC</b>	Registered investment companies
<b>RMBS</b>	Residential mortgage backed securities
<b>S&amp;P</b>	Standard & Poor's
<b>SARS CoV-2</b>	Severe acute respiratory syndrome coronavirus-2
<b>SEC</b>	Securities and Exchange Commission
<b>SIFMA</b>	Securities Industry and Financial Markets Association
<b>SLR</b>	Supplementary leverage ratio
<b>SMCCF</b>	Secondary Market Corporate Credit Facility
<b>TALF</b>	Term Asset-Backed Securities Lending Facility
<b>TYVIX</b>	Chicago Board Options Exchange 10-year US Treasury Note Volatility Index
<b>VIX</b>	Chicago Board Options Exchange Volatility Index
<b>VRDN</b>	Variable-rate demand notes
<b>WFH</b>	Work-from-home
<b>WHO</b>	World Health Organization

## Notes

- <sup>1</sup> See page 46 for a more detailed discussion on some of the Federal Reserve's COVID-19 related programs.
- <sup>2</sup> As John C. Williams, president and CEO of the Federal Reserve Bank of New York (FRBNY) recently observed, "The unique nature of this recession—a global pandemic—has required us to design an innovative response. Some of our actions have the hallmarks of those taken during the 2008 financial crisis, but many more have required a fresh approach." See John C. Williams, "Rising to the Challenge: Central Banking, Financial Markets, and the Pandemic" (Remarks delivered to the Financial Research Advisory Committee for the Treasury's Office of Financial Research, July 16, 2020), [www.newyorkfed.org/newsevents/speeches/2020/wil200716](http://www.newyorkfed.org/newsevents/speeches/2020/wil200716).
- <sup>3</sup> According to the website of the University of Washington's Institute for Health Metrics and Evaluation (IHME), its social distancing index shows "how human mobility has changed relative to background levels for each location. These mobility patterns have changed as social distancing measures have been implemented and/or eased. Individual decisionmaking also factors into mobility patterns, as individuals in certain locations choose to increase or decrease their movement regardless of government mandates. When mobility is high, the risk of COVID-19 spreading may also be high."
- <sup>4</sup> US Bureau of Economic Activity, "Gross Domestic Product (Third Estimate), Corporate Profits (Revised), and GDP by Industry, Second Quarter 2020," September 30, 2020, [www.bea.gov/news/2020/gross-domestic-product-third-estimate-corporate-profits-revised-and-gdp-industry-annual](http://www.bea.gov/news/2020/gross-domestic-product-third-estimate-corporate-profits-revised-and-gdp-industry-annual). The BEA is the entity responsible for calculating US GDP; these "third" estimates are for 2020:Q2.
- <sup>5</sup> US Bureau of Labor Statistics, "Employment Situation News Release," July 2, 2020.
- <sup>6</sup> See, e.g., Karen Langley and Anna Hirtenstein, "Dow Closes at Record as Coronavirus Worries Abate," *Wall Street Journal*, February 12, 2020, stating that "US stocks set new records as concerns about the economic impact of the coronavirus outbreak continued to ease." See also Paul Hannon and Amara Omeokwe, "Coronavirus Hits US Business Activity," *Wall Street Journal*, February 21, 2020, quoting Federal Reserve Bank of Atlanta President Raphael Bostic noting that companies in his district "have told him the coronavirus situation is 'going to be a disruption, but...we are not expecting it to be more structural.'"
- <sup>7</sup> The Johns Hopkins Coronavirus Research Center reports that the cumulative total confirmed cases of COVID-19 in the United States was 25 as of February 29, 2020.
- <sup>8</sup> See, e.g., Jason Horowitz and Elisabetta Povoledo, "Europe Confronts Coronavirus as Italy Battles an Eruption of Cases," *New York Times*, February 23, 2020, [www.nytimes.com/2020/02/23/world/europe/italy-coronavirus.html](http://www.nytimes.com/2020/02/23/world/europe/italy-coronavirus.html).
- <sup>9</sup> See Mauro F. Guillén, "The Global Economic & Financial Crisis: A Timeline," The Lauder Institute, University of Pennsylvania, [https://lauder.wharton.upenn.edu/wp-content/uploads/2015/06/Chronology\\_Economic\\_Financial\\_Crisis.pdf](https://lauder.wharton.upenn.edu/wp-content/uploads/2015/06/Chronology_Economic_Financial_Crisis.pdf).
- <sup>10</sup> A Treasury security is "on-the-run" when it is the most recently issued bond of a given maturity and is "off-the-run" when it is a bond of the same maturity but issued less recently. The two securities are identical in maturity, but differ in that, for example, the off-the-run bond was issued one month ago or even a few years ago and may have a different coupon. Because the two bonds have the same maturity, however, they should have similar yields.
- <sup>11</sup> Bid-ask spreads of off-the-run Treasuries typically are slightly wider than those of on-the-run Treasuries because (for structural reasons) on-the-run Treasuries tend to be more liquid. During March, bid-ask spreads of off-the-run Treasuries were tens of basis points wider than their on-the-run counterparts, which is extremely abnormal.

- <sup>12</sup> See, e.g., Federal Reserve Board, “Report on the Federal Reserve’s Balance Sheet,” August 2020, [www.federalreserve.gov/publications/files/balance\\_sheet\\_developments\\_report\\_202008.pdf.pdf](http://www.federalreserve.gov/publications/files/balance_sheet_developments_report_202008.pdf.pdf). See also Lorie K. Logan, “The Federal Reserve’s Recent Actions to Support the Flow of Credit to Households and Businesses” (Remarks prepared for the Foreign Exchange Committee, Federal Reserve Bank of New York, April 14, 2020); J. Cheng, D. Wessel, and J. Younger, “How Did COVID-19 Disrupt the Market for US Treasury Debt,” *Up Front* (Brookings Institution blog), May 1, 2020; D. Duffie, “Still the World’s Safe Haven? Redesigning the US Treasury Market After the COVID-19 Crisis” (Hutchins Center Working Paper no. 62, Brookings Institution, June 2020); J. Baer, “The Day the Coronavirus Nearly Broke the Financial Markets,” *Wall Street Journal*, May 20, 2020; and *Financial Stability Report* (Washington, DC: Federal Reserve Board, May 2020).
- <sup>13</sup> Quarter-end reporting for global banks and fiscal year-end reporting for Japanese banks also may have played a role in dealers’ decisions to limit risk during March.
- <sup>14</sup> See Justin Muzinich (Remarks delivered at the 2020 US Treasury Market Conference, September 29, 2020), page 3. Available at <https://home.treasury.gov/system/files/136/Justin-Muzinich-Remarks-2020-UST-mkt-conf-Sep-29-public-release.pdf>.
- <sup>15</sup> Id.
- <sup>16</sup> According to US Treasury Deputy Secretary Justin Muzinich, “foreign institutions sold nearly \$300 billion of Treasuries in March,” and “[c]entral banks in particular sought dollar liquidity by selling shorter dated coupon securities in order to raise cash for currency defense and to help meet the liquidity needs of their domestic financial institutions.” See Justin Muzinich (Remarks delivered at the 2020 US Treasury Market Conference, September 29, 2020), page 4 and Figure 6. Available at <https://home.treasury.gov/system/files/136/Justin-Muzinich-Remarks-2020-UST-mkt-conf-Sep-29-public-release.pdf>. See also Craig Torres, “Quarles Says Central Banks Played Role in Treasuries Strains,” Bloomberg News, September 29, 2020, [www.bloomberg.com/news/articles/2020-09-29/quarles-says-central-banks-played-role-in-treasuries-strains](http://www.bloomberg.com/news/articles/2020-09-29/quarles-says-central-banks-played-role-in-treasuries-strains) (quoting remarks by Federal Reserve Vice Chair and Financial Stability Board Chair Randal K. Quarles at a panel hosted by Harvard Law School and the Program on International Financial Systems indicating that sales of Treasury securities by foreign central banks were “a significant source” in the sell-off that occurred in March). Additional, circumstantial evidence of this selling pressure comes from Federal Reserve actions in mid-March, when the Federal Reserve increased its preexisting dollar swap lines with certain countries and opened swap lines with others. These swap lines may have relieved the pressures on foreign central banks to sell Treasury securities to raise cash.
- <sup>17</sup> US dollars are the world’s primary reserve currency. For this reason, many foreign central banks hold reserves in US dollars, which they invest in Treasury securities.
- <sup>18</sup> The exchange will close out the position of an investor who is unable to post the additional margin.
- <sup>19</sup> For a discussion, see A. Schrimpf, H. S. Shin, and V. Sushko, “Leverage and Margin Spirals in Fixed-Income Markets During the COVID-19 Crisis,” *BIS Bulletin*, no. 2 (April 2, 2020).
- <sup>20</sup> A long futures position is closed out by acquiring a short futures position with the same gross notional value.
- <sup>21</sup> See Lorie K. Logan, “The Federal Reserve’s Recent Actions to Support the Flow of Credit to Households and Businesses” (Remarks prepared for the Foreign Exchange Committee, Federal Reserve Bank of New York, April 14, 2020).
- <sup>22</sup> For hedge funds, see *Financial Stability Report* (Washington, DC: Federal Reserve Board, May 2020), 44–45, stating that “hedge funds reportedly reduced their leverage significantly as market volatility rose and many hedge funds experienced margin calls. Some types of hedge funds are built around strategies that can result in rapid deleveraging when volatility spikes, which could, in turn, contribute to further market volatility.”
- <sup>23</sup> *Financial Stability Report* (Washington, DC: Federal Reserve Board, May 2020), 54.
- <sup>24</sup> See, e.g., A. Schrimpf, H. S. Shin, and V. Sushko, “Leverage and Margin Spirals in Fixed-Income Markets During the COVID-19 Crisis,” *BIS Bulletin*, no. 2 (April 2, 2020). See also D. Barth and J. Kahn, “Basis Trades and Treasury Market Illiquidity,” *OFR Brief Series*, Office of Financial Research 20, no. 1 (July 16, 2020).

- <sup>25</sup> See J. Younger, “Revisiting the Ides of March, Part II: The Going Gets Weird,” *Follow the Money* (Council on Foreign Relations blog), July 22, 2020.
- <sup>26</sup> There are two types of bank capital requirements: risk-based capital and leverage capital. Risk-based capital, as the name suggests, sets capital requirements on a risk-adjusted basis. Leverage capital is inherently risk insensitive, meaning that capital requirements increase as assets increase, regardless of the risk of those assets. The SLR is a leverage capital requirement. Under the SLR, if a BHC (or an affiliated dealer) acquires a Treasury security, the BHC must hold additional capital—despite the fact that Treasury securities are considered to be risk free. Capital is costly, so the SLR creates a disincentive for a BHC’s affiliated dealer to add bonds to its inventory. As a result, dealers may charge more to intermediate Treasuries and other fixed-income securities, leading to a widening of bid-ask spreads.
- <sup>27</sup> Under Basel III, the LCR requires banks to hold enough high-quality liquid assets to fund cash outflows for 30 days.
- <sup>28</sup> See, e.g., European Central Bank, *Financial Stability Review*, May 2020, stating that “dealers were unwilling to absorb the large supply of bonds arising from rapid sales.” See also *Financial Stability Report* (Washington, DC: Federal Reserve Board, May 2020), 21, stating, “As market makers, dealers absorbed large amounts of less-liquid off-the-run Treasury securities from investors who sought to secure liquidity by selling assets or had to unwind positions, which reportedly expanded dealers’ balance sheets against the constraints imposed by regulatory or risk-management considerations”; and M. Fleming, “Treasury Market Liquidity and the Federal Reserve During the COVID-19 Pandemic,” *Liberty Street Economics* (Federal Reserve Bank of New York blog), May 29, 2020, stating, “Dealers accommodated some of the cash market sales but were unable to do more because of bloated inventories, balance sheet constraints, and internal risk limits amid the high volatility.”
- <sup>29</sup> See J. Cheng, D. Wessel, and J. Younger, “How Did COVID-19 Disrupt the Market for US Treasury Debt,” *Up Front* (Brookings Institution blog), May 1, 2020, stating, “[a]s selling of Treasuries picked up in March, banks and dealers faced balance sheet constraints and internal risk limits amid the elevated volatility. This led to higher costs for even modest transactions and crowded out their ability to intermediate in other asset classes such as credit and municipal debt.” See also D. Duffie, “Still the World’s Safe Haven? Redesigning the US Treasury Market After the COVID-19 Crisis” (Hutchins Center Working Paper no. 62, Brookings Institution, June 2020).
- <sup>30</sup> J. Younger, M. Salem, and H. St. John, “When Market Risk Meets Operational Risk,” JP Morgan, North American Fixed-Income Strategy, March 10, 2020.
- <sup>31</sup> See J. Younger, “Revisiting the Ides of March, Part II: The Going Gets Weird,” *Follow the Money* (Council on Foreign Relations blog), July 22, 2020.
- <sup>32</sup> The FRA-OIS spread is the difference between 3-month LIBOR (the London Interbank Offered Rate) and the federal funds rate.
- <sup>33</sup> See BlackRock, “Understanding VRDNs,” *Cash Academy*, [www.blackrock.com/cash/literature/whitepaper/understanding-variable-rate-demand-notes.pdf](http://www.blackrock.com/cash/literature/whitepaper/understanding-variable-rate-demand-notes.pdf).
- <sup>34</sup> Primary dealers are large dealers that are trading counterparties of the Federal Reserve Bank of New York in its implementation of monetary policy. They are also expected to make markets for the New York Fed on behalf of its official accountholders as needed, and to bid on a pro rata basis in all Treasury auctions at reasonably competitive prices.
- <sup>35</sup> More detail on this point will be provided in a forthcoming ICI paper.
- <sup>36</sup> For example, Standard & Poor’s uses a bond rating scale ranging from AAA, AA, A, to BBB—with AAA being most creditworthy and BBB being less so, just one notch above non-investment grade. Ratings for non-investment grade bonds (high-yield bonds) range from BB, B, CC, C, to D—with BB being the most creditworthy of that category and D being the least. Other major credit rating agencies (e.g., Moody’s, Fitch) use similar letter-based rating scales.

- <sup>37</sup> Other investors include private, federal, and state and local defined benefit pension plans; government sponsored entities; and other financial institutions.
- <sup>38</sup> For example, suppose interest rates rise in high-yield bonds by 6 percentage points, but only 2.5 percentage points for investment grade bonds, and that high-yield and investment grade bonds have durations of 3 years and 7 years, respectively. In this case, prices for both types of bonds would decline by about 18 percent because the price impact from rising interest rates is estimated as the negative change in yield multiplied by duration (high-yield =  $-6 \times 3$ ) and investment grade =  $(-2.5 \times 7)$ ).
- <sup>39</sup> See Paul J. Davies, “Corporate Debt Engulfed by Market Turbulence,” *Wall Street Journal*, March 6, 2020.
- <sup>40</sup> In the view of Federal Reserve Chair Jerome H. Powell, “When it became clear in late February that the disease was spreading worldwide, financial markets were roiled by a global flight to cash. By the end of the month, many important markets were faltering, raising the threat of a financial crisis that could exacerbate the economic fallout of the pandemic.” See Jerome H. Powell, “Recent Economic Developments and the Challenges Ahead” (Speech delivered to the National Association for Business Economics Virtual Annual Meeting, October 6, 2020), [www.federalreserve.gov/newsevents/speech/powell20201006a.htm](http://www.federalreserve.gov/newsevents/speech/powell20201006a.htm). See also John C. Williams, “A Solution to Every Puzzle” (Remarks at the 2020 US Treasury Market Conference, September 29, 2020), [www.newyorkfed.org/newsevents/speeches/2020/wil200929](http://www.newyorkfed.org/newsevents/speeches/2020/wil200929). Williams, FRBNY president and CEO, said, “in March of this year the global spread of the pandemic led to a rapid and massive movement of funds around the world as investors sought to protect themselves from the highly uncertain and darkening economic outlook. These flows threatened to overwhelm the financial system and resulted in intense strain and disruption in short-term funding markets and markets for Treasury securities and agency mortgage backed securities. Measures of market functioning deteriorated to levels near, or in some cases worse than, those we saw at the peak of the 2008 global financial crisis.”
- <sup>41</sup> See Coronavirus Aid, Relief, and Economic Security Act (CARES Act), Pub. L. No. 116-136, 134 Stat. 281 (enacted March 27, 2020), [www.congress.gov/116/plaws/publ136/PLAW-116publ136.pdf](http://www.congress.gov/116/plaws/publ136/PLAW-116publ136.pdf).
- <sup>42</sup> See a list of SEC and staff actions in response to the COVID-19 crisis at [www.sec.gov/sec-coronavirus-covid-19-response](http://www.sec.gov/sec-coronavirus-covid-19-response).
- <sup>43</sup> See a list of CFTC and staff actions in response to the COVID-19 crisis at [www.cftc.gov/coronavirus](http://www.cftc.gov/coronavirus).
- <sup>44</sup> As FRBNY President and CEO John C. Williams recently observed, “despite the clear effect that these facilities have had on the availability of credit, actual take-up of the facilities has been relatively low. But this is in fact a measure of success—the existence of the facilities, even in a backstop role, has helped boost confidence to the point where borrowers are able to access credit from the private market at affordable rates.” See John C. Williams, “Rising to the Challenge: Central Banking, Financial Markets, and the Pandemic” (Remarks delivered to the Financial Research Advisory Committee for the Treasury’s Office of Financial Research, July 16, 2020), [www.newyorkfed.org/newsevents/speeches/2020/wil200716](http://www.newyorkfed.org/newsevents/speeches/2020/wil200716).
- <sup>45</sup> Nick Timiraos, “Fed Officials Say It Is Too Soon to Assess Coronavirus Impact on US Economy,” *Wall Street Journal*, February 24, 2020.
- <sup>46</sup> Federal Reserve Board, “Statement from Federal Reserve Chair Jerome H. Powell,” news release, February 28, 2020, [www.federalreserve.gov/newsevents/pressreleases/other20200228a.htm](http://www.federalreserve.gov/newsevents/pressreleases/other20200228a.htm).
- <sup>47</sup> See Federal Reserve statement, “Federal Reserve Issues FOMC Statement,” news release, March 3, 2020, [www.federalreserve.gov/newsevents/pressreleases/monetary20200303a.htm](http://www.federalreserve.gov/newsevents/pressreleases/monetary20200303a.htm).
- <sup>48</sup> Colby Smith, “Investors in US Treasuries Face Prospects of Zero Yields,” *Financial Times*, March 6, 2020.
- <sup>49</sup> Lorie K. Logan, “The Federal Reserve’s Market Functioning Purchases: From Supporting to Sustaining” (Speech delivered at SIFMA Webinar Series, “A Briefing with the Federal Reserve Bank of New York,” virtual, July 15, 2020), [www.newyorkfed.org/newsevents/speeches/2020/log200715](http://www.newyorkfed.org/newsevents/speeches/2020/log200715).

- <sup>50</sup> Steven Spratt, “How a Little Known Trade Upended the US Treasury Market,” Bloomberg, March 17, 2020.
- <sup>51</sup> See Board of Governors of the Federal Reserve System, Consumer Financial Protection Bureau, Federal Deposit Insurance Corporation, National Credit Union Administration, Office of the Comptroller of the Currency, Conference of State Bank Supervisors, “Agencies Encourage Financial Institutions to Meet Financial Needs of Customers and Members Affected by Coronavirus” joint news release, March 9, 2020, [www.federalreserve.gov/newsevents/pressreleases/bcreg20200309a.htm](http://www.federalreserve.gov/newsevents/pressreleases/bcreg20200309a.htm).
- <sup>52</sup> Id.
- <sup>53</sup> The Federal Reserve stated that equities would not be eligible as collateral, including shares issued by ETFs, mutual funds, and unit trusts.
- <sup>54</sup> In other words, the borrowing bank might have to compensate the Federal Reserve if the collateral declined in value.
- <sup>55</sup> CPFF borrowing costs were initially set at 200 basis points (2 percentage points) over the 3-month overnight index swap rate (which was by this time close to zero). The Federal Reserve later revised the terms, lowering the cost of borrowing through the CPFF to 110 basis points over the 3-month overnight index swap rate (which was still close to zero).
- <sup>56</sup> Federal Reserve Board, “Federal Reserve Board Broadens Program of Support for the Flow of Credit to Households and Businesses by Establishing a Money Market Mutual Fund Liquidity Facility (MMLF),” news release, March 18, 2020. Showing the urgency and the rapid pace at which the Federal Reserve was responding to events, the MMLF was announced at 11:30 p.m. (ET).
- <sup>57</sup> See Lorie K. Logan, “The Federal Reserve’s Recent Actions to Support the Flow of Credit to Households and Businesses” (Remarks prepared for the Foreign Exchange Committee, Federal Reserve Bank of New York, April 14, 2020).
- <sup>58</sup> See Board of Governors of the Federal Reserve System, “Coordinated Central Bank Action to Enhance the Provision of US Dollar Liquidity,” news release, March 15, 2020, [www.federalreserve.gov/newsevents/pressreleases/monetary20200315c.htm](http://www.federalreserve.gov/newsevents/pressreleases/monetary20200315c.htm).
- <sup>59</sup> See Board of Governors of the Federal Reserve System, “Federal Reserve Announces the Establishment of Temporary US Dollar Liquidity Arrangements with Other Central Banks,” news release, March 19, 2020, [www.federalreserve.gov/newsevents/pressreleases/monetary20200319b.htm](http://www.federalreserve.gov/newsevents/pressreleases/monetary20200319b.htm).
- <sup>60</sup> See Board of Governors of the Federal Reserve System, “Coordinated Central Bank Action to Further Enhance the Provision of US Dollar Liquidity,” news release, March 20, 2020, [www.federalreserve.gov/newsevents/pressreleases/monetary20200320a.htm](http://www.federalreserve.gov/newsevents/pressreleases/monetary20200320a.htm).
- <sup>61</sup> Under the terms of the SMCCF, corporate bonds could not be purchased until eligible issuers had completed a certification process. The Federal Reserve stated that “[i]n the interim, ETF purchases can serve as an efficient mechanism to access the corporate bond market, thereby helping the Facility to achieve its objectives.” See Investment Management Agreement (Secondary Market Corporate Credit Facility), May 11, 2020, 47. Available at [www.newyorkfed.org/medialibrary/media/markets/SMCCF\\_Investment\\_Management\\_Agreement.pdf](http://www.newyorkfed.org/medialibrary/media/markets/SMCCF_Investment_Management_Agreement.pdf).
- <sup>62</sup> The PMCCF and SMCCF were each individually backstopped with \$10 billion provided by the US Treasury under authority from Congress. Assuming the Federal Reserve would want to maintain a capital buffer of 10 percent for each of the two facilities, each facility could reach \$100 billion in financing.
- <sup>63</sup> See James Polti, Brendan Greeley, Colby Smith, and Joe Rennison, “Federal Reserve’s Full Firepower Fails to Arrest Slide in Markets,” *Financial Times*, March 24, 2020.
- <sup>64</sup> See Federal Reserve Bank of New York, “Statement Regarding Treasury Securities and Agency Mortgage-Backed Securities Operations,” March 23, 2020, [www.newyorkfed.org/markets/opolicy/operating\\_policy\\_200323](http://www.newyorkfed.org/markets/opolicy/operating_policy_200323).
- <sup>65</sup> See Board of Governors of the Federal Reserve System, “Federal Reserve Announces Establishment of a Temporary FIMA Repo Facility to Help Support the Smooth Functioning of Financial Markets,” news release, March 31, 2020, [www.federalreserve.gov/newsevents/pressreleases/monetary20200331a.htm](http://www.federalreserve.gov/newsevents/pressreleases/monetary20200331a.htm).

- <sup>66</sup> See Board of Governors of the Federal Reserve System, “Federal Reserve Board Announces Temporary Change to Its Supplementary Leverage Ratio Rule to Ease Strains in the Treasury Market Resulting from the Coronavirus and Increase Banking Organizations’ Ability to Provide Credit to Households and Businesses,” news release, April 1, 2020, [www.federalreserve.gov/newsevents/pressreleases/bcreg20200401a.htm](http://www.federalreserve.gov/newsevents/pressreleases/bcreg20200401a.htm).
- <sup>67</sup> See Federal Reserve Board, “Federal Reserve Board Announces Temporary Change to Its Supplementary Leverage Ratio Rule to Ease Strains in the Treasury Market Resulting from the Coronavirus and Increase Banking Organizations’ Ability to Provide Credit to Households and Businesses,” news release, April 1, 2020, [www.federalreserve.gov/newsevents/pressreleases/bcreg20200401a.htm](http://www.federalreserve.gov/newsevents/pressreleases/bcreg20200401a.htm). The press release further states, “Liquidity conditions in Treasury markets have deteriorated rapidly, and financial institutions are receiving significant inflows of customer deposits along with increased reserve levels. The regulatory restrictions that accompany this balance sheet growth may constrain the firms’ ability to continue to serve as financial intermediaries and to provide credit to households and businesses. The change to the supplementary leverage ratio will mitigate the effects of those restrictions and better enable firms to support the economy.”
- <sup>68</sup> See Board of Governors of the Federal Reserve System, “Federal Reserve Takes Additional Actions to Provide up to \$2.3 Trillion in Loans to Support the Economy,” news release, April 9, 2020, [www.federalreserve.gov/newsevents/pressreleases/monetary20200409a.htm](http://www.federalreserve.gov/newsevents/pressreleases/monetary20200409a.htm).
- <sup>69</sup> Jerome H. Powell, “COVID-19 and the Economy” (Remarks delivered at a webinar, “Federal Reserve Chair Jerome Powell on COVID-19 and the Economy,” Hutchins Center on Fiscal and Monetary Policy, The Brookings Institution, April 9, 2020). The archived webcast is available at [www.brookings.edu/events/webinar-federal-reserve-chair-jerome-powell-on-covid-19-and-the-economy](http://www.brookings.edu/events/webinar-federal-reserve-chair-jerome-powell-on-covid-19-and-the-economy). The full text of Powell’s prepared remarks is available at [www.federalreserve.gov/newsevents/speech/powell20200409a.htm](http://www.federalreserve.gov/newsevents/speech/powell20200409a.htm).
- <sup>70</sup> According to Federal Reserve data, on February 26, 2020, the Federal Reserve had assets of more than \$4.2 trillion.
- <sup>71</sup> See John C. Williams, “A Solution to Every Puzzle” (Remarks at the 2020 US Treasury Market Conference, September 29, 2020), [www.newyorkfed.org/newsevents/speeches/2020/wil200929](http://www.newyorkfed.org/newsevents/speeches/2020/wil200929). See also John C. Williams, “Rising to the Challenge: Central Banking, Financial Markets, and the Pandemic” (Remarks delivered to the Financial Research Advisory Committee for the Treasury’s Office of Financial Research, July 16, 2020), [www.newyorkfed.org/newsevents/speeches/2020/wil200716](http://www.newyorkfed.org/newsevents/speeches/2020/wil200716). Williams said, “These are unprecedented times, and the pandemic presents truly unique challenges. However, the actions we have undertaken harken back to why the Federal Reserve was created in the first place. That is, to do what only a central bank can do: to keep credit flowing when fear and uncertainty take hold, and in that way to foster a strong economy with maximum employment and stable prices.”





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