Financial Stability Report

November 2020

BOARD OF GOVERNORS OF THE FEDERAL RESERVE SYSTEM

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Note: This report generally reflects information that was available as of October 26, 2020.

Purpose

This report presents the Federal Reserve Board's current assessment of the resilience of the U.S. financial system. By publishing this report, the Board intends to promote public understanding and increase transparency and accountability for the Federal Reserve's views on this topic.

Promoting financial stability is a key element in meeting the Federal Reserve's dual mandate for monetary policy regarding full employment and stable prices. In an unstable financial system, adverse events are more likely to result in severe financial stress and disrupt the flow of credit, leading to high unemployment and great financial hardship. Monitoring and assessing financial stability also support the Federal Reserve's regulatory and supervisory activities, which promote the safety and soundness of our nation's banks and other important financial institutions. Information gathered while monitoring the stability of the financial system helps the Federal Reserve develop its view of the salient risks to be included in the scenarios of the stress tests and its setting of the countercyclical capital buffer (CCyB).[1]

The Board's *Financial Stability Report* is similar to those published by other central banks and complements the annual report of the Financial Stability Oversight Council (FSOC), which is chaired by the Secretary of the Treasury and includes the Federal Reserve Board Chair and other financial regulators.

[1] More information on the Federal Reserve's supervisory and regulatory activities is available on the Board's website; see Board of Governors of the Federal Reserve System (2020), *Supervision and Regulation Report* (Washington: Board of Governors, May), available at https://www.federalreserve.gov/publications/supervision-and-regulation-report.htm as well as the webpages for Supervision and Regulation (https://www.federalreserve.gov/supervisionreg.htm) and Payment Systems (https://www.federalreserve.gov/paymentsystems.htm). Moreover, additional details about the conduct of monetary policy are also on the Board's website; see the *Monetary Policy Report* (https://www.federalreserve.gov/monetarypolicy/mpr_default.htm) and the webpage for Monetary Policy (https://www.federalreserve.gov/monetarypolicy.htm).

Framework

A stable financial system, when hit by adverse events, or "shocks," continues to meet the demands of households and businesses for financial services, such as credit provision and payment services. In contrast, in an unstable system, these same shocks are likely to have much larger effects, disrupting the flow of credit and leading to declines in employment and economic activity.

Consistent with this view of financial stability, the Federal Reserve Board's monitoring framework distinguishes between shocks to and vulnerabilities of the financial system. Shocks, such as sudden changes to financial or economic conditions, are typically surprises and are inherently difficult to predict. Vulnerabilities tend to build up over time and are the aspects of the financial system that are most expected to cause widespread problems in times of stress. As a result, the framework focuses primarily on monitoring vulnerabilities and emphasizes four broad categories based on research.[2]

1. Elevated **valuation pressures** are signaled by asset prices that are high relative to economic fundamentals or historical norms and are often driven by an increased willingness of investors to take on risk. As such, elevated valuation pressures imply a greater possibility of outsized drops in asset prices.

2. Excessive **borrowing by businesses and households** leaves them vulnerable to distress if their incomes decline or the assets they own fall in value. In the event of such shocks, businesses and households with high debt burdens may need to cut back spending sharply, affecting the overall level of economic activity. Moreover, when businesses and households cannot make payments on their loans, financial institutions and investors incur losses.

3. Excessive **leverage within the financial sector** increases the risk that financial institutions will not have the ability to absorb even modest losses when hit by adverse shocks. In those situations, institutions will be forced to cut back lending, sell their assets, or, in extreme cases, shut down. Such responses can substantially impair credit access for households and businesses.

4. **Funding risks** expose the financial system to the possibility that investors will "run" by withdrawing their funds from a particular institution or sector. Many financial institutions raise funds from the public with a commitment to return their investors' money on short notice, but those institutions then invest much of the funds in illiquid assets that are hard to sell quickly or in assets that have a long maturity. This liquidity and maturity

[2] For a review of the research literature in this area and further discussion, see Tobias Adrian, Daniel Covitz, and Nellie Liang (2015), "Financial Stability Monitoring," *Annual Review of Financial Economics,* vol. 7 (December), pp. 357–95.

transformation can create an incentive for investors to withdraw funds quickly in adverse situations. Facing a run, financial institutions may need to sell assets quickly at "fire sale" prices, thereby incurring substantial losses and potentially even becoming insolvent. Historians and economists often refer to widespread investor runs as "financial panics."

These vulnerabilities often interact with each other. For example, elevated valuation pressures tend to be associated with excessive borrowing by businesses and households because both borrowers and lenders are more willing to accept higher degrees of risk and leverage when asset prices are appreciating rapidly. The associated debt and leverage, in turn, make the risk of outsized declines in asset prices more likely and more damaging. Similarly, the risk of a run on a financial institution and the consequent fire sales of assets are greatly amplified when significant leverage is involved.

It is important to note that liquidity and maturity transformation and lending to households, businesses, and financial firms are key aspects of how the financial system supports the economy. For example, banks provide safe, liquid assets to depositors and long-term loans to households and businesses; businesses rely on loans or bonds to fund investment projects; and households benefit from a well-functioning mortgage market when buying a home.

The Federal Reserve's monitoring framework also tracks domestic and international developments to identify near-term risks—that is, plausible adverse developments or shocks that could stress the U.S. financial system. The analysis of these risks focuses on assessing how such potential shocks may play out through the U.S. financial system, given our current assessment of the four areas of vulnerabilities.

While this framework provides a systematic way to assess financial stability, some potential risks do not fit neatly into it because they are novel or difficult to quantify. In addition, some vulnerabilities are difficult to measure with currently available data, and the set of vulnerabilities may evolve over time. Given these limitations, we continually rely on ongoing research by the Federal Reserve staff, academics, and other experts to improve our measurement of existing vulnerabilities and to keep pace with changes in the financial system that could create new forms of vulnerabilities or add to existing ones.

Federal Reserve actions to promote the resilience of the financial system

The assessment of financial vulnerabilities informs Federal Reserve actions to promote the resilience of the financial system. The Federal Reserve works with other domestic agencies directly and through the FSOC to monitor risks to financial stability and to undertake supervisory and regulatory efforts to mitigate the risks and consequences of financial instability.

Actions taken by the Federal Reserve to promote the resilience of the financial system include its supervision and regulation of financial institutions—in particular, large bank holding companies (BHCs), the U.S. operations of certain foreign banking organizations,

and financial market utilities. Specifically, in the post-crisis period, for the largest, most systemically important BHCs, these actions have included requirements for more and higher-quality capital, an innovative stress-testing regime, new liquidity regulation, and improvements in the resolvability of such BHCs.

In addition, the Federal Reserve's assessment of financial vulnerabilities informs the design of stress-test scenarios and decisions regarding the CCyB. The stress scenarios incorporate some systematic elements to make the tests more stringent when financial imbalances are rising, and the assessment of vulnerabilities also helps identify salient risks that can be included in the scenarios. The CCyB is designed to increase the resilience of large banking organizations when there is an elevated risk of above-normal losses and to promote a more sustainable supply of credit over the economic cycle.

Overview

This report reviews conditions affecting the stability of the financial system by analyzing vulnerabilities related to valuation pressures, borrowing by businesses and households, financial leverage, and funding risk. It also highlights several near-term risks that, if realized, could interact with such vulnerabilities.

Since the May 2020 *Financial Stability Report* was issued, asset prices have continued to move up, on balance, amid periods of volatility. Business and household earnings have fallen and business borrowing has risen, which leave households and firms more vulnerable to future shocks. Banks absorbed large losses related to the pandemic but remained well capitalized throughout; moreover, capital ratios have since generally recovered to pre-pandemic levels. However, the COVID-19 shock highlighted how vulnerabilities related to leverage and funding risk at nonbank financial institutions could amplify shocks in the financial system in times of stress.

Our view of the current level of vulnerabilities is as follows:

1. **Asset valuations.** Asset prices have generally increased since May of this year. The elevated levels of asset prices in various markets likely reflect the low level of Treasury yields, and measures of the compensation for risk appear roughly aligned with historical norms. Given the high level of uncertainty associated with the pandemic, assessing valuation pressures is particularly challenging, and asset prices remain vulnerable to significant declines should investor risk sentiment fall or the economic recovery weaken.

2. **Borrowing by businesses and households.** Debt owed by businesses, which was already historically high relative to gross domestic product (GDP) before the pandemic, has risen sharply as businesses increased borrowing to weather the period of weak earnings. The general decline in revenues associated with the severe reduction in economic activity has weakened the ability of businesses to service these obligations. Household debt was at a moderate level relative to income before the public health shock, but many households have lost jobs and seen their earnings fall. As many households continue to struggle, loan defaults may rise, leading to material losses. So far, strains in the business and household sectors have been mitigated by significant government lending and relief programs and by low interest rates. That said, some households and businesses have been substantially more affected to date than others, suggesting that the sources of vulnerability in these sectors are unevenly distributed.

3. **Leverage in the financial sector.** The pandemic stressed the resilience of banks, but they remain well capitalized. Leverage at broker-dealers also remains low. In contrast, measures of leverage at life insurance companies are at post-2008 highs and remain elevated at

hedge funds relative to the past five years. Some nonbank financial institutions felt significant strains amid the acute period of extreme market volatility, declining asset prices, and worsening market liquidity earlier this year. Pressures eased as a result of policy actions, including Federal Reserve asset purchases and repurchase agreement (repo) operations, regulatory relief for dealers affiliated with BHCs, and support from the emergency lending facilities.

4. **Funding risk.** Bank funding risk remains low, as they rely only modestly on short-term wholesale funding and maintain large amounts of high-quality liquid assets, which has helped banks manage heightened liquidity pressures. Banks also benefited from a surge in deposit inflows through the second quarter of 2020. In contrast, the large redemptions from money funds and fixed-income mutual funds, as well as the need for extraordinary support from emergency lending facilities, highlighted vulnerabilities in these sectors. While in place, those facilities substantially mitigate these vulnerabilities.

The report also details how near-term risks have changed since the May 2020 report. The outlook for the pandemic and economic activity is uncertain. In the near term, risks associated with the course of COVID-19 and its effects on the U.S. and global economies remain high. In addition, there is potential for stresses to interact with preexisting vulnerabilities in dollar funding markets or those stemming from financial systems or fiscal weaknesses in Europe, China, and emerging market economies (EMEs). These risks have the potential to interact with the vulnerabilities identified in this report and pose additional risks to the U.S. financial system.

Federal Reserve Actions and Facilities to Support Households, Businesses, and Municipalities during the COVID-19 Crisis

Since the beginning of the pandemic, the Federal Reserve has taken forceful actions to support the continued flow of credit to households, businesses, and state and local governments. At the onset of the pandemic, it became clear that businesses and families would face an extended period during which many forms of economic activity were curtailed for public health reasons. During this period, revenues and incomes would be sharply lower. Employers faced the prospect of being unable to pay wages and other obligations, which could force them to shut down permanently and, in turn, restrain the economy's recovery. At the same time, the availability of credit sharply worsened, with many lending markets commonly tapped by employers effectively shut.

Supported by funds provided by the CARES Act, the Federal Reserve created, with the authorization of the U.S. Treasury Department, a number of emergency lending facilities.[1] Collectively, the facilities support the flow of credit throughout the economy both by providing backstop measures that give investors confidence that lending support is available should conditions deteriorate substantially and by supplying funding that is more directly used to meet credit demand.[2]

Backstops for larger firms and municipalities

The Primary Market Corporate Credit Facility (PMCCF), Secondary Market Corporate Credit Facility (SMCCF), and Municipal Liquidity Facility (MLF) were established to improve the flow of credit through bond markets, where large firms and municipalities obtain most of their long-term funding.[3] The PMCCF stands ready to purchase new bonds and loans issued by investment-grade U.S. corporations so that they can maintain business operations and employment during the pandemic. The SMCCF supports trading in the bonds that corporations previously issued. The MLF helps state and local governments as well as certain multistate or revenue bond issuers manage their cash flow needs, which may be particularly acute given the potential mismatch between delayed or diminished tax receipts and higher-than-normal spending for unemployment insurance and other essential services.

The announcements of the PMCCF, SMCCF, and MLF in late March and early April led to rapid improvements in corporate and municipal bond markets well ahead of the facilities' actual opening. Spreads across a variety of debt markets quickly narrowed, permitting businesses and municipalities to borrow at sharply lower costs (figures A, B, and C). SMCCF purchases to date amount to about

(continued on next page)

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1 The CARES Act (Coronavirus Aid, Relief, and Economic Security Act) authorized the Treasury's equity contribution to many of the facilities, which collectively can support up to $2.6 trillion of credit to firms of all sizes and to state and local governments.

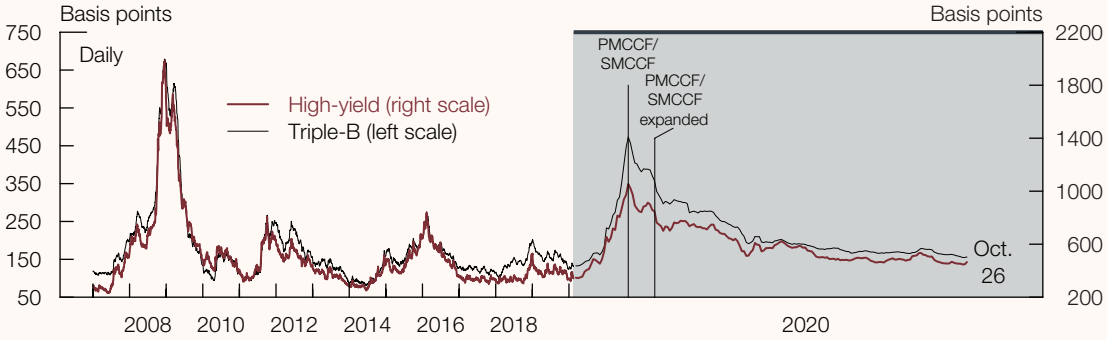
2 In addition, backstop facilities may also implicitly affect the prices at which credit is intermediated. For additional information on facilities' price effects, see Sam Schulhofer-Wohl (2020), "The Influence and Limits of Central Bank Backstops," Federal Reserve Bank of Chicago, *Chicago Fed Insights* (blog), August 17, https://www.chicagofed.org/publications/blogs/chicago-fed-insights/2020/the-influence-and-limits-of-central-bank-backstops.
Though borrowers must meet eligibility standards and funds are not unlimited, these programs are designed to be broad based; taken together, they facilitate credit provision for sectors that account for more than 97 percent of all U.S. employment. See Ryan Decker, Robert Kurtzman, Byron Lutz, and Chris Nekarda (forthcoming), "Across the Universe: Policy Support for Employment and Revenue in the Pandemic Recession," Finance and Economics Discussion Series (Washington: Board of Governors of the Federal Reserve System).

3 For more details on the facilities, see the box "The Federal Reserve's Monetary Policy Actions and Facilities to Support the Economy since the COVID-19 Outbreak" in Board of Governors of the Federal Reserve System (2020), *Financial Stability Report* (Washington: Board of Governors, May), pp. 9–15, https://www.federalreserve.gov/publications/files/financial-stability-report-20200515.pdf.

Federal Reserve Actions and Facilities *(continued)*

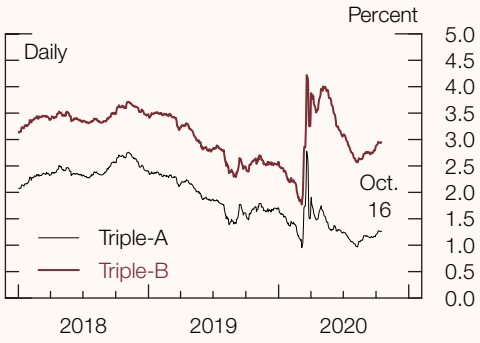
$13 billion—just more than 0.2 percent of the $5.5 trillion of outstanding nonfinancial corporate bonds. The MLF has, to date, purchased two issues totaling just more than $1.6 billion. However, since the announcement of the backstop facilities and funding market stabilization measures, more than $1 trillion in new nonfinancial corporate bonds and more than $250 billion in municipal debt have been issued, purchased almost entirely by the private sector (figures D and E).

Figure A. Corporate Bond Spreads to 10-Year Treasury



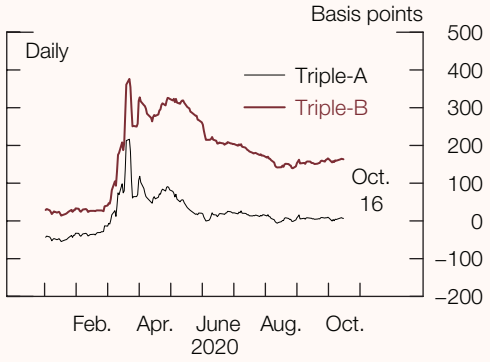
Source: ICE Data Indices, LLC, used with permission.

Figure B. Municipal Bond Yields, by Rating



Source: ICE Data Indices, LLC.

Figure C. Municipal Bond Spreads, by Rating

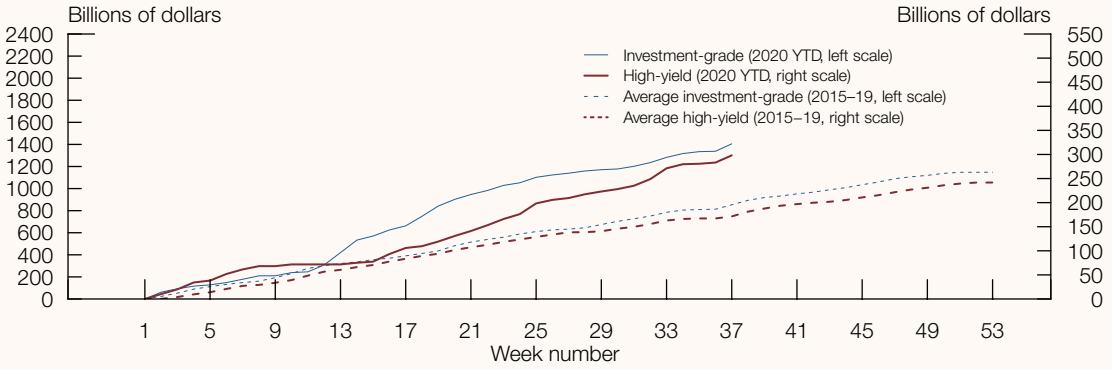


Source: ICE Data Indices, LLC.

The Term Asset-Backed Securities Loan Facility (TALF) provides additional support for consumers and businesses. The TALF supports the issuance of asset-backed securities (ABS) backed by student loans, auto loans, credit card loans, loans backed by the Small Business Administration (SBA), and certain other assets. A key market that benefits from the TALF is commercial real estate (CRE), as legacy commercial mortgage-backed securities (CMBS) and SBA securitizations collateralized by CRE mortgages are eligible for the TALF and have represented the bulk of the assets pledged as collateral for TALF loans. Similar to the other backstop facilities, while outstanding balances in the TALF have remained modest, spreads in ABS markets have narrowed considerably, and private market issuance has resumed (figure F).

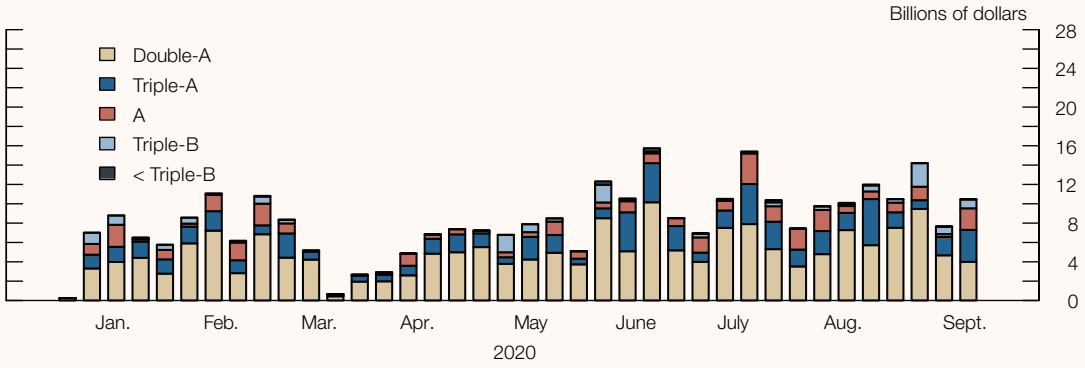
(continued)

Figure D. Cumulative Corporate Credit Issuance



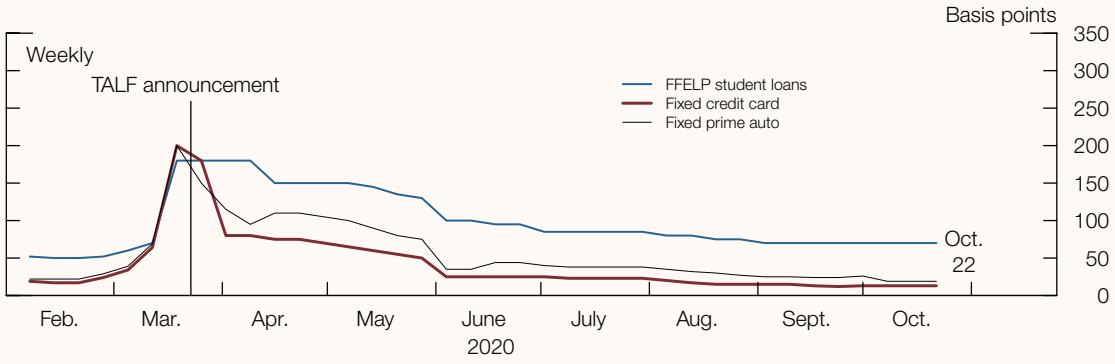
Source: S&P Global, Leveraged Commentary & Data.

Figure E. 2020 Weekly Municipal Bond Issuance, by Rating



Source: Bloomberg.

Figure F. Consumer ABS Spreads (3-Year Triple-A)



Source: JPMorgan Chase & Co.

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Federal Reserve Actions and Facilities *(continued)*

Funding for small and medium-sized businesses

The Federal Reserve has taken actions to support lending by banks and nonbanks that specialize in small business loans. The Paycheck Protection Program Liquidity Facility (PPPLF) was established to extend credit to lenders that participate in the SBA's Paycheck Protection Program (PPP), which provides payroll support for small businesses. The PPP provides forgivable loans to small businesses in order for them to keep workers on their payrolls. The Main Street Lending Program (Main Street) targets firms that are often too small to issue corporate bonds or access capital markets.

Through September 30, the Federal Reserve had made more than 11,000 PPPLF advances to nearly 800 banking institutions, totaling around $70 billion. Small community banks account for 50 percent of the advances and 90 percent of active borrowers. Moreover, 80 community development financial institutions and minority development institutions, which serve communities in distress and minority communities, have received PPPLF advances supporting nearly $17 billion in loans. The average PPP loan size that the advances support was just more than $100,000, suggesting that the PPPLF funds were mostly directed to lenders that helped support small business employment. The $669 billion advanced under the PPP earlier this year may have restrained small business demand for bank loans, with many borrowers reportedly using the funds to pay down lines of credit.

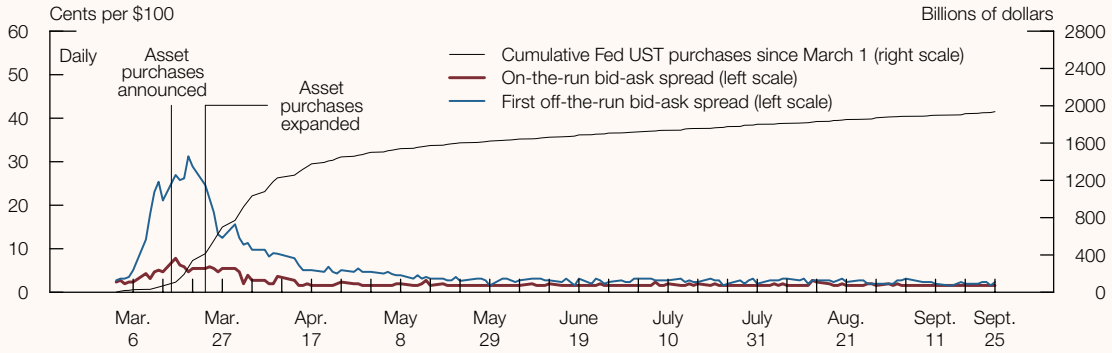
Main Street established five types of loans: three for for-profit businesses and two for nonprofit organizations. Banks originate the loans, and the Federal Reserve, in turn, purchases 95 percent participation in them. Eligibility requirements and terms differ across loan types, but borrowers must have fewer than 15,000 employees or 2019 revenues of less than $5 billion. Main Street loans are designed specifically to help borrowers weather a period of sharply reduced revenues, featuring interest and principal payments that are deferred over the first two years, underwriting criteria that generally look back to borrowers' pre-pandemic financial circumstances and post-pandemic prospects, and other elements. As of October 5, Main Street had purchased 303 loan participations, totaling nearly $3 billion.

To date, Main Street loans appear to be flowing to borrowers from the hardest-hit areas of the country. For example, more loans are going to firms in states that experienced larger unemployment rate increases during the height of the pandemic. Loans have also covered a wide range of industries. Importantly, small and medium-sized banks, which tend to supply credit to small and medium-sized businesses, make up the majority of the loan participants. Community banks (defined as institutions with less than $10 billion in assets) have originated roughly 61 percent of the dollar value of extended loans. Main Street provides an important backstop should the recovery falter and a larger number of businesses need more access to credit.

Federal Reserve Actions to Stabilize Short-Term Funding Markets during the COVID-19 Crisis

At the onset of the pandemic in late March 2020, investors rapidly moved into cash and the most liquid financial instruments, causing acute stresses in some short-term funding markets. Dislocations in markets for U.S. Treasury securities occurred, and market functioning was unusually strained (see figure A and the box "A Retrospective on the March 2020 Turmoil in Treasury and Mortgage-Backed Securities Markets"). Investors shortened the horizon over which they would lend to companies in the commercial paper (CP) market. In addition, some prime money market funds (MMFs) experienced historically large redemptions. These stresses had the potential to amplify the shock of the pandemic, because a breakdown in short-term funding markets could leave companies unable to meet near-term obligations and households and businesses unable to access accounts they routinely use to make payments.

Figure A. Indicative U.S. Treasury Bid-Ask Spreads



Source: Federal Reserve Bank of New York.

The Federal Reserve, with the support of the Department of the Treasury, quickly responded and announced the Commercial Paper Funding Facility (CPFF), the Money Market Mutual Fund Liquidity Facility (MMLF), and the Primary Dealer Credit Facility (PDCF) to stabilize funding markets, backstop against further stress, and improve the flow of credit to households and businesses. The facilities gave investors confidence that they could access their cash when needed and that companies would be able to roll over CP when needed, relieving selling pressures. Consequently, redemptions among prime MMFs fell dramatically, spreads on corporate CP narrowed, and term CP volumes of five days and greater stabilized (figure B). Although balances in the PDCF, CPFF, and MMLF have fallen from their initial highs to very low levels, the facilities continue to serve as important backstops against further market stress and support the flow of credit as the pandemic persists (figure C).

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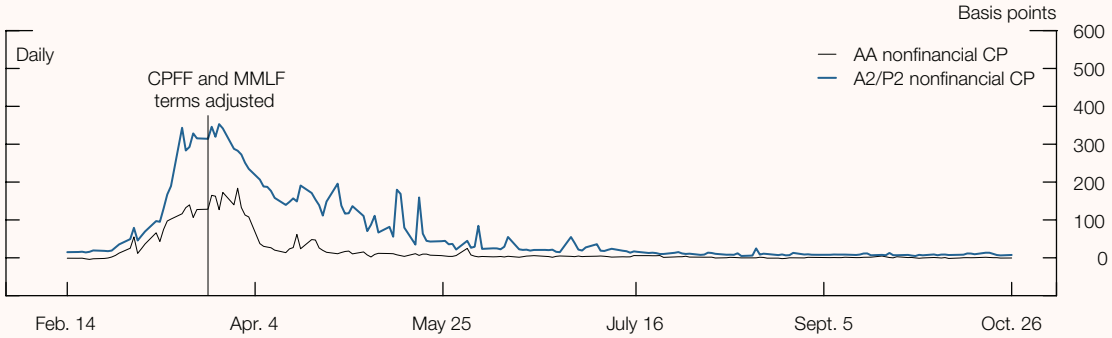
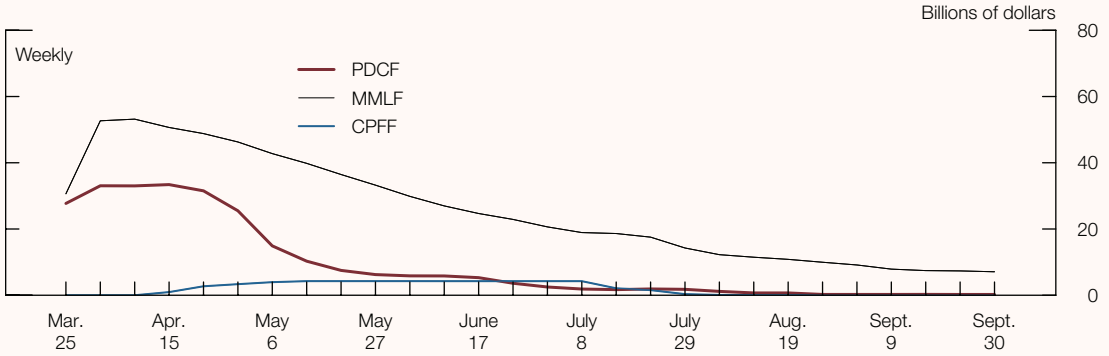
Federal Reserve Actions to Stabilize Funding Markets *(continued)*

Figure B. 1-Month Funding Market Spreads for Investment-Grade Nonfinancial Corporations



Source: Board of Governors of the Federal Reserve System; DTCC Solutions LLC, an affiliate of the Depository Trust & Clearing Corporation.

Figure C. Outstanding Balances of Emergency Lending Facilities



Source: Federal Reserve Board, Statistical Release H.4.1, "Factors Affecting Reserve Balances."

1. Asset Valuations

Asset prices have generally increased since May, and, when adjusted for low interest rates, valuation pressures appear roughly in line with their historical norms

At the time of the May *Financial Stability Report,* improvements in investor risk sentiment and market functioning had started to boost asset prices. Over the past six months, asset prices in key markets have continued to rise in light of the rebound in economic activity, policy actions to mitigate the financial amplification of the COVID-19 shock, and investor optimism. The U.S. broad-market stock price index has risen substantially from its low point this year and touched record highs in recent months, although volatility remains high and there is considerable uncertainty about the path of earnings. Spreads on corporate bonds and leveraged loans have decreased significantly. After accounting for the low level of interest rates, however, measures of the compensation for risk are roughly in line with their historical norms.

Prices for commercial properties have started to fall, although they remain elevated relative to incomes. Low transaction volumes—especially for distressed properties—make commercial property valuations particularly difficult to judge. Farmland prices remain elevated relative to rents and incomes. Supported by low mortgage rates, housing prices have increased along with strong home sales.

Asset prices remain vulnerable to significant declines, given a high degree of uncertainty around the course of the pandemic and the pace of the recovery

Prompt and forceful policy responses—including fiscal stimulus, lower interest rates, and various asset purchase and emergency lending programs—have supported a stronger-than-expected economic recovery. However, uncertainty remains high, and investor risk sentiment could shift swiftly should the economic recovery prove less promising or progress on containing the virus disappoint. Some segments of the economy, such as energy as well as travel and hospitality, are particularly vulnerable to a prolonged pandemic. Within CRE, retail, office, and lodging properties exhibit the highest vulnerability.

Table 1 shows the size of the asset markets discussed in this section. The largest asset markets are those for residential real estate, corporate public equities, CRE, and Treasury securities.

Table 1. Size of Selected Asset Markets

Item	Outstanding (billions of dollars)	Growth, 2019:Q2–2020:Q2 (percent)	Average annual growth, 1997–2020:Q2 (percent)
Residential real estate	39,290	4.6	5.6
Equities	37,188	4.5	8.0
Commercial real estate	20,444	2.0	7.0
Treasury securities	19,867	25.1	8.8
Investment-grade corporate bonds	6,354	8.7	8.6
Farmland	2,561	1.3	5.3
High-yield and unrated corporate bonds	1,572	20.0	7.6
Leveraged loans*	1,185	–.6	14.3
Price growth (real)			
Commercial real estate**		–.9	2.5
Residential real estate***		3.7	2.1

Note: The data extend through 2020:Q2. Growth rates are measured from Q2 of the year immediately preceding the period through Q2 of the final year of the period. Equities, real estate, and farmland are at market value; bonds and loans are at book value.

* The amount outstanding shows institutional leveraged loans and generally excludes loan commitments held by banks. For example, lines of credit are generally excluded from this measure. Average annual growth of leveraged loans is from 2000 to 2020:Q2, as this market was fairly small before then.

** One-year growth of commercial real estate prices is from June 2019 to June 2020, and average annual growth is from 1998:Q4 to 2020:Q2. Both growth rates are calculated from value-weighted nominal prices deflated using the consumer price index.

*** One-year growth of residential real estate is from June 2019 to June 2020, and average annual growth is from 1997:Q4 to 2020:Q2. Nominal prices are deflated using the consumer price index.

Source: For leveraged loans, S&P Global Market Intelligence, Leveraged Commentary & Data; for corporate bonds, Mergent, Inc., Corporate Fixed Income Securities Database; for farmland, Department of Agriculture; for residential real estate price growth, CoreLogic; for commercial real estate price growth, CoStar Group, Inc., CoStar Commercial Repeat Sale Indices; for all other items, Federal Reserve Board, Statistical Release Z.1, "Financial Accounts of the United States."

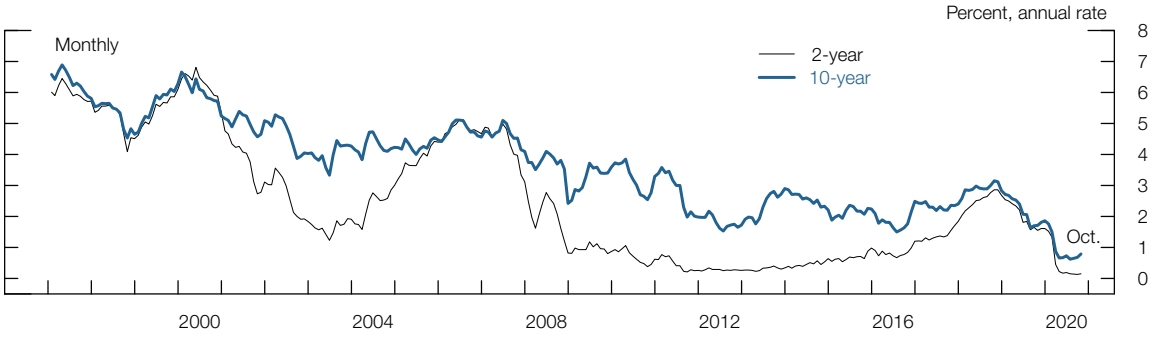
Treasury yields are near historical lows

Treasury yields across the maturity spectrum have generally changed little since May and are near historical lows (figure 1-1). Model estimates of Treasury term premiums remain at record lows (figure 1-2).[3] The low yields of longer-dated Treasury securities and historically low term premiums are consistent with market expectations for interest rates to be low for a long time. In addition, a forward-looking measure of Treasury market volatility derived from options prices dropped to a historical low, in sharp contrast to the turmoil in March (figure 1-3).

[3] Treasury term premiums capture the difference between the yield that investors require for holding longer-term Treasury securities—for which realized returns are more sensitive to risks from future inflation or volatility in interest rates than the realized returns of shorter-term securities—and the expected yield from rolling over shorter-dated ones.

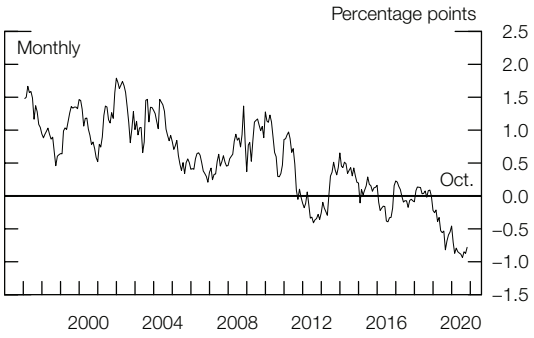
Federal Reserve actions, including asset purchases, continue to sustain the functioning of Treasury markets. Measures that capture the market's ability to absorb large orders without significant price disruptions, such as the quantity of outstanding offers to buy and sell Treasury securities, have largely recovered to pre-pandemic levels (figure 1-4).

1-1. Yields on Nominal Treasury Securities



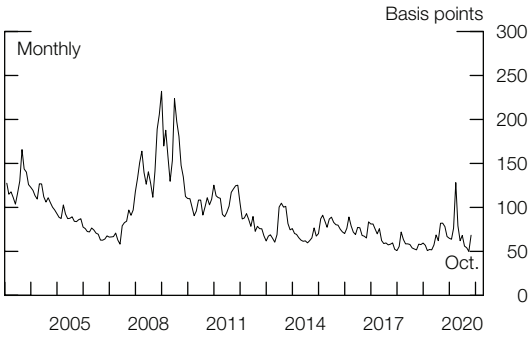
Source: Federal Reserve Board, Statistical Release H.15, "Selected Interest Rates."

1-2. Term Premium on 10-Year Nominal Treasury Securities



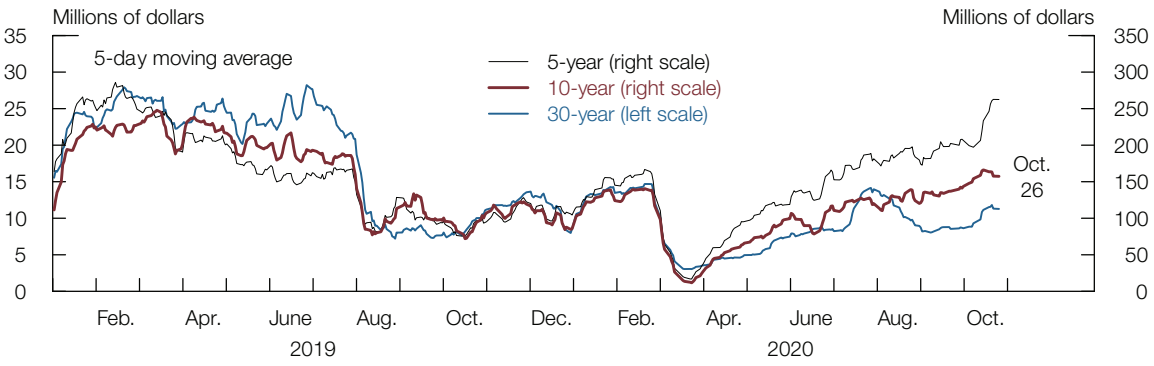
Source: Department of the Treasury; Wolters Kluwer, Blue Chip Financial Forecasts; Federal Reserve Bank of New York; Federal Reserve Board staff estimates.

1-3. Implied Volatility of 10-Year Swap Rate



Source: Barclays.

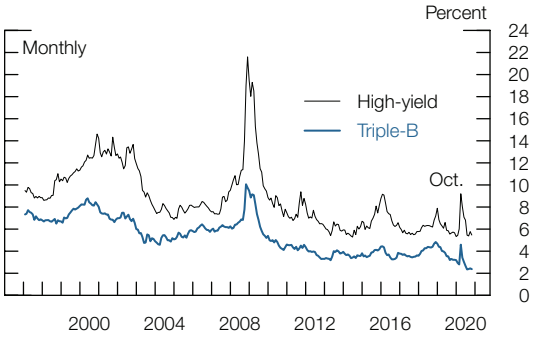
1-4. Treasury Market Depth



Source: Repo interdealer broker community.

Corporate debt market spreads returned to historical norms, market functioning improved, and issuance resumed

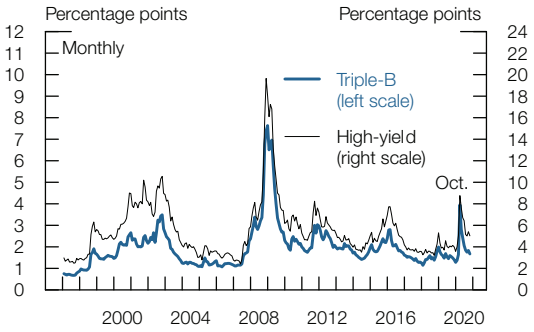
1-5. Corporate Bond Yields



Source: ICE Data Indices, LLC, used with permission.

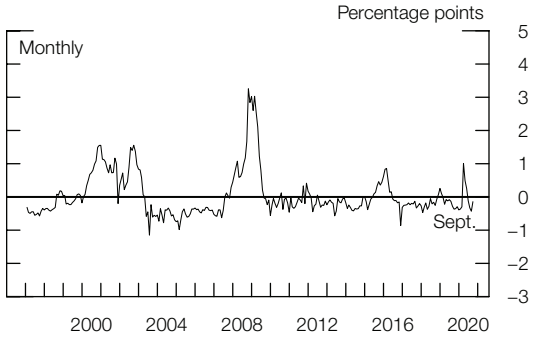
Supported by very low Treasury yields, yields on corporate bonds dropped to historically low levels (figure 1-5). Spreads of yields on corporate bonds over comparable-maturity Treasury yields narrowed considerably and stand at about their historical medians (figure 1-6).[4] However, spreads in sectors heavily affected by the pandemic, such as the energy, airline, and leisure industries, remain quite elevated. Reflecting a pickup in risk appetite, the excess bond premium—measured as the gap between corporate bond spreads and expected credit losses—fell below its historical median (figure 1-7).[5]

1-6. Corporate Bond Spreads to Similar-Maturity Treasury Securities



Source: ICE Data Indices, LLC, used with permission.

1-7. Corporate Bond Premium over Expected Losses



Source: Federal Reserve Board staff calculations based on Lehman Brothers Fixed Income Database (Warga); Intercontinental Exchange, Inc., ICE Data Services; Center for Research in Security Prices, CRSP/Compustat Merged Database, Wharton Research Data Services; S&P Global Market Intelligence, Compustat.

The announcement of a range of measures to support market functioning and the flow of credit in late March, particularly the corporate credit facilities, led to significant improvement in corporate bond market functioning and provided a backstop to support borrowing by corporations (see the box "Federal Reserve Actions and Facilities to Support Households, Businesses, and Municipalities during the COVID-19 Crisis"). Bid-ask spreads have tightened.

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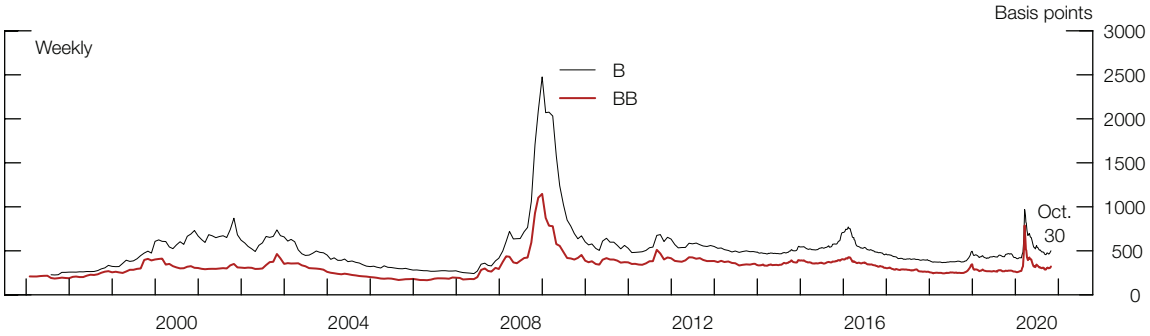
[4] Spreads between yields on corporate bonds and comparable-maturity Treasury securities reflect the extra compensation investors require to hold debt that is subject to corporate default or liquidity risks.

[5] For a description of the excess bond premium, see Simon Gilchrist and Egon Zakrajšek (2012), "Credit Spreads and Business Cycle Fluctuations," *American Economic Review,* vol. 102 (June), pp. 1692–720.

Corporate bond issuance by both investment- and speculative-grade firms has been very strong, as companies have increased their cash buffers and refinanced their debt at lower interest rates and longer maturities. Despite the decline in spreads and the increase in new issuance, corporate credit quality has deteriorated since May—as evidenced by defaults and firm ratings downgrades—though it has shown some signs of stabilization in recent months.

Spreads on leveraged loans in the secondary market have tightened significantly since the spring and are now close to their post-2008 medians (figure 1-8). Spreads on newly issued leveraged loans have also tightened.

1-8. Secondary Market Spreads of Leveraged Loans



Source: S&P, Leveraged Commentary & Data.

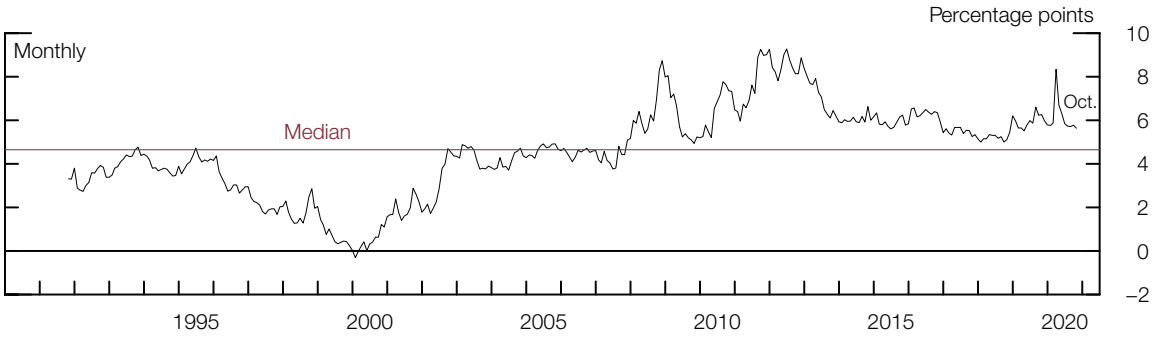
Equity prices rose sharply, with higher valuations supported, in part, by low interest rates

Valuations in equity markets have risen substantially as equity prices have continued to move up since the previous *Financial Stability Report*. Prices relative to forecasts of corporate earnings have also risen considerably and are currently near the top of their historical distribution, even though there is significant uncertainty in the earnings outlook among market participants (figure 1-9). However, while the gap between the forward earnings-to-price ratio and the expected real yield on 10-year Treasury securities—a rough measure of the premium that investors require for holding risky corporate equities—has declined since May, it remains above its historical median due to the low level of Treasury yields (figure 1-10). This development suggests that investor risk appetite, though higher since May, is still within historical norms.

1-9. Forward Price-to-Earnings Ratio of S&P 500 Firms

Source: Federal Reserve Board staff calculations using Refinitiv (formerly Thomson Reuters), Institutional Brokers Estimate System Estimates.

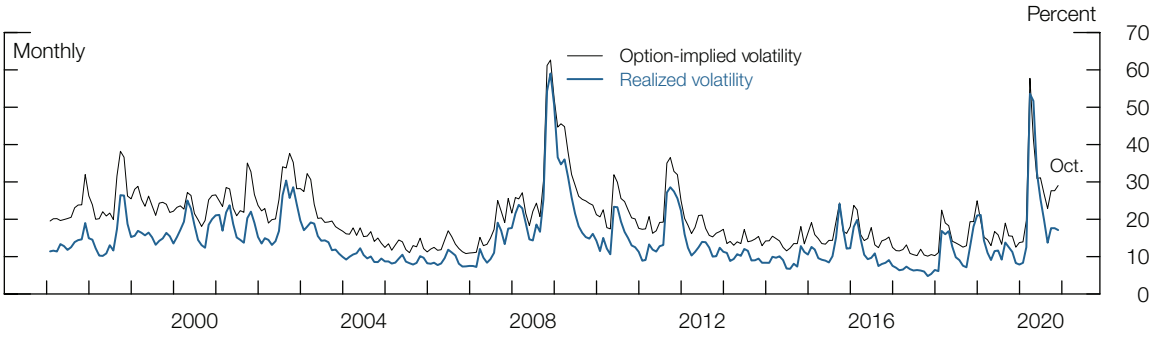
1-10. Spread of Forward Earnings-to-Price Ratio of S&P 500 Firms to 10-Year Real Treasury Yield



Source: Federal Reserve Board staff calculations using Refinitiv (formerly Thomson Reuters), Institutional Brokers Estimate System Estimates; Department of the Treasury; Federal Reserve Bank of Philadelphia, Survey of Professional Forecasters.

While equity price volatility has fallen since the late spring, it remains elevated by historical standards. Further, option-implied volatility, a close proxy for expected volatility, did not fall as much as realized volatility (figure 1-11). Elevated volatility and the divergence between expected and realized volatility suggest investors are pricing in concerns about downside risks and considerable uncertainty about future outcomes.

1-11. S&P 500 Return Volatility



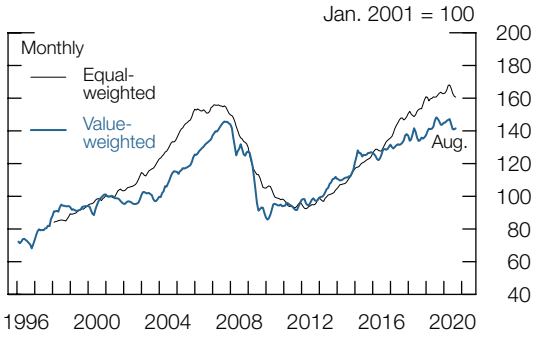
Source: Bloomberg Finance L.P.

Prices of commercial properties are still elevated relative to incomes

Since the May *Financial Stability Report,* CRE prices have declined moderately (figure 1-12). However, capitalization rates, which measure annual income relative to prices for recently transacted commercial properties, have remained near historically low levels, suggesting elevated valuation pressures may still exist (figure 1-13).[6]

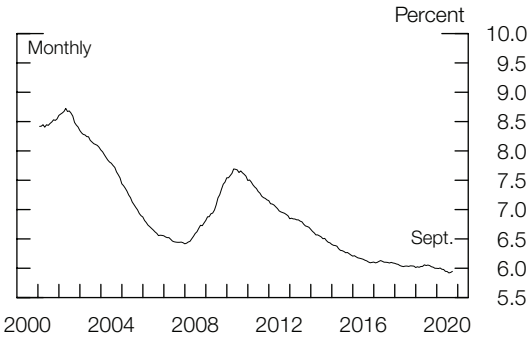
[6] Capitalization rates reflect the reported incomes used for underwriting loans on new transactions. They therefore represent a selected sample of properties and, as transaction volumes remain depressed, may not reflect the loss of income other data sources are reporting.

1-12. Commercial Real Estate Prices (Real)



Source: CoStar Group, Inc., CoStar Commercial Repeat Sale Indices; Bureau of Labor Statistics, consumer price index via Haver Analytics.

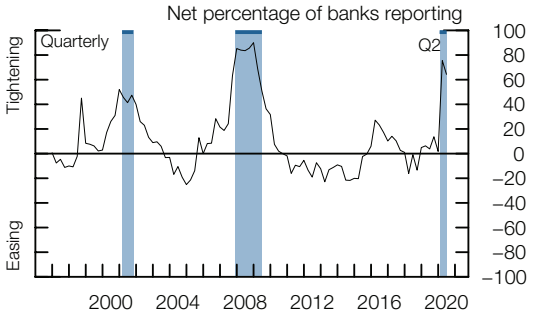
1-13. Capitalization Rate at Property Purchase



Source: Real Capital Analytics; Andrew C. Florance, Norm G. Miller, Ruijue Peng, and Jay Spivey (2010), "Slicing, Dicing, and Scoping the Size of the U.S. Commercial Real Estate Market," *Journal of Real Estate Portfolio Management*, vol. 16 (May–August), pp. 101–18.

Evidence of significant strains are present in other data sources. Vacancy rates have turned higher, and rent growth has either slowed or turned negative. Prices of real estate investment trusts (REITs) that invest in lodging and retail properties remain well below their pre-pandemic levels, although prices of those that invest in industrial properties have somewhat recovered since the spring. Additionally, delinquency rates on CMBS, which normally contain riskier loans, have spiked. Finally, the July Senior Loan Officer Opinion Survey on Bank Lending Practices (SLOOS) indicated that a major fraction of banks reported weaker demand for CRE loans and tighter lending standards, on net, in the second quarter of 2020 (figure 1-14).

1-14. Change in Bank Standards for Commercial Real Estate Loans

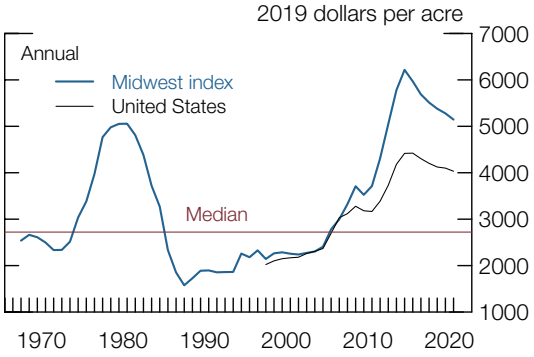


Source: Federal Reserve Board, Senior Loan Officer Opinion Survey on Bank Lending Practices; Federal Reserve Board staff calculations.

Farmland prices remain high relative to rents

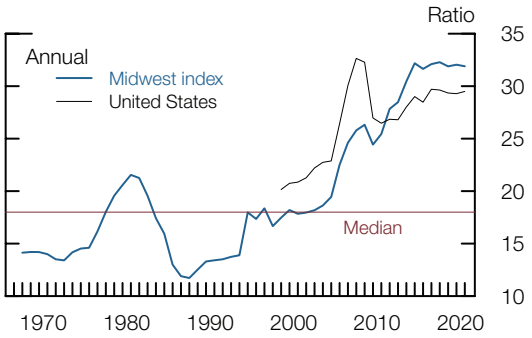
According to data through the second quarter of 2020, farmland prices continued to decline modestly at the national level and at a slightly faster pace in several midwestern states, where prices were more elevated (figure 1-15). Despite the declines, farmland prices remain high relative to rents (figure 1-16).

1-15. Farmland Prices



Source: Department of Agriculture; Federal Reserve Board staff calculations.

1-16. Farmland Price-to-Rent Ratio

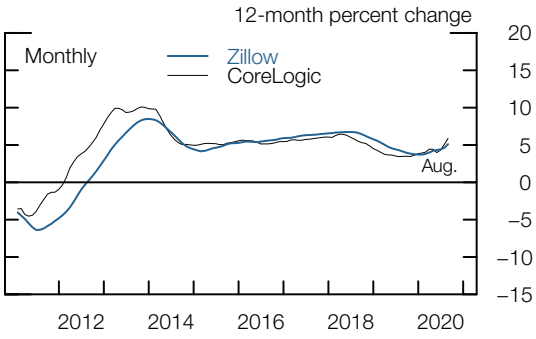


Source: Department of Agriculture; Federal Reserve Board staff calculations.

House price growth accelerated over the summer, while the price-to-rent ratio remains slightly above its long-run trend

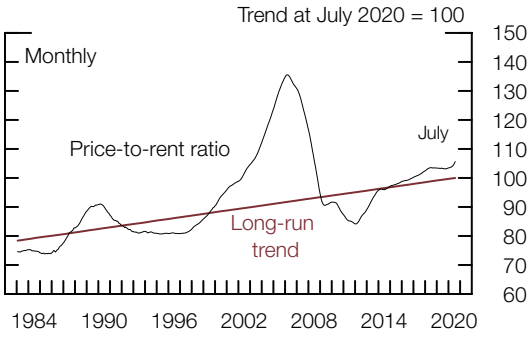
Since the previous *Financial Stability Report,* average house price growth has accelerated somewhat (figure 1-17). Nationwide, prices appear to be a little above their long-run average relationship with property rents (figure 1-18). Housing price-to-rent ratios continued to vary significantly across regional markets (figure 1-19).

1-17. Growth of Nominal Prices of Existing Homes



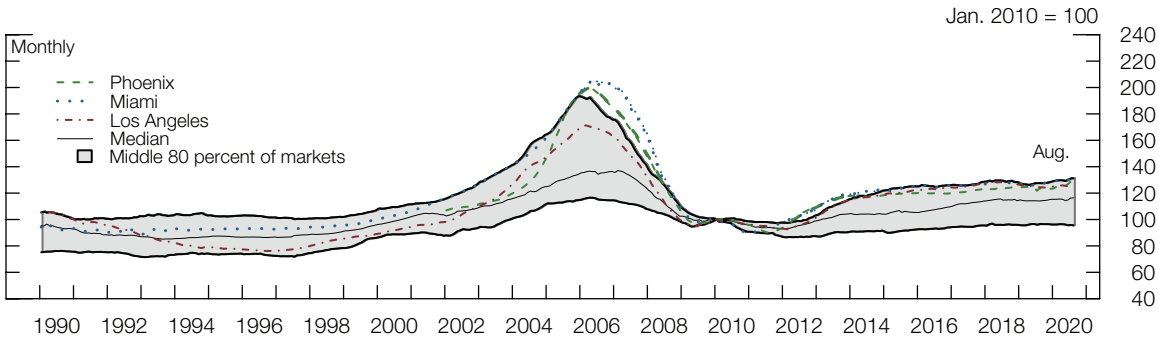
Source: CoreLogic Real Estate Data; Zillow, Inc., Zillow Real Estate Data.

1-18. Housing Price-to-Rent Ratio



Source: For house prices, CoreLogic; for rent data, Bureau of Labor Statistics.

1-19. Selected Local Housing Price-to-Rent Ratio Indexes



Source: For house prices, CoreLogic Real Estate Data; for rent data, Bureau of Labor Statistics.

The strength in the housing sector reflects robust demand from households and is being supported by the low level of interest rates. However, downside risk remains, given the unusually large number of mortgage loans in forbearance programs and the uncertainty around their ultimate repayment.

2. Borrowing by Businesses and Households

Historically high levels of business debt and the weakening in household finances could pose a significant medium-run vulnerability for the financial system

Vulnerabilities arising from business debt, which were already elevated at the start of the pandemic, have grown further. Business debt levels increased notably earlier this year as businesses borrowed heavily to weather the pandemic-related shutdowns. However, some of that debt was extended through the PPP and may be eligible for forgiveness, and the low level of interest rates means that businesses can carry more debt. In contrast to business borrowing, household borrowing advanced more slowly than overall economic activity before the COVID-19 crisis and remained heavily concentrated among borrowers with high credit scores. As a result, vulnerabilities arising from household debt were at more modest levels on the eve of the shock; nonetheless, a substantial number of households are facing increasing financial distress.

Table 2 shows the amounts outstanding and recent historical growth rates of forms of debt owed by nonfinancial businesses and households as of the end of the second quarter of 2020. Total outstanding private credit was split about evenly between businesses and households, with businesses owing $17.6 trillion and households owing about $16.1 trillion.

Accelerating debt growth and the decline in gross domestic product in the second quarter led to a sharp increase in the ratio of credit to gross domestic product

Before the onset of the pandemic, the combined total debt owed by businesses and households expanded at a pace similar to that of nominal GDP for several years. Between the end of 2019 and June, credit growth accelerated and reached about 9 percent in annualized terms, mostly reflecting strong business borrowing. The precipitous drop in GDP following the outbreak and the increase in business borrowing have caused a dramatic rise in the credit-to-GDP ratio to historical highs (figure 2-1). The household debt-to-GDP ratio had fallen steadily over the long expansion but has jumped recently, returning to levels last seen in 2012 (figure 2-2).

Business debt outstanding has grown rapidly so far in 2020 as companies take advantage of low interest rates to bolster cash reserves needed to manage through the pandemic

Borrowing by businesses, likely seeking to bridge pandemic-related interruptions to revenues, was extremely high in the first half of 2020 (figure 2-3). Most of the growth in the first quarter was driven by a surge in bank credit-line draws in March, while the growth in the second quarter was driven by very strong corporate bond issuance and by approximately $500 billion in loans extended under the PPP. However, a significant fraction of the PPP loans may be eligible for forgiveness, as noted earlier, and banks' loan extensions not tied to the PPP

Table 2. Outstanding Amounts of Nonfinancial Business and Household Credit

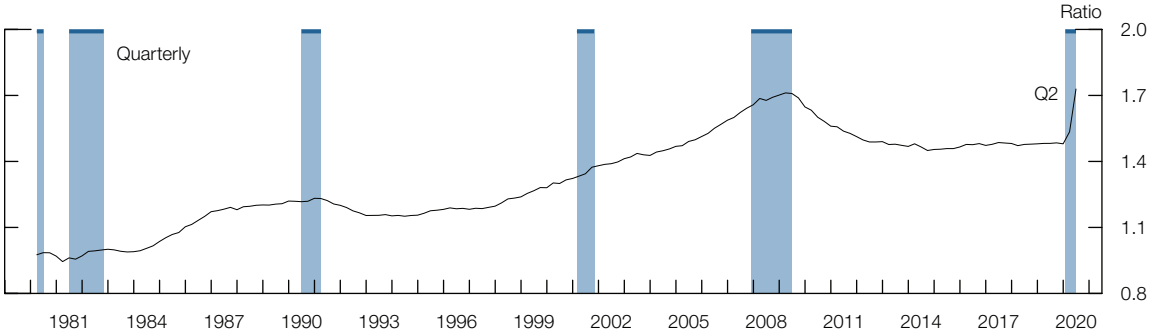
Item	Outstanding (billions of dollars)	Growth, 2019:Q2–2020:Q2 (percent)	Average annual growth, 1997–2020:Q2 (percent)
Total private nonfinancial credit	33,669	6.7	5.7
Total nonfinancial business credit	17,604	10.5	6.2
Corporate business credit	11,041	11.2	5.6
Bonds and commercial paper	7,126	9.4	6.1
Bank lending	1,684	25.7	4.5
Leveraged loans*	1,126	–.6	14.3
Noncorporate business credit	6,564	9.3	7.6
Commercial real estate	2,551	5.7	6.2
Total household credit	16,065	2.8	5.2
Mortgages	10,592	3.0	5.4
Consumer credit	4,079	.8	4.8
Student loans	1,677	4.0	8.9
Auto loans	1,198	3.1	4.9
Credit cards	954	–8.0	2.3
Nominal GDP	19,487	–6.0	3.7

Note: The data extend through 2020:Q2. Growth rates are measured from Q2 of the year immediately preceding the period through Q2 of the final year of the period. The table reports the main components of corporate business credit, total household credit, and consumer credit. Other, smaller components are not reported. The commercial real estate (CRE) row shows CRE debt owed by both corporate and noncorporate businesses. The total household-sector credit includes debt owed by other entities, such as nonprofit organizations. GDP is gross domestic product.

* Leveraged loans included in this table are an estimate of the leveraged loans that are made to nonfinancial businesses only and do not include the small amount of leveraged loans outstanding for financial businesses. The amount outstanding shows institutional leveraged loans and generally excludes loan commitments held by banks. For example, lines of credit are generally excluded from this measure. The average annual growth rate shown for leveraged loans is computed from 2000 to 2020:Q2, as this market was fairly small before 2000.

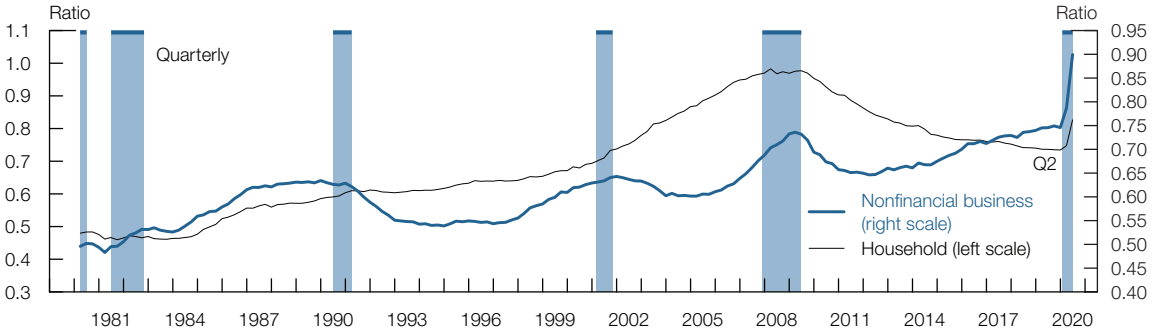
Source: For leveraged loans, S&P Global, Leveraged Commentary & Data; for GDP, Bureau of Economic Analysis, national income and product accounts; for all other items, Federal Reserve Board, Statistical Release Z.1, "Financial Accounts of the United States."

2-1. Private Nonfinancial-Sector Credit-to-GDP Ratio



Source: Federal Reserve Board staff calculations based on Bureau of Economic Analysis, national income and product accounts, and Federal Reserve Board, Statistical Release Z.1, "Financial Accounts of the United States."

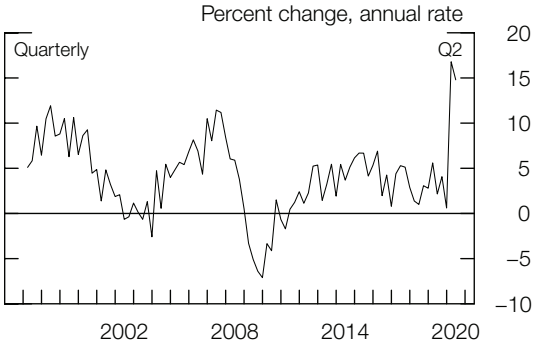
2-2. Nonfinancial Business- and Household-Sector Credit-to-GDP Ratios



Source: Federal Reserve Board staff calculations based on Bureau of Economic Analysis, national income and product accounts, and Federal Reserve Board, Statistical Release Z.1, "Financial Accounts of the United States."

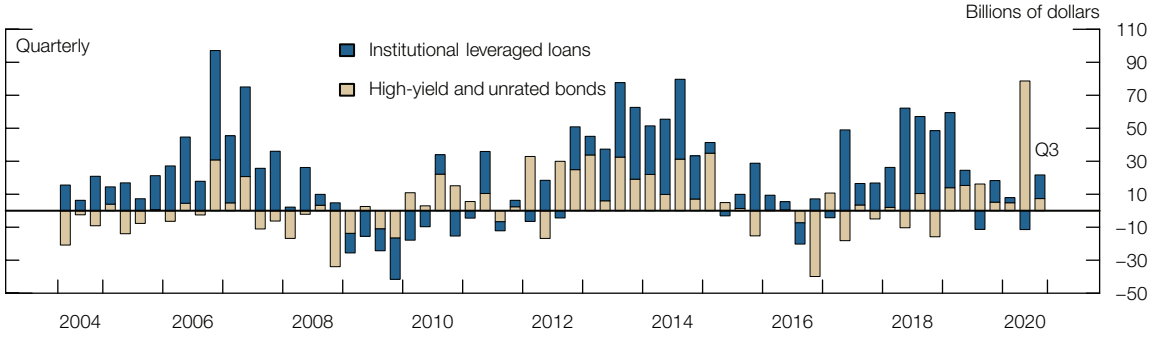
declined in the second and third quarters as some firms started to repay their credit lines and as the loan supply tightened. Firms' liquid assets increased notably in the first and second quarters, suggesting that firms were keeping their borrowed funds largely as a buffer. Moreover, historically low interest rates continue to somewhat mitigate investor concerns about default risks arising from high leverage. The net issuance of riskier forms of business debt—high-yield bonds and institutional leveraged loans—had remained high overall through 2019 but slowed during the acute market strains earlier this year. In the second quarter, net issuance of high-yield bonds rebounded, while leveraged loan net issuance contracted. In the third quarter, both high-yield bond and leveraged loan net issuances returned to roughly average historical levels (figure 2-4).

2-3. Growth of Real Aggregate Debt of the Business Sector



Source: Federal Reserve Board, Statistical Release Z.1, "Financial Accounts of the United States."

2-4. Net Issuance of Risky Business Debt

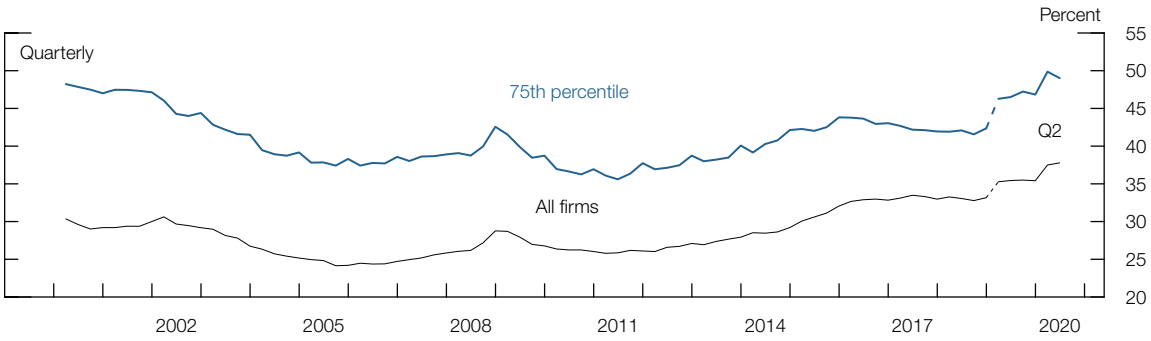


Source: Mergent, Fixed Income Securities Database; S&P Global, Leveraged Commentary & Data.

After significantly increasing in the aftermath of the pandemic, business debt vulnerabilities have moderated more recently but appear high relative to their historical range

An indicator of the leverage of large businesses—the ratio of debt to assets for all publicly traded nonfinancial firms—was at its highest level in 20 years at the end of the second quarter (figure 2-5).[7] An alternative indicator of business leverage that subtracts cash holdings from debt—net leverage—also remains near 20-year highs, but it ticked down in the second quarter as firms' cash position improved.

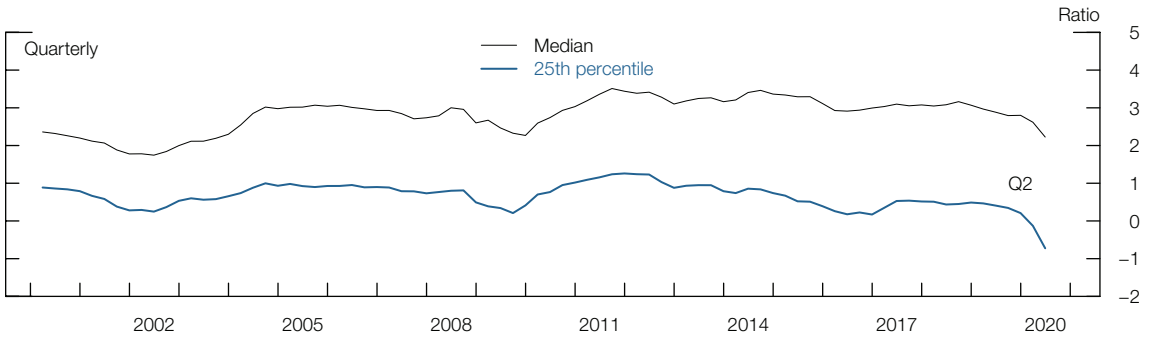
2-5. Gross Balance Sheet Leverage of Public Nonfinancial Businesses



Source: Federal Reserve Board staff calculations based on S&P Global, Compustat.

Despite lower interest rates, the ratio of earnings to interest expenses (the interest coverage ratio) dropped sharply in the second quarter. The decrease was driven by the significant earnings declines as a result of the COVID-19 outbreak. The interest coverage ratio for the median firm is now down to its historical median, and the ratio is negative for many firms because of negative earnings (figure 2-6).

2-6. Interest Coverage Ratios for Public Nonfinancial Businesses



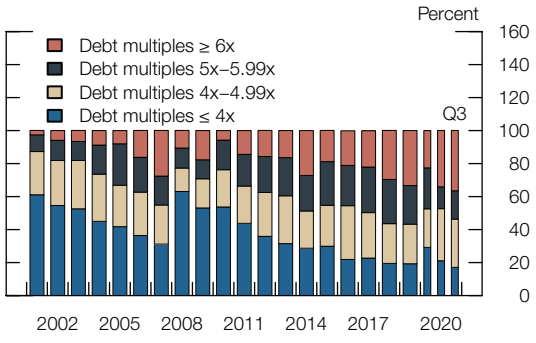
Source: Federal Reserve Board staff calculations based on S&P Global, Compustat.

[7] The dashed sections in the series in the first quarter of 2019 reflect a structural break due to a new accounting standard that requires operating leases, previously considered off-balance-sheet activities, to be included in measures of debt and assets.

In part reflecting the declines in earnings, credit quality deteriorated notably after the onset of the pandemic but showed signs of stabilization, particularly among large firms, in the third quarter. The pace of corporate bond downgrades was elevated through the spring but slowed considerably in the summer. At the end of the third quarter, about half of nonfinancial investment-grade debt outstanding was rated in the lowest category of the investment-grade range (triple-B)—near an all-time high. As has been mentioned in previous *Financial Stability Report*s, widespread downgrades of investment-grade bonds to speculative-grade ratings could lead investors to accelerate the sale of downgraded bonds, possibly generating market dislocations and downward price pressures in a segment of the corporate bond market known to exhibit relatively low liquidity. Expected bond defaults rose sharply in March to the highest post-crisis levels and, while they have moved down since then, remain above their long-term medians. However, only about 5 percent of outstanding bonds are due within one year, and less than 20 percent of outstanding bonds are due within three years.

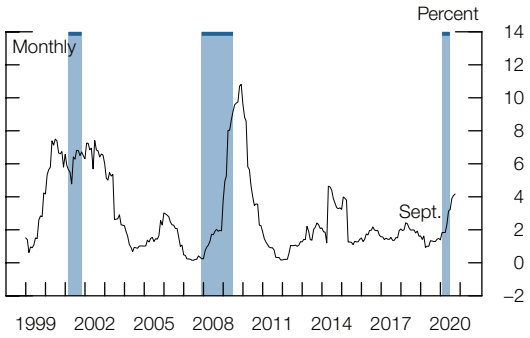
Vulnerabilities in the leveraged loan market appear to have lessened somewhat since May, especially for sectors less affected by COVID-19 and for large firms. The share of newly issued loans to large corporations with high leverage—defined as those with ratios of debt to earnings before interest, taxes, depreciation, and amortization greater than 6—dropped in the first quarter but returned in the second and third quarters to the historical highs reached in recent years (figure 2-7). While realized defaults have increased since May, there is some evidence that expected future defaults have decreased over this time frame (figure 2-8). Moreover, downgrades of leveraged loans, which rose sharply in the second quarter, slowed significantly in the third quarter and have returned to pre-pandemic levels. This evidence suggests a more stable outlook for future defaults than in May.

2-7. Distribution of Large Institutional Leveraged Loan Volumes, by Debt-to-EBITDA Ratio



Source: S&P Global, Leveraged Commentary & Data.

2-8. Default Rates of Leveraged Loans



Source: S&P Global, Leveraged Commentary & Data.

Small businesses have been substantially more affected to date by the effects of COVID-19, and strains associated with the performance of small business debt may worsen significantly

Credit quality for small businesses has worsened notably since the COVID-19 outbreak and has not yet stabilized, with many small businesses closing or scaling back operations

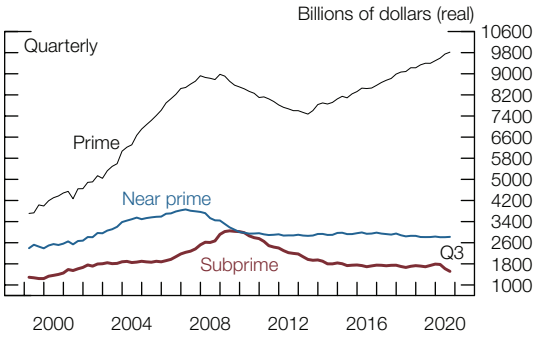
significantly during the crisis. Short- and long-term delinquencies at small businesses in August were at elevated levels last seen in 2011. Many small businesses relied on PPP loans to weather the pandemic-related period of low earnings, but the PPP ceased extending loans in August. Survey evidence suggests that credit availability has tightened for small businesses. Moreover, many small businesses report having scarce cash on hand and anticipate financial strains in coming months as they exhaust PPP funds and as accommodation measures expire.

While stresses on households have grown, credit quality has been supported by new and expanded government programs that have lifted household incomes

Although households were generally in sound financial condition before the pandemic, they have experienced a significant loss in earnings due to the spike in unemployment and business closures. Moreover, job losses were heavily concentrated among the most financially vulnerable, including lower-wage workers, young people, women, and minorities. The deterioration in household credit quality to date was mitigated by new and enlarged government programs that have supported household incomes—including expanded unemployment insurance and direct stimulus payments in the CARES Act—and by a moderate improvement in economic activity. However, most COVID-related support for households has already expired or will expire in the coming months, which risks increasing financial stress for many low- to moderate-income households. Strains associated with the performance of household debt may worsen significantly and affect lenders throughout the financial system.

Borrowing by households continued rising at a modest pace in the first half of 2020, with new extensions of credit skewed toward prime-rated borrowers . . .

2-9. Total Household Loan Balances



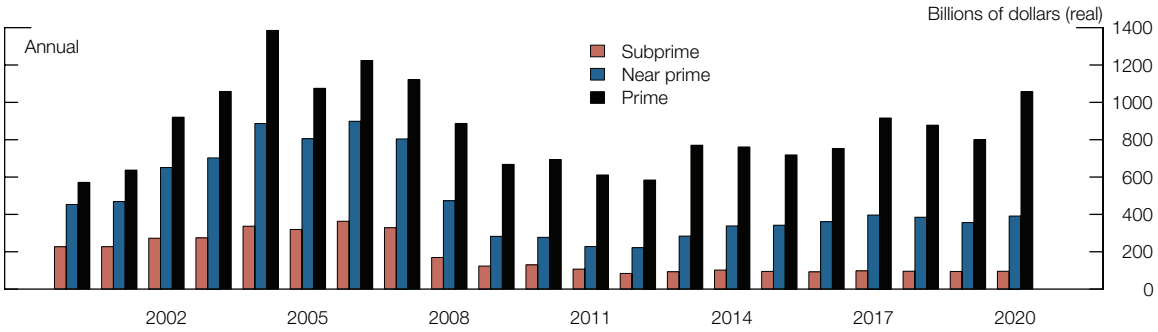
Source: Federal Reserve Bank of New York Consumer Credit Panel/Equifax; Bureau of Labor Statistics, consumer price index via Haver Analytics.

Through September of this year, household debt (after an adjustment for general price inflation) edged higher, on net, with debt owed by households with prime credit scores continuing to account for most of the growth. By contrast, inflation-adjusted loan balances for the remaining one-half of borrowers with near-prime and subprime credit scores have changed little since 2014 (figure 2-9).

. . . but the sudden increase in unemployment in the spring and sharp decline in earnings have led to a sharp rise in the share of mortgages that are either delinquent or in loss mitigation . . .

Mortgage debt accounts for roughly two-thirds of total household credit, with mortgage extensions skewed toward prime borrowers in recent years (figure 2-10). Although many households are facing substantial losses in earnings, widespread loss-mitigation measures

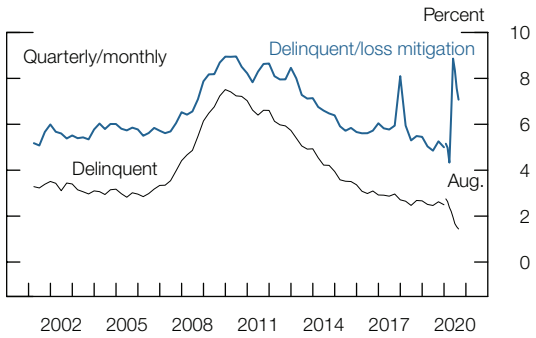
2-10. Estimate of New Mortgage Volume to Households



Source: Federal Reserve Bank of New York Consumer Credit Panel/Equifax; Bureau of Labor Statistics, consumer price index via Haver Analytics.

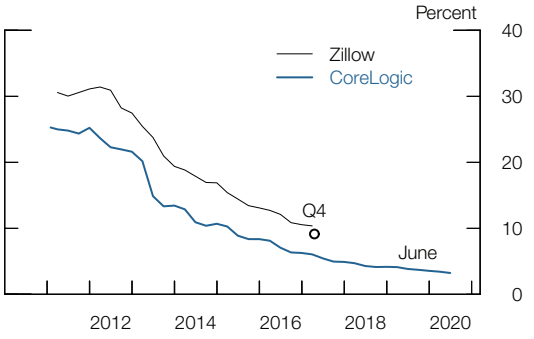
have helped damp the effect of COVID-19 on mortgage delinquencies (figure 2-11).[8] The percentage of mortgages that are either delinquent or in loss mitigation stood at 7 percent in August, below the 2007–09 financial crisis peak of 9 percent, with the caveat that, unlike during the Great Recession, most are currently in a loss-mitigation program rather than being delinquent. Note also that some borrowers in loss mitigation have kept making mortgage payments. Although the severe decline in economic activity and tightening of lending standards originating from the COVID-19 shock might put downward pressure on house prices, at the end of the second quarter, the estimated share of outstanding mortgages with negative equity is very low (figure 2-12). The ratio of outstanding mortgage debt to home values at the end of the second quarter remains at the level seen in the relatively calm housing market of the late 1990s (figure 2-13).

2-11. Mortgage Loss Mitigation and Delinquency



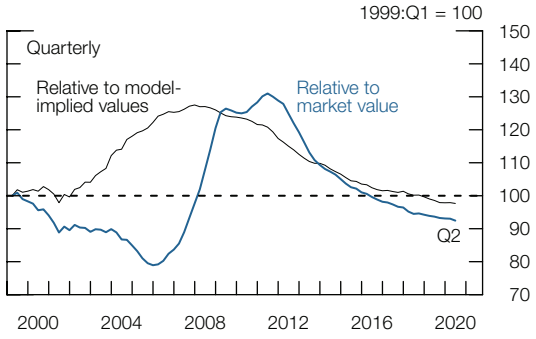
Source: Federal Reserve Bank of New York Consumer Credit Panel/Equifax.

2-12. Estimate of Mortgages with Negative Equity



Source: CoreLogic; Zillow.

2-13. Estimates of Housing Leverage



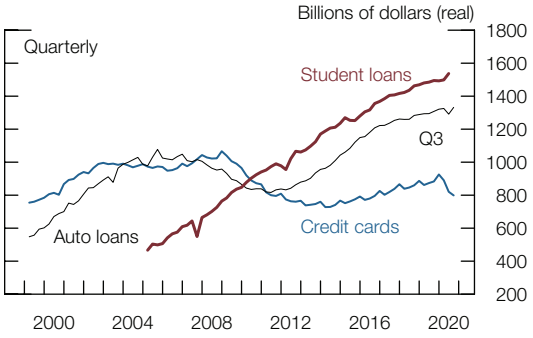
Source: Federal Reserve Bank of New York Consumer Credit Panel/Equifax; CoreLogic; Bureau of Labor Statistics via Haver Analytics.

[8] Loss mitigation is a broad term that describes a variety of loan relief programs implemented by banks to help borrowers cope with payments, including the loan forbearance programs described in the May *Financial Stability Report,* payment deferrals (including partial payment deferrals), loan modifications (including federal government plans), and loans with zero scheduled payments and a nonzero balance.

Higher levels of homeowner equity generally reduce the likelihood of borrower defaults and provide lenders with a degree of protection against credit losses even as borrowers take advantage of loss-mitigation measures. These considerations lessen concerns that a deterioration in lenders' balance sheets might impede future credit issuance and further worsen the economic outlook.

. . . and some households are struggling to make debt payments

2-14. Consumer Credit Balances

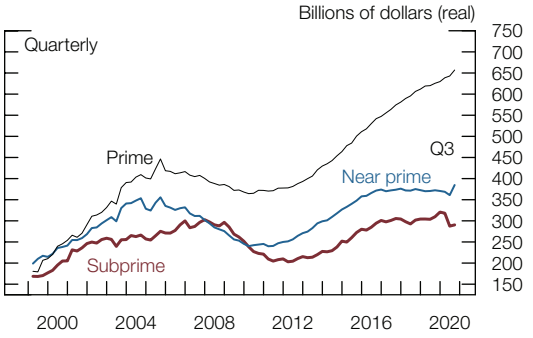


Source: Federal Reserve Bank of New York Consumer Credit Panel/Equifax; Bureau of Labor Statistics, consumer price index via Haver Analytics.

The remaining one-third of total debt owed by households, commonly referred to as consumer credit, consists mainly of student loans, auto loans, and credit card debt (figure 2-14). Table 2 shows that consumer credit rose 0.8 percent over the year ending in the second quarter and currently stands at a little more than $4 trillion.

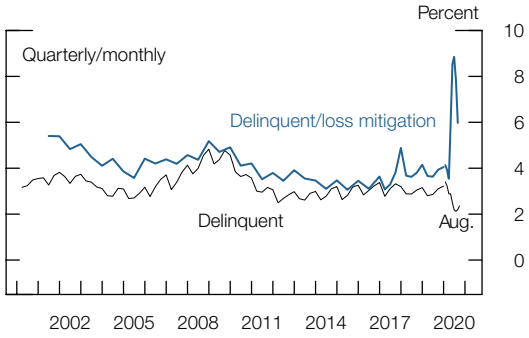
Borrowers with subprime credit scores accounted for about one-fifth of outstanding auto loan balances as of the end of the third quarter (figure 2-15). Despite the long economic expansion and low interest rates, delinquency rates on auto loans for subprime borrowers were elevated during the past several years. In response to the COVID-19 outbreak, the share of auto loans that were either delinquent or in loss mitigation jumped and, by August, was about 50 percent higher than the share observed in January, although this share is notably down from May and June (figure 2-16). Similar to mortgage borrowers, many—but not all—auto loan borrowers in loss mitigation have stopped making payments. As of August, 4.5 percent of all auto loan borrowers had not made a payment since at least April.

2-15. Auto Loan Balances



Source: Federal Reserve Bank of New York Consumer Credit Panel/Equifax; Bureau of Labor Statistics, consumer price index via Haver Analytics.

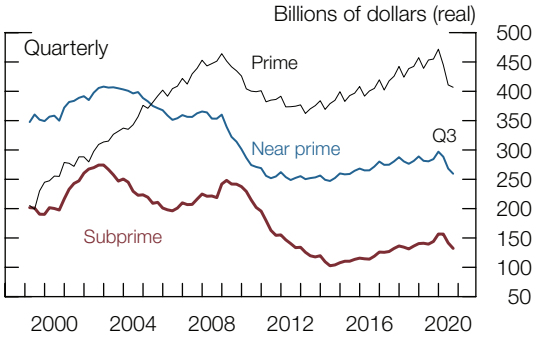
2-16. Auto Loss Mitigation and Delinquency



Source: Federal Reserve Bank of New York Consumer Credit Panel/Equifax.

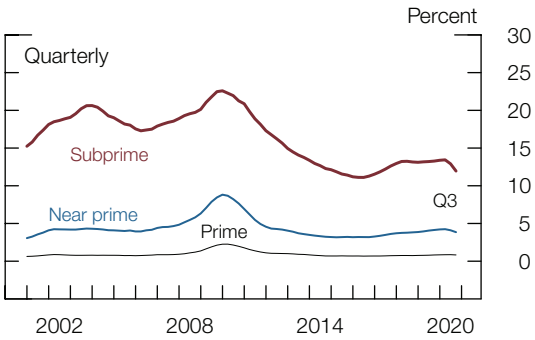
Consumer credit card balances contracted sharply in response to depressed consumer spending and declines in credit card utilization rates (figure 2-17). Subprime and near-prime borrowers, taken together, account for about half of consumer credit card balances. The share of credit card balances in delinquency fell since May (figure 2-18). This improved performance is likely driven in part by COVID-related accommodations provided by lenders.

2-17. Credit Card Balances



Source: Federal Reserve Bank of New York Consumer Credit Panel/Equifax; Bureau of Labor Statistics, consumer price index via Haver Analytics.

2-18. Credit Card Delinquency Rates



Source: Federal Reserve Bank of New York Consumer Credit Panel/Equifax.

Finally, the already elevated delinquency rates on student loans highlight the state of finances for some households going into the COVID-19 outbreak. The risk that student loan debt poses to the financial system appears limited at this time; the majority of loans were issued through government programs, and protections originally introduced in the CARES Act, which were later extended, guarantee payment forbearance and stop interest accrual through December 31.

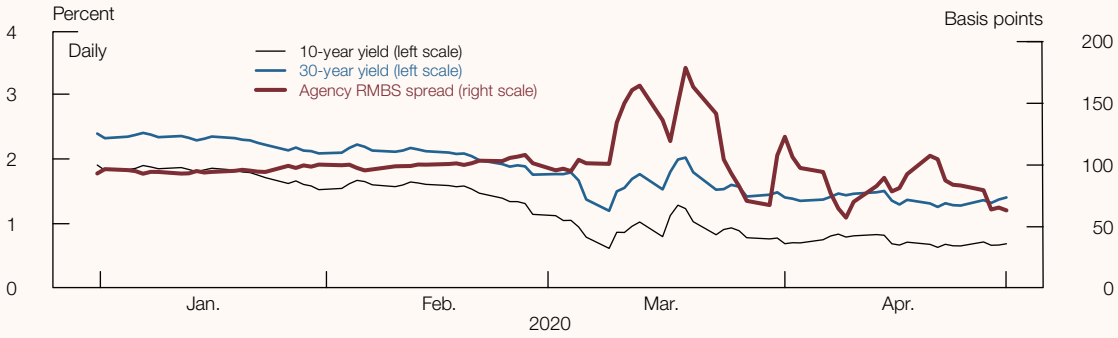
A Retrospective on the March 2020 Turmoil in Treasury and Mortgage-Backed Securities Markets

The U.S. Treasury market and the market for agency residential mortgage-backed securities (RMBS) are among the most liquid securities markets in the world. These markets are critical to the overall functioning of the financial system and to the effective transmission of monetary policy to the broader economy. Many companies and investors treat Treasury securities as risk-free assets, almost as cash, and expect to be able to quickly sell them to raise money to meet any need for liquidity. In mid-March, however, as the effects of the COVID-19 pandemic on financial markets intensified, Treasury and RMBS markets experienced severe dislocations and market functioning became unusually strained. Intense and widespread selling pressures in a context of unprecedented uncertainty appeared to strain dealers' intermediation capacity or willingness to absorb further sales and intermediate in both markets. The Federal Reserve responded through a series of policy actions aimed at supporting smooth market functioning. Following these actions, the acute stresses receded, and market functioning has since largely been restored. We look back at the March events and examine the roles of some institutional participants—in particular, foreign institutions, hedge funds, mortgage REITs (mREITs), principal trading firms (PTFs), and dealers—which have all been reported as having contributed significantly to the March turmoil. A range of other institutional investors, such as mutual funds, may also have contributed to the turmoil and is the subject of ongoing analysis.

The March turmoil

In late February and early March, as fears about the economic effects of the coronavirus intensified and investors moved into the safety of U.S. Treasury securities, Treasury yields fell sharply, and agency RMBS spreads widened (figure A). Daily trading volumes in both on- and off-the-run securities in the Treasury market increased substantially, and daily volumes in the agency RMBS market also spiked.[1] Consistent with previous episodes of heightened volatility, measures of trading costs increased notably; for example, indicative bid-ask spreads for the 10-year on-the-run and first and second off-the-run Treasury securities began to rise sharply (figure B).

Figure A. Yields on Nominal Treasury Securities and Agency RMBS Spread

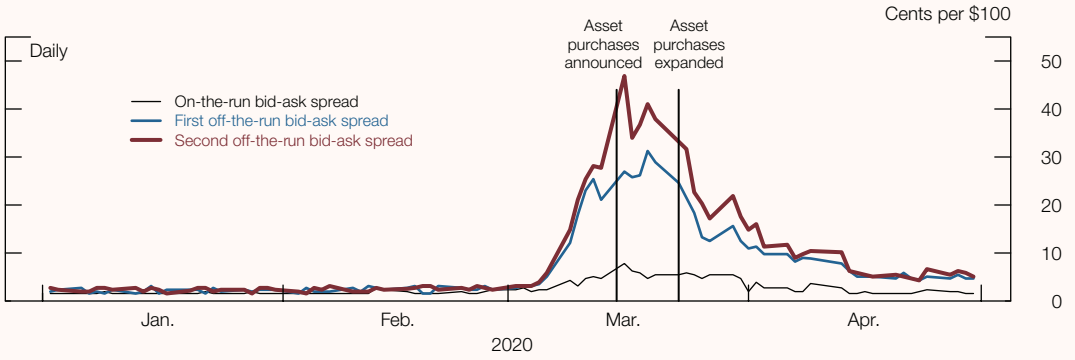


Source: Federal Reserve Bank of New York; Federal Reserve Board staff calculations; JPMorgan Chase & Co.

(continued)

[1] In general, the most recently issued Treasury securities are the most frequently traded and thus the most liquid. These securities are known as "on the run" securities, while less recent issues are called "off the run" securities.

Figure B. 10-Year Indicative Bid-Ask Spreads



Source: Federal Reserve Bank of New York, New Price Quote System.

Trading conditions deteriorated rapidly in the second week of March as a range of investors sought to sell Treasury securities, particularly those viewed as less liquid, in order to raise cash. Amid unusually poor market functioning and extreme volatility, Treasury yields increased (as shown in figure A), while agency RMBS spreads widened sharply. While trading volumes of both securities remained robust, bid-ask spreads widened dramatically, particularly for off-the-run Treasury securities (as shown in figure B). Stresses soon spilled over into the more liquid on-the-run segment of the Treasury market as well as into the Treasury futures market. Stresses were also evident in a breakdown of the usually tight link between Treasury cash and futures prices, with the Treasury cash–futures basis—defined as the difference between prices of Treasury futures contracts and prices of Treasury cash securities eligible for delivery into those futures contracts—widening notably.

The Federal Reserve's actions to support market functioning

The Federal Reserve took a number of steps to support smooth market functioning. First, between March 9 and March 17, the Federal Reserve expanded its overnight and term repo operations to address disruptions in Treasury financing markets and ensure that the supply of reserves remained ample. Second, on March 15, the Federal Open Market Committee (FOMC) authorized the purchase of at least $500 billion and $200 billion of Treasury securities and agency RMBS securities, respectively, and on March 23, the FOMC announced it would expand the size of asset purchases in the amounts needed to support smooth market functioning. Third, on March 17, the Federal Reserve established the PDCF to support dealer-intermediated markets by expanding primary dealers' access to term funding against a wide range of collateral. Fourth, on March 31, the Federal Reserve established the FIMA (Foreign and International Monetary Authorities) Repo Facility to give central banks and other international monetary authorities the ability to access dollars for liquidity purposes without having to sell their Treasury securities outright. This facility complemented the additional provision of dollar funding through the expansion and enhancement of dollar liquidity swap lines announced by the Federal Reserve and several other central banks during the third week of March. Finally, on the regulatory front, on April 1, the Federal Reserve announced a temporary change in its supplementary leverage ratio rule by excluding U.S. Treasury securities and reserve balances from the calculation of the ratio for BHCs.[2]

(continued on next page)

[2] For an overview of these and other Federal Reserve actions to mitigate the economic effects of the COVID-19 pandemic, see the box "The Federal Reserve's Monetary Policy Actions and Facilities to Support the Economy since the COVID-19 Outbreak" in Board of Governors of the Federal Reserve System (2020), *Financial Stability Report* (Washington: Board of Governors, May), pp. 9–15, https://www.federalreserve.gov/publications/files/financial-stability-report-20200515.pdf.

A Retrospective on the March 2020 Turmoil *(continued)*

While these actions helped support smooth market functioning, it is important to identify and better understand the drivers behind the March turmoil. To do so, we next provide a (necessarily preliminary) discussion of the likely roles played by several important groups of market participants as the March events unfolded.

The role of foreign institutions

Large-scale sales of U.S. Treasury securities by foreign investors likely contributed to the March turmoil. Indeed, based on Treasury International Capital data, foreign investors are estimated to have sold a record amount of more than $400 billion of Treasury securities in March.[3] More than half of this decline reflected liquidations by foreign official institutions, as foreign central banks sought to raise U.S. dollar cash in order to hold precautionary liquidity and to intervene in foreign exchange (FX) markets. The precautionary demand was reflected in a sizable March increase in deposits in the Federal Reserve's foreign repo pool. The introduction of the temporary FIMA Repo Facility helped broaden the reach of the Federal Reserve's provision of U.S. dollar liquidity overseas beyond its dollar swap lines and contributed to the stabilization in the U.S. Treasury market.

The role of hedge funds

Treasury market functioning over this period may also have been affected by the activities of hedge funds, particularly those engaged in relative value (RV) trades. These trades, which generally involve trading to take advantage of small price differences between Treasury cash securities and futures, between on-the-run and off-the-run Treasury securities, and between Treasury securities and MBS, align the relative prices of these assets and typically promote market functioning. They usually entail investors being long in one instrument and short in the other.[4] For instance, the Treasury cash–futures basis trade consists of a long cash Treasury position and a short position in a Treasury futures contract with a similar maturity. These trades often involve significant leverage, which is obtained by financing the cash Treasury position in repo markets. Under normal circumstances, this type of trading activity acts to keep the cash–futures basis narrow.

In late February and early March, as Treasury market volatility increased, repo rates rose, and the Treasury cash–futures basis began to widen, many RV hedge funds reportedly reduced their Treasury positions as they unwound their basis trades, which may have contributed to further basis widening.[5] Indeed, market commentary has pointed to the sale of Treasury positions by RV funds exiting their basis trades and their sudden role reversal from net buyers of less liquid Treasury securities to net sellers as principal factors contributing to the Treasury market dislocations in mid-March. However, due to a lack of comprehensive data on hedge funds' Treasury cash and derivatives positions, it is unclear what the actual volume of Treasury sales by RV hedge funds was in March and how large a role RV funds played in amplifying the March Treasury market illiquidity.

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[3] See also Carol Bertaut and Ruth Judson (2014), "Estimating U.S. Cross-Border Securities Positions: New Data and New Methods," International Finance Discussion Papers 1113 (Washington: Board of Governors of the Federal Reserve System, August), https://www.federalreserve.gov/pubs/ifdp/2014/1113/ifdp1113.pdf.

[4] If investors have a long position, they have bought and own the asset, while if they have a short position, they have sold the asset but do not yet own it.

[5] Hedge fund deleveraging was reportedly due in part to a combination of factors, including increased margin requirements on futures positions, margin calls on losing trades, and compliance with internal risk-management practices.

That said, a set of proxy indicators can be used to shed some light on hedge funds' arbitrage activity in March. For instance, a measure of U.S. hedge funds' holdings of Treasury securities published in the Enhanced Financial Accounts of the United States indicates that hedge funds reduced their cash Treasury positions by about $35 billion (or 3 percent) in the first quarter of the year, consistent with the narrative that hedge fund selling contributed to the Treasury market selloff.[6]

On the futures side of the basis trade, data from the Commodity Futures Trading Commission show that leveraged funds, including hedge funds, had sizable net short positions in Treasury futures contracts before the COVID-19 outbreak. In March, leveraged funds reduced their net short futures positions by about $80 billion, suggesting that hedge funds unwound some of their Treasury cash–futures basis trades.[7]

In addition, most RV funds' basis trades require funding, which is typically provided by dealers through repo. Supervisory data indicate that hedge fund Treasury financing from dealers increased in late February through late March, suggesting that dealers continued to finance hedge fund Treasury activities even as market volatility spiked. Similarly, in the June Senior Credit Officer Opinion Survey on Dealer Financing Terms (SCOOS), dealers reported no changes in funding volume collateralized by Treasury securities to RV funds in mid-March relative to mid-February volumes. However, about one-fourth of dealers reported that demand for Treasury financing by these funds increased during the selloff, while a similar fraction of dealers indicated that the availability of such financing decreased. Together, supervisory data and the SCOOS results suggest that the decline in hedge funds' Treasury holdings, in the aggregate, was likely not driven by their inability to finance these positions.

In sum, the reduction in hedge fund Treasury positions may have contributed notably to Treasury market volatility in mid-March amid a massive repositioning by a wide range of investors. However, so far, the evidence that large-scale deleveraging of hedge fund Treasury positions was the primary driver of the turmoil remains weak.

The role of mortgage real estate investment trusts

Similar to the Treasury market, liquidity in the agency RMBS market deteriorated significantly in March. Reportedly contributing to the March turmoil were mREITs, which are leveraged investment companies that invest in pools of agency RMBS and other mortgage-backed assets.[8] Such firms primarily fund their holdings of these long-maturity assets using short-term borrowing in the agency RMBS repo market through dealers. At the same time, they typically hedge their interest rate risk by taking short positions in Treasury securities or swaps (or both). As a result, mREITs have leveraged exposures to RMBS–Treasury spreads and RMBS–swap spreads, financed by repo loans that can be rapidly withdrawn.

As RMBS spreads began to widen in late February and spread volatility rose, mREITs' hedges fell in value, triggering margin calls. Because mREITs generally maintain low levels of unencumbered assets that can be used to satisfy the increased margin requirements, the margin calls likely precipitated the

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[6] Quarterly hedge fund balance sheet estimates in the Enhanced Financial Accounts are based on the Securities and Exchange Commission Private Funds Statistics form and reflect hedge funds' positions in cash Treasury securities. See Board of Governors of the Federal Reserve System (2020), "Enhanced Financial Accounts: Hedge Funds," webpage, https://www.federalreserve.gov/releases/efa/efa-hedge-funds.htm.

[7] Of note, although the decline in leveraged funds' Treasury futures positions was significant, it was not outsized relative to the volatility of the positions in previous months.

[8] MBS holdings of mREITs predominantly consist of agency securities.

A Retrospective on the March 2020 Turmoil *(continued)*

unwinding of some of the mREITs' agency RMBS positions. The substantial forced selling and rapid deleveraging intensified stresses in the agency RMBS market and contributed to a further widening of spreads, creating a feedback loop between spread widening and forced deleveraging of mREITs' portfolios. However, following the Federal Reserve's March 23 announcement of increased purchases of Treasury securities and agency RMBS, agency RMBS market functioning improved considerably, with agency RMBS spreads rapidly tightening and spread volatility slowly diminishing. By late March, the pace of agency RMBS selling from mREITs and other levered investors had slowed substantially.

The role of principal trading firms

PTFs are active in the electronic segments of the Treasury cash and futures markets, where trading takes place using a central limit order book (CLOB).[9] In the cash market, PTFs predominantly transact in the most liquid on-the-run Treasury securities. PTFs, along with some dealers, are known to adopt high-speed automated trading strategies that account for a significant share of trading and liquidity provision.[10] The 2015 *Joint Staff Report* showed that in previous periods of market stress, PTFs have contributed to keeping quoted bid-ask spreads in these parts of the Treasury market relatively tight.[11] More precisely, PTFs—and dealers employing high-speed trading technology—are able to keep spreads tight by reducing posted depth and replenishing the order book faster to manage their exposure to volatility.

During the March turmoil, however, unprecedented strains were also witnessed in the on-the-run segment of the Treasury market, with market depth plummeting and quoted bid-ask spreads widening sharply, raising questions about the role of PTFs in the turmoil (figure C). Some research suggests that the observed widening in bid-ask spreads for on-the-run Treasury securities during the March events points to an unusual reduction in the speed with which high-speed trading entities were replenishing quotes on the order book in response to trades.[12] Order book replenishment was not sufficiently fast to avoid significantly heightened bid-ask spread levels and increased volatility as PTFs and other high-speed trading entities scaled down Treasury market-making activity, in aggregate. The reduction in high-speed market-making activity appears to have contributed to the spread of pandemic-related stresses to even the most liquid segments of financial markets. The reasons behind this reduction

(continued)

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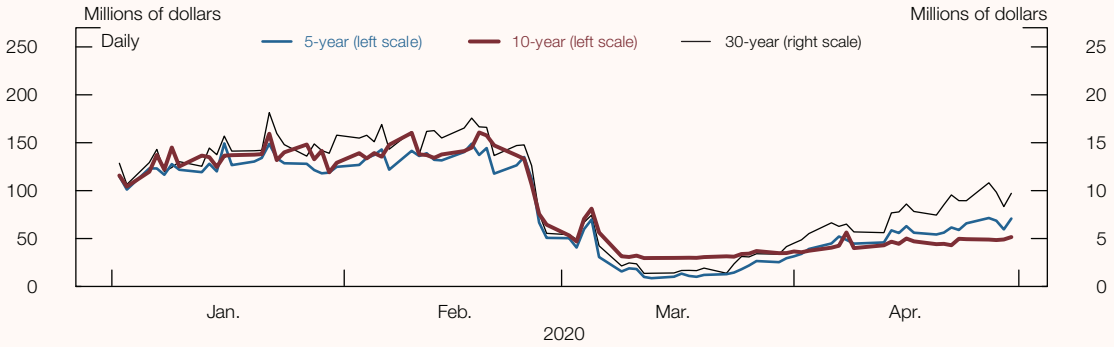
[9] On a CLOB, participants can post quotes for buying and selling securities, with incoming orders matched to outstanding quotes using an electronic matching engine.

[10] PTFs have become increasingly important in electronic Treasury markets over the past several years. They now account for the majority of traded volumes on electronic interdealer broker platforms in the Treasury market, playing an important role in the provision of liquidity by posting quotes and replenishing those quotes quickly. See Doug Brain, Michiel De Pooter, Dobrislav Dobrev, Michael Fleming, Pete Johansson, Collin Jones, Frank Keane, Michael Puglia, Liza Reiderman, Tony Rodrigues, and Or Shachar (2018), "Unlocking the Treasury Market through TRACE," FEDS Notes (Washington: Board of Governors of the Federal Reserve System, September 18), https://www.federalreserve.gov/econres/notes/feds-notes/unlocking-the-treasury-market-through-trace-20180928.htm; and James Collin Harkrader and Michael Puglia (2020), "Principal Trading Firm Activity in Treasury Cash Markets," FEDS Notes (Washington: Board of Governors of the Federal Reserve System, August 4), https://www.federalreserve.gov/econres/notes/feds-notes/principal-trading-firm-activity-in-treasury-cash-markets-20200804.htm.

[11] For further details, see U.S. Department of the Treasury, Board of Governors of the Federal Reserve System, Federal Reserve Bank of New York, U.S. Securities and Exchange Commission, and U.S. Commodity Futures Trading Commission (2015), *Joint Staff Report: The U.S. Treasury Market on October 15, 2014* (Washington: Treasury, Board of Governors, FRBNY, SEC, and CFTC, July), https://www.treasury.gov/press-center/press-releases/Documents/Joint_Staff_Report_Treasury_10-15-2015.pdf.

[12] See Dobrislav Dobrev and Andrew Meldrum (2020), "What Do Quoted Spreads Tell Us about Machine Trading at Times of Market Stress? Evidence from Treasury and FX Markets during the COVID-19-Related Market Turmoil in March 2020," FEDS Notes (Washington: Board of Governors of the Federal Reserve System, September 25), https://www.federalreserve.gov/econres/notes/feds-notes/what-do-quoted-spreads-tell-us-about-machine-trading-market-stress-march-2020-20200925.htm.

Figure C. On-the-Run Market Depth



Source: Repo interdealer broker community.

merit further analysis but would most likely include the considerably elevated economic uncertainty in mid-March, the exceptionally high volatility of Treasury yields, and the breakdown in typical correlations within the Treasury market as well as between the prices of Treasury securities and other assets.

The role of dealers

Dealers play a central role in U.S. Treasury and agency RMBS markets by participating in primary markets, buying and selling securities from clients, and providing Treasury and agency RMBS financing to other market participants. Dealers were holding unusually high levels of these securities even before the pandemic, reflecting in part strong Treasury issuance over recent years. Beginning in late February, as a wide range of investors, both domestic and foreign, rushed to obtain liquidity or to rebalance their portfolios in the face of the pandemic, dealers absorbed large amounts of less liquid securities, including off-the-run Treasury securities and agency RMBS, onto their balance sheets. By the second week of March, amid expanding inventories, imbalanced client trading flows, and heightened volatility, some dealers reportedly reached their intermediation capacity or became increasingly unwilling to absorb further sales.[13] At the same time, investor demand for repo financing rose sharply, in particular against Treasury collateral, putting further pressure on dealer balance sheets and pushing up dealer funding costs.[14] Market commentary pointed to dealer balance sheet constraints and their reluctance to intermediate as important factors behind the deterioration in the functioning of Treasury and agency RMBS markets in early March.

Following the expansion of the Federal Reserve's asset purchases, dealer balance sheet pressures eased in late March as dealers were able to offload some of their inventories, and Treasury and agency RMBS market functioning improved. Indeed, dealer inventory holdings of U.S. Treasury securities declined from their mid-March peak as the Federal Reserve's Treasury purchases picked up, suggesting that asset purchases absorbed some of the Treasury securities that might have otherwise been

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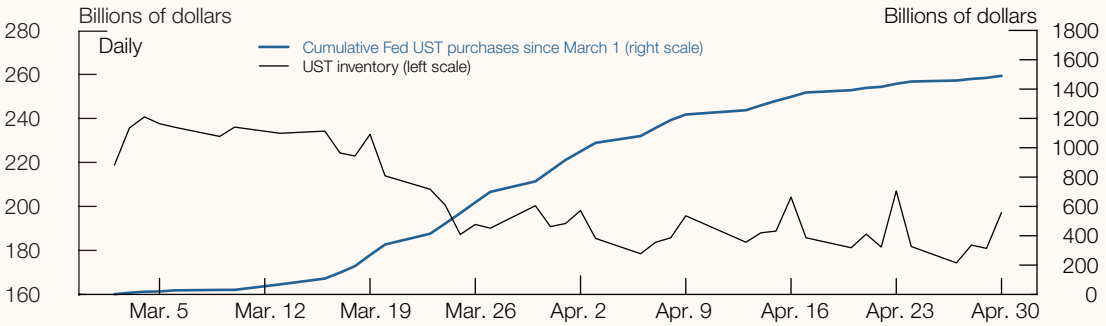
[13] Limits on dealers' intermediation capacity may be driven by their internal capital, liquidity, and risk-management practices; their compliance with regulations; or concerns over their profit and loss statements.

[14] Dealers typically use repo to fund both their cash Treasury positions and their lending to clients through Treasury reverse repos. Thus, the ability and willingness to engage in repo, which increases the size of dealers' balance sheets, will affect their willingness to take on additional inventories and provide lending through reverse repos.

A Retrospective on the March 2020 Turmoil *(continued)*

held on dealer balance sheets (figure D). Similarly, the increase in agency RMBS purchases following the March 23 announcement coincided with some reduction in dealer inventories of agency RMBS securities toward the end of March, indicating that the agency RMBS purchases also helped alleviate balance sheet constraints related to agency RMBS.

Figure D. Fed UST Purchases and Dealer UST Inventory



Source: Federal Reserve Board, Form FR 2052a, Complex Institution Liquidity Monitoring Report.

Overall, asset purchases were effective in freeing up dealer balance sheet capacity and improving dealers' willingness to intermediate these markets. Funding conditions for dealers also gradually improved following the expansion of repo operations and the announcement of the PDCF, with borrowing rates for dealers declining notably. In addition, dealer Treasury financing volumes increased in late March, indicating that dealers were able to use their spare balance sheet capacity to support their clients' activities.

Looking ahead

The functioning of Treasury markets, including the capacity of dealer balance sheets to absorb extraordinary flows, was discussed extensively at a recent conference sponsored by the members of the interagency working group (the Board of Governors of the Federal Reserve System, the Commodity Futures Trading Commission, the Federal Reserve Bank of New York, the Securities and Exchange Commission, and the U.S. Treasury Department).[15] Participants discussed a number of proposals to ensure that dealer capacity could be used effectively in an environment of growing Treasury supply, including the possibility of wider clearing in Treasury cash and repo markets and the potential for use of "all to all" trading platforms that allow buyers and sellers to trade without a dealer intermediary. Meanwhile, the Securities and Exchange Commission has proposed changes to Treasury market regulation that could encourage wider access to Treasury market trading platforms and thereby promote forms of all-to-all trading.[16]

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[15] See Federal Reserve Bank of New York (2020), "The 2020 U.S. Treasury Market Conference," press release, September 29, https://www.newyorkfed.org/newsevents/events/markets/2020/0929-2020.

[16] See Securities and Exchange Commission (2020), "SEC Proposes Rules to Extend Regulations ATS and SCI to Treasuries and Other Government Securities Markets," press release, September 28, https://www.sec.gov/news/press-release/2020-227.

3. Leverage in the Financial Sector

Leverage at banks and broker-dealers remains low; in contrast, measures of leverage at life insurance companies are at post-2008 highs and remain elevated at hedge funds relative to the past five years

Table 3. Size of Selected Sectors of the Financial System, by Types of Institutions and Vehicles

Item	Total assets (billions of dollars)	Growth, 2019:Q2–2020:Q2 (percent)	Average annual growth, 1997–2020:Q2 (percent)
Banks and credit unions	22,780	16.7	6.6
Mutual funds	16,776	.6	9.1
Insurance companies	11,553	7.4	6.0
Life	8,828	7.7	6.1
Property and casualty	2,725	6.2	5.6
Hedge funds*	7,623	–3.0	7.3
Broker-dealers	3,507	.6	4.8
	Outstanding (billions of dollars)		
Securitization	10,492	5.3	5.4
Agency	9,725	5.2	5.9
Non-agency**	1,217	6.2	3.2

Note: The data extend through 2020:Q2. Growth rates are measured from Q2 of the year immediately preceding the period through Q2 of the final year of the period. Life insurance companies' assets include both general and separate account assets.

* Hedge fund data start in 2012:Q4 and are updated through 2020:Q1.

** Non-agency securitization excludes securitized credit held on balance sheets of banks and finance companies.

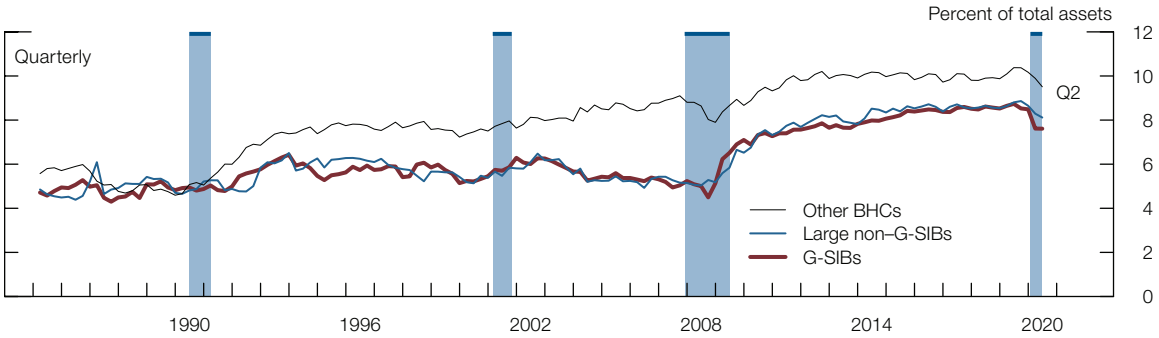
Source: Federal Reserve Board, Statistical Release Z.1, "Financial Accounts of the United States"; Federal Reserve Board, "Enhanced Financial Accounts of the United States."

Banks continue to be well capitalized, though challenging conditions remain

The pandemic has tested the resilience of banks. The ratio of tangible capital—a measure of bank equity that excludes items such as goodwill—to total assets at large banks decreased in the first half of the year (figure 3-1). The common equity Tier 1 (CET1) ratio—a regulatory risk-based measure of bank capitalization—also declined significantly in the first quarter as many firms tapped credit lines at the onset of the pandemic, but the ratio recovered to pre-pandemic levels in the second quarter for most banks as demand for bank credit waned and earlier drawdowns were generally repaid. The initial decline in the CET1 capital ratio

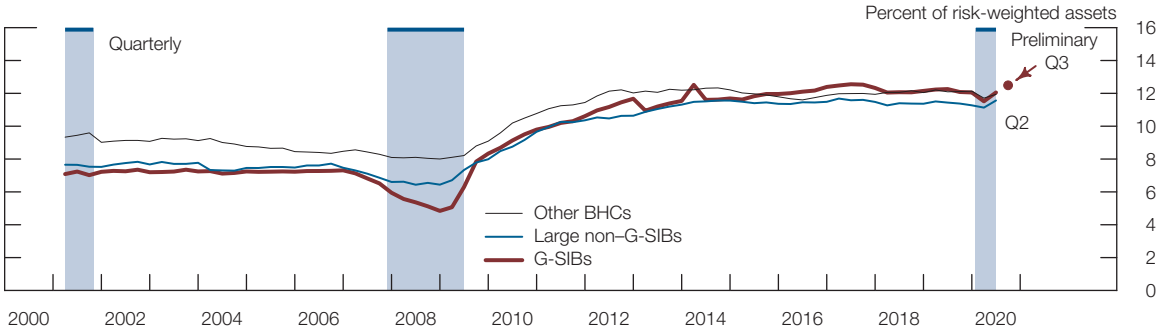
was also driven by a temporary pickup in risk-weighted assets related to banks' trading operations amid heightened volatility in many financial markets. The CET1 capital ratio at both the largest banks and other BHCs remained well above required minimum levels (figure 3-2).

3-1. Ratio of Tangible Bank Equity to Assets



Source: Federal Financial Institutions Examination Council, Consolidated Reports of Condition and Income (Call Report).

3-2. Common Equity Tier 1 Ratio of Banks



Source: Federal Reserve Board, Form FR Y-9C, Consolidated Financial Statements for Holding Companies.

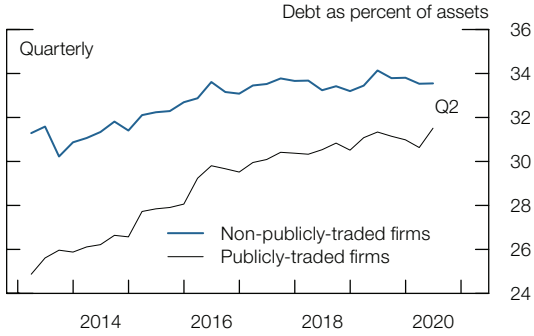
In June, the Federal Reserve released the results of the 2020 Dodd-Frank Act stress tests and the Comprehensive Capital Analysis and Review along with a sensitivity analysis to assess the resilience of large banks under three hypothetical downside scenarios that could have resulted from the coronavirus event. The analysis under the more severe downside scenarios, which did not incorporate the effects of planned capital distributions, showed that most banks would remain well capitalized but several would approach their minimum capital levels.[9] Given the heightened uncertainty in the economy and markets at that time, the Federal Reserve announced that it would require banks to resubmit their capital plans in the fourth quarter of 2020. The scenarios to be used for the resubmission were released on September 17, 2020, and the Federal Reserve will release bank-specific results of its inde-

[9] See Board of Governors of the Federal Reserve System (2020), "Federal Reserve Board Releases Results of Stress Tests for 2020 and Additional Sensitivity Analyses Conducted in Light of the Coronavirus Event," press release, June 25, https://www.federalreserve.gov/newsevents/pressreleases/bcreg20200625c.htm.

pendent assessment by the end of the year.[10] The Federal Reserve also took steps in June to restrict capital distributions in the third quarter by banks with more than $100 billion in assets, including prohibiting share repurchases and limiting dividends based on the previous four quarters of earnings. On September 30, the Federal Reserve voted to extend restrictions to the fourth quarter.[11]

As of the second quarter of 2020, the credit quality of bank loans had deteriorated considerably. Commercial and industrial (C&I) and CRE loans in loss-mitigation programs increased sharply in the second quarter and remain elevated, despite some recent moderation. The credit quality of firms taking C&I loans continued to deteriorate through June, as measured by credit rating downgrades, and remained one of the largest drivers of the increase in loan loss provisions. Furthermore, as of the second quarter of 2020, the leverage of firms that obtained C&I loans from the largest banks stood at historically high levels (figure 3-3). Credit quality of CRE loans also continued to deteriorate, as rental income declined, vacancies increased, and consumer spending weakened, particularly in COVID-affected properties such as hotels and retail establishments. Consumer loans and mortgages in loss-mitigation programs also increased.

3-3. Borrower Leverage for Bank Commercial and Industrial Loans



Source: Federal Reserve Board, Form FR Y-14Q (Schedule H.1), Capital Assessments and Stress Testing.

Because of the implementation of loss-mitigation programs, government stimulus payments, and PPP loans, the true status of credit quality is not reflected in loan delinquencies. As these programs expire, some of these accounts in loss mitigation could roll into and be reflected in higher bank delinquency rates later this year and early next year, followed by higher charge-off rates and losses. All told, a great deal of uncertainty about the future path of these losses remains.

Allowances for loan losses surged in the first half of 2020 as large banks implemented the current expected credit losses (CECL) accounting standard and reassessed their losses (especially in credit card loans and corporate lending) in light of the COVID-19 shock.[12] Under

[10] See Board of Governors of the Federal Reserve System (2020), "Federal Reserve Board Releases Hypothetical Scenarios for Second Round of Bank Stress Tests," press release, September 17, https://www.federalreserve.gov/newsevents/pressreleases/bcreg20200917a.htm.

[11] See Board of Governors of the Federal Reserve System (2020), "Federal Reserve Board Announces It Will Extend for an Additional Quarter Several Measures to Ensure That Large Banks Maintain a High Level of Capital Resilience," press release, September 30, https://www.federalreserve.gov/newsevents/pressreleases/bcreg20200930b.htm.

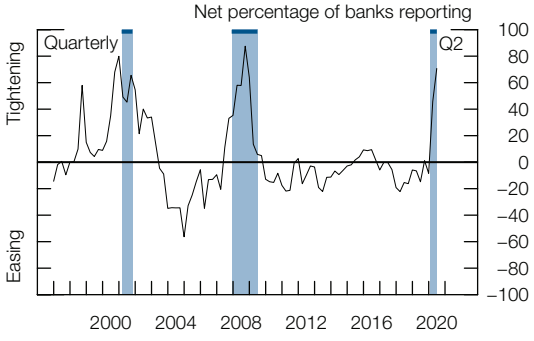
[12] Under accounting rules, banks prepare for possible loan losses before they actually occur. Loan loss provisions, in the bank's income statement, are expenses set aside for uncollected loan payments and are added to the allowance for loan and lease losses (ALLL), which is renamed to allowance for credit losses for banks adopting CECL. On a bank's balance sheet, total

CECL accounting standards, banks must set aside allowances for the expected losses over the life of a loan. Under the previous method, banks were not able to provision for loan losses until later in a credit cycle, when the losses were incurred.

The increase in loan loss allowances along with the expectation that interest rates will remain low for a longer time weakened the bank profitability outlook, a key factor in banks' ability to accumulate equity capital. Net income contracted sharply in the first half of the year because banks set aside a higher fraction of revenues as loan loss provisions and net interest margins were compressed. An increase in trading and investment banking revenues partly offset these downward pressures on income.

Data from the July 2020 SLOOS indicate that banks continued to tighten standards on C&I loans in the second quarter (figure 3-4). Banks cited the uncertain economic outlook and industry-specific problems as the main reasons. More broadly, banks reported tightening across all loan types. In particular, nearly all major credit card lenders reported lending standards becoming stricter. While most banks reported that the level of C&I lending standards is on the tighter end of the range of standards that has prevailed since 2005, only a modest share reported standards as being at the tightest point. This information suggests that banks' strong capital positions at the onset of the pandemic may have mitigated some of the disruption in credit availability relative to during the 2007–09 financial crisis. The contraction in credit availability was also mitigated by the PPP, under which approximately $500 billion in PPP loans were placed on banks' balance sheets at the end of the second quarter. However, tighter lending standards may make obtaining credit difficult for some creditworthy businesses and households. Credit availability contributes to a more robust recovery, which, in turn, improves credit quality and thus leads to better financial stability outcomes.

3-4. Change in Bank Lending Standards for Commercial and Industrial Loans



Source: Federal Reserve Board, Senior Loan Officer Opinion Survey on Bank Lending Practices; Federal Reserve Board staff calculations.

Based on preliminary earnings data, CET1 capital ratios at the U.S. global systemically important banks slightly increased above pre-pandemic levels in the third quarter (as shown in figure 3-2), as the required restrictions on capital payouts continued. Declines in risk-

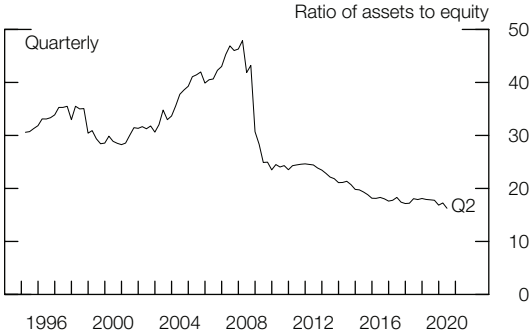
loans are reported net of ALLL. For more details, see Board of Governors of the Federal Reserve System (2020), "Allowance for Loan and Lease Losses (ALLL)," webpage, https://www.federalreserve.gov/supervisionreg/topics/alll.htm.

weighted assets, driven in part by slowed loan demand and tighter lending standards, also contributed to the rise in CET1 capital ratios. Large banks improved earnings relative to the first two quarters of 2020, predominantly because of lower loan loss provisions. As a result, allowances for losses remained about the same at large banks in the third quarter.

Leverage is at historically low levels at broker-dealers . . .

Leverage at broker-dealers changed little in the first half of 2020 and stayed at historically low levels (figure 3-5). The deterioration in liquidity in March across dealer-intermediated markets demonstrated that, despite dealers' low leverage, fragilities still remain and pose a concern for financial stability (see the box "A Retrospective on the March 2020 Turmoil in Treasury and Mortgage-Backed Securities Markets"). Dealer usage of the PDCF, established in March 2020 amid an extraordinary increase in demand for dealer intermediation and financing, has steadily declined to less than $1 billion. Dealers reported strong earnings in the third quarter, after having had record earnings in the second quarter, driven by high underwriting and trading revenues. Net borrowing of primary dealers is unchanged since May but remains high relative to recent years. Primary dealers' Treasury positions declined slightly, on net, during the same period but remain at the upper end of their historical range.

3-5. Leverage at Broker-Dealers

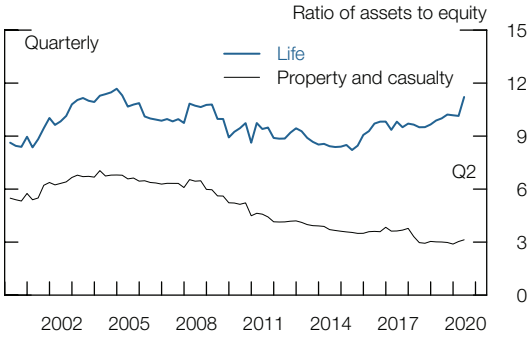


Source: Federal Reserve Board, Statistical Release Z.1, "Financial Accounts of the United States."

. . . but is at post-2008 highs at life insurance companies . . .

Leverage at life insurance companies rose to post-2008 highs (figure 3-6). This leverage measure is calculated using the book value of assets and thus does not immediately reflect the decrease in asset market values—notably, of corporate bonds—in the first quarter and the subsequent improvement. Life insurers hold a sizable proportion of their assets as corporate bonds and remain vulnerable to significant decreases in corporate bond prices. In addition, poor performance of CRE debt in life insurers' general accounts could harm their capital

3-6. Leverage at Insurance Companies



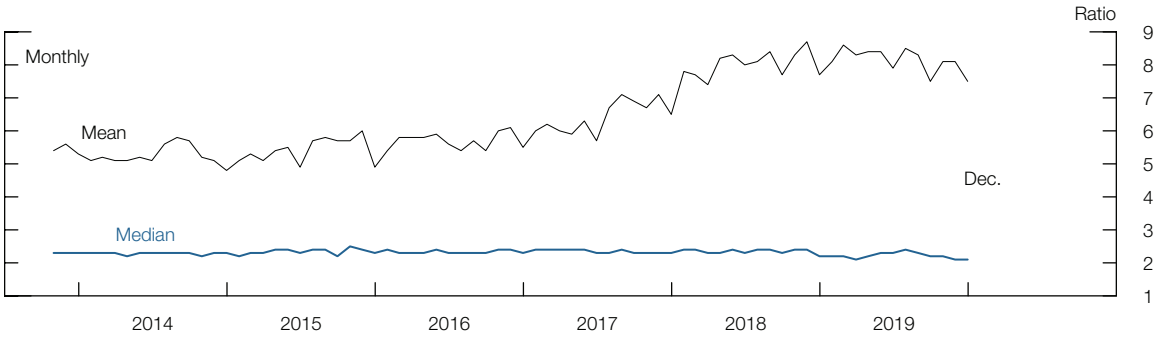
Source: S&P Global Market Intelligence, regulatory filings of large insurance groups.

positions. Meanwhile, based on information through the second quarter of 2020, leverage at property and casualty insurers stayed at lower levels relative to historical averages.

. . . and remains elevated at hedge funds relative to the past five years

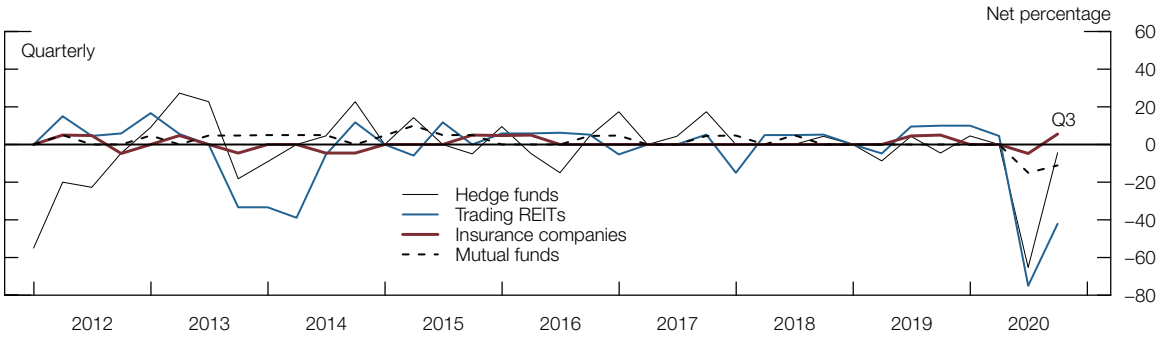
Gross leverage of hedge funds decreased somewhat in the second half of 2019, the most recent data available, but still remained near the upper end of its historical distribution (figure 3-7).[13] More recently, in the SCOOS, most dealers reported that the use of leverage by hedge fund clients declined between February and May, but few dealers reported additional changes in the use of leverage by hedge funds between May and August (figure 3-8). Moreover, several indicators of leverage intermediated by dealers on behalf of hedge funds have reverted to their pre-pandemic levels near the upper ends of their historical distributions. The COVID-19 shock exposed vulnerabilities at hedge funds. Extreme market volatility and lower liquidity in asset markets led to substantial losses at some hedge funds and sizable margin calls (see the box "A Retrospective on the March 2020 Turmoil in Treasury and Mortgage-Backed Securities Markets"). As a result of these losses and, to a lesser extent,

3-7. Gross Leverage at Hedge Funds



Source: Federal Reserve Board staff calculations based on Securities and Exchange Commission, Form PF, Reporting Form for Investment Advisers to Private Funds and Certain Commodity Pool Operators and Commodity Trading Advisors.

3-8. Change in the Use of Financial Leverage



Source: Federal Reserve Board, Senior Credit Officer Opinion Survey on Dealer Financing Terms.

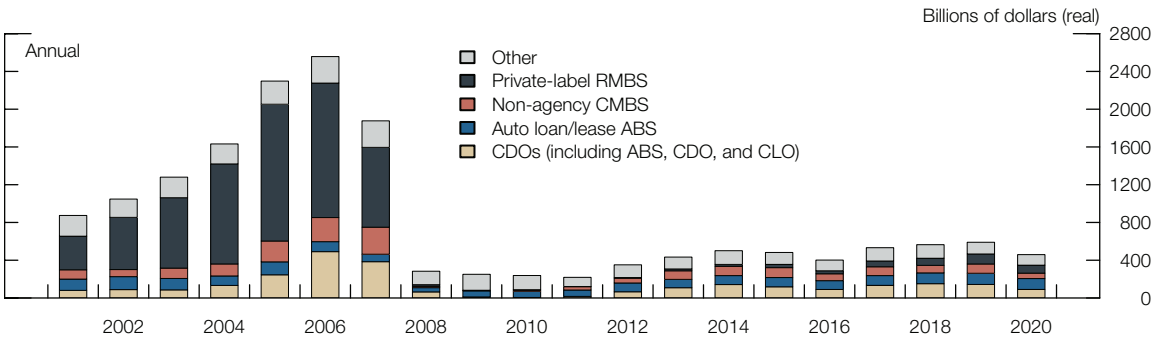
[13] Comprehensive data on hedge fund leverage are available only with a long lag. The Federal Reserve supplements these data with more timely but less comprehensive measures.

outflows, hedge funds' assets dropped substantially in the first quarter. In the second quarter, hedge funds' assets partially recovered from these losses as market conditions improved, but outflows continued, albeit at a slower pace.

Securitization volumes increased after coming to a halt in March but remain significantly below 2019 levels . . .

Securitization allows financial institutions to bundle loans or other financial assets and sell claims on the cash flows generated by these assets as tradable securities, much like bonds. This process often involves the creation of securities with different levels of seniority, or "tranches," and thus represents a form of credit risk transformation whereby some highly rated securities can be produced from a pool of lower-rated underlying assets. Examples of the resulting securities include collateralized loan obligations (CLOs), ABS, CMBS, and RMBS. Issuance volumes of non-agency securities—that is, those not guaranteed by a government-sponsored enterprise (GSE) or by the federal government—have resumed after coming to a halt from mid-March to early April but remain about 20 percent lower through September of this year compared with the same period in 2019 (figure 3-9). The recovery, facilitated by the reestablishment of the TALF by the Federal Reserve in March, was uneven across asset classes. Securities backed by asset classes perceived to be less risky, such as auto and credit card ABS, recovered earlier than other securities, such as CMBS, and have experienced more robust issuance amid strong investor demand. However, the September SCOOS showed easing in credit conditions for non-agency CMBS.

3-9. Issuance of Non-agency Securitized Products, by Asset Class



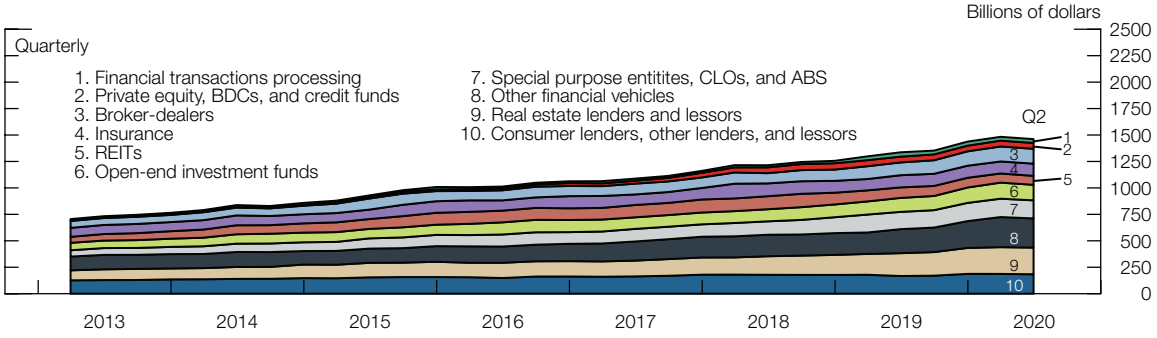
Source: Green Street Advisors, LLC, Commercial Mortgage Alert (cmalert.com) and Asset-Backed Alert (abalert.com); Bureau of Labor Statistics, consumer price index via Haver Analytics.

. . . and bank lending to nonbank financial firms decreased in the second quarter, as credit drawdowns in the first quarter were repaid quickly

The outstanding amount of bank loans to financial institutions operating outside the banking sector—such as finance companies, asset managers, securitization vehicles, and REITs—increased $113 billion (about 15 percent) in the first quarter of 2020, reflecting drawdowns of credit lines. The outstanding amount then declined $89 billion in the second quarter (about 10 percent) as nonbank financial institutions repaid the drawn amounts. Committed

lines of credit from large banks to nonbank financial firms, which include undrawn amounts, edged down slightly in the second quarter of 2020 but remained close to $1.5 trillion (figure 3-10).[14]

3-10. Large Bank Lending to Nonbank Financial Firms: Committed Amounts



Source: Federal Reserve Board, Form FR Y-14Q (Schedule H.1), Capital Assessments and Stress Testing.

[14] Data on this type of bank lending can be informative about the use of leverage by nonbanks and shed light on the credit exposures of banks to these institutions. The Federal Reserve is able to monitor the exposures of the largest U.S. banks to businesses more closely than in the past because those banks now report detailed information about their loan commitments on regulatory form FR Y-14Q. See Board of Governors of the Federal Reserve System (2020), "Report Forms: FR Y-14Q," webpage, https://www.federalreserve.gov/apps/reportforms/reportdetail.aspx?sOoYJ+5BzDZGWnsSjRJKDwRxOb5Kb1hL.

4. Funding Risk

The COVID-19 shock exposed vulnerabilities at nonbank financial firms that contributed to market turmoil and required the Federal Reserve to establish emergency facilities to restore the functioning of markets for short-term funding and corporate bonds

As of the second quarter of 2020, the total amount of liabilities most vulnerable to runs, including those of nonbanks, had increased 17.1 percent over the past year to $17.3 trillion (table 4). Banks rely only modestly on short-term wholesale funding and maintain large amounts of high-quality liquid assets, in part because of liquidity regulations and supervisory programs introduced after the 2007–09 financial crisis and the improved understanding and management by banks of their liquidity risks.[15]

Table 4. Size of Selected Instruments and Institutions

Item	Outstanding/ total assets (billions of dollars)	Growth, 2019:Q2–2020:Q2 (percent)	Average, annual growth, 1997–2020:Q2 (percent)
Total runnable money-like liabilities*	17,349	17.1	4.8
Uninsured deposits	6,229	28.9	11.7
Domestic money market funds**	4,635	44.8	6.3
Prime	762	13.8	.9
Government	3,743	56.2	16.0
Tax-exempt	130	–4.9	–1.3
Repurchase agreements	3,884	–1.9	5.5
Commercial paper	1,006	–7.7	2.3
Securities lending***	649	.1	7.4
Bond mutual funds	4,445	7.0	9.0

Note: The data extend through 2020:Q2. Growth rates are measured from Q2 of the year immediately preceding the period through Q2 of the final year of the period. Total runnable money-like liabilities exceeds the sum of listed components. Items not included in the table are variable-rate demand obligations (VRDOs), federal funds, funding-agreement-backed securities, private liquidity funds, offshore money market funds, and local government investment pools.

* Average annual growth is from 2003:Q2 to 2020:Q2.

** Average annual growth is from 2001:Q2 to 2020:Q2.

*** Average annual growth is from 2000:Q2 to 2020:Q2.

Source: Securities and Exchange Commission, Private Funds Statistics; iMoneyNet, Inc., Offshore Money Fund Analyzer; Bloomberg Finance L.P.; Securities Industry and Financial Markets Association: U.S. Municipal Variable-Rate Demand Obligation Update; Risk Management Association, Securities Lending Report; DTCC Solutions LLC, an affiliate of the Depository Trust & Clearing Corporation: commercial paper data; Federal Reserve Board staff calculations based on Investment Company Institute data; Federal Reserve Board, Statistical Release H.6, "Money Stock and Debt Measures" (M3 monetary aggregate); Federal Reserve Board, Statistical Release Z.1, "Financial Accounts of the United States"; Federal Financial Institutions Examination Council, Consolidated Reports of Condition and Income (Call Report); Morningstar, Inc., Morningstar Direct; Moody's Analytics, Inc., CreditView, Asset-Backed Commercial Paper Program Index.

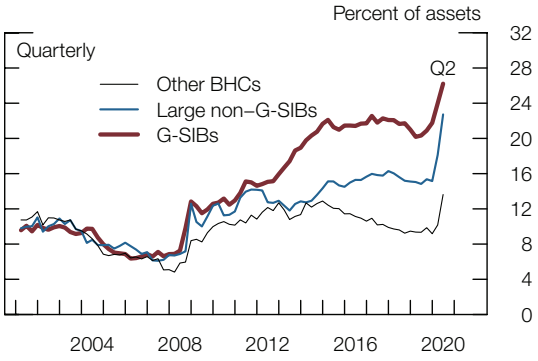
[15] The large increase in uninsured deposits shown in table 4 is mostly excluded from this definition of short-term wholesale funding.

As noted in previous *Financial Stability Report*s, the financial system's vulnerability to funding risks had increased because of the renewed growth in prime MMFs during 2018 and 2019 as well as the increase in corporate debt held by long-term mutual funds since 2008. These developments, discussed in more detail later in this section, contributed to considerable funding strains in March. These strains, in turn, prevented a range of employers from obtaining access to credit markets during a period when borrowing needs were particularly acute; in response, the Federal Reserve undertook several actions, including establishing emergency lending facilities and providing regulatory relief, to ensure the smooth functioning of various markets and to support the flow of credit to households and businesses. For more information, see the boxes "Federal Reserve Actions to Stabilize Short-Term Funding Markets during the COVID-19 Crisis" and "Federal Reserve Actions and Facilities to Support Households, Businesses, and Municipalities during the COVID-19 Crisis." Going forward, regulatory agencies, including the Federal Reserve, are exploring reforms that will address structural vulnerabilities in the nonbank financial institutions sector that have required emergency interventions during both the 2007–09 financial crisis and the COVID-19 crisis.

Banks continue to have high levels of liquid assets and stable funding

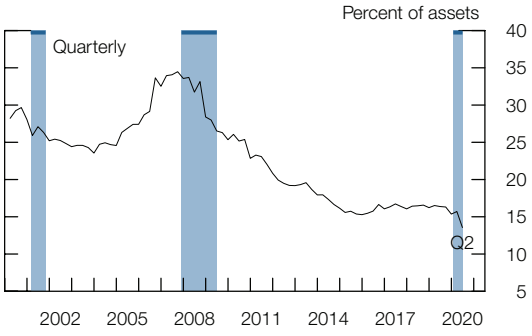
At most large banks, liquid asset positions increased substantially in the second quarter, reflecting an increase in reserves (figure 4-1). In addition, their liquidity ratios are well above regulatory requirements. At the onset of the pandemic, bank reliance on the most unstable sources of funding stood at historically low levels (figure 4-2). Strong capital and liquidity buffers enabled banks to accommodate drawdowns when businesses relied heavily on their lines of credit as the COVID-19 shock hit. Banks also managed liquidity pressures by increased borrowing from the discount window and Federal Home Loan Banks. In addition, banks experienced heavy deposit inflows, consistent with investors becoming more risk averse and credit-line borrowers depositing the proceeds from line draws taken as precautionary measures. Core deposits continued to increase across the banking system through September 2020.

4-1. Liquid Assets Held by Banks



Source: Federal Reserve Board, Form FR Y-9C, Consolidated Financial Statements for Holding Companies; Federal Financial Institutions Examination Council, Consolidated Reports of Condition and Income (Call Report).

4-2. Short-Term Wholesale Funding of Banks



Source: Federal Reserve Board, Form FR Y-9C, Consolidated Financial Statements for Holding Companies.

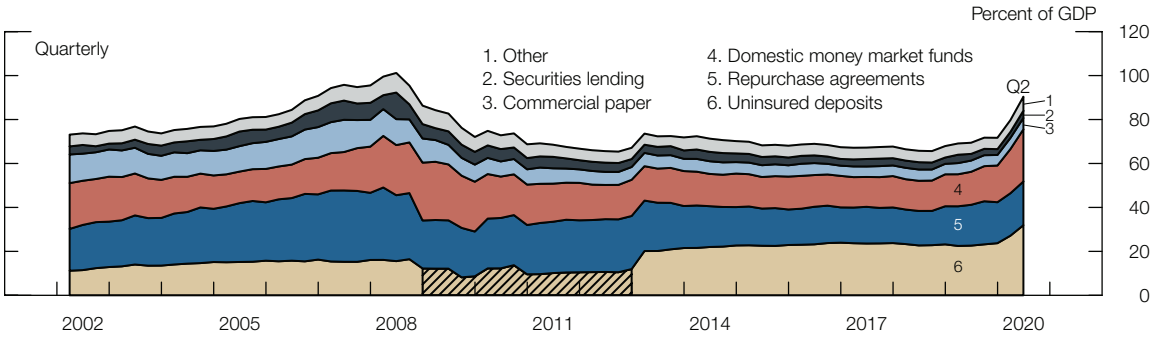
Funding strains on mortgage servicers eased after policy actions, but uncertainties remain

As discussed in the May *Financial Stability Report,* mortgage servicers are responsible for advancing payments on behalf of a borrower that requests forbearance under the CARES Act. This responsibility can cause strains for nonbank mortgage servicers because they do not have the kinds of strong capital and liquidity buffers that banks have built to weather shocks or access to the same sources of liquidity as banks. Instead, nonbanks have relied on their internal cash or, in some cases, fairly expensive private-market financing to fund these payments. Liquidity pressures on nonbank mortgage servicers eased in April, as Ginnie Mae established a facility to lend against advances of principal and interest (but not taxes and insurance) and the Federal Housing Finance Agency limited servicing advances up to four months. Mortgage servicer liquidity positions also benefited from an increase in refinancing activity through the second quarter. However, strains may emerge again if mortgage forbearance take-up increases substantially or the fiscal support provided to households under the CARES Act that enables them to continue to make mortgage payments is not extended.

Money markets have stabilized but would be vulnerable without the emergency facilities in place

Money-like liabilities that are prone to runs—an aggregate measure of private short-term debt that can be rapidly withdrawn in times of stress—increased substantially and stood at about 92 percent of GDP in the second quarter of 2020 (figure 4-3). The growth in runnable liabilities over the first half of 2020 was largely attributable to a surge in domestic MMFs and uninsured deposits.

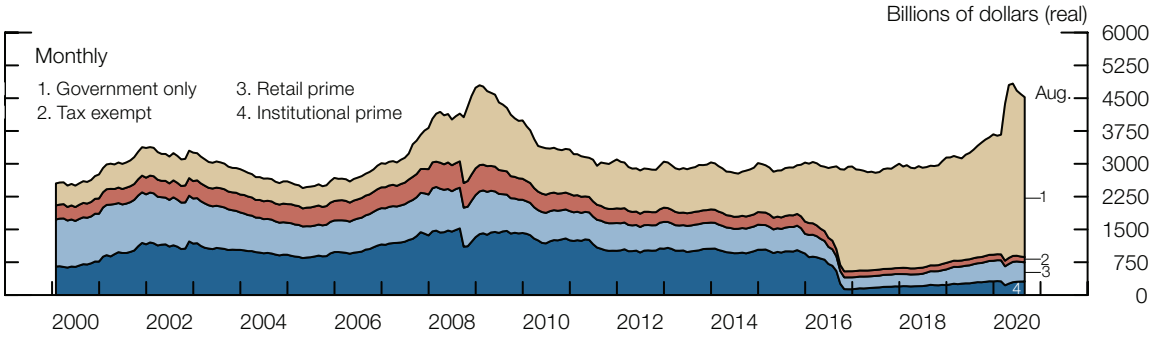
4-3. Runnable Money-Like Liabilities as a Share of GDP, by Instrument and Institution



Source: Securities and Exchange Commission, Private Funds Statistics; iMoneyNet, Inc., Offshore Money Fund Analyzer; Bloomberg Finance L.P.; Securities Industry and Financial Markets Association: U.S. Municipal Variable-Rate Demand Obligation Update; Risk Management Association, Securities Lending Report; DTCC Solutions LLC, an affiliate of the Depository Trust & Clearing Corporation: commercial paper data; Federal Reserve Board staff calculations based on Investment Company Institute data; Federal Reserve Board, Statistical Release H.6, "Money Stock and Debt Measures" (M3 monetary aggregate); Federal Reserve Board, Statistical Release Z.1, "Financial Accounts of the United States"; Federal Financial Institutions Examination Council, Consolidated Reports of Condition and Income (Call Report); Moody's Analytics, Inc., CreditView, ABCP Asset-Backed Commercial Paper Program Index; Bureau of Economic Analysis, gross domestic product via Haver Analytics.

Prime MMFs, particularly institutional funds, experienced runs in March, with outflows reaching the same proportion of assets redeemed during the run on MMFs in 2008. Heavy redemptions from these funds were prompted in part by investor concerns about the possibility of liquidity fees and redemption gates. Retail prime funds and tax-exempt funds also suffered heavy redemptions. As investors fled to safety, short-term funding markets became severely dislocated. Actions by the Federal Reserve were required to slow redemptions and restore the functioning of short-term funding markets (see the box "Federal Reserve Actions to Stabilize Short-Term Funding Markets during the COVID-19 Crisis"). Assets under management at prime MMFs regained most of the decrease in late March and remained stable from May through August 2020 (figure 4-4).

4-4. Domestic Money Market Fund Assets



Source: Federal Reserve Board staff calculations based on Investment Company Institute data; Bureau of Labor Statistics, consumer price index via Haver Analytics.

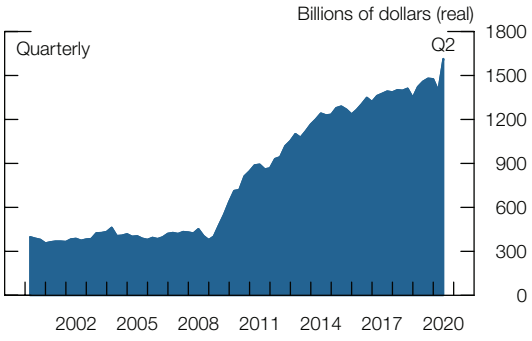
Emergency measures undertaken by the Federal Reserve with the support of the Treasury have temporarily lowered the risk of adverse events associated with vulnerabilities in the nonbank sector in the near term, but remaining vulnerabilities call for structural fixes in the longer term. In addition, other cash-management vehicles similar to institutional prime funds, such as dollar-denominated offshore funds and short-term investment funds, do not directly benefit from the backstop provided by the MMLF. Between $400 billion and $1 trillion of these vehicles' assets under management closely mirror institutional U.S. prime funds, and heavy redemptions may destabilize short-term funding markets even in the presence of the MMLF. Depressed asset prices due to fire sales could lead to mark-to-market losses for other investors, including U.S. prime funds.

Outflows from long-term mutual funds that hold less liquid assets have mostly reversed, but the redemption waves had run-like characteristics that highlighted significant structural vulnerabilities in the sector

U.S. corporate bonds held by mutual funds increased substantially in the second quarter of 2020 and reached $1.7 trillion after contracting in the first quarter (figure 4-5). Mutual

funds are estimated to hold about one-sixth of outstanding corporate bonds. These open-end mutual funds engage in liquidity transformation by offering daily redemptions to investors, notwithstanding the liquidity profile of a fund's underlying assets. Funds investing substantially in corporate bonds and bank loans may be particularly exposed to liquidity transformation risks given the relative illiquidity of such assets.

4-5. U.S. Corporate Bonds Held by Mutual Funds

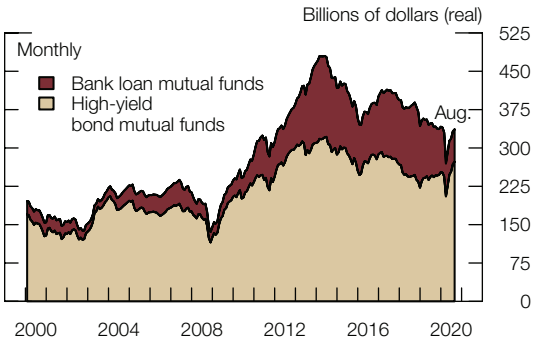


Source: Federal Reserve Board staff estimates based on Federal Reserve Board, Statistical Release Z.1, "Financial Accounts of the United States"; Bureau of Labor Statistics, consumer price index via Haver Analytics.

The record outflows from fixed-income mutual funds in March caused considerable strains for the affected funds, and their forced sales contributed to a deterioration in liquidity in fixed-income markets. The magnitude of investor redemptions was unprecedented, and heavy redemptions occurred among a wide range of funds, including investment-grade corporate bond funds and municipal bond funds. There were no reports of mutual funds failing to meet investor redemptions, but funds were forced to sell assets under worsening market conditions, further draining liquidity from corporate bond markets.

The announcement of a number of emergency lending facilities, including those designed to support corporate borrowing, improved bond market liquidity significantly and eased strains faced by mutual funds. Investment-grade and high-yield bond funds received inflows since May, and assets under management now exceed their pre-pandemic levels (figure 4-6). Bank loan mutual funds, which faced record redemptions in March, subsequently had more modest outflows through August (figure 4-7). Their total assets under management have decreased about 25 percent since February and stood at $64 billion in August.

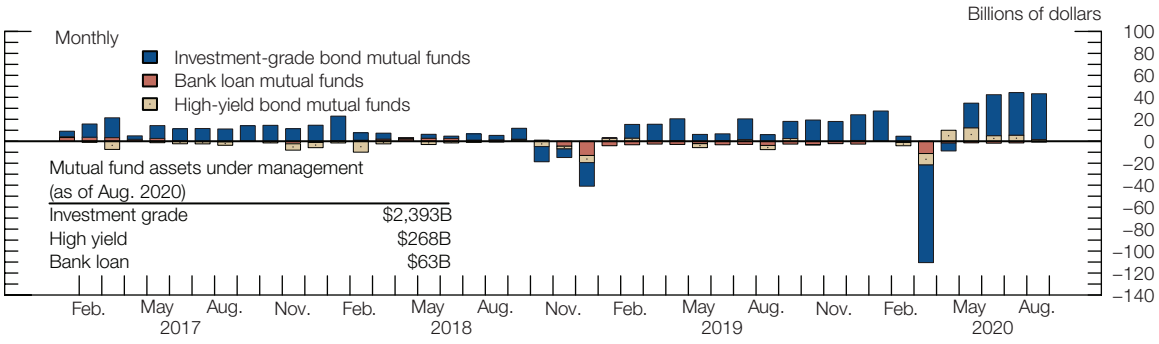
4-6. Bank Loan and High-Yield Bond Mutual Fund Assets



Source: Investment Company Institute; Bureau of Labor Statistics, consumer price index via Haver Analytics.

The fire-sale dynamics in March associated with open-end mutual funds concentrated in fixed-income assets demonstrated the severity of structural vulnerabilities highlighted in previous *Financial Stability Report*s. By providing a backstop in the corporate bond market, the emergency lending facilities significantly alleviated the stress of large outflows faced by investment-grade corporate bond funds, and the backstop's effect has also flowed through to high-yield bond funds and bank loan funds. Even so, the March turbulence demonstrated

4-7. Mutual Fund Net Flows



Source: Investment Company Institute.

that fixed-income mutual funds continue to be vulnerable to large, sudden redemptions, and sizable outflows can still lead to a deterioration in market liquidity of underlying assets. This structural vulnerability may call for structural reforms.

Central counterparties continue to manage risks amid elevated volatility

Meanwhile, driven largely by increased clearing of over-the-counter derivatives, central counterparties (CCPs) intermediate a larger share of transactions across more markets than at the time of the 2007–09 financial crisis. CCPs have supported market functioning throughout the pandemic, effectively managing the increased risks posed by elevated volatility and mitigating counterparty risks. However, the volatile environment continues to imply heightened tail risks for clearinghouses and their members. Further market stresses, as well as resulting increases in cash and collateral requirements by CCPs, could increase liquidity pressures on market participants, potentially even beyond the heightened pressures met during the acute phase of the COVID-19 shock.

Collateralized loan obligation fundamentals have improved in recent months but are still weak compared with pre-pandemic levels

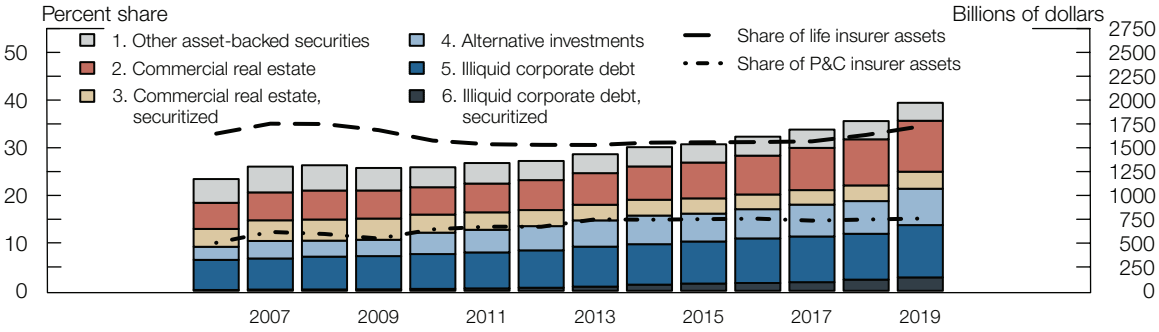
CLO issuance declined about 33 percent through September 2020 compared with the same period in 2019. These securities fund more than 50 percent of outstanding institutional leveraged loans—loans that have been under significant price pressures, as previously discussed. Unlike open-end mutual funds, CLOs do not generally permit early redemptions or rely on funding that must be rolled over before the underlying assets mature. As a result, CLOs avoid the run risk associated with a rapid reversal in investor sentiment. Overall, CLO fundamentals have improved in recent months but are still weak compared with pre-pandemic levels, and some risks remain. For example, the surge in underlying loan downgrades and defaults led to a spike in the number of CLOs that failed collateral tests in recent months. Managers of CLOs that failed overcollateralization tests typically attempted to cure those failures by selling risky collateral. To the extent that CLO managers fail to remedy impairments in junior CLO tranches, the resulting downgrades of those tranches may force some CLO

investors, including leveraged funds, to sell their CLO holdings. Such sales have the potential to put pressure on the prices of junior CLO tranches.

Liquidity risks at life insurers are at post-2008 highs and have been increasing

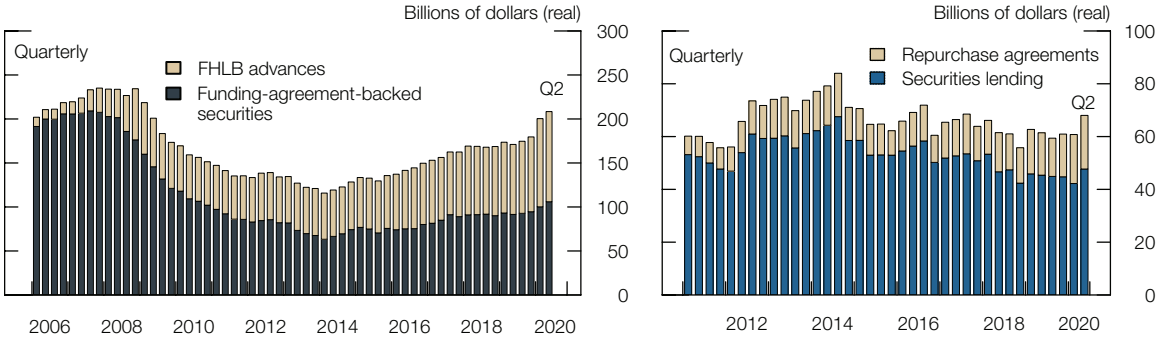
Over the past decade, life insurers have widened the gap between the liquidity of their assets and the liquidity of their liabilities, potentially making it harder for them to meet sudden claims. Life insurers have been increasing the share of illiquid, risky assets on their balance sheets. These assets—including CRE loans, less liquid corporate debt, and alternative investments—edged up to 35 percent of general account assets, the same level as just before the 2007–09 financial crisis (figure 4-8). Meanwhile, the share of liquid liabilities remains above its level during the financial crisis, in part because of increasing nontraditional liabilities (figure 4-9).

4-8. Less Liquid General Account Assets Held by U.S. Insurers



Source: Staff estimates based on data from Bloomberg Finance L.P. and NAIC Annual Statutory Filings.

4-9. Nontraditional Liabilities of U.S. Life Insurers, by Liability Type



Source: Bureau of Labor Statistics, consumer price index via Haver Analytics; Moody's Analytics, Inc., CreditView, Asset-Backed Commercial Paper Program Index; Securities and Exchange Commission, Forms 10-Q and 10-K; National Association of Insurance Commissioners, quarterly and annual statutory filings accessed via the S&P Global Market Intelligence platform; Bloomberg Finance L.P.

LIBOR Transition Update

Recognizing the potential instability in LIBOR (London interbank offered rate) and other similar interbank offered rates (IBORs), the Group of Twenty asked the Financial Stability Board's (FSB) Official Sector Steering Group in 2012 to identify more robust potential alternative rates, while seeking to strengthen the existing IBORs to the extent possible. Although LIBOR has undergone substantial reforms since that time, most panel banks are forced to base their submissions on expert judgment because their reliance on the type of wholesale unsecured funding that LIBOR is meant to represent has declined significantly. In 2017, after some banks had started leaving IBOR panels, the LIBOR regulator, the U.K. Financial Conduct Authority (FCA), brokered a voluntary agreement with the remaining panel banks to continue their participation through the end of 2021. The FCA has warned that market participants should prepare for the possibility that LIBOR will end at that time or thereafter. The FSB has stated that the LIBOR transition remains a priority even during the COVID-19 crisis.

Overview

The pace of preparation for the cessation of LIBOR publication has picked up in recent months. Changes to infrastructure are now in place or expected to be ready soon. Although disruptions from COVID-19 caused many firms to slow some transition activities temporarily, a recent survey of financial institutions by Moody's indicates that most surveyed firms believe they are on track in their preparations for LIBOR cessation.[1] However, LIBOR use remains predominant despite continued warnings from the official sector that participants should prepare for the risk that it will cease to be published after the end of 2021, and critical work is still needed to ensure that LIBOR cessation does not cause significant financial market disruptions.

The Alternative Reference Rates Committee (ARRC) released *Best Practices for Completing the Transition from LIBOR* in May.[2] The document provides guiding steps and timelines for a smooth transition from LIBOR for floating-rate notes, business loans, consumer loans, securitizations, and derivatives, including recommendations that no new LIBOR floating-rate debt be issued after 2020 and no new LIBOR loans be issued after June 2021. While LIBOR-submitting banks have made a commitment to providing rates through the end of 2021, many of the steps necessary for a smooth transition need to occur much sooner.

Two important milestones in the derivatives market have been reached recently. First, on October 16, 2020, the two main interest rate derivatives clearinghouses (CME and LCH) switched from discounting cleared U.S. dollar swaps using the federal funds rate to using the Secured Overnight Financing Rate (SOFR). The switch has been associated with increased SOFR-based trading activity as market participants seek to hedge discounting exposures. Second, the International Swaps and Derivatives Association (ISDA) supplemented its protocol for derivatives contracts to facilitate the use of risk-free reference rates upon the cessation or nonrepresentativeness of LIBOR. The ISDA protocol has been promoted as the most efficient way for derivatives market participants to mitigate the risks associated with LIBOR discontinuation. These two events will solidify the transition away from LIBOR for derivatives.

(continued)

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[1] See Moody's Investors Service (2020), *IBOR Phaseout 15 Months Away, but Hurdles Could Stretch beyond Finish Line*, sector in-depth report (New York: Moody's, September 22).

[2] See Alternative Reference Rates Committee (2020), "ARRC Announces Best Practices for Completing Transition from LIBOR—Provides Date-Based Guidance, Including When No New LIBOR Activity Should Be Conducted," press release, May 27, https://www.newyorkfed.org/medialibrary/Microsites/arrc/files/2020/ARRC_Press_Release_Best_Practices.pdf.

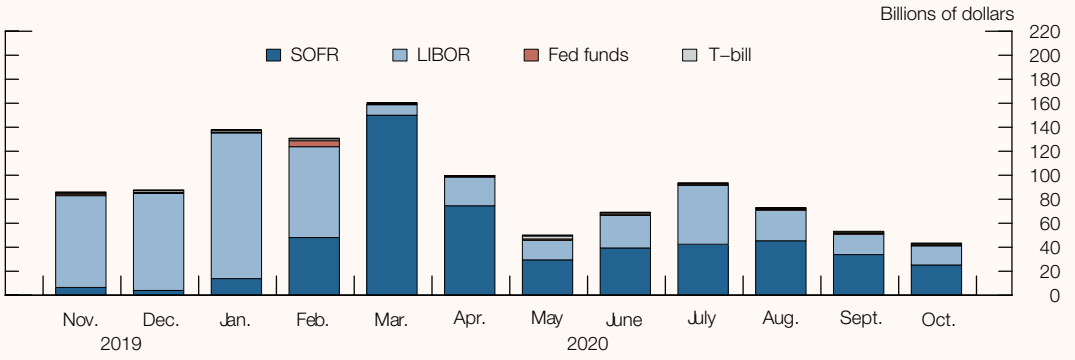
Official-sector actions

Efforts by the U.S. official sector have removed potential impediments to the transition away from LIBOR. Swap margin rules have been amended to permit swaps entered into before an applicable compliance date to retain their legacy status if they are modified to replace LIBOR. Similarly, the Financial Accounting Standards Board provided optional expedients and exceptions for applying generally accepted accounting principles to contract modifications and hedging relationships that reference LIBOR, and the U.S. Department of the Treasury is nearing similar measures in its final rules for tax relief. Consumer-oriented agencies such as the Consumer Financial Protection Bureau (CFPB) and the U.S. Department of Housing and Urban Development have proposed regulatory amendments to facilitate the transition. The CFPB has also updated its consumer handbook for adjustable-rate mortgages (ARMs) to provide guidance to consumers about reference rates.

Issuance and trading activity

Issuance and trading of SOFR-referencing instruments have grown but remain clearly lower than activity referencing LIBOR, although GSEs have been successfully moving to issuance of SOFR-based products. Issuance in the floating-rate note market, in which GSEs have a large presence, was mostly SOFR based in the first half of 2020 (figure A). Fannie Mae and Freddie Mac are accepting SOFR-referenced ARMs and have announced that they will no longer accept LIBOR-referenced ARMs after 2020; Ginnie Mae has announced similar restrictions that will be enacted in early 2021. Loan issuance remains mostly LIBOR based, although inclusion of fallback language is growing.

Figure A. Floating-Rate Notes Issuance, by Reference Rate



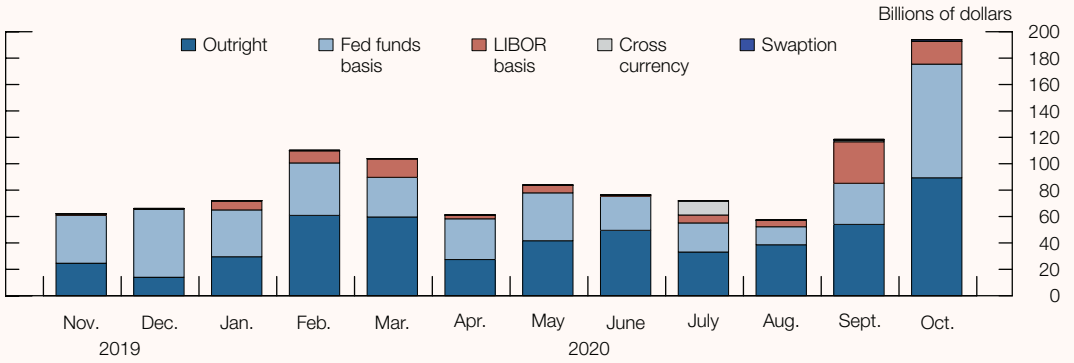
Source: Bloomberg.

The trading volume of SOFR derivatives reached a high point in March 2020, as interest rate volatility led to increased derivatives market activity (figures B and C). Since then, the reduction in policy rates and the high degree of certainty that interest rates will stay near zero have contributed to less trading of all types of short-term interest rate derivatives, including SOFR derivatives. Derivatives trading in SOFR-based products increased in October with the switch to SOFR discounting. Market participants appear to be prepared for this switch: Awareness is high, trading systems have been updated, and SOFR trading volumes as a share of total volumes have been growing in the swaps and futures markets, albeit slowly.

(continued on next page)

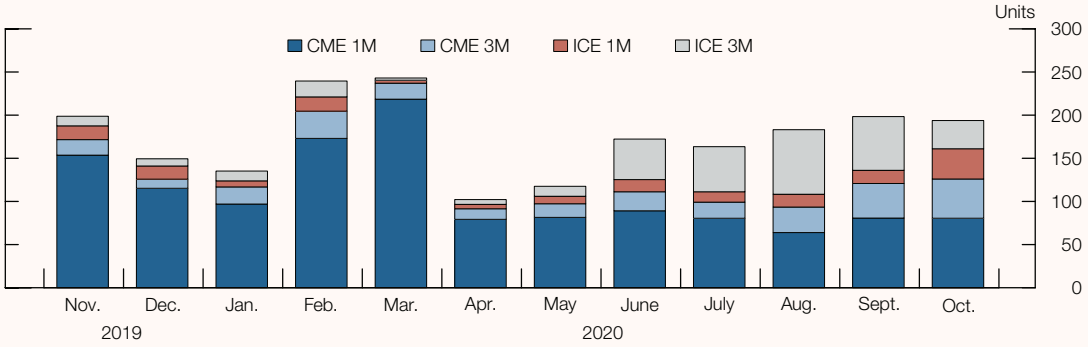
LIBOR Transition Update *(continued)*

Figure B. Monthly SOFR Swap Volumes



Source: Bloomberg Finance L.P., Bloomberg Valuation Service (BVAL); Federal Reserve Bank of New York staff calculations.

Figure C. Average Daily Notional SOFR Futures



Source: CME and ICE via Bloomberg.

Legacy contracts

The ARRC has had recommended fallback language for new LIBOR issuances in the most commonly used products in place for some time. Use of the ARRC recommendations, or similar language, has been prevalent in floating-rate debt issuance for more than a year and in most syndicated loans. For contracts that either do not address a permanent end to LIBOR or have ambiguous fallback language, interest payment uncertainty could lead to complex problems for parties or courts to sort out and create uncertainty in financial markets. Many financial products and agreements that reference LIBOR are governed by New York law. As a result, the ARRC has proposed New York State legislation that would substitute the recommended benchmark replacement in legacy contracts where the contract language is silent or the fallback provisions prescribe LIBOR use.

Near-Term Risks to the Financial System

The course of the pandemic and the ultimate extent and duration of the resulting economic and financial consequences remain one of the most significant risks to the financial system. The realization of this risk continues to depend largely on the success of public health measures and other government actions to contain the spread of COVID-19, on the steps households and businesses take to resume economic activity, and on the duration of the government lending and relief programs that have, so far, ameliorated the most adverse potential economic outcomes.

The Federal Reserve routinely engages in discussions with domestic and international policymakers, academics, community groups, and others to gauge the set of risks of particular concern to these groups. As noted in the box "Salient Shocks to Financial Stability Cited in Market Outreach," contacts were mostly focused on the risks associated with the evolution of the pandemic and the policy support to contain its effects as well as on the uncertainties related to the elections in November. The following analysis considers possible interactions of existing vulnerabilities with four broad categories of risk, some of which were also raised in these discussions: a prolonged slowdown in U.S. economic growth, disruptions in dollar funding markets, risks emanating from Europe, and risks originating in China and other EMEs.

The effects of the pandemic have increased the vulnerabilities of the financial system to future shocks, including additional waves of substantial COVID-19 outbreaks

Most forecasters expect a moderate recovery in economic output in the United States and abroad following a global recession, but uncertainty surrounding this outcome is unusually high. The sharp slowdown in economic activity has disproportionately affected some businesses and households, and a further weakening in the balance sheets of those that are especially vulnerable could affect the financial system. Furthermore, monetary and fiscal policy tools have limited ability to moderate some dimensions of what is fundamentally a public health shock.

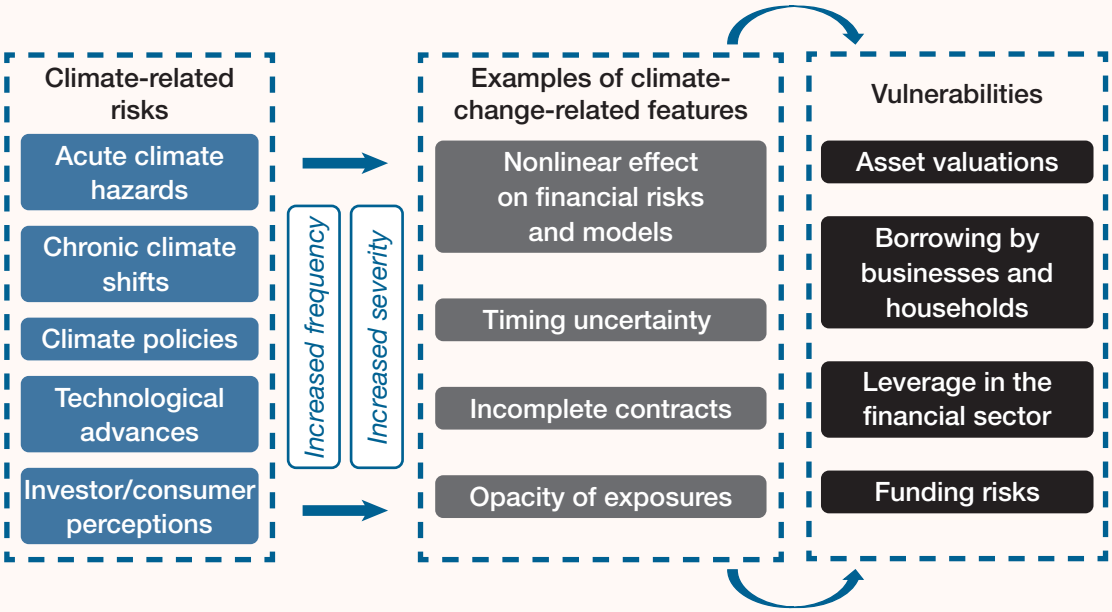
If the pandemic persists for longer than anticipated—especially if there are extended delays in the production or distribution of a successful vaccine—downward pressure on the U.S. economy could derail the nascent recovery and strain financial markets and financial institutions, particularly if many businesses are shuttered again and many workers are laid off and left without a normal income for a long period. If that were the case, a number of the vulnerabilities identified in this report could grow further, making them more likely to amplify negative shocks to the economy. Investor risk appetite and asset prices have increased in recent months but could suffer significant declines should the pandemic take an unexpected course or the economic recovery prove less sustainable. Given the generally high level of leverage in the nonfinancial business sector, prolonged weak profits could trigger financial stress and defaults. In addition, a protracted slowdown could further harm the finances of even high-credit-score households, which could lead to defaults and place financial pressure on banks

The Implications of Climate Change for Financial Stability

Climate change refers to the trend toward higher average global temperatures and accompanying environmental shifts such as rising sea levels and more severe weather events. Climate change adds a layer of economic uncertainty and risk that we have only begun to incorporate into our analysis of financial stability. Different sectors of the economy and geographic regions face different risks that will diverge from historical patterns. In this discussion, we focus on how climate change, which increases the likelihood of dislocations and disruptions in the economy, is likely to increase financial shocks and financial system vulnerabilities that could further amplify these shocks.

These climate risks are present over various horizons. The figure illustrates how these risks become financial stability risks. Acute hazards, such as storms, floods, droughts, or wildfires, can quickly alter, or reveal new information about, future economic conditions or the value of real or financial assets. Moreover, in the presence of rapid shifts in public perceptions of risk, chronic hazards (like a slow rise in sea levels) have the potential to produce similar abrupt repricing events. These repricing events and direct losses associated with climate hazards can result in an increased frequency and severity of financial shocks; the timing and repercussions of these shocks are difficult to predict in advance.

Possible Transmission from Climate-Related Risks to Financial System Vulnerabilities



Source: Federal Reserve Board staff.

Features of climate change can also increase financial system vulnerabilities, as illustrated in the figure. Opacity of exposures and heterogeneous beliefs of market participants about exposures to climate risks can lead to mispricing of assets and the risk of downward price shocks. Similarly, uncertainty about the timing and intensity of severe weather events and disasters, as well as the poorly understood relationships between these events and economic outcomes, could lead to abrupt repricing of assets. Climate risks thus create new vulnerabilities associated with nonfinancial and financial lever-

(continued)

age. In regions affected by severe events, households and businesses could become overlevered if the value of their assets or income prospects become impaired. Levered financial institutions may be exposed to losses from disasters made more likely by climate change that are not accurately reflected in current financial models; for example, financial models may lack sufficient geographical granularity to accurately connect local physical damages to financial exposures. The financial system is also vulnerable to amplification effects of these damages if contracts are incomplete and do not capture all damages and if poorly understood financial exposures cause spillover effects or financial contagion.

One example of how climate change is likely to increase financial stability risks is through real estate exposures. Some residential and commercial properties will be subject to acute hazards such as storm surges associated with rising sea levels and more intense and frequent hurricanes. Continued productive use of these properties would require investment and adaptation. As inundations or storm surges become more frequent, the expected value of exposed real estate may decrease, which may in turn pose risks to real estate loans, mortgage-backed securities, the holders of these loans and securities, and the profitability of nonfinancial firms using such properties.

With perfect information, the price of real-estate-linked assets and the valuations of claims linked to such assets—held by banks, insurers, investment funds, and nonfinancial firms—would already reflect these climate-related risks. However, given the uncertain timing and severity of future climate-related flooding and the associated opacity of asset exposures, investors in real-estate-linked assets may react abruptly to new information about a region's exposure to climate-related financial risks. A sharp repricing, in turn, could create incentives to fire sale such assets by leveraged financial and nonfinancial firms. These asset valuation changes would be amplified by financial and nonfinancial leverage, funding risks, and interconnections across holders of the collateral-based assets, thereby creating risks to financial stability.

Several policies or other factors could moderate climate-related financial vulnerabilities or the likelihood of large shocks. Within the financial system, increased transparency through improved measurement and disclosure could improve the pricing of climate risks, such as an increase in the frequency and severity of extreme weather events, thereby reducing the probability of sudden changes in asset prices. Continued research into the interconnections between the climate, the economy, and the financial sector could strengthen knowledge of transmission, clarify linkages and exposures, and facilitate more efficient pricing of risk. Outside the financial system, efforts to mitigate or adapt to the physical effects of climate change through technological advances and policy changes could also reduce climate risks in the long run.

Staff members throughout the Federal Reserve System continue to research the relationships among climate risks and economic and financial risks and, ultimately, to better identify the transmission channels through which climate risks could affect the financial sector. This work is conducted in close consultation with other U.S. agencies and international groups in an effort to strengthen the knowledge and understanding of this growing economic and financial stability issue.

The Federal Reserve is evaluating and investing in ways to deepen its understanding of the full scope of implications of climate change for markets, financial exposures, and interconnections between markets and financial institutions. It will monitor and assess the financial system for vulnerabilities related to climate change through its financial stability framework. Moreover, Federal Reserve supervisors expect banks to have systems in place that appropriately identify, measure, control, and monitor all of their material risks, which for many banks are likely to extend to climate risks.

and other lenders. Broader solvency issues could impair the ability of some financial institutions to lend or induce increased asset sales and redemptions of withdrawable liabilities.

Although leverage remains at modest levels at banks, broker-dealers, and other financial institutions, the leverage of some nonbank financial institutions, such as life insurance companies and hedge funds, is high, exposing them to risks stemming from sharp drops in asset prices and funding illiquidity risks. Furthermore, prime MMFs and fixed-income mutual funds remain vulnerable to funding strains and sudden redemptions, as demonstrated during the acute period of extreme market volatility and deteriorating asset prices earlier this year. While government support has lowered the risk of adverse events associated with vulnerabilities in the nonbank sector, this sector would be vulnerable to funding risk should the government support be withdrawn.

Disruptions in global dollar funding markets remain an important source of risk

As was highlighted by the period of acute financial stress in March, disruptions in global dollar funding markets are also an important risk to the U.S. financial system. In many advanced foreign economies and EMEs, the reliance of banks and nonbank financial institutions on short-term dollar funding markets, including through off-balance-sheet instruments such as FX swaps, remains a vulnerability.[16] Disruptions in offshore dollar funding markets can adversely affect these foreign financial institutions, which may reduce lending to U.S. residents and liquidate holdings of U.S. assets in order to obtain dollars, harming U.S. households and businesses. These risks are mitigated, however, by the Federal Reserve dollar swap lines with other central banks and the FIMA Repo Facility.[17]

Stresses emanating from Europe also pose risks to the United States because of strong transmission channels . . .

European financial institutions and businesses play an important role in global financial intermediation and have notable financial and economic linkages with the United States. Faced with the largest decline in economic activity in postwar history due to the COVID-19 pandemic, European authorities have used fiscal support, accommodative monetary policy, and bank regulatory and supervisory measures to mitigate the effect of the pandemic on households and businesses. However, if a material worsening of the pandemic suppresses economic activity more than expected, continued regulatory forbearance and further expansionary policies may lead to concerns about debt sustainability in some countries. If debt sustainability were to markedly deteriorate in some of the highly indebted European sovereigns and corporates, stresses could materialize in debt markets and credit losses could be

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[16] FX swaps are widely used by market participants to borrow dollars for fixed periods of time—for instance, to fund purchases of U.S. securities. In such a transaction, a participant exchanges foreign currency for U.S. dollars at the current exchange rate while contracting at the same time to reverse the transaction at a future date at an agreed-upon exchange rate (the "forward" rate). In effect, such an FX swap is a dollar loan collateralized with foreign currency.

[17] For more information, see the box "Federal Reserve Tools to Lessen Strains in Global Dollar Funding Markets" in Board of Governors of the Federal Reserve System (2020), *Financial Stability Report* (Washington: Board of Governors, May), pp. 16–18, https://www.federalreserve.gov/publications/files/financial-stability-report-20200515.pdf.

realized in certain European financial institutions. Stresses in Europe could, in turn, affect the U.S. economy and the financial system through a further deterioration in risk appetite and losses due to direct and indirect credit exposures.

In addition to the risks related to COVID-19, the possibility of a no-trade-deal Brexit continues to pose risks to the European and U.S. financial systems. Although the United Kingdom formally left the European Union (EU) in January, it remains under the EU's trade rules and financial regulations until the end of this year. The failure to reach a final trade agreement could lead to supply chain disruptions in Europe, aggravate negative effects of COVID-19 to the real economy, and increase losses at U.K. financial institutions. Accordingly, a no-trade-deal Brexit could lead to strains in global financial markets, resulting in a tightening of U.S. financial conditions.

. . . and adverse developments in emerging market economies with vulnerable financial systems could spill over to the United States

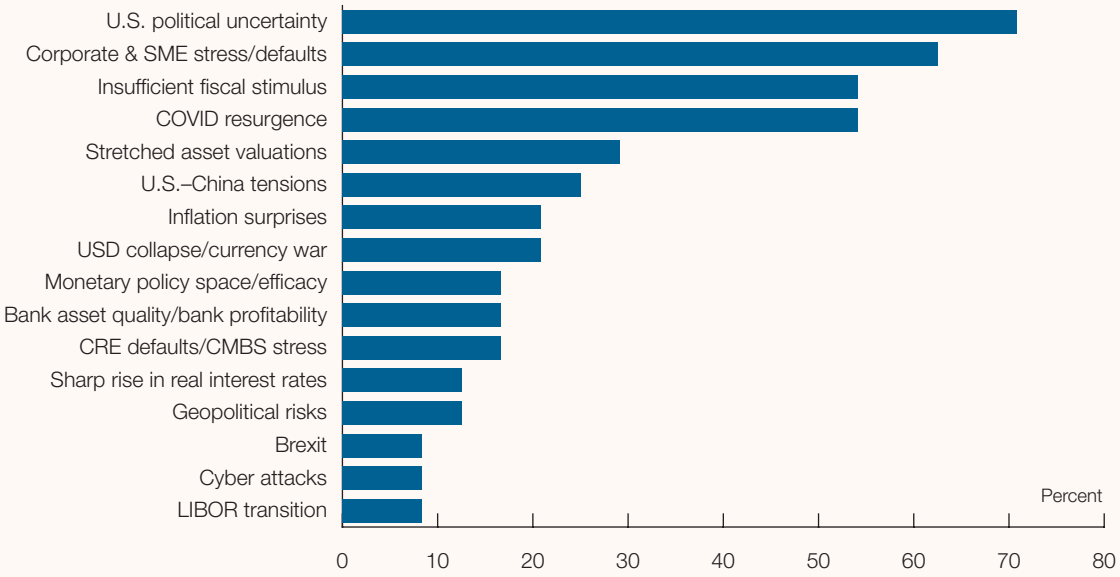
China entered the pandemic with elevated corporate and local government debt, high financial-sector leverage, and stretched real estate prices. After an acute downturn, real activity in China has rebounded more sharply than in other countries in part because China was able to contain the spread of the virus more quickly. Although policy continues to support the broader economy, authorities have continued to introduce measures to tamp down on speculation in real estate markets. A sudden price correction in domestic property markets, along with weakened global demand from abroad due to a resurgence of COVID-19, could put pressure on certain firms, particularly Chinese property developers, which are already highly indebted. This development, in turn, could substantially stress the vulnerable financial sector and local governments. This situation, along with heightened trade tensions, could further strain global financial markets and disrupt regional supply chains and exports to and from China. Moreover, a reduction in risk appetite, aggravated by other geopolitical risks, could negatively affect the United States, given the size of China's economy and financial system, and its extensive trade linkages with the rest of the world.

Widespread stresses in EMEs have abated somewhat, in no small part because of an improvement in global financial conditions, but faltering economic growth, both within EMEs and elsewhere, could lead to a reemergence of financial strains in EMEs, with nontrivial repercussions for the United States. In particular, EMEs with vulnerable financial systems could see another wave of capital outflows because of a drop in global risk appetite or an escalation of problems in their banking systems. Under these circumstances, authorities may find it difficult to curb the possible amplification of financial stresses because of limited fiscal capacity. For oil exporters, these dynamics could be exacerbated if oil prices fall precipitously because of weak demand or a marked increase in the supply of oil. Further dollar appreciation due to widespread stresses in EMEs could potentially put additional strains both on EME firms with currency mismatches and on U.S. firms that rely on exports and supply chains for their business operations. Some U.S. financial institutions may be directly affected by their exposures to these U.S. firms, in addition to the stressed EME firms and sovereigns themselves.

Salient Shocks to Financial Stability Cited in Market Outreach

As part of its market intelligence gathering for this report, the Federal Reserve staff solicited views from a wide range of contacts on risks to U.S. financial stability. From early September to mid-October, the staff surveyed 24 contacts at banks, investment firms, academic institutions, and political consultancies. As shown in the figure, respondents frequently cited concerns about U.S. political uncertainty as well as the risk of a COVID-19 resurgence generating renewed restrictions. Relatedly, a large share of respondents highlighted uncertainty surrounding the likelihood and efficacy of a policy response to economic weakness as well as concerns over the potential for increased insolvencies among nonfinancial corporates and small businesses.

Most Cited Potential Shocks over Next 12 to 18 Months



Source: Federal Reserve Bank of New York survey of 24 market contacts from early September to mid-October.

U.S. political uncertainty

A significant share of respondents pointed to U.S. political uncertainty as a major source of risk. Many contacts highlighted the prospect that a contested presidential election or delayed election result could amplify investor uncertainty, and some pointed to increased market-implied volatilities covering the election as signaling a relatively high degree of uncertainty over the path of asset prices.

COVID-19 resurgence

Contacts were also focused on the risk that a large COVID-19 wave in the fall and winter could lead to new lockdown measures, inhibiting the recovery or causing another downturn. Several highlighted related concerns regarding the risk of delays, or failures, in developing and deploying a vaccine, and a few noted that market prices reflected excessive optimism in the timing of a vaccine and the ability to avoid new restrictions.

(continued)

Policy fatigue or limits

A related concern was that recurring outbreaks would fail to galvanize a fiscal and monetary response as forceful or effective as during the initial outbreak. A number of contacts worried that a deepening political divide could delay timing or reduce the size of additional fiscal stimulus. Moreover, with policy rates near zero, several respondents identified risks surrounding the limits and efficacy of monetary policy stimulus in the event that the recovery stalls or reverses.

Increases in business defaults

Market participants noted the risk of sharply rising default rates among nonfinancial corporates and small businesses, especially if the pandemic is prolonged or containment measures are reinstated. Contacts referenced the elevated levels of leverage in the corporate sector and expressed concern regarding the long-run effects of the virus on business models and consumer behavior. Several respondents noted that rising defaults could weaken bank asset quality and underpin a sharp retrenchment in credit to businesses.

Figure Notes

Box: Federal Reserve Actions and Facilities to Support Households, Businesses, and Municipalities during the COVID-19 Crisis

Figure A

The shaded area with a top cap represents an expanded window focusing on the period from February 17 onward. The triple-B reflects the effective yield of the ICE Bank of America Merrill Lynch triple-B U.S. Corporate Index (C0A4), and the high yield reflects the effective yield of the ICE BofAML U.S. High Yield Index (H0A0). Treasury yields from smoothed yield curve are estimated from off-the-run securities. Spreads over 10-year Treasury yield. PMCCF is the Primary Market Corporate Credit Facility, and SMCCF is the Secondary Market Corporate Credit Facility.

Figure C

Spreads on municipal bonds are relative to comparable-maturity Treasury yields.

Figure E

Key identifies bars in order from bottom to top.

Figure F

TALF is the Term Asset-Backed Securities Loan Facility. Spreads are to the swap rate for credit card and auto asset-backed securities (ABS) and to 3-month LIBOR (London interbank offered rate) for student loans. FFELP is Federal Family Education Loan Program.

Box: Federal Reserve Actions to Stabilize Short-Term Funding Markets during the COVID-19 Crisis

Figure A

Indicative bid-ask spreads for 10-year Treasury note. The bid-ask spread for a security is the difference between the bid price and the ask price, where the "bid" is the price to buy a security and the "ask" is the price to sell it. On March 15, the Federal Open Market Committee announced an increase of its holdings of Treasury securities by at least $500 billion and its holdings of agency mortgage-backed securities by at least $200 billion. On March 23, the Federal Reserve announced it would continue to purchase Treasury securities and agency mortgage-backed securities in the amounts needed to support smooth market functioning and effective transmission of monetary policy to broader financial conditions. UST is U.S. Treasury securities.

Figure B

All spreads are to overnight index swaps of the same tenor. CP is commercial paper and CPFF is the Commercial Paper Funding Facility. MMLF is the Money Market Mutual Fund Liquidity Facility. MMLF operations began on March 23. On the same day, the Federal Reserve announced that the MMLF would be expanded to include negotiable certificates of deposit and variable-rate demand notes. CPFF operations began on April 14. Neither DTCC Solutions LLC nor any of its affiliates shall be responsible for any errors or

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Figure C
PDCF is Primary Dealer Credit Facility. MMLF is the Money Market Mutual Fund Liquidity Facility. CPFF is the Commercial Paper Funding Facility.

Figure 1-1
The 2- and 10-year Treasury rates are the constant-maturity yields based on the most actively traded securities.

Figure 1-2
Term premiums are estimated from a three-factor term structure model using Treasury yields and Blue Chip interest rate forecasts.

Figure 1-3
Implied volatility on 10-year swap rate, 1 month ahead, derived from swaptions.

Figure 1-4
Market depth is defined as the average top three bid and ask quote sizes for on-the-run Treasury securities.

Figure 1-5
The triple-B series reflects the effective yield of the ICE Bank of America Merrill Lynch triple-B U.S. Corporate Index (C0A4), and the high-yield series reflects the effective yield of the ICE BofAML U.S. High Yield Index (H0A0).

Figure 1-6
The triple-B series reflects the options-adjusted spread of the ICE Bank of America Merrill Lynch triple-B U.S. Corporate Index (C0A4), and the high-yield series reflects the options-adjusted spread of the ICE BofAML U.S. High Yield Index (H0A0).

Figure 1-8
The data show secondary-market discounted spreads to maturity. Spreads are the constant spread used to equate discounted loan cash flows to the current market price.

Figure 1-9
Aggregate forward price-to-earnings ratio of S&P 500 firms. Based on expected earnings for 12 months ahead.

Figure 1-10
Aggregate forward earnings-to-price ratio of S&P 500 firms. Based on expected earnings for 12 months ahead. Real Treasury yields are calculated from the 10-year consumer price index inflation forecast and the smoothed nominal yield curve estimated from off-the-run securities.

Figure 1-11
Realized volatility estimated from 5-minute returns using an exponentially weighted moving average with 75 percent of the weight distributed over the past 20 days.

Figure 1-12
Series deflated using the consumer price index and seasonally adjusted by Federal Reserve Board staff. The data begin in 1998 for the equal-weighted curve and 1996 for the value-weighted curve.

Figure 1-13
Data are a 12-month moving average of weighted capitalization rates in the industrial, retail, office, and multifamily sectors, based on national square footage in 2009.

Figure 1-14
Banks' responses are weighted by their commercial real estate loan market shares. The shaded bars with top caps indicate periods of business recession as defined by the National Bureau of Economic Research: March 2001–November 2001, December 2007–June 2009, and February 2020–June 2020. Survey respondents to the Senior Loan Officer Opinion Survey on Bank Lending Practices are asked the changes over the quarter.

Figure 1-15
The data for the United States start in 1997. Midwest index is a weighted average of Corn Belt and Great Plains states that comes from staff calculations. Values are given in real terms. Data are through July 2020.

Figure 1-16
The data for the United States start in 1998. Midwest index is the weighted average of Corn Belt and Great Plains states. Data are through July 2020.

Figure 1-18
Log of the price-to-rent ratio. Long-run trend is estimated using data from 1978 to 2001 and includes the effect of carrying costs on the expected price-to-rent ratio. The last value of the trend is normalized to equal 100.

Figure 1-19
The data are seasonally adjusted. The data for Phoenix start in 2002. Monthly rent values for Phoenix are interpolated from semiannual numbers. Percentiles are based on 19 metropolitan statistical areas.

Figure 2-1
The shaded bars with top caps indicate periods of business recession as defined by the National Bureau of Economic Research: January 1980–July 1980, July 1981–November 1982, July 1990–March 1991, March 2001–November 2001, December 2007–June 2009, and February 2020–June 2020. GDP is gross domestic product.

Figure 2-2
The shaded bars with top caps indicate periods of business recession as defined by the National Bureau of Economic Research: January 1980–July 1980, July 1981–

November 1982, July 1990–March 1991, March 2001–November 2001, December 2007–June 2009, and February 2020–June 2020. GDP is gross domestic product.

Figure 2-3
Nominal debt growth is seasonally adjusted and is translated into real terms after subtracting the growth rate of the price deflator for core personal consumption expenditure price.

Figure 2-4
Institutional leveraged loans generally exclude loan commitments held by banks. Key identifies bars in order from top to bottom.

Figure 2-5
Gross leverage is an asset-weighted average of the ratio of firms' book value of total debt to book value of total assets. The 75th percentile is calculated from a sample of the 2,500 largest firms by assets. The dashed sections of the lines in the first quarter of 2019 reflect the structural break in the series due to the 2019 compliance deadline for Financial Accounting Standards Board rule Accounting Standards Update 2016-02.

Figure 2-6
The interest coverage ratio is earnings before interest and taxes over interest payments. Firms with leverage less than 5 percent and interest payments less than $500,000 are excluded.

Figure 2-7
Volumes are for large corporations with earnings before interest, taxes, depreciation, and amortization (EBITDA) greater than $50 million and exclude existing tranches of add-ons and amendments as well as restatements with no new money. Key identifies bars in order from top to bottom.

Figure 2-8
The data begin in December 1998. The default rate is calculated as the amount in default over the past 12 months divided by the total outstanding volume at the beginning of the 12-month period. The shaded bars with top caps indicate periods of business recession as defined by the National Bureau of Economic Research: March 2001–November 2001, December 2007–September 2009, and February 2020–June 2020.

Figure 2-9
Subprime are those with an Equifax Risk Score below 620; near prime are from 620 to 719; prime are greater than 719. Scores are measured contemporaneously. Student loan balances before 2004 are estimated using average growth from 2004 to 2007, by risk score. The data are converted to constant 2019 dollars using the consumer price index.

Figure 2-10
Year-over-year change in balances for the second quarter of each year among those households whose balance increased over this window. Subprime are those with an Equifax Risk Score below 620; near prime are from 620 to 719; prime are greater than 719. Scores were measured a year ago. The data are converted to constant 2019 dollars using the consumer price index. Key identifies bars in order from left to right.

Figure 2-11
Loss mitigation includes tradelines that have a narrative code of forbearance, natural disaster, payment deferral (including partial), loan modification (including federal government plans), and loans with zero scheduled payment and a nonzero balance. Delinquent includes loans reported to the credit bureau at least 30 days past due. The line break represents the data transitioning from quarterly to monthly beginning January 2020.

Figure 2-12
Estimated share of mortgages with negative equity according to CoreLogic and Zillow. For CoreLogic, the data are monthly. For Zillow, the data are quarterly and, for 2017, are available only for the first and fourth quarters.

Figure 2-13
Housing leverage is estimated as the ratio of the average outstanding mortgage loan balance for owner-occupied homes with a mortgage to (1) current home values using the CoreLogic national house price index and (2) model-implied house prices estimated by a staff model based on rents, interest rates, and a time trend.

Figure 2-14
The data are converted to constant 2019 dollars using the consumer price index.

Figure 2-15
Subprime are those with an Equifax Risk Score below 620; near prime are from 620 to 719; prime are greater than 719. Scores are measured contemporaneously. The data are converted to constant 2019 dollars using the consumer price index.

Figure 2-16
Loss mitigation includes tradelines that have a narrative code of forbearance, natural disaster, payment deferral (including partial), loan modification (including federal government plans), and loans with zero scheduled payment and a nonzero balance. Delinquent includes loans reported to the credit bureau as at least 30 days past due. The line break represents the data transitioning from quarterly to monthly beginning January 2020.

Figure 2-17
Subprime are those with an Equifax Risk Score below 620; near prime are from 620 to 719; prime are greater than 719. Scores are measured contemporaneously. The data are converted to constant 2019 dollars using the consumer price index.

Figure 2-18
Delinquency is at least 30 days past due, excluding severe derogatory loans. The data are four-quarter moving averages. Subprime are those with an Equifax Risk Score below 620; near prime are from 620 to 719; prime are greater than 719. Credit scores are lagged four quarters.

Box: A Retrospective on the March 2020 Turmoil in Treasury and Mortgage-Backed Securities Markets

Figure A
Smoothed yield curve estimated from off-the-run Treasury coupon securities. Agency resi-

dential mortgage-backed security (RMBS) spread is the difference between the yield on the 30-year 2.5 percent coupon uniform mortgage-backed security and the duration-matched Treasury yield.

Figure C

Market depth is defined as the average top three bid and ask quote sizes.

Figure D

UST stands for U.S. Treasury. The volume of dealers' non-rehypothecated Treasury repurchase agreements serves as a proxy for the total dealer securities inventory.

Figure 3-1

Bank equity is total equity capital net of preferred equity and intangible assets, and assets are total assets. The data are seasonally adjusted by Federal Reserve Board staff. G-SIBs are U.S. global systemically important banks. Large non–G-SIBs are bank holding companies (BHCs) and intermediate holding companies with greater than $100 billion in total assets that are not G-SIBs. The shaded bars with top caps indicate periods of business recession as defined by the National Bureau of Economic Research: July 1990–March 1991, March 2001–November 2001, December 2007–June 2009, and February 2020–June 2020.

Figure 3-2

The data are seasonally adjusted by Federal Reserve Board staff. Sample consists of domestic bank holding companies (BHCs) and intermediate holding companies (IHCs) with a substantial U.S. commercial banking presence. G-SIBs are global systemically important U.S. banks. Large non–G-SIBs are BHCs and IHCs with greater than $100 billion in total assets that are not G-SIBs. Before 2014:Q1 (advanced-approaches BHCs) or before 2015:Q1 (non-advanced-approaches BHCs) the numerator of the common equity Tier 1 ratio is Tier 1 common capital. Afterward, the numerator is common equity Tier 1 capital. The denominator is risk-weighted assets. The shaded bars with top caps indicate periods of business recession as defined by the National Bureau of Economic Research (NBER): March 2001–November 2001, December 2007–June 2009, and February 2020–June 2020.

Figure 3-3

Weighted median leverage of nonfinancial firms that borrow using commercial and industrial loans from the 26 banks that have filed in every quarter since 2013:Q1. Leverage is measured as the ratio of the book value of total debt to the book value of total assets of the borrower, as reported by the lender, and the median is weighted by committed amounts.

Figure 3-4

Banks' responses are weighted by their commercial and industrial loan market shares. Survey respondents to the Senior Loan Officer Opinion Survey on Bank Lending Practices are asked about the changes over the quarter. Results are shown for loans to large and medium-sized firms. The shaded bars with top caps indicate periods of business recession as defined by the National Bureau of Economic Research: March 2001–November 2001, December 2007–June 2009, and February 2020–June 2020.

Figure 3-5
Leverage is calculated by dividing total assets by equity.

Figure 3-6
Ratio is calculated as (total assets − separate account assets)/(total capital − accumulated other comprehensive income) using generally accepted accounting principles. The largest 10 publicly traded life and property and casualty insurers are represented.

Figure 3-7
Leverage is computed as the ratio of hedge funds' gross notional exposure to net asset value. Gross notional exposure includes the nominal value of all long and short positions and derivative notional exposures. Options are delta-adjusted, and interest rate derivatives are reported at 10-year bond equivalents. Data are reported on a three-quarter lag.

Figure 3-8
Net percentage equals the percentage of institutions that reported increased use of financial leverage over the past three months minus the percentage of institutions that reported decreased use of financial leverage over the past three months. REIT is real estate investment trust.

Figure 3-9
The data from the first, second, and third quarters of 2020 are annualized to create the 2020 bar. CMBS is commercial mortgage-backed securities; CDO is collateralized debt obligation; RMBS is residential mortgage-backed securities; CLO is collateralized loan obligation. The "Other" category consists of other asset-backed securities (ABS) backed by credit card debt, student loans, equipment, floor plans, and miscellaneous receivables; resecuritized real estate mortgage investment conduit (Re-REMIC) RMBS; and Re-REMIC CMBS. The data are converted to constant 2020 dollars using the consumer price index. Key identifies bars in order from top to bottom.

Figure 3-10
Committed amounts on credit lines and term loans extended to nonbank financial firms by a balanced panel of 26 bank holding companies that have filed Form FR Y-14Q in every quarter since 2013:Q1. Nonbank financial firms are identified based on reported North American Industry Classification System (NAICS) codes. In addition to NAICS codes, a name-matching algorithm is applied to identify specific entities such as real estate investment trusts (REITs), special purpose entities, collateralized loan obligations (CLOs), and asset-backed securities (ABS). REITs incorporate both mortgage (trading) REITs and equity REITs. Broker-dealers also include commodity contracts dealers and brokerages and other securities and commodity exchanges. Other financial vehicles include closed-end investment and mutual funds as well as financial planning and pension funds. BDC is business development company.

Figure 4-1
Liquid assets are cash plus estimates of securities that qualify as high-quality liquid assets as defined by the Liquidity Coverage Ratio requirement. Accordingly, Level 1 assets and

discounts and restrictions on Level 2 assets are incorporated into the estimate. G-SIBs are U.S. global systemically important banks. Large non–G-SIBs are bank holding companies (BHCs) and intermediate holding companies with greater than $100 billion in total assets.

Figure 4-2

Short-term wholesale funding is defined as the sum of large time deposits with maturity less than one year, federal funds purchased and securities sold under agreements to repurchase, deposits in foreign offices with maturity less than one year, trading liabilities (excluding revaluation losses on derivatives), and other borrowed money with maturity less than one year. The shaded bars with top caps indicate periods of business recession as defined by the National Bureau of Economic Research: March 2001–November 2001, December 2007–June 2009, and February 2020–June 2020.

Figure 4-3

The black striped area denotes the period from 2008:Q4 to 2012:Q4 when insured deposits increased because of the Transaction Account Guarantee program. "Other" consists of variable-rate demand obligations (VRDOs), federal funds, funding-agreement-backed securities, private liquidity funds, offshore money market funds, and local government investment pools. Securities lending includes only lending collateralized by cash. GDP is gross domestic product. Values for VRDOs come from Bloomberg beginning in 2019:Q1. See Jack Bao, Josh David, and Song Han (2015), "The Runnables," FEDS Notes (Washington: Board of Governors of the Federal Reserve System, September 3), https://www.federalreserve.gov/econresdata/notes/feds-notes/2015/the-runnables-20150903.html.

Figure 4-4

The data are converted to constant 2020 dollars using the consumer price index.

Figure 4-5

The data are converted to constant 2020 dollars using the consumer price index.

Figure 4-6

The data are converted to constant 2020 dollars using the consumer price index. Key identifies series in order from top to bottom.

Figure 4-7

Key identifies series in order from top to bottom. Mutual fund assets under management as of August 2020 included $2,393 billion in investment-grade bond funds, $268 billion in high-yield bond funds, and $63 billion in bank loan funds.

Figure 4-8

Securitized products include collateralized loan obligations for corporate debt, private-label commercial mortgage-backed securities for commercial real estate, and private-label residential mortgage-backed securities and asset-backed securities backed by autos, credit cards, consumer loans, and student loans for other asset-backed securities. Illiquid corporate debt includes private placements, bank/syndicated loans, and high-yield bonds. Alternative investments include assets filed under Schedule BA. P&C is property and casualty. Key identifies series in order from top to bottom.

Figure 4-9
The data are converted to constant 2020 dollars using the consumer price index. FHLB is Federal Home Loan Bank. Key identifies series in order from top to bottom.

Box: LIBOR Transition Update

Figure A
Key identifies series in order from bottom to top. SOFR is the Secured Overnight Financing Rate. LIBOR is the London interbank offered rate.

Figure B
Key identifies series in order from bottom to top. SOFR is the Secured Overnight Financing Rate. LIBOR is the London interbank offered rate.

Figure C
Key identifies series in order from bottom to top. SOFR is the Secured Overnight Financing Rate. CME is the formal name of what used to be the Chicago Mercantile Exchange. ICE is the Intercontinental Exchange. 1M and 3M are 1-month and 3-month securities.

Box: Salient Shocks to Financial Stability Cited in Market Outreach

Figure
Responses are to the following question: "Over the next 12–18 months, which shocks, if realized, do you think would have the greatest negative effect on the functioning of the U.S. financial system?" SME is small and medium-sized enterprises. CRE is commercial real estate. CMBS is commercial mortgage-backed security. LIBOR is London interbank offered rate.

Corrections

On November 10, 2021, the data in figure 3-2 was corrected to fix a coding error.

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