



Financial Stability Report

May 2022

BOARD OF GOVERNORS OF THE FEDERAL RESERVE SYSTEM



The Federal Reserve System is the central bank of the United States. It performs five key functions to promote the effective operation of the U.S. economy and, more generally, the public interest.

The Federal Reserve

- **conducts the nation's monetary policy** to promote maximum employment and stable prices in the U.S. economy;
- **promotes the stability of the financial system** and seeks to minimize and contain systemic risks through active monitoring and engagement in the U.S. and abroad;
- **promotes the safety and soundness of individual financial institutions** and monitors their impact on the financial system as a whole;
- **fosters payment and settlement system safety and efficiency** through services to the banking industry and the U.S. government that facilitate U.S.-dollar transactions and payments; and
- **promotes consumer protection and community development** through consumer-focused supervision and examination, research and analysis of emerging consumer issues and trends, community economic development activities, and administration of consumer laws and regulations.

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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.

More on the Federal Reserve's Monitoring Efforts

See the [Financial Stability](#) section of the Federal Reserve Board's website for more information on how the Federal Reserve monitors the stability of the U.S. and world financial systems.

The website includes

- a more detailed look at our [monitoring framework](#) for assessing risk in each category;
- more data and research on related topics;
- information on how we coordinate, cooperate, and otherwise take action on financial system issues; and
- [public education resources](#) describing the importance of our efforts.

¹ More information on the Federal Reserve's supervisory and regulatory activities is available on the Board's website; see the *Supervision and Regulation Report* (<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. By 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 (see Section 1, [Asset Valuations](#)).
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 (see Section 2, [Borrowing by Businesses and Households](#)).
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 (see Section 3, [Leverage in the Financial Sector](#)).
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 transformation can create an

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.

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” (see Section 4, [Funding Risks](#)).

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 oversized 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 U.S. 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 these vulnerabilities.

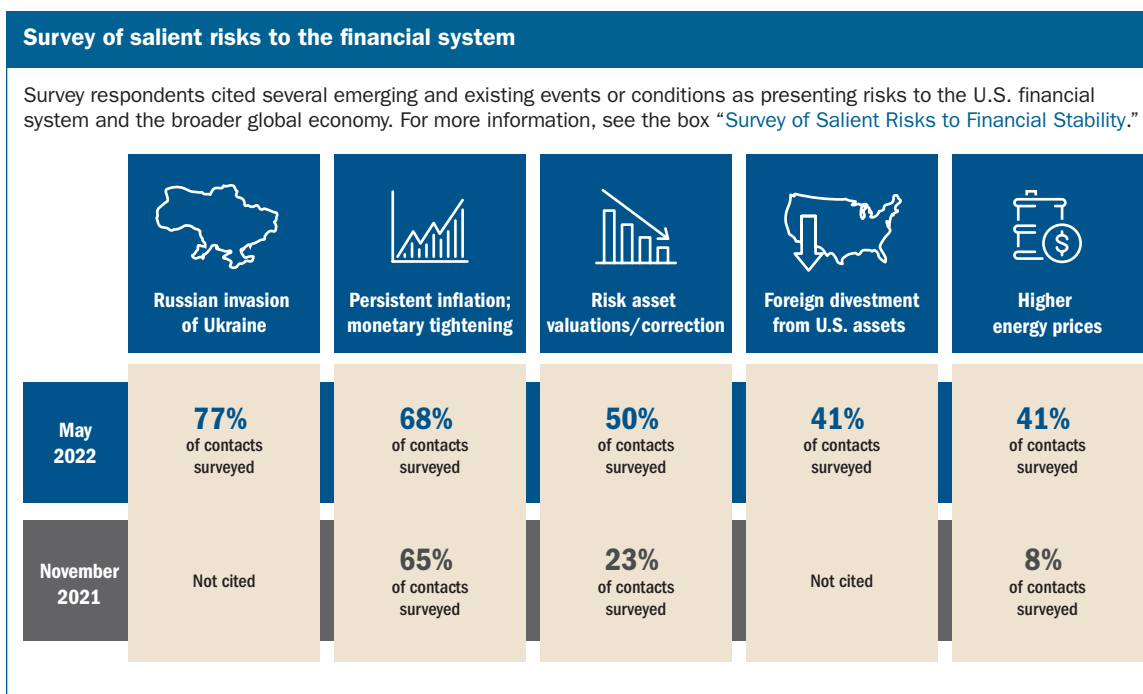
Since the November 2021 *Financial Stability Report*, uncertainty about the economic outlook has increased. The Russian invasion of Ukraine has caused tremendous human and economic hardship, and the implications for the U.S. and global economies are highly uncertain. In the near term, the invasion and related events are likely to create additional upward pressure on inflation and weigh on economic activity. After deteriorating early in the period because of the emergence and spread of the highly contagious Omicron variant, the pandemic outlook has improved but remains uncertain. Finally, inflation has been higher and more persistent than expected, even before the invasion of Ukraine, and uncertainty over the inflation outlook poses risks to financial conditions and economic activity.

Financial system vulnerability assessment, May 2022			
 <p>Asset valuations</p>	 <p>Borrowing by businesses and households</p>	 <p>Leverage in the financial sector</p>	 <p>Funding risks</p>
<ul style="list-style-type: none"> • Uncertainty about the economic outlook led to large fluctuations in prices of financial assets. • Despite markedly higher Treasury yields, real and financial asset prices generally remained high relative to their corresponding expected cash flows. • House prices continued to rise at a rapid pace that outstripped increases in rents. 	<ul style="list-style-type: none"> • The debt-to-GDP ratio continued to decline, although businesses and households' debt grew throughout 2021. • Interest coverage ratios for large businesses exceeded the historical average, but the business debt-to-GDP ratio remains high. • Increases in household debt were concentrated among borrowers with strong credit histories. 	<ul style="list-style-type: none"> • Banks are well capitalized, but risk-based capital ratios declined at the largest banks due to heightened market volatility. • Leverage was high at life insurers and somewhat elevated at hedge funds. • Issuance of non-agency securitized products reached post-2008 highs, and bank lending to nonbank financial institutions continued to grow rapidly. 	<ul style="list-style-type: none"> • Domestic banks maintained high levels of liquid assets and stable funding. • Structural vulnerabilities persist at money market funds and some other mutual funds, and the rapidly growing stablecoin sector is vulnerable to runs. • Central counterparties made larger margin calls amid elevated market volatility.

Against this backdrop, financial markets experienced high volatility and some strains on market liquidity. On net, over the period, Treasury yields increased markedly, broad equity prices declined notably, and credit spreads widened considerably in corporate bond markets. While business and household debt increased last year and likely has continued to do so this year, the ratio of credit to gross domestic product (GDP) continued to fall and is approaching pre-pandemic levels. Credit quality remained robust. Banks remained well capitalized, but some money market and bond funds are still exposed to sizable liquidity risks. A few signs of funding pressures emerged amid the escalation of geopolitical tensions. However, broad funding markets proved resilient, and spillovers have been limited to date.

- 1. Asset valuations.** Heightened uncertainty about the economic outlook led to notable fluctuations in financial markets. Since the previous report, broad equity prices declined notably, and spreads in corporate bond markets widened considerably. Prices of risky financial assets remained generally high compared with corresponding expected cash flows. Since November, house prices rose at a rapid rate and continued to outstrip increases in rents. Asset prices remain vulnerable to declines in response to negative shocks (see Section 1, [Asset Valuations](#)).
- 2. Borrowing by businesses and households.** Key indicators of vulnerabilities arising from business and household debt—including debt-to-GDP ratios, gross leverage, and interest coverage ratios—continued to improve and have largely recovered from the economic stresses of the COVID-19 recession. Nonetheless, rising inflation, supply chain disruptions, and ongoing geopolitical events might pose risks to the ability of some businesses and households to service their debts (see Section 2, [Borrowing by Businesses and Households](#)).
- 3. Leverage in the financial sector.** Banks maintained risk-based capital ratios well above regulatory minimums. Leverage at broker-dealers stayed low, while leverage at life insurance companies and hedge funds remained high by historical standards. Issuance of non-agency asset-backed securities recovered from the low levels of the pandemic (see Section 3, [Leverage in the Financial Sector](#)).
- 4. Funding risks.** Funding risks at domestic banks remained low as a result of large holdings of liquid assets and a limited reliance on short-term wholesale funding. However, some types of money market funds (MMFs) and stablecoins remain prone to runs, and many bond and bank loan mutual funds continue to be vulnerable to redemption risks. Elevated market volatility associated with the Russian invasion of Ukraine has led to increased margin calls by central counterparties (CCPs), which in turn increased the demand for liquidity from a range of market participants (see Section 4, [Funding Risks](#)).

This report also details how near-term risks have changed since the November 2021 report based in part on the most frequently cited risks to U.S. financial stability as gathered from outreach to a wide range of researchers, academics, and market contacts (discussed in the box “[Survey of Salient Risks to Financial Stability](#)”). Stresses in Europe related to the Russian invasion of Ukraine



or in emerging markets—such as those that could arise from China or be driven by inflationary pressures—could spill over to the United States. In addition, elevated inflation and rising rates in the United States could negatively affect domestic economic activity, asset prices, credit quality, and financial conditions more generally. As concerns over cyber risk have increased, U.S. government agencies and their private-sector partners have been stepping up their efforts to protect the financial system and other critical infrastructures. If any of these near-term risks were realized, and especially should such events precipitate a marked worsening of the economic outlook, their effects could be amplified through the financial vulnerabilities identified in this report.

The report includes additional boxes that analyze salient topics related to financial stability, including two boxes on recent notable events in financial markets—namely, “[Recent Liquidity Strains across U.S. Treasury, Equity Index Futures, and Oil Futures Markets](#)” and “[Commodity Market Stresses following Russia’s Invasion of Ukraine](#).” Additional boxes include “[LIBOR Transition Update](#),” “[Central Bank Digital Currency and Financial Stability](#),” and “[Stresses in China’s Real Estate Sector](#).”

1 | Asset Valuations

Increased uncertainty about the economic outlook led to large fluctuations in asset prices

Since the November 2021 *Financial Stability Report*, amid news about the highly contagious Omicron variant, higher-than-expected inflation, and the Russian invasion of Ukraine, uncertainty about the economic outlook increased, and prices of financial assets fluctuated widely. The Russian invasion of Ukraine and the subsequent imposition of sanctions on Russia disrupted commodity markets, resulting in a significant rise in commodity prices (see the box “[Commodity Market Stresses following Russia’s Invasion of Ukraine](#)”). On net, Treasury yields increased markedly, broad equity prices declined notably, and corporate bond spreads widened considerably. While the effect of recent developments on asset cash flows remained uncertain, valuation measures based on current expectations of cash flows continued to be high relative to historical norms.

House prices continued to rise at a rapid pace that further outstripped rent growth. With valuations at high levels, house prices could be particularly sensitive to shocks. Nonetheless, little evidence to date exists of an erosion in mortgage underwriting standards or a surge in speculative practices, suggesting that while a negative shock to house prices may hurt homeowners, such a shock is unlikely to be amplified by the financial system.

Driven by the multifamily and industrial sectors, overall commercial real estate (CRE) prices continued to increase since the November report, with some price indexes surpassing their 2006 peaks. With capitalization rates at low levels and capitalization spreads at moderate levels, CRE valuation pressures remained somewhat on the high side. Farmland prices were elevated relative to rents and incomes, although farm incomes are broadly expected to rise.

Table 1.1 shows the sizes of the asset markets discussed in this section. The largest asset markets are those for equities, residential real estate, CRE, and Treasury securities.

Amid high volatility, Treasury yields rose from very low levels to somewhat above their pre-pandemic levels

Reflecting a less accommodative monetary policy stance associated with elevated inflation and a tight labor market, yields on Treasury securities increased markedly and reached somewhat above their pre-pandemic levels (figure 1.1). Model estimates of Treasury term premiums also increased notably but remained moderate by historical standards (figure 1.2).³ Further increases in Treasury yields, especially if accompanied by a weaker economic outlook, could put downward pressure on valuations in various other markets. Consistent with heightened uncertainty about the economic

³ Treasury term premiums capture the difference between the yield that investors require for holding longer-term Treasury securities and the expected yield from rolling over shorter-dated ones.

Table 1.1. Size of selected asset markets

Item	Outstanding (billions of dollars)	Growth, 2020:Q4–2021:Q4 (percent)	Average annual growth, 1997–2021:Q4 (percent)
Equities	58,562	24.8	9.8
Residential real estate	48,825	16.5	6.1
Commercial real estate	23,787	12.7	7.2
Treasury securities	22,558	7.7	8.2
Investment-grade corporate bonds	6,738	3.3	8.2
Farmland	2,693	2.0	5.3
High-yield and unrated corporate bonds	1,753	8.3	7.1
Leveraged loans*	1,341	12.4	14.3
Price growth (real)			
Commercial real estate**		9.4	3.1
Residential real estate***		10.4	2.6

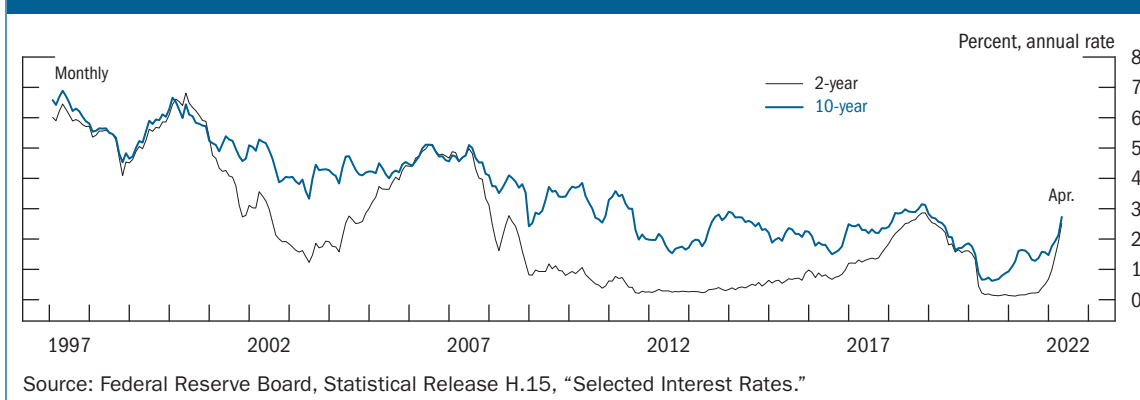
Note: The data extend through 2021:Q4. Average annual growth rates are measured from Q4 of the year immediately preceding the period through Q4 of the final year of the period. Equities, real estate, and farmland are at nominal market value; bonds and loans are at nominal book value.

* 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:Q4 to 2021:Q4, as this market was fairly small before then.

** One-year growth of commercial real estate prices is from December 2020 to December 2021, and average annual growth is from 1998:Q4 to 2021:Q4. Both growth rates are calculated from value-weighted nominal prices deflated using the consumer price index (CPI).

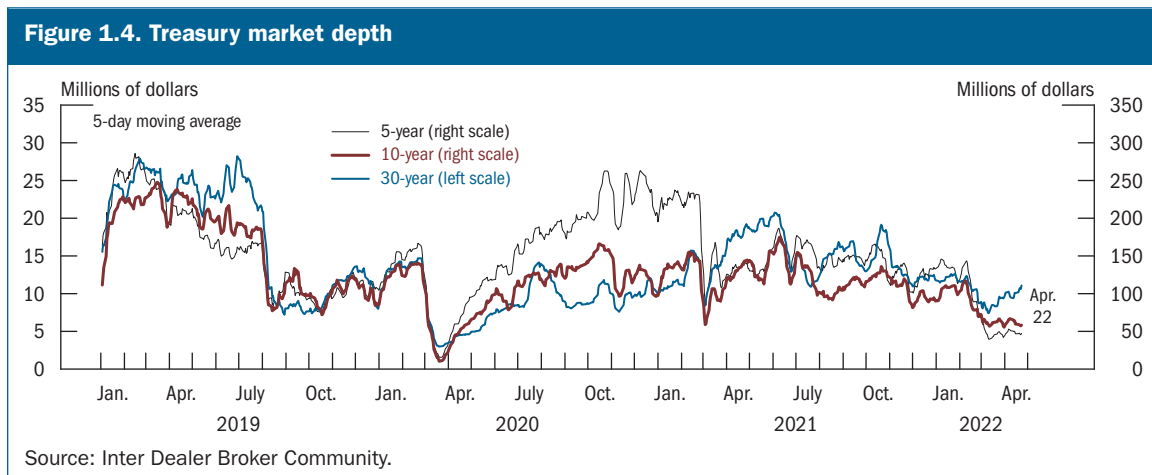
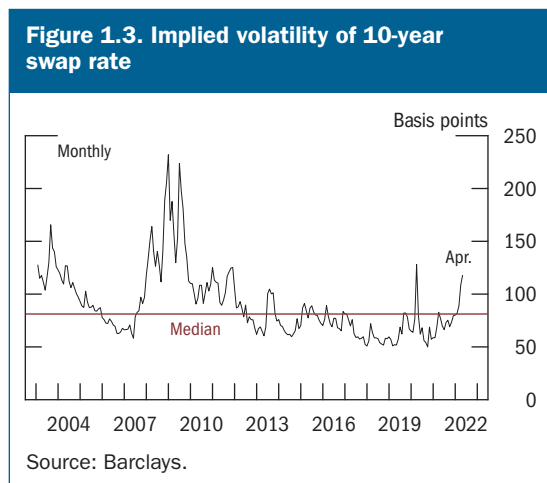
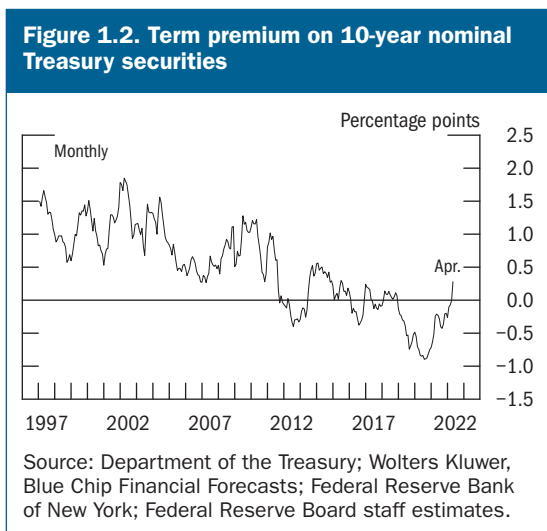
*** One-year growth of residential real estate prices is from December 2020 to December 2021, and average annual growth is from 1997:Q4 to 2021:Q4. Nominal prices are deflated using the CPI.

Source: For leveraged loans, S&P Global, Leveraged Commentary & Data; for corporate bonds, Mergent, Fixed Income Securities Database; for farmland, Department of Agriculture; for residential real estate price growth, CoreLogic, Inc.; 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.”

Figure 1.1. Yields on nominal Treasury securities

outlook, a forward-looking measure of Treasury market volatility derived from options prices increased significantly and remained elevated (figure 1.3). Since the November report, liquidity metrics, such as market depth, suggest a notable deterioration in Treasury market liquidity

(figure 1.4).⁴ In addition, the price spread of the most recently issued Treasury securities over previously issued comparable-maturity Treasury securities widened, reflecting a willingness to pay a higher premium for holding actively traded liquid securities. Low market liquidity likely contributed to large fluctuations in prices of financial assets, but markets functioned well overall. For more information on market liquidity developments, see the box “Recent Liquidity Strains across U.S. Treasury, Equity Index Futures, and Oil Futures Markets.” Of note, last November, the Inter-Agency Working Group for Treasury Market Surveillance released a report analyzing the disruptions to the U.S. Treasury markets at the onset of the COVID-19 pandemic in March 2020 and discussing potential reforms.⁵



⁴ Market depth indicates the quantity of an asset available to buy or sell at the best posted bid and ask prices.
⁵ For details on past disruptions to U.S. Treasury market functioning and potential market structure reforms that could help improve resilience, 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 (2021), *Recent Disruptions and Potential Reforms in the U.S. Treasury Market: A Staff Progress Report* (Washington: Inter-Agency Working Group for Treasury Market Surveillance, November), <https://home.treasury.gov/system/files/136/IAWG-Treasury-Report.pdf>.

Box 1.1. Recent Liquidity Strains across U.S. Treasury, Equity Index Futures, and Oil Futures Markets

Market liquidity—the ease of buying and selling desired quantities of an asset—is an important indicator of how well markets are functioning. According to some measures, market liquidity has declined since late 2021 in the markets for recently issued U.S. cash Treasury securities and for equity index futures. These markets play important roles in the functioning of the economy and financial system and are usually highly liquid. Low liquidity in these markets can amplify price volatility and result in unexpected tightening in financial conditions. In extreme cases, such as the market turmoil at the onset of the pandemic in March 2020, low liquidity can impair the ability of the financial system to respond to a large shock because investors may not be able to adjust their holdings of assets to raise cash or hedge risks, or they may be able to do so only at a substantial cost. While the recent deterioration in liquidity has not been as extreme as in some past episodes, the risk of a sudden significant deterioration appears higher than normal. In addition, since the Russian invasion of Ukraine, liquidity has been somewhat strained at times in oil futures markets, while markets for some other affected commodities have been subject to notable dysfunction, as discussed in the box “[Commodity Market Stresses following Russia’s Invasion of Ukraine](#).”

Different measures capture different dimensions of market liquidity

Trading in the financial markets considered here takes place on electronic central limit order books (CLOBs). On a CLOB, market participants can either provide liquidity by posting quotes to buy and sell securities or consume liquidity by submitting an order to buy or sell at the best available quoted price. Measures that capture different dimensions of market liquidity in CLOB markets include the bid-ask spread and quoted depth. The *bid-ask spread* is the difference between the best “bid” quote to buy an asset and the best “ask” quote to sell that asset. Smaller bid-ask spreads indicate lower trading costs and, hence, more liquid markets. *Quoted depth* is the quantity of an asset available to buy or sell at the best quoted prices. Greater depth indicates the ability to trade larger amounts without accepting a worse price and, hence, more liquid markets.¹

Liquidity providers bear the risk that the quotes they post become stale and are taken advantage of by faster traders if the prevailing price moves. This risk is of greater concern when prices become more volatile. In addition, the risk associated with holding inventories of securities also increases with higher volatility. Liquidity providers reduce these risks by quoting in lower quantities and possibly also widening bid-ask spreads. Thus, markets tend to be less liquid during periods of higher volatility. In extreme cases, some liquidity providers may pull back from the market altogether, which can result in very low depth and wider-than-usual bid-ask spreads.

Market depth has recently deteriorated across a range of markets

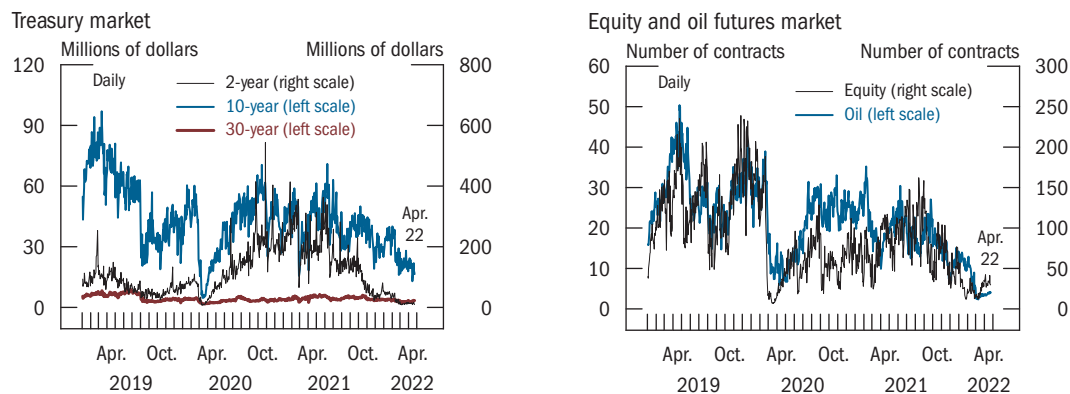
Quoted depth has decreased since late 2021 for the interdealer U.S. Treasury securities, S&P 500 E-mini futures, and West Texas Intermediate crude oil futures markets (figure A). Initially, in Treasury and equity markets, the decline in depth reflected rising uncertainty about the outlook for monetary policy; in the Treasury market, the decreases in depth were greatest for bonds with shorter maturities because the prices of those securities are more sensitive to expectations for monetary policy over the near term. In oil markets, depth has declined particularly sharply in recent months as a result of the elevated level of uncertainty and volatility associated with the Russian invasion of Ukraine.

(continued)

¹ For a description of other measures of market liquidity, see, among others, the box “What Has Been Happening to the Liquidity of U.S. Treasury and Equity Futures Markets?” in Board of Governors of the Federal Reserve System (2019), *Financial Stability Report* (Washington: Board of Governors, November), pp. 14–16, <https://www.federalreserve.gov/publications/files/financial-stability-report-20191115.pdf>; and Abdourahmane Sarr and Tonny Lybek (2002), “Measuring Liquidity in Financial Markets,” IMF Working Paper 02/232 (Washington: International Monetary Fund, December), <https://www.imf.org/en/Publications/WP/Issues/2016/12/30/Measuring-Liquidity-in-Financial-Markets-16211>.

Box 1.1.—continued

Figure A. Market depth

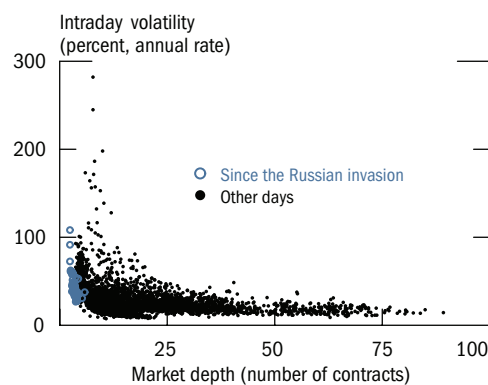


Recently, depth in these markets has been lower than is typical even after taking into account the level of volatility, as shown for the oil market in figure B. This markedly low depth could indicate that liquidity providers are being particularly cautious, and liquidity may be more fragile than usual. Declining depth at times of rising uncertainty and volatility could result in a negative feedback loop, as lower liquidity in turn may cause prices to be more volatile.

Bid-ask spreads remain more stable in the most liquid markets

While depth has been low, quoted bid-ask spreads paint a more mixed picture (figure C). Average bid-ask spreads in the most liquid Treasury and equity markets have increased only slightly above their typical levels.² These mild increases suggest that, though liquidity providers have been less willing to quote in large size, they have replenished quotes sufficiently quickly to meet incoming orders without exhausting all quotes at the best prices. Depleting the best quotes would have caused bid-ask spreads to widen until new quotes at narrower spreads were posted subsequently. Moreover, at least some market participants may have been able to split trades into smaller transaction sizes to avoid exhausting all the quotes available at the best prices.³

Figure B. Market depth and volatility in oil futures



Source: Refinitiv, DataScope Tick History.

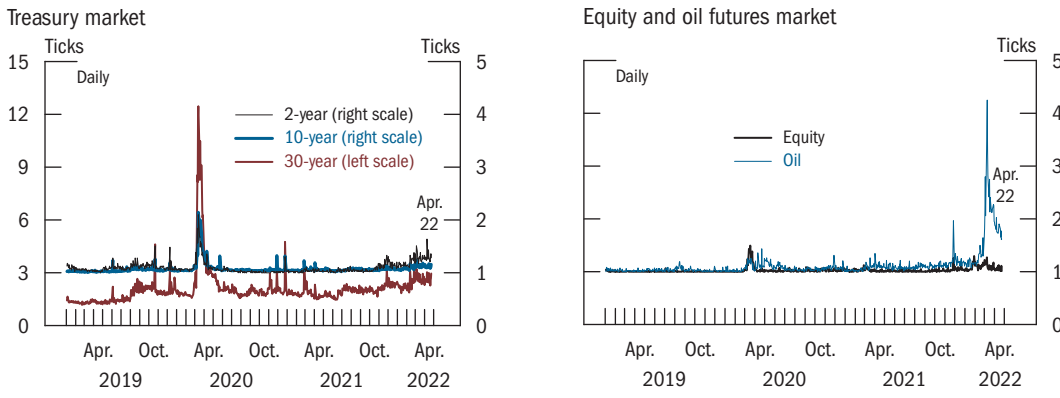
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² Average bid-ask spreads in most of these markets, except for the longest-tenor Treasury securities, are usually only slightly higher than a single “tick,” the smallest permitted difference between quoted prices. The tick size for the 2-year Treasury note is 1/256 of a dollar per \$100 of par value, while that for the 10-year Treasury note and the 30-year Treasury bond is 4/256 of a dollar per \$100 of par value. The tick size for the S&P 500 E-mini futures contract is \$0.25 per index point, and that for the West Texas Intermediate crude oil futures contract is \$0.01 per barrel.

³ Electronic trading allows investors to minimize the cost of trading by splitting larger transactions into multiple smaller transaction amounts, allowing quoted depth to get replenished in between. For example, see Bank for International Settlements, Markets Committee (2020), *FX Execution Algorithms and Market Functioning* (Basel, Switzerland: BIS, October), <https://www.bis.org/publ/mktc13.pdf>; and Dhara Ranasinghe and Saikat Chatterjee (2020), “Pandemic Propels Old-School Bond Traders towards an Electronic Future,” *Reuters*, June 22.

Box 1.1.—continued

Figure C. Bid-ask spreads

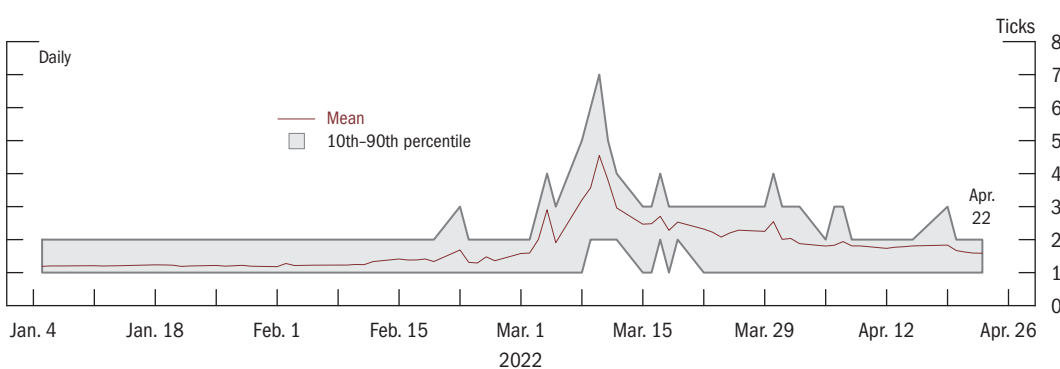


Source: For left panel, Inter Dealer Broker Community; for right panel, Refinitiv, DataScope Tick History.

However, bid-ask spreads in some other markets increased more notably before partially falling back, as illustrated in figure C for oil futures. To shed more light on liquidity provision for oil futures, figure D shows the 10th and 90th percentiles of bid-ask spreads within each day, along with their average level, for the period since the beginning of the year. On days of larger variations in spreads (as captured by a widening of the gray area between the 10th and 90th percentiles), incoming orders more often exhausted all available quotes at the best prices, causing spreads to widen temporarily until new quotes at narrower spreads were posted. However, even on those days, there were times during the day when quoted spreads were fairly tight, and more trading took place at these times.⁴ These findings suggest that investors who are capable of timing their trades to when spreads are narrow are able to

(continued)

Figure D. Bid-ask spreads for oil futures



Source: Refinitiv, DataScope Tick History.

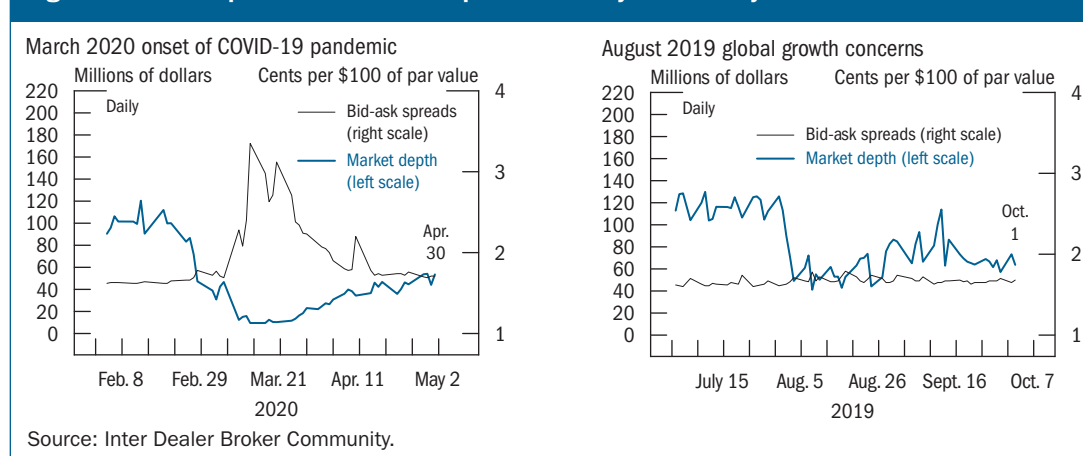
⁴ For comparison, in March 2020, the intraday variations in quoted bid-ask spreads for recently issued 30-year Treasury bonds were significantly larger—and spreads were reverting closer to their typical levels much less frequently—than observed during the current episode in the oil market, suggesting that the deterioration in liquidity provision was more severe during the March 2020 episode. Nonetheless, similar to the current episode, trading volumes were somewhat more concentrated at times when quoted spreads were narrower, as documented in 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://doi.org/10.17016/2380-7172.2748>.

Box 1.1.—continued

avoid large increases in trading costs. Furthermore, market commentary does not point to substantial difficulties in obtaining quotes in oil markets, and the increases in bid-ask spreads are less extreme when measured relative to prices.

It is difficult to predict periods of extreme market illiquidity

While recent low depth in the most liquid Treasury and equity markets has not generally been accompanied by extremely high and volatile bid-ask spreads, that situation could change if liquidity providers were to slow or stop replenishing quotes in response to incoming orders. However, as demonstrated in two recent episodes of low market depth in August 2019 and March 2020, it is difficult to predict whether market liquidity would deteriorate in this way. Figure E compares the evolution of quoted depth and bid-ask spreads for the 10-year Treasury note during these two episodes. The left panel shows that quoted depth decreased rapidly from late February to early March 2020. Bid-ask spreads stayed low and stable until early March but then increased dramatically in mid-March after some liquidity providers scaled down their market-making activity. In contrast, the right panel shows an episode in August 2019 when a prolonged period of low depth was not followed by heightened bid-ask spreads.⁵

Figure E. Bid-ask spreads and market depth for the 10-year Treasury note

In conclusion, quoted depth is currently low in Treasury, equity, and oil markets, but there have been no reports of severe market functioning problems, and the effect on trading costs for many investors has likely been limited. Thus, the current state of liquidity in these key markets does not appear to be a substantial barrier to efficient capital allocation and risk management within the economy. However, the low level of depth means that liquidity provision remains fragile due to heavier reliance on sufficiently rapid quote replenishment to meet trading demands without resulting in sharp price moves. This dependence on higher-velocity quote replenishment when depth is low could pose an important vulnerability in these markets, as it suggests that there is a higher-than-normal risk that a significant deterioration in liquidity provision could make prices even more volatile and lead to market dysfunction.⁶

⁵ A more comprehensive comparison of Treasury market depth following different episodes of market stress can be found in Alex Aronovich, Dobrislav Dobrev, and Andrew Meldrum (2021). "The Treasury Market Flash Event of February 25, 2021," FEDS Notes (Washington: Board of Governors of the Federal Reserve System, May 14), <https://doi.org/10.17016/2380-7172.2909>.

⁶ An extreme case of slow quote replenishment could increase the risk of observing large directional price moves and reversals even on thin trading flows. Episodes such as the sterling flash event on October 7, 2016, further reveal the potential for extreme events of this kind to have some broader economic effects as noted by Bank for International Settlements, Markets Committee (2017), *The Sterling 'Flash Event' of 7 October 2016* (Basel, Switzerland: BIS, January), <https://www.bis.org/publ/mkctc09.pdf>.

Corporate bond valuations eased somewhat but remained high

Heightened uncertainty weighed on risk appetite for corporate bonds, increasing their yields considerably more than those on comparable-maturity Treasury securities (figure 1.5).⁶ Consequently, corresponding corporate-to-Treasury spreads widened, easing valuation pressures somewhat. Even so, corporate bond spreads remained low by historical standards, suggesting that valuations continued to be high (figure 1.6).⁷ The excess bond premium, which is a measure that captures the gap between corporate bond spreads and expected credit losses, also suggests that investor risk appetite was high. In March, the premium stood at the bottom decile of its historical distribution (figure 1.7).⁸

Figure 1.5. Corporate bond yields

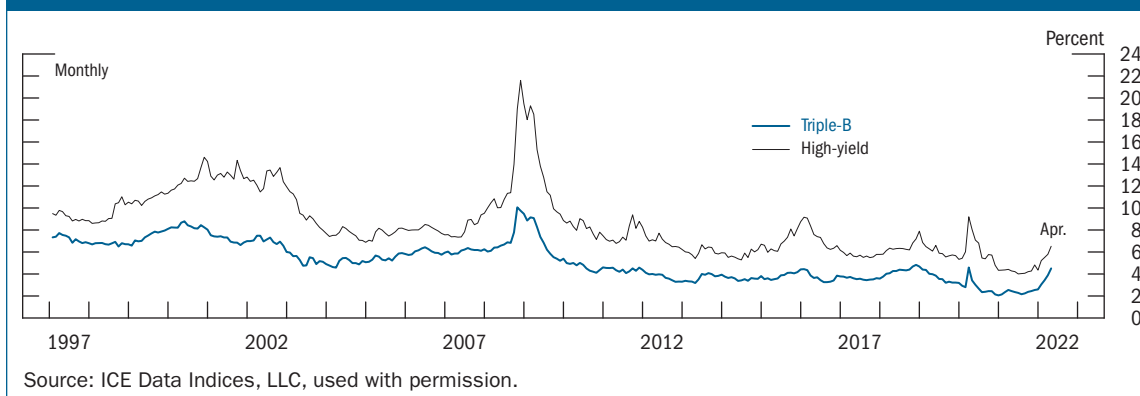
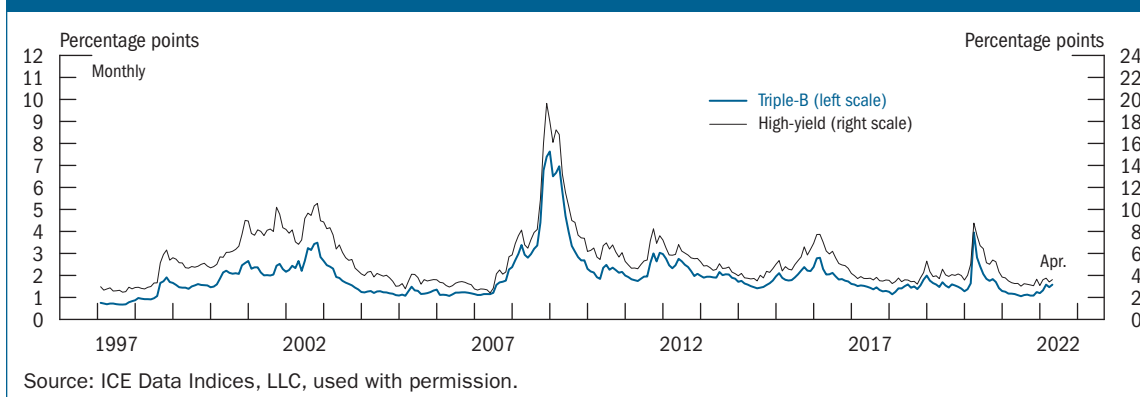


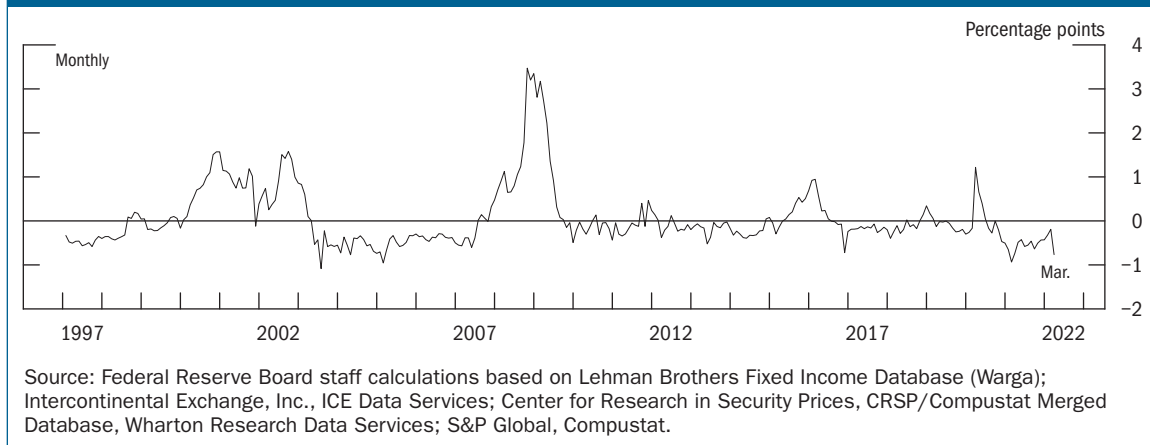
Figure 1.6. Corporate bond spreads to similar-maturity Treasury securities



⁶ For a detailed discussion on risk appetite, see the box “Vulnerabilities from Asset Valuations, Risk Appetite, and Low Interest Rates” in Board of Governors of the Federal Reserve System (2021), *Financial Stability Report* (Washington: Board of Governors, May), pp. 15–18, <https://www.federalreserve.gov/publications/files/financial-stability-report-20210506.pdf>.

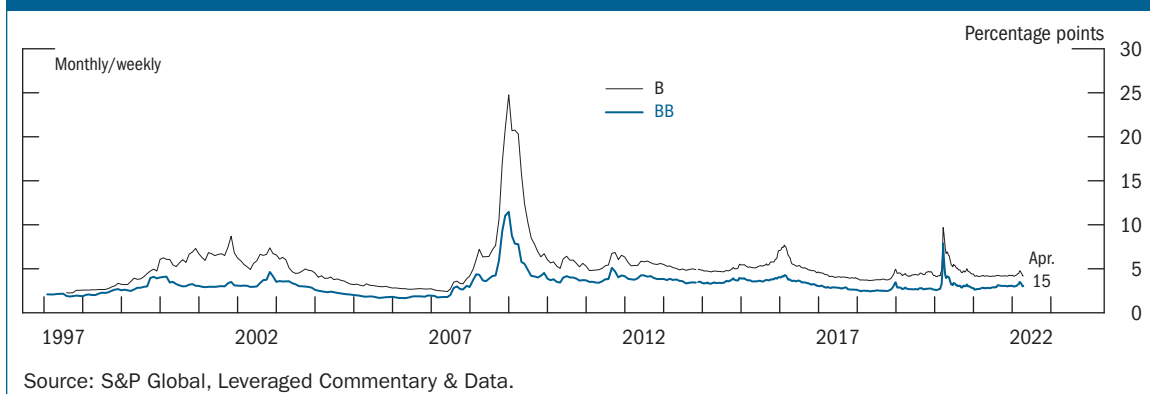
⁷ Spreads between yields on corporate bonds and comparable-maturity Treasury securities reflect the extra compensation investors require to hold debt that is subject to corporate default or include a liquidity risk premium.

⁸ 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.

Figure 1.7. Excess bond premium

Reflecting higher interest rates and heightened uncertainty, corporate bond issuance declined in recent months but generally stayed solid. Meanwhile, the share of new speculative-grade bonds with the lowest ratings was at low levels by historical standards. In contrast, the share of outstanding bonds with the lowest investment-grade ratings—the so-called triple-B cliff—reached its highest level in two decades, suggesting that many investment-grade bonds remain vulnerable to being downgraded to speculative-grade in the event of a negative economic shock.

Risk appetite in the leveraged loan market appeared to have changed little and continued to be somewhat elevated. Spreads on lower-rated leveraged loans in the secondary market were little changed and stood at the lower quintile of their historical distribution for the period since the 2008 financial crisis (figure 1.8). Despite a temporary slowdown due to the Russian invasion of Ukraine, leveraged loan issuance remained solid, on balance, as demand for floating-rate products stayed strong amid expectations for further rate increases and was supported by elevated risk appetite. Separately, leveraged loan market benchmark interest rates are transitioning smoothly from LIBOR to the Secured Overnight Financing Rate (SOFR) (see the box “[LIBOR Transition Update](#)”).

Figure 1.8. Secondary-market spreads of leveraged loans

Box 1.2. LIBOR Transition Update

There has been a clear shift away from the use of U.S. dollar (USD) LIBOR as a reference rate in financial contracts since the start of the year. This shift is consistent with supervisory guidance issued by the Federal Reserve and other U.S. and global regulators encouraging banks to stop most new use of USD LIBOR by the end of 2021.

The transition away from LIBOR is now largely complete in floating-rate note markets, where nearly all new issuance now references SOFR. In securitization markets, Fannie Mae and Freddie Mac stopped accepting LIBOR adjustable-rate mortgages in 2021, and all associated mortgage-backed securities (MBS) issuance is now tied to SOFR. Likewise, SOFR is now the dominant benchmark in interest rate swaps trading between dealers and in cross-currency basis swaps between USD and other major currencies (figure A).

The syndicated loan market, which had been slower to move away from LIBOR, shifted almost entirely to SOFR-referenced products in early 2022 (figure B). Data on bilateral (nonsyndicated) loans are less available, but supervisory assessments indicate that most banks have reduced LIBOR lending

(continued)

Figure A. Transition progress in several markets is near completion

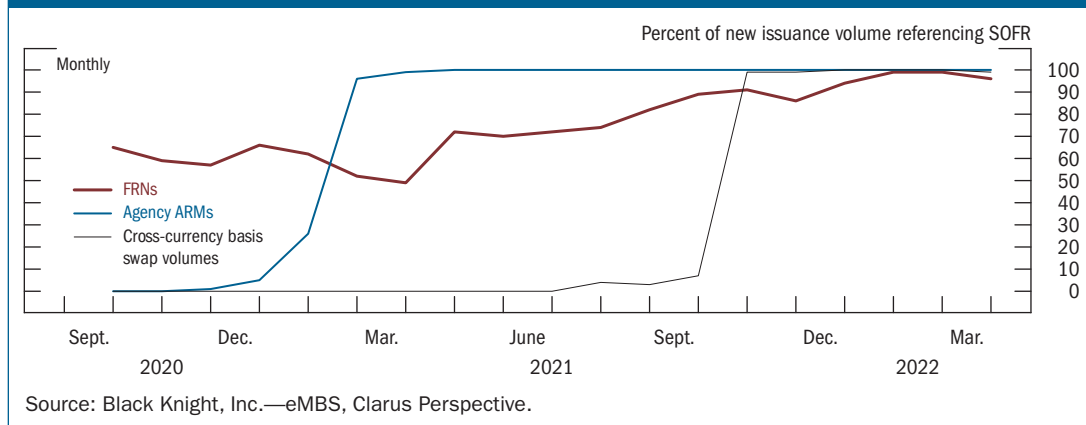
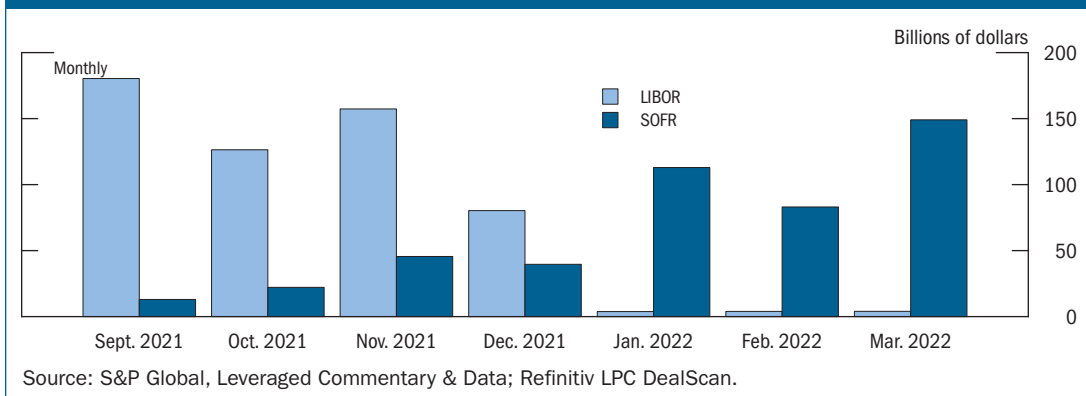


Figure B. Syndicated lending



Box 1.2.—*continued*

sharply since the start of the year, with most loans now referencing SOFR. There appears to be only limited lending activity based on credit-sensitive alternatives to SOFR. Hedging opportunities for those rates also appear to be limited; while futures markets and swaps clearing have developed on some credit-sensitive rates, activity has thus far remained negligible.

Despite this progress, there are still some specific areas in which USD LIBOR use has continued, most notably in exchange-traded futures and options markets, where supervised entities play a less significant role. While SOFR futures have grown noticeably over the past several months, LIBOR has still accounted for a substantial proportion of interest rate futures trading. Because futures markets play an important role in helping end users hedge their risks, which are now associated with SOFR, it will be important to see continued progress away from LIBOR over this year.

The start of the year marked the end of publication of two little-used USD LIBOR tenors (the one-week and two-month USD LIBOR rates) as well as all tenors of Swiss franc and euro LIBOR. Several tenors of sterling and yen LIBOR also ended, while some other tenors continued to be published as non-representative “synthetic” rates that are now based on spread-adjusted risk-free rates rather than on polls of banks. The transition from all four of the non-USD LIBOR currencies went smoothly as a result of extensive preparations.

With most new use of USD LIBOR now at an end, attention has turned toward addressing the risks in legacy contracts. While the one-week and two-month USD LIBOR rates were little used, there are substantial legacy positions in the remaining overnight, one-month, three-month, six-month, and one-year USD LIBOR tenors, which will cease to be published as panel-based, representative rates after June 30, 2023. In March 2021, the Alternative Reference Rates Committee estimated outstanding legacy USD LIBOR exposures at roughly \$223 trillion. Approximately \$74 trillion of these legacy contracts are set to mature beyond the critical date of June 2023, and some of those contracts lack adequate fallback language.

In March, the Congress passed, and President Biden signed into law, new statutory provisions that address LIBOR contracts that do not have adequate fallback language. The legislation marked an important step in helping ensure that these legacy contracts can smoothly transition away from LIBOR. The law requires the Federal Reserve Board to issue rules to designate spread-adjusted, SOFR-based fallbacks for such contracts.

Broad equity prices were highly volatile and declined notably on net

Amid increasing interest rates and news on both the Omicron variant and the Russian invasion of Ukraine, broad equity prices fluctuated widely and declined notably, on net, since the November 2021 *Financial Stability Report*. While the effect of high inflation and the Russia–Ukraine conflict on corporate earnings remained uncertain, earnings forecasts of private-sector analysts were revised a bit higher. Consequently, prices relative to earnings forecasts declined somewhat from previously very elevated levels but were still in the top quintile of their historical distribution, suggesting that valuations eased slightly (figure 1.9). Meanwhile, the difference between the forward earnings-to-price ratio and the expected

real yield on 10-year Treasury securities—a rough measure of the extra compensation that investors require for holding stocks relative to risk-free bonds, known as the equity premium—declined moderately (figure 1.10). Option-implied volatility increased significantly before reversing part of the run-up to still-elevated levels (figure 1.11). Consistent with the large price fluctuations and the uncertainty over the outlook for corporate profitability, the pace of initial public offerings declined and was low compared with historical standards.

Figure 1.9. Forward price-to-earnings ratio of S&P 500 firms

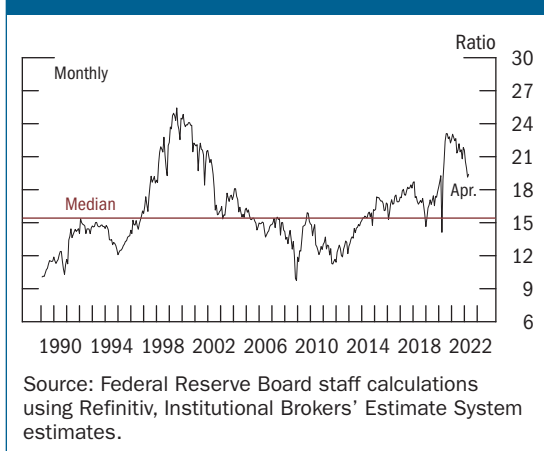
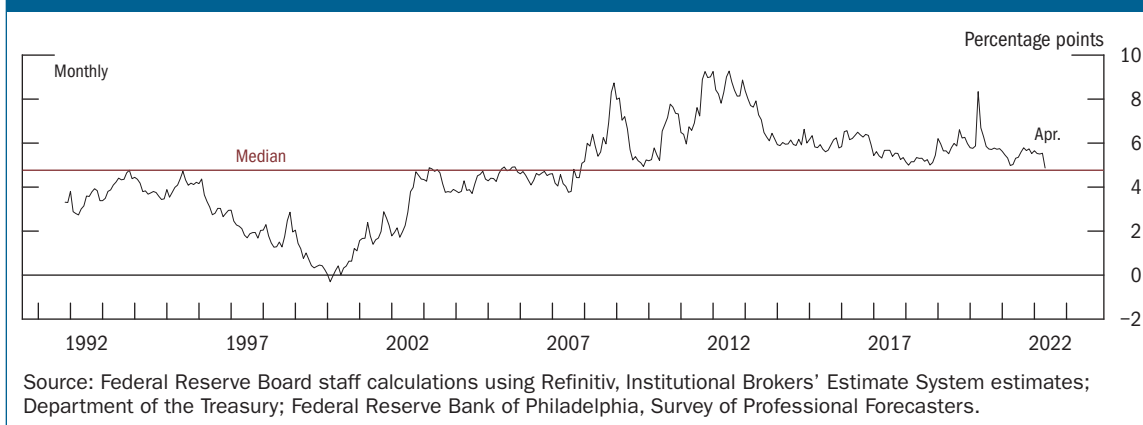
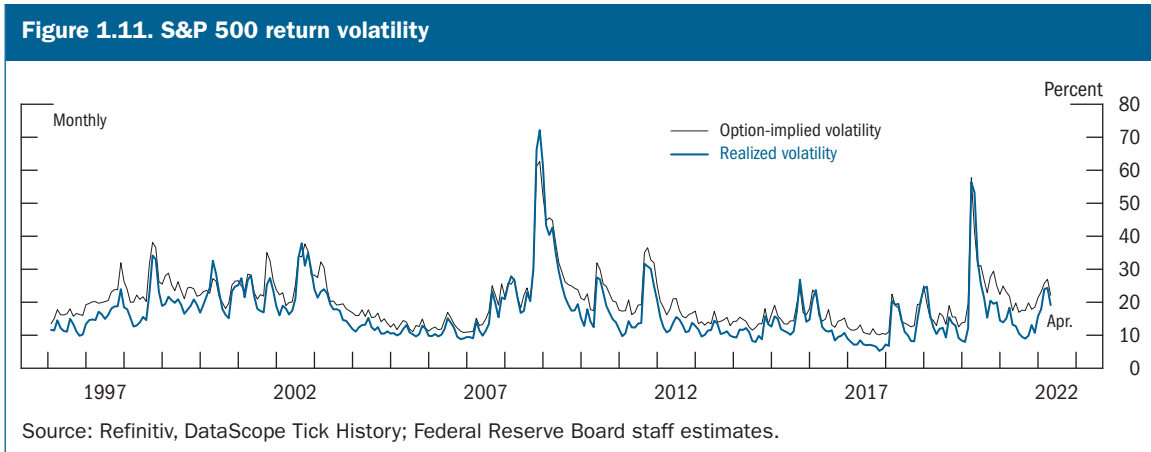


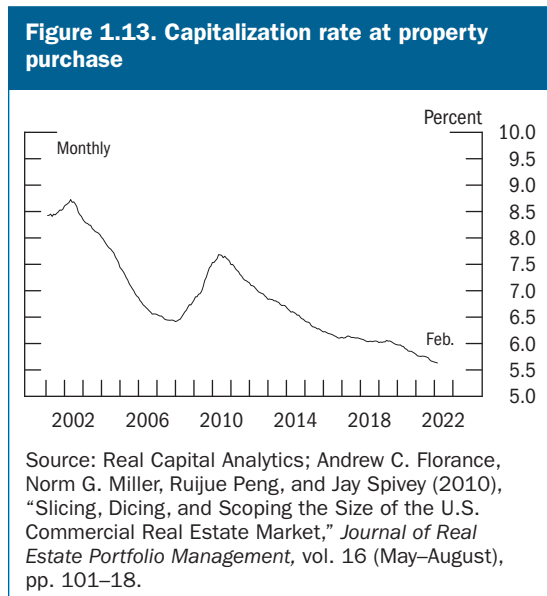
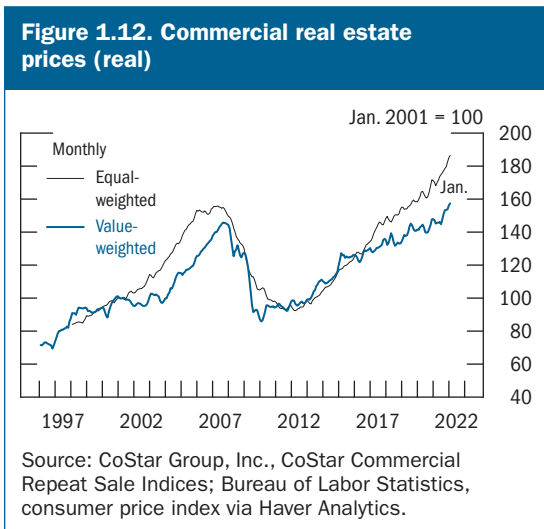
Figure 1.10. Spread of forward earnings-to-price ratio of S&P 500 firms to expected 10-year real Treasury yield



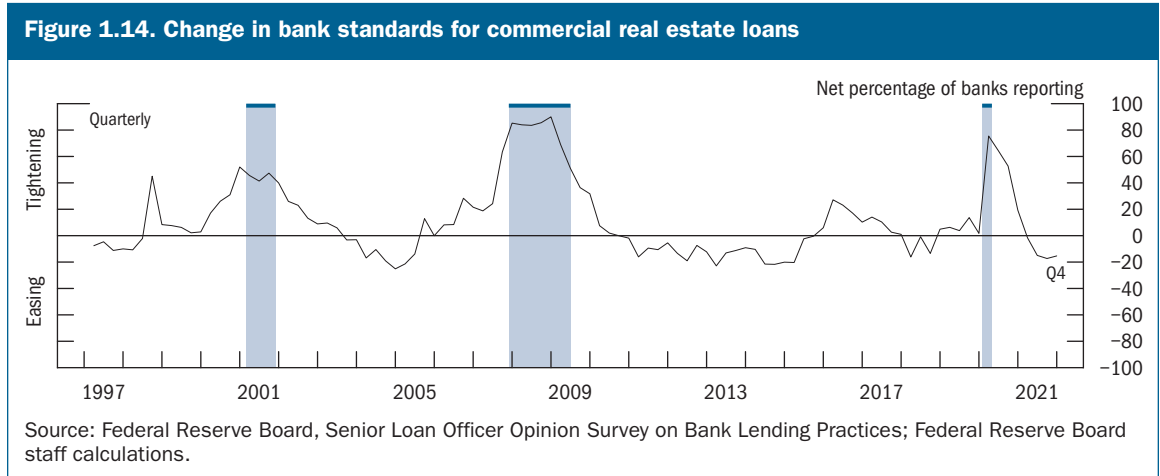


Commercial real estate valuations remained somewhat on the high side

Since the November *Financial Stability Report*, aggregate CRE price indexes continued to increase, driven by the multifamily and industrial sectors (figure 1.12). Capitalization rates at the time of property purchase, which measure the annual income of commercial properties relative to their prices, continued to decline and were at historical lows in February (figure 1.13). However, the spreads of capitalization rates to real Treasury yields—which provide a measure of risk appetite in this market—were little changed through February, remaining near their historical averages. Valuations in some segments of the CRE markets reflected weaker fundamentals compared with other segments. For example, vacancy rates and increases in asking rents were weaker in the retail and office sectors, and capitalization rates for those property types remained higher than those for other property types. Meanwhile, in the January Senior Loan Officer Opinion Survey on Bank

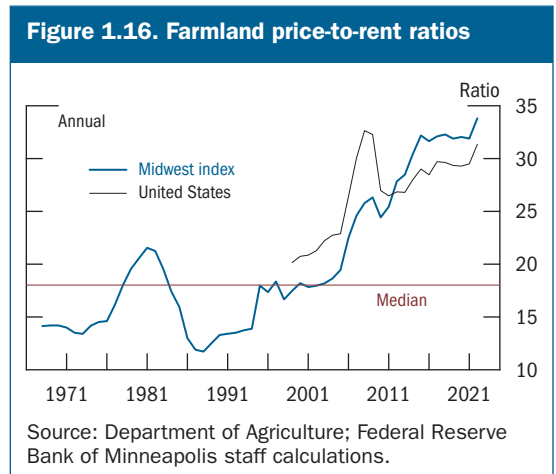
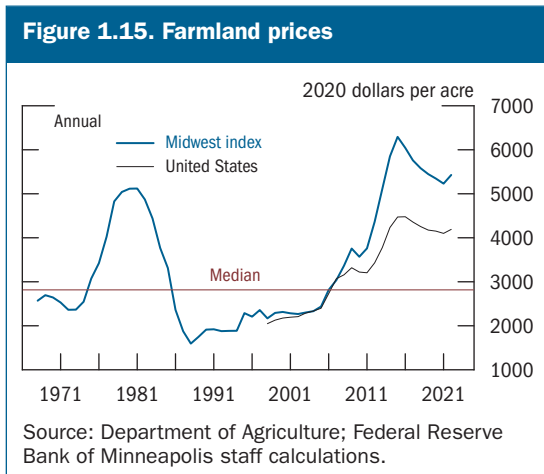


Lending Practices (SLOOS), banks reported stronger demand for CRE loans and easier lending standards for the last quarter of 2021, largely reflecting strengthening fundamentals (figure 1.14). Considering all these factors, CRE valuations appeared somewhat on the high side across property types.



Farmland prices relative to rents remained elevated

Farmland prices were at high levels, and the ratios of farmland prices to rents remained close to their historical highs (figures 1.15 and 1.16). Nevertheless, recent price increases in commodity markets suggest that the outlook for farm income was strong, on balance, as the positive effects of a substantial rise in prices of agricultural commodities, such as wheat and corn, appeared to outweigh the negative effects of higher prices for inputs, like fuel and fertilizers.



House prices continued to increase at a rapid pace, and price-to-rent ratios remained high relative to historical levels

House prices continued to increase at a rapid pace, which may reflect strong demand for housing space as people continued to spend more time at home, as well as constraints on supply (figure 1.17). Nationwide, house price-to-rent ratios increased further and stood slightly above the peak of the mid-2000s. A model of house price valuation also points to stretched valuations (figure 1.18). However, house valuations do not seem as stretched if valuation measures incorporate market-based measures of rents. For example, using the latest asking rents that tenants would pay when current leases expire and are renewed, house valuations appeared to be well below their peak of the mid-2000s. House price increases were widespread across regions and property types, and price-to-rent ratios also increased noticeably across regional markets (figure 1.19). Loan-to-value ratios and debt-to-income ratios were stable in recent years, suggesting that there is little evidence to date that recent house price increases were driven by a surge in speculative activity, an erosion in mortgage underwriting standards, or increased use of high-leverage loan products.

Figure 1.17. Growth of nominal prices of existing homes

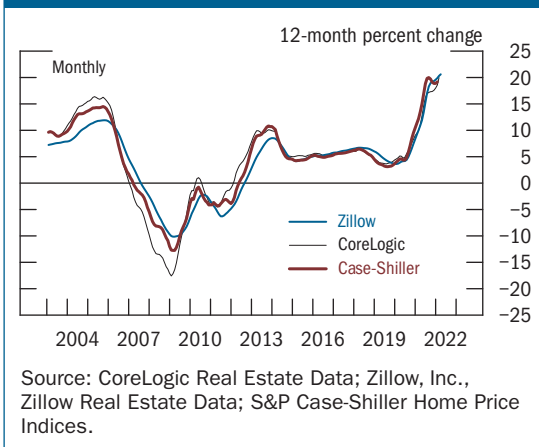


Figure 1.18. House price valuation measure

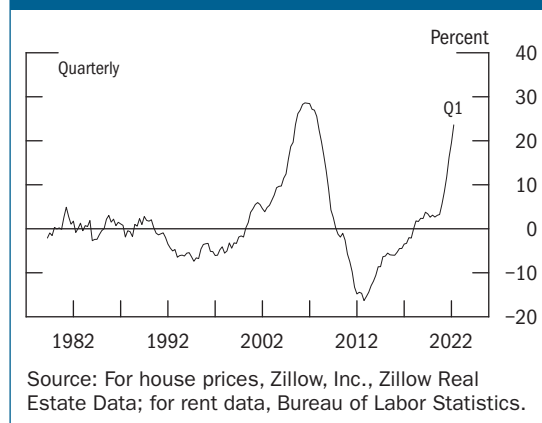
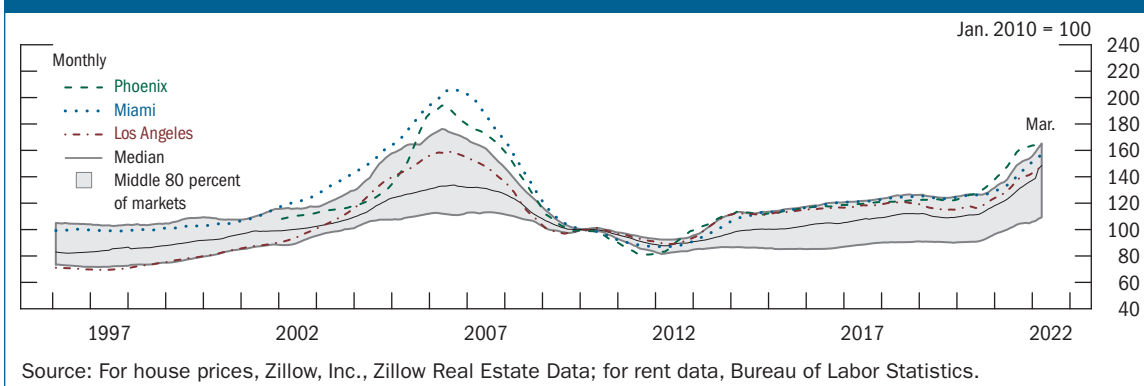


Figure 1.19. Selected local housing price-to-rent ratio indexes



Hence, a negative shock to house prices may hurt homeowners, but such a shock is unlikely to be amplified by the financial system. Credit availability for borrowers with lower credit scores improved slowly but remained below pre-pandemic levels. After staying at extremely low levels for most of the pandemic period, the number of foreclosure starts rose following the expiration of federal foreclosure protections at the end of 2021, returning to roughly their pre-pandemic levels.

2 | Borrowing by Businesses and Households

Vulnerabilities from business and household debt are moderate

Key indicators of vulnerabilities arising from business debt, including debt-to-GDP ratio and gross leverage, largely returned to near or below pre-pandemic levels, and median interest coverage ratios improved, reaching their highest level over the past two decades in the second half of 2021. Indicators of household vulnerabilities—including the household-credit-to-GDP ratio as well as mortgage, auto, and credit card delinquencies—were in the bottom range of the levels observed over the past 20 years. Nonetheless, rising inflation, increasing borrowing costs, and ongoing geopolitical tensions pose risks to the economic outlook, particularly for businesses that were most affected by the pandemic and for households that face the expiration of federal support programs. These segments of businesses and households might be more vulnerable to adverse shocks.

Table 2.1 shows the amounts outstanding and recent historical growth rates of forms of debt owed by nonfinancial businesses and households as of the fourth quarter of 2021. Total outstanding private credit was split about evenly between businesses and households, with businesses owing \$18.5 trillion and households owing \$17.9 trillion.

The ratio of business and household debt to gross domestic product continued to decline

Although the combined total debt of nonfinancial businesses and households grew throughout 2021, the debt-to-GDP ratio further declined from its pandemic highs because of the rapid pace of nominal GDP growth (figure 2.1). Regarding the individual sectors, the ratios of both business and household debt-to-GDP decreased in the second half of 2021 (figure 2.2).

Key indicators point to a reduction in business debt vulnerabilities, but balance sheet leverage remains high in some sectors

Overall, business debt vulnerabilities continued to decrease, even as business debt adjusted for inflation grew modestly in the second half of 2021, driven by robust commercial and industrial (C&I) loan origination volumes (figure 2.3). A number of factors were moderating vulnerabilities in the business sector during this period. Firms continued to maintain large cash buffers, as strong earnings offset a faster pace of share repurchases and increased capital outlays. Moreover, low interest rates continued to mitigate investor concerns about default risk arising from high leverage. The net issuance of high-yield bonds declined, while the net issuance of institutional leveraged loans remained strong as investors continued to demand floating-rate products amid expectations of rate increases. On net, issuance of total risky business debt—high-yield bonds and institutional leveraged loans—declined since the November report (figure 2.4).

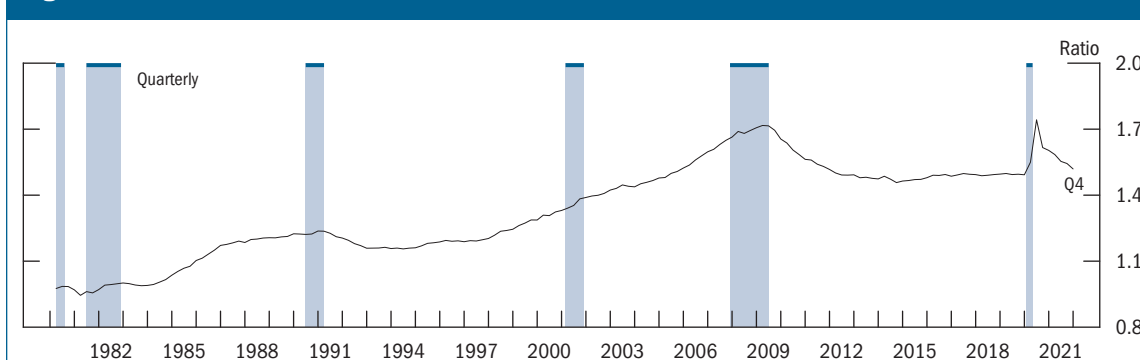
Table 2.1. Outstanding amounts of nonfinancial business and household credit

Item	Outstanding (billions of dollars)	Growth, 2020:Q4–2021:Q4 (percent)	Average annual growth, 1997–2021:Q4 (percent)
Total private nonfinancial credit	36,474	5.9	5.6
Total nonfinancial business credit	18,541	4.5	5.8
Corporate business credit	11,650	5.1	5.2
Bonds and commercial paper	7,390	2.5	5.7
Bank lending	1,533	1.8	3.0
Leveraged loans*	1,248	11.7	14.2
Noncorporate business credit	6,891	3.6	7.2
Commercial real estate credit	2,820	7.3	6.2
Total household credit	17,933	7.3	5.4
Mortgages	11,743	7.6	5.5
Consumer credit	4,434	6.0	5.1
Student loans	1,749	2.7	8.5
Auto loans	1,314	7.3	5.0
Credit cards	1,043	7.0	3.1
Nominal GDP	24,008	11.3	4.3

Note: The data extend through 2021:Q4. Outstanding amounts are in nominal terms. Average annual growth rates are measured from Q4 of the year immediately preceding the period through Q4 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.

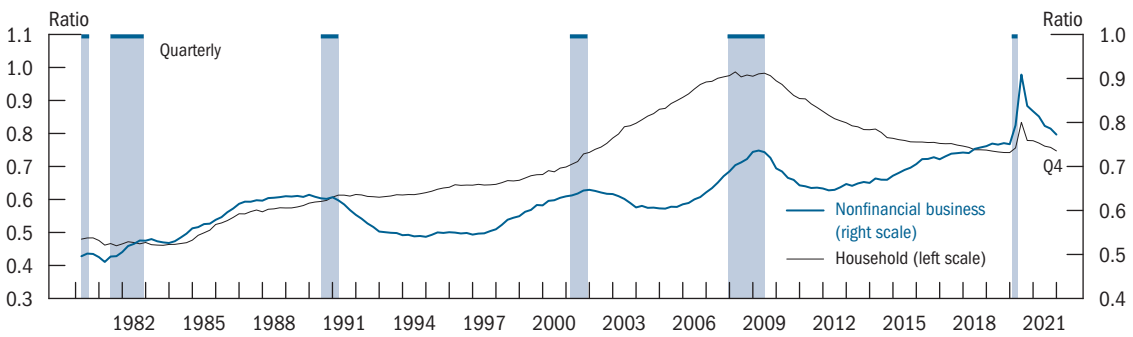
* Leveraged loans included in this table are an estimate of the leveraged loans that are made to nonfinancial businesses only and do not include the small amount of leveraged loans outstanding for financial businesses. The amount outstanding shows institutional leveraged loans and generally excludes 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 2021:Q4, 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.”

Figure 2.1. Private nonfinancial-sector credit-to-GDP ratio

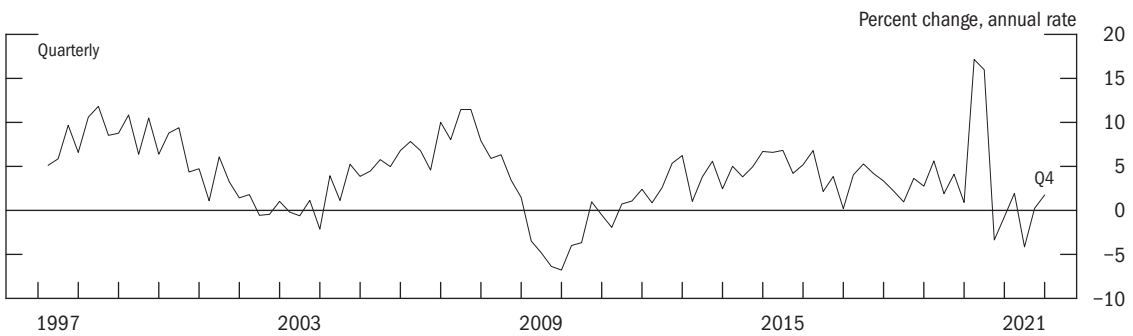
Source: Federal Reserve Board staff calculations based on Bureau of Economic Analysis, national income and product accounts, and Federal Reserve Board, Statistical Release Z.1, “Financial Accounts of the United States.”

Figure 2.2. Nonfinancial business- and household-sector credit-to-GDP ratios



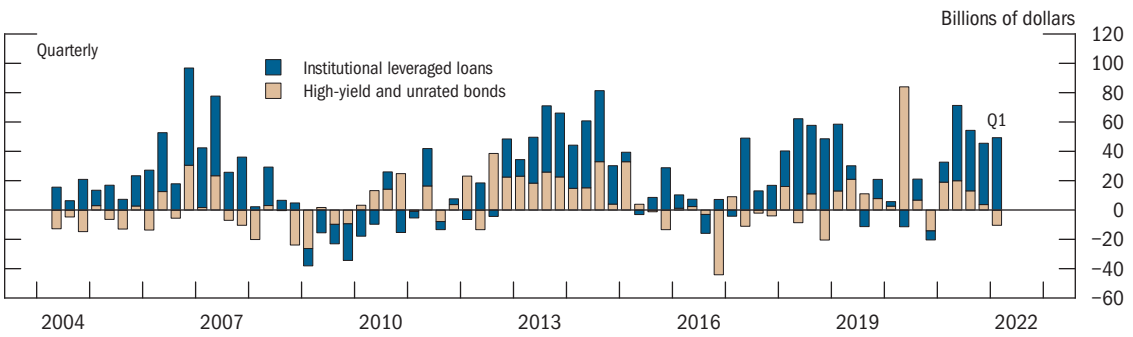
Source: Federal Reserve Board staff calculations based on Bureau of Economic Analysis, national income and product accounts, and Federal Reserve Board, Statistical Release Z.1, "Financial Accounts of the United States."

Figure 2.3. Growth of real aggregate debt of the business sector

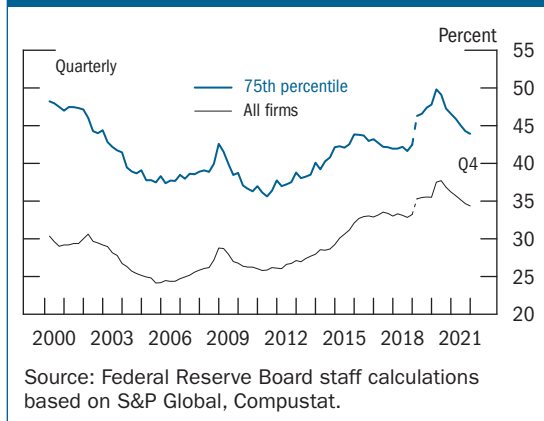


Source: Federal Reserve Board, Statistical Release Z.1, "Financial Accounts of the United States."

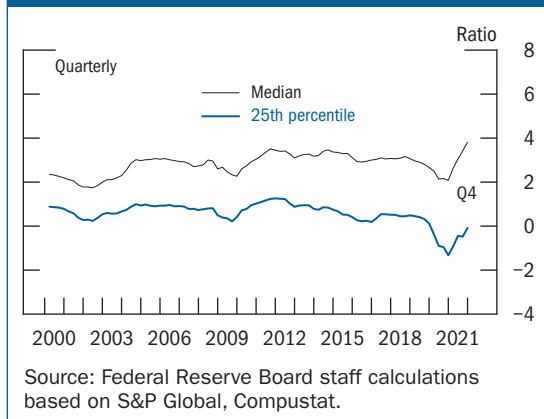
Figure 2.4. Net issuance of risky business debt



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

Figure 2.5. Gross balance sheet leverage of public nonfinancial businesses

Gross leverage of large businesses—the ratio of debt to assets for all publicly traded nonfinancial firms—declined to somewhat below pre-pandemic levels in the second half of 2021 (figure 2.5). This measure, however, remained at record-high levels for large firms in industries most affected by the pandemic, such as airlines, hospitality and leisure, and restaurants. The share of total nonfinancial public firm debt owed by these industries stood at 5.6 percent. Over the same period, net leverage—the ratio of debt less cash to total assets—held stable at below pre-pandemic levels among all large businesses, supported by ample cash holdings, but remained high relative to its history. Similarly, although net leverage in hard-hit industries edged up in the second half of 2021, it continued to remain below pre-pandemic levels.

Figure 2.6. Interest coverage ratios for public nonfinancial businesses

As earnings among large firms continued to increase and interest rates remained low, the ratio of earnings to interest expenses (the interest coverage ratio) continued to rise during the second half of 2021, indicating that large firms were better able to service debt. The median interest coverage ratio reached its highest level in the past two

decades (figure 2.6). Nevertheless, the effect of high inflation, rising interest rates, supply chain disruptions, and the ongoing geopolitical conflict on corporate profitability is uncertain. A significant decline in corporate profitability or an unexpectedly large increase in interest rates could curtail the ability of some firms to service their debt. In addition, the upward pressure on oil prices, if sustained, could curb the recovery in hard-hit industries such as airlines. (See the box [“Commodity Market Stresses following Russia’s Invasion of Ukraine.”](#))

An important caveat to the noted improvements in leverage and interest coverage ratios is that comprehensive data are only available for publicly traded firms.⁹ These firms tend to be large and

⁹ It is important to note, however, that the credit aggregates shown in figures 2.1, 2.2, and 2.3 include debt of both public and private firms.

have better access to capital markets, which allowed them to more easily weather disruptions, such as those associated with the pandemic. By contrast, smaller firms that are privately held tend to have higher leverage than public firms and to primarily borrow from banks, private credit and equity funds, and sophisticated investors.

Since the November report, the credit quality of outstanding corporate bonds remained largely unchanged at a strong level, in part because of high corporate profitability. The volume of credit rating upgrades continued to outpace that of downgrades. The fraction of nonfinancial corporate bonds with speculative-grade ratings—the higher-risk segment of the market—was little changed in the last quarter of 2021. Expected one-year-ahead bond defaults remained low, well below their long-run medians.

After falling sharply in 2021, default rates on leveraged loans stabilized below pre-pandemic levels as of March 2022, even as underwriting standards for newly issued loans weakened (figure 2.7). For instance, 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—exceeded historical highs (figure 2.8).

Figure 2.7. Default rates of leveraged loans

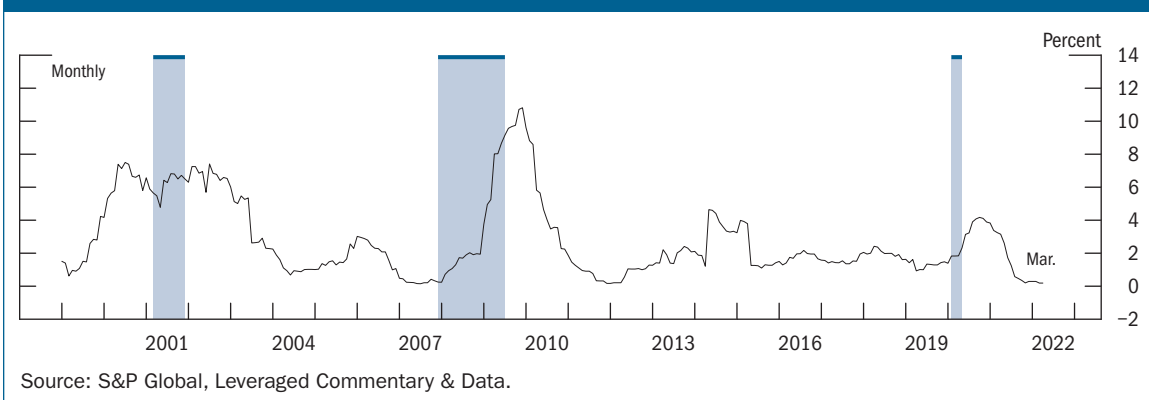
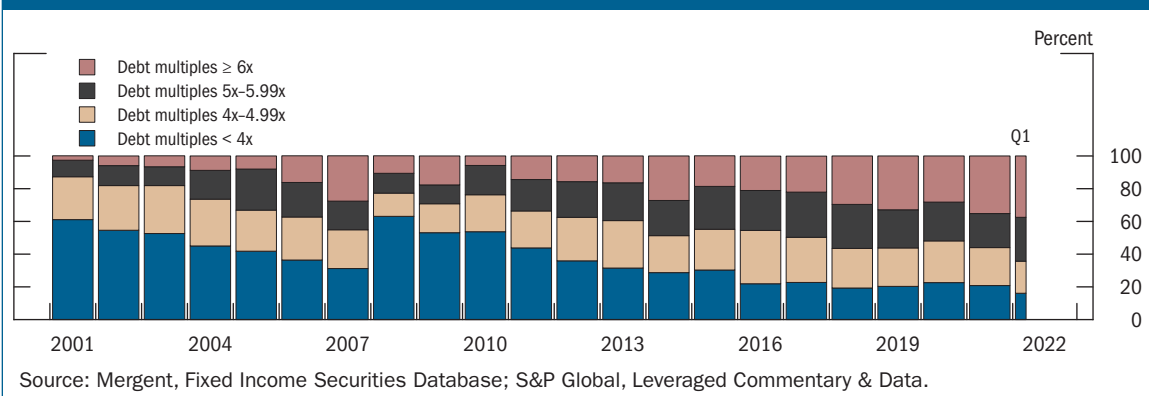


Figure 2.8. Distribution of large institutional leveraged loan volumes, by debt-to-EBITDA ratio



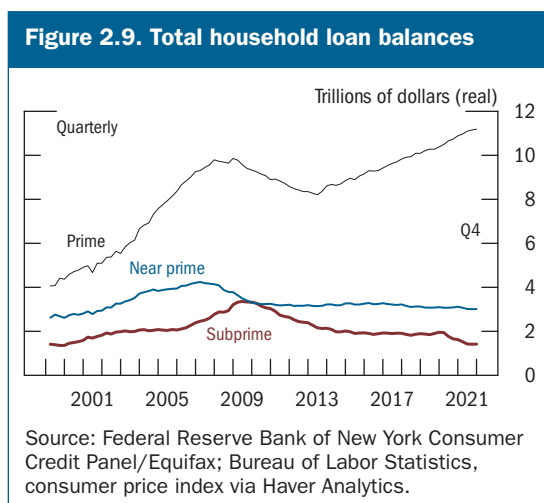
Many small businesses could be adversely affected by rising costs

Credit quality for small businesses continued to improve, with short- and long-term delinquencies declining below their pre-pandemic levels. Moreover, data from the April 2022 Census Bureau Small Business Pulse Survey showed that the share of small businesses with at least three months of cash on hand, relative to expenses, remains near its pandemic-era high. However, increasing labor costs and prices for other inputs may reduce small firms' earnings and their ability to service their loans.

Vulnerabilities from household debt remained moderate

The financial position of many households continued to improve since the previous *Financial Stability Report*, supported in part by a strong labor market, high personal savings, remaining pandemic relief programs, and rising house prices. Still, some households remained financially strained and more vulnerable to future shocks, especially with the expiration of loan forbearance and persistently high inflation.

Borrowing by households continued to rise in line with income and is concentrated among borrowers with low credit risk



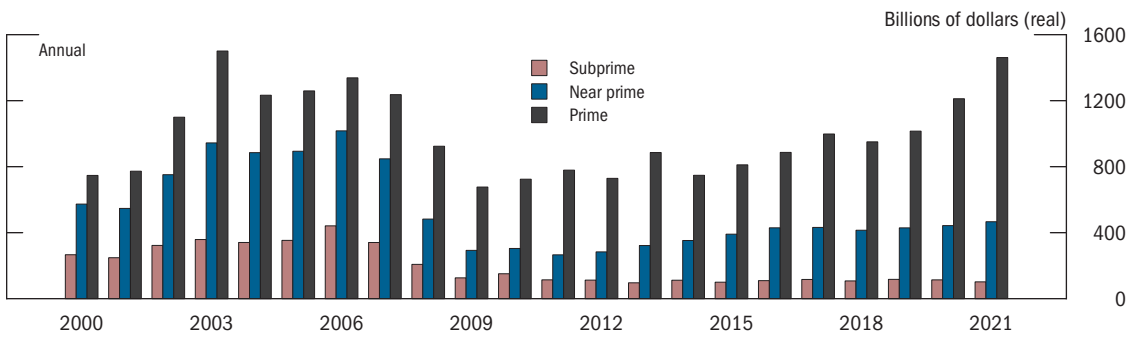
Borrowers with prime credit scores (more than half of the total number of borrowers) accounted for all the increase in total household debt in real terms, including gains in mortgage and credit card debt. By contrast, loan balances for borrowers with near-prime and subprime scores stayed roughly stable (figure 2.9). However, subprime debt balances may increase with the expiration of loan forbearance programs.¹⁰

Credit risk of outstanding household debt remained generally low

Mortgage debt accounted for roughly two-thirds of total household debt, with new mortgage extensions skewed toward prime borrowers in recent years (figure 2.10). Mortgage forbearance programs helped significantly reduce the effect of the pandemic on mortgage delinquencies (figure 2.11). The share of mortgages that were either delinquent or in a loss-mitigation program,

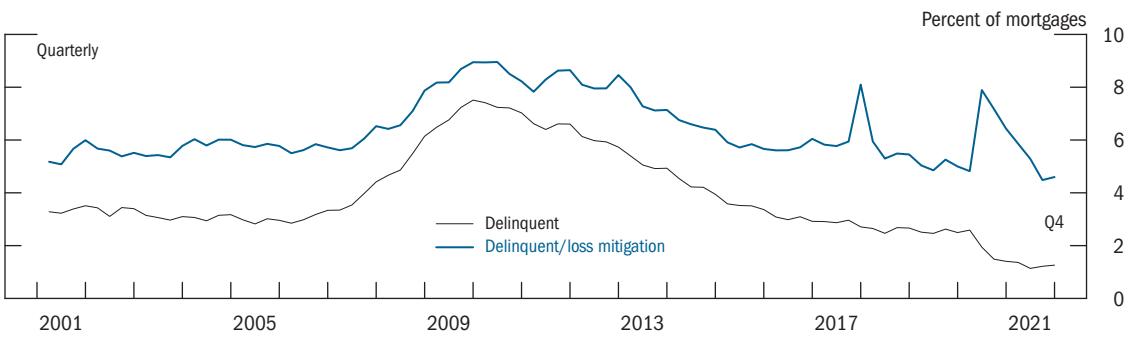
¹⁰ Households may have been able to use the liquidity afforded by the forbearance programs to avoid borrowing more. Once that flexibility expires, these households may borrow more to finance their consumption.

Figure 2.10. Estimates of new mortgage volumes to households



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

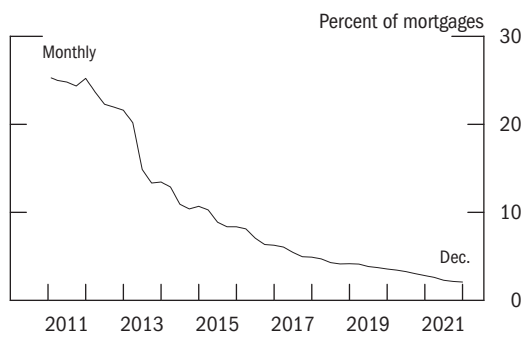
Figure 2.11. Mortgage loss mitigation and delinquency



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

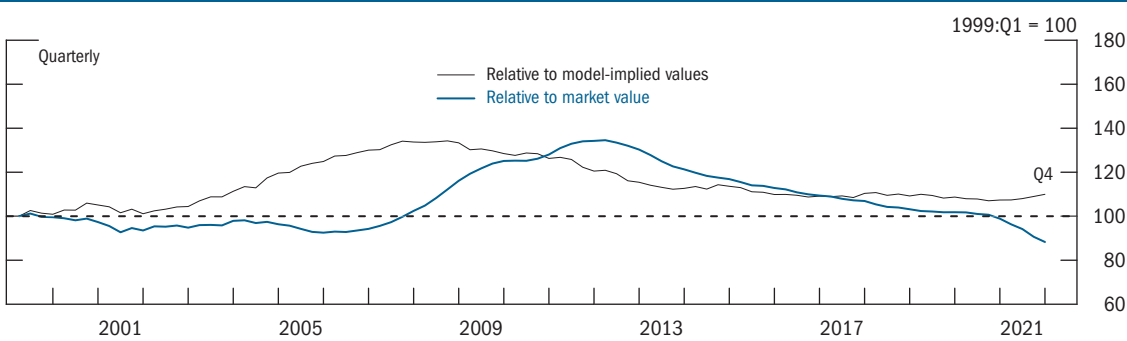
including forbearance, fell to slightly above 4 percent in December 2021, below pre-pandemic levels. Forbearance for mortgages continued to wind down, but about 800,000 borrowers, representing about 1.5 percent of all mortgaged properties, were still in forbearance plans as of January 2022. The recent robust house price increases put many borrowers in a solid equity position (figure 2.12). Unlike in the years before the Great Recession, borrower leverage did not increase relative to home values, even when measuring home values as a function of rents and other market fundamentals (figure 2.13).

Figure 2.12. Estimate of mortgages with negative equity



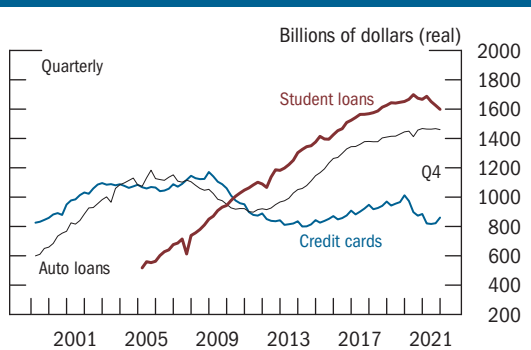
Source: CoreLogic, Inc., Real Estate Data.

Figure 2.13. Estimates of housing leverage



Source: Federal Reserve Bank of New York Consumer Credit Panel/Equifax; Zillow, Inc., Zillow Real Estate Data; Bureau of Labor Statistics via Haver Analytics.

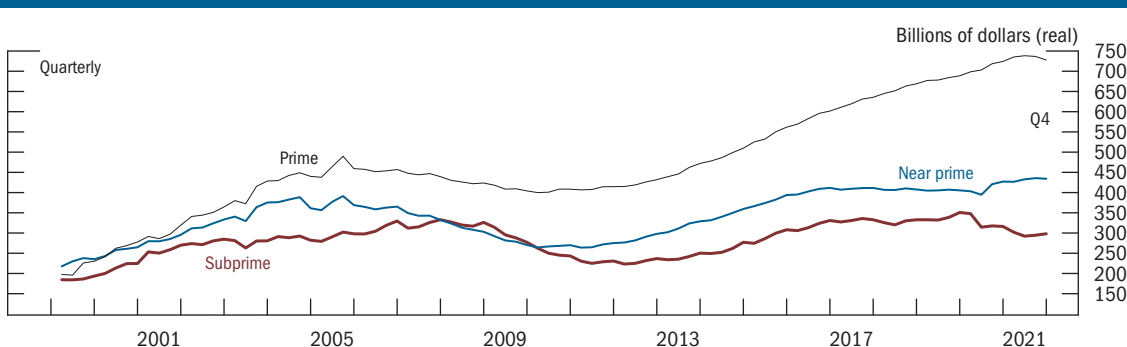
Figure 2.14. Consumer credit balances



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

Most of the remaining one-third of household debt was consumer credit, which consisted primarily of student loans, auto loans, and credit card debt (table 2.1). Inflation-adjusted consumer credit edged down in 2021, as student debt declined, auto debt was flat, and credit card debt increased slightly in real terms (figure 2.14). Auto loan balances expanded moderately, on net, among borrowers with near-prime credit scores and contracted slightly among prime borrowers (figure 2.15). The share of auto loans that were either delinquent or in loss mitigation remained around 3.5 percent in

Figure 2.15. Auto loan balances

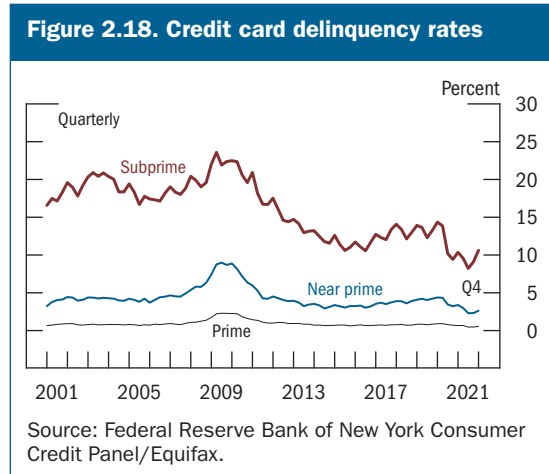
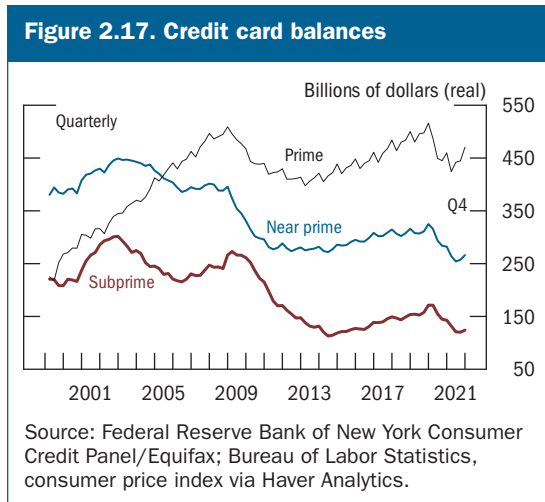
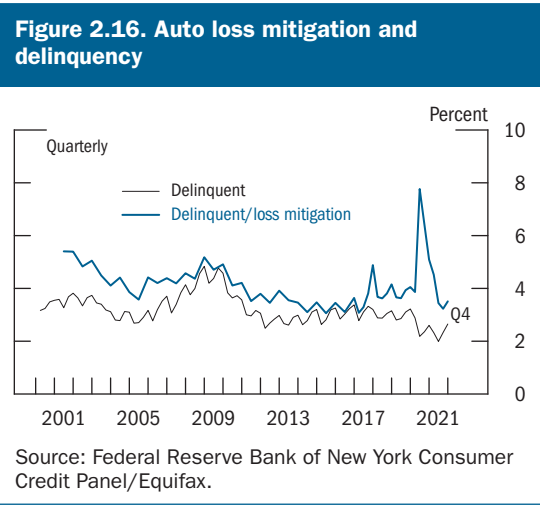


Source: Federal Reserve Bank of New York Consumer Credit Panel/Equifax; Bureau of Labor Statistics, consumer price index via Haver Analytics.

December 2021, with outright delinquency rates rising above 2 percent but remaining low by historical standards (figure 2.16).

Aggregate real student loan balances continued to decline in the second half of 2021 (figure 2.14). The risk that student loan debt poses to the financial system appears limited because most of the loans were issued through government programs and are owed by households in the top 40 percent of the income distribution. However, some borrowers may be adversely affected by the scheduled expiration of forbearance relief programs in August 2022.

In the last quarter of 2021, consumer credit card balances increased slightly from the low levels reached following the pandemic (figure 2.17). Delinquency rates were roughly flat for borrowers with prime scores and ticked up slightly for near-prime and subprime borrowers in the fourth quarter of 2021 (figure 2.18). Although credit card delinquencies for subprime and near-prime borrowers remained far below pre-pandemic levels, they may be adversely affected by increasing interest rates.



3 | Leverage in the Financial Sector

Leverage remained low at banks and broker-dealers but high at life insurance companies and somewhat elevated at hedge funds

The banking sector continued to be well capitalized, but banks have a large share of long-duration assets that are exposed to rising interest rates. Leverage at broker-dealers and at property and casualty (P&C) insurers remained at historically low levels. Leverage continued to be high at life insurance companies, and the most comprehensive available measures of hedge fund leverage remained somewhat above their historical averages. However, comprehensive measures of hedge fund leverage are only available with a considerable lag, and the sector is difficult to monitor in real time. Issuance volumes of non-agency securitized products reached new post-2008 highs, and bank lending to nonbank financial institutions (NBFIs) continued to grow rapidly. Direct exposures of U.S. financial institutions to Russia were small, but the ongoing geopolitical tensions could affect the U.S. financial sector through indirect channels.

Table 3.1 shows the sizes and growth rates of the types of financial institutions discussed in this section.

Item	Total assets (billions of dollars)	Growth, 2020:Q4–2021:Q4 (percent)	Average annual growth, 1997–2021:Q4 (percent)
Banks and credit unions	25,606	9.2	6.3
Mutual funds	22,209	13.5	10.1
Insurance companies	12,896	4.9	6.1
Life	9,785	3.9	6.2
Property and casualty	3,111	8.1	5.8
Hedge funds*	9,591	18.2	10.1
Broker-dealers**	5,160	8.9	5.2
Outstanding (billions of dollars)			
Securitization	12,016	6.4	5.5
Agency	10,646	5.8	5.9
Non-agency***	1,370	11.8	3.5
<p>Note: The data extend through 2021:Q4. Outstanding amounts are in nominal terms. Average annual growth rates are measured from Q4 of the year immediately preceding the period through Q4 of the final year of the period. Life insurance companies' assets include both general and separate account assets.</p> <p>* Hedge fund data start in 2012:Q4 and are updated through 2021:Q3. Growth rates for the hedge fund data are measured from Q3 of the year immediately preceding the period through Q3 of 2021.</p> <p>** Broker-dealer assets are calculated as unnetted values.</p> <p>*** Non-agency securitization excludes securitized credit held on balance sheets of banks and finance companies.</p> <p>Source: Federal Reserve Board, Statistical Release Z.1, "Financial Accounts of the United States"; Federal Reserve Board, "Enhanced Financial Accounts of the United States."</p>			

Banks remained well capitalized

The common equity Tier 1 ratio (CET1)—a regulatory risk-based measure of bank capital adequacy—remained at high levels relative to pre-2008 norms. In the second half of last year, this ratio was unchanged at U.S. global systemically important banks (G-SIBs) and declined somewhat for other large banks because of a general increase in bank lending (figure 3.1). In the first quarter of 2022, CET1 ratios decreased at G-SIBs, as heightened market volatility caused risk-weighted assets to rise. The ratio of tangible equity to total assets—a measure of bank capital adequacy that does not account for the riskiness of credit exposures and excludes intangible items such as goodwill from capital—continued to trend down in the second half of 2021 due to growth in low-risk assets, funded by inflows of core deposits (figure 3.2). Bank profitability declined somewhat in the first quarter of 2022 as banks increased loan loss provisions amid higher uncertainty about the economic outlook, but banks continue to report that rising interest rates will support their profitability going forward.

Measures of credit quality for most loan portfolios continued to improve during the second half of 2021. The outstanding amounts of bank loans to firms that experienced credit rating upgrades

Figure 3.1. Common equity Tier 1 ratio of banks

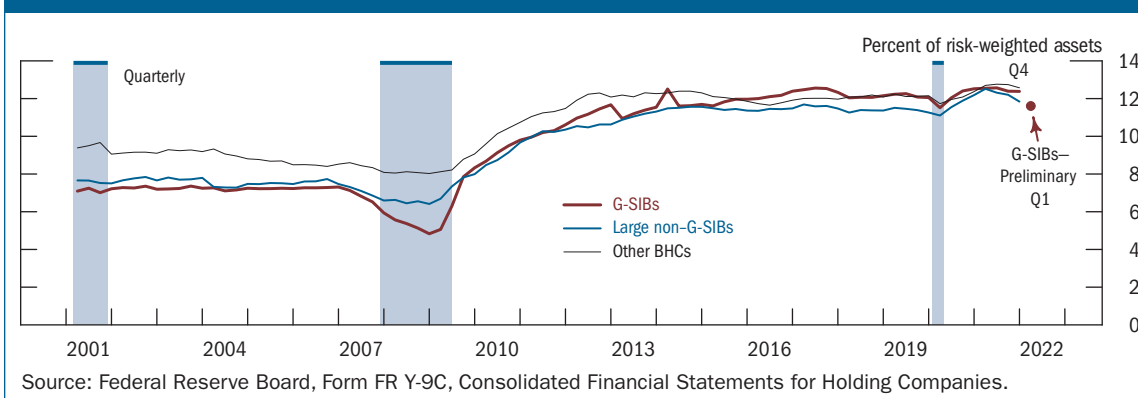
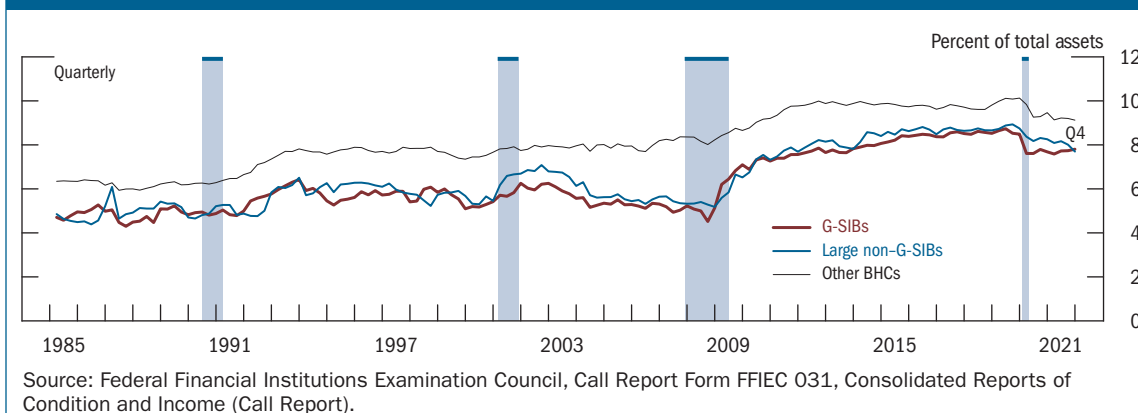


Figure 3.2. Ratio of tangible bank equity to assets

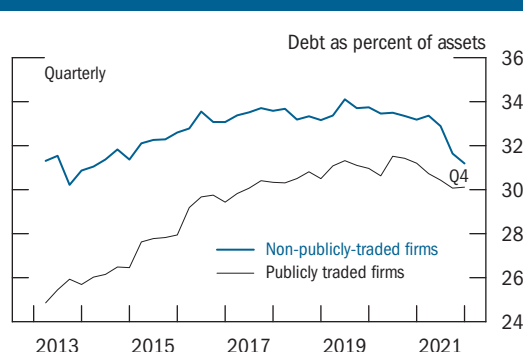


outpaced those that experienced credit rating downgrades. The leverage of firms with outstanding loans at large banks declined during the same period but remained somewhat elevated relative to the levels observed since 2013 (figure 3.3). Delinquency rates on most loans to businesses and households that are held by banks continued to decline, but delinquency rates on C&I loans to COVID-19-affected industries, and in certain segments of the CRE sector, remained elevated.

The October 2021 and January 2022 SLOOS indicated that banks continued to ease lending standards on most types of loans in the second half of 2021, albeit at a slower pace than in the first half of the year (figure 3.4).¹¹ To date, available measures do not seem to indicate that the continued easing of lending standards for bank credit has led to a broad-based increase in risk-taking by banks. In response to a set of special forward-looking questions in the January 2022 SLOOS, banks reported expecting an improvement in the quality of most business loans and a deterioration in the quality of household loans in their portfolio over 2022.

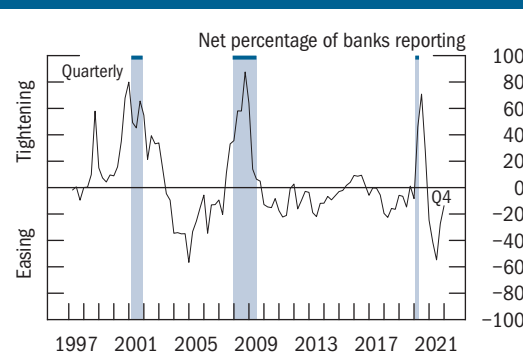
Vulnerabilities of U.S. banks to the Russian invasion of Ukraine appear to be limited. Before the invasion, banks maintained relatively small footprints in Russia and Ukraine, and their outstanding loans to borrowers in those countries were small. Exposures of large banks to counterparties that are active in commodity markets increased markedly, but banks appear to have managed risks amid the extremely high volatility seen in these markets since the beginning of the invasion. However, several indirect channels could pose risks for U.S. banks, including heightened volatility in asset markets; disruptions in payment, clearing, and settlement systems due to sanctions; and interconnections with large European banks, which could be adversely affected through the effect of the conflict on the European economy, as discussed in the [Near-Term Risks to the Financial System](#) section.

Figure 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.

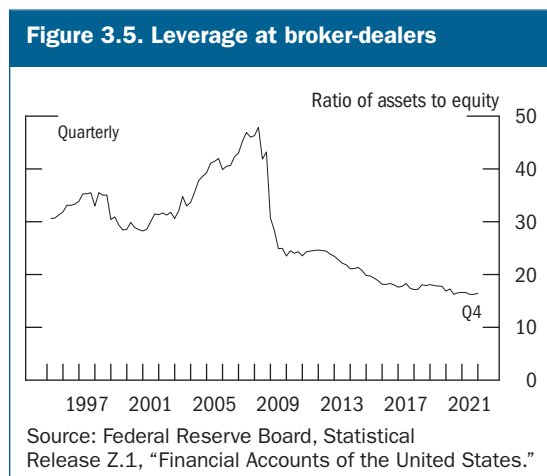
Figure 3.4. Change in bank lending standards for commercial and industrial loans



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

¹¹ The survey is available on the Federal Reserve Board's website at <https://www.federalreserve.gov/data/sloos.htm>.

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



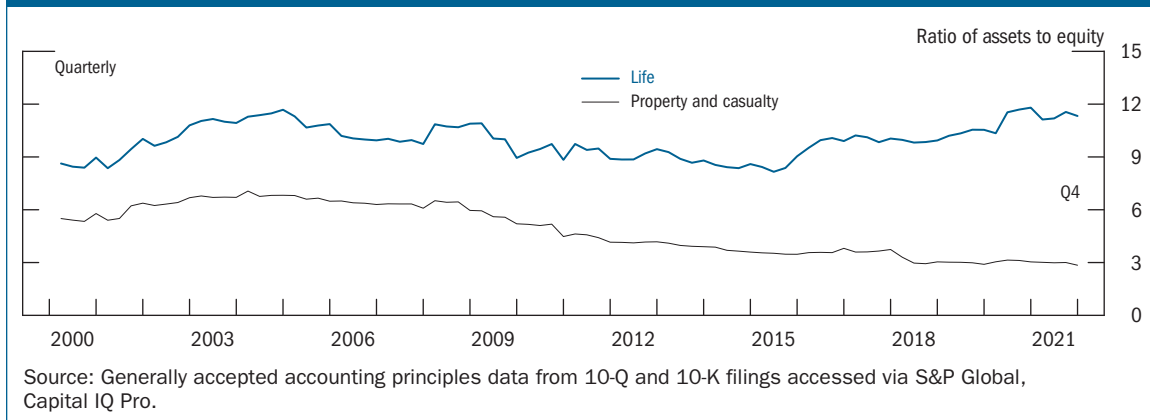
Broker-dealer leverage was little changed in the second half of 2021 and remained near historically low levels (figure 3.5). Net secured borrowing by primary dealers and their net securities positions decreased modestly over the same period. Gross secured borrowing and lending—a measure of funding intermediation activity by dealers—stayed largely unchanged, but secured financing backed by equity collateral remains near historical highs. Measures of dealer balance sheet costs continued to lie in the lower range of their distributions over the past few years, and dealers' trading revenues remained strong.

In the March 2022 Senior Credit Officer Opinion Survey on Dealer Financing Terms (SCOOS), which covered the period between December 2021 and February 2022, dealers reported little change in the use of leverage and in the terms associated with securities financing and over-the-counter (OTC) derivatives transactions.¹² In response to a set of special questions about the potential effects of rising interest rates, nearly one-half of dealers expect somewhat increased demand for funding from some hedge funds and insurance companies if interest rates across all maturities increase by a similar amount. These responses suggest that if dealers are unable to meet the increased demand for funding, rising interest rates could lead to a deterioration of market liquidity.

. . . but leverage at life insurance companies remained high . . .

Leverage at life insurers remained near its highest level of the past two decades (figure 3.6). Life insurers continued to invest heavily in corporate bonds, collateralized loan obligations (CLOs), and CRE debt, which leaves their capital positions vulnerable to sudden drops in the value of these risky assets. Gradually rising interest rates improve the profitability outlook of life insurers, as their liabilities generally have longer effective durations than their assets, and higher interest rates may reduce life insurers' incentives to invest in riskier assets. However, a large and unexpected increase in interest rates could induce policyholders to surrender their contracts at a higher-than-expected rate. If the increase in surrenders is substantial enough, it could put downward pressure on life insurers' financial performance.

¹² The survey is available on the Federal Reserve Board's website at <https://www.federalreserve.gov/data/scoos.htm>.

Figure 3.6. Leverage at insurance companies

Meanwhile, leverage at P&C insurers remained low relative to historical levels, and vulnerabilities in the insurance sector arising from direct exposures to Russian-domiciled firms and indirect exposures through European banks appeared limited.

... and hedge fund leverage continued to be somewhat elevated

In response to the March 2022 SCOOS—the most recent source of information on hedge fund leverage—dealers reported little change in hedge funds' use of leverage over the previous three months (figure 3.7). More comprehensive measures, based on confidential data collected by the Securities and Exchange Commission (SEC), suggest that in the third quarter of 2021, on-balance-sheet leverage increased modestly to a level above its historical average, while gross leverage, which includes off-balance-sheet derivatives exposures, remained elevated (figure 3.8). Because these measures are only available with a significant lag, real-time monitoring of hedge fund leverage is difficult.

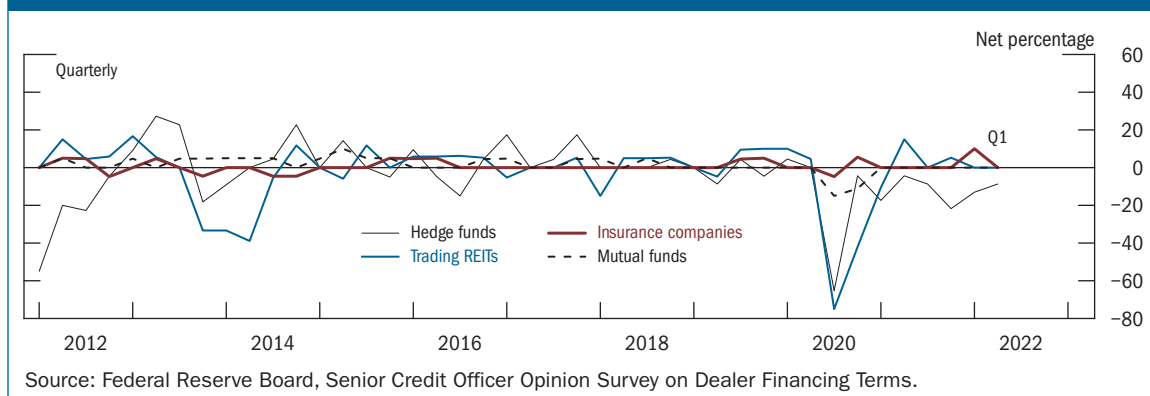
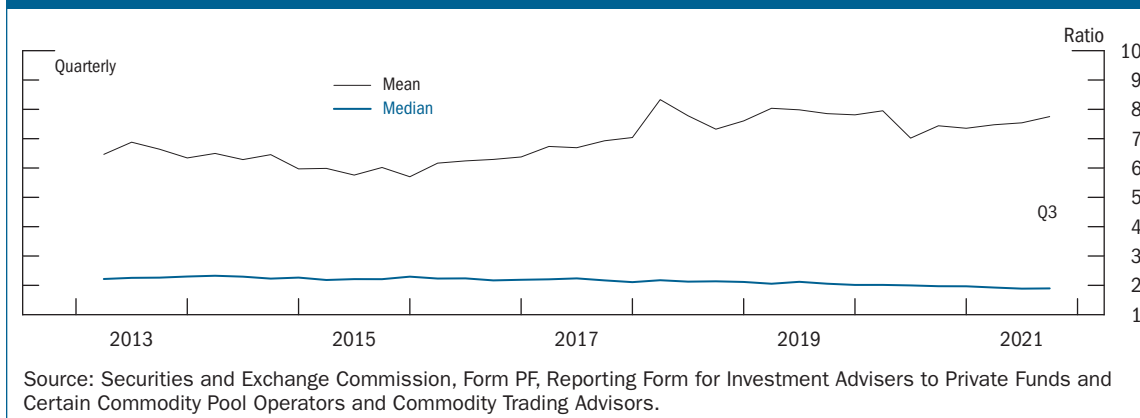
Figure 3.7. Change in the use of financial leverage

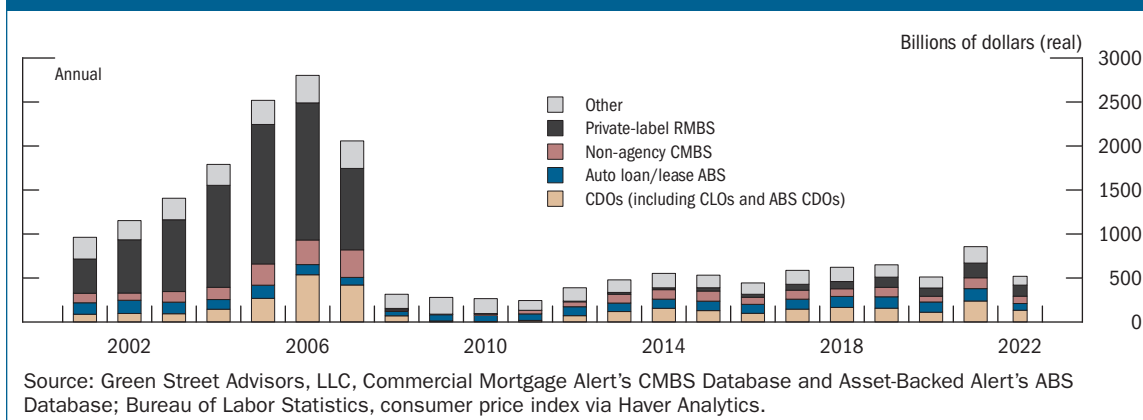
Figure 3.8. Gross leverage at hedge funds

According to confidential data collected by the SEC, large hedge fund advisers had small direct exposures to Russia in the third quarter of 2021. However, hedge funds could be indirectly exposed to the associated geopolitical tensions through their positions in commodity derivatives.

Issuance of non-agency securities by securitization vehicles reached post-2008 highs . . .

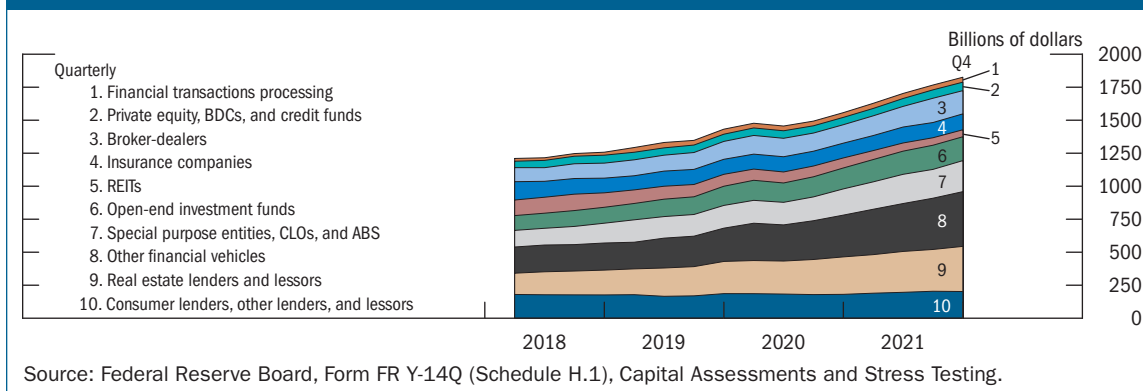
Following a decline early in the pandemic, issuance of non-agency securities recovered in 2021 and reached new post-2008 highs, although they are still at a fraction of their pre-2008 levels mainly due to a still-moribund market for non-agency residential mortgage-backed securities (figure 3.9).¹³ Issuance was generally elevated across asset classes, with CLOs and commercial mortgage-backed securities (CMBS) experiencing particularly high volumes. This growth was driven by strong investor demand for products with wider spreads amid improving economic conditions. Similar to bank loans, some securitized products are floating rate, which makes them attractive to investors in a rising interest rate environment and has been further supporting investor demand recently. Meanwhile, credit performance of assets underlying most securitized products improved, although delinquencies in non-agency CMBS backed by properties hit the hardest by the pandemic remained relatively high. Leverage embedded in securitization products remained generally stable.

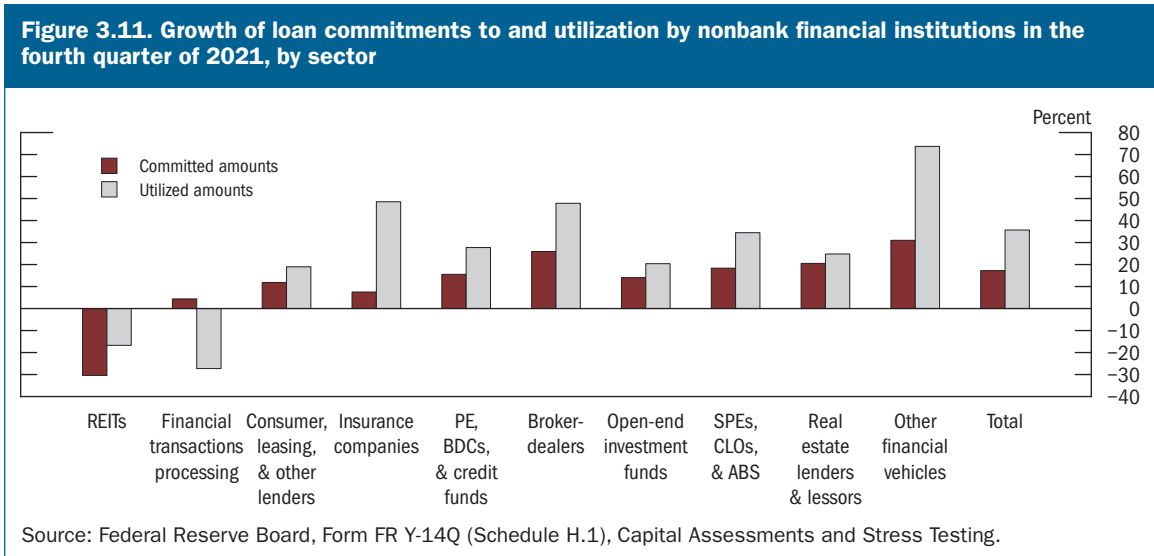
¹³ Securitization allows financial institutions to bundle loans or other financial assets and sell claims on the cash flows generated by these assets as tradable securities, much like bonds. Examples of the resulting securities include CLOs (predominantly backed by leveraged loans), asset-backed securities (often backed by credit card and auto debt), CMBS, and residential mortgage-backed securities. By funding assets with debt issued by investment funds known as special purpose entities (SPEs), securitization can add leverage to the financial system, in part because SPEs are generally subject to regulatory regimes, such as risk retention rules, that are less stringent than banks' regulatory capital requirements.

Figure 3.9. Issuance of non-agency securitized products, by asset class

. . . and bank lending to nonbank financial institutions continued to grow rapidly

Bank lending to NBFIs, which can be informative about the use of leverage by NBFIs and shed light on their interconnectedness with the core of the financial system, continued to increase notably. The growth in committed amounts of credit from large banks to NBFIs in 2021 outpaced the already rapid growth of 2020, driven by lending to real estate lenders and lessors, open-end investment funds, broker-dealers, and other financial vehicles (figure 3.10). The utilized amounts of credit increased for most NBFIs during the same period (figure 3.11). However, delinquency rates on loans by large banks to NBFIs declined modestly in 2021, returning to their average levels over the past decade. Further, the overall level of delinquency rates on loans by large banks to NBFIs was below the delinquency rates on loans by large banks to nonfinancial borrowers. Because NBFIs rely primarily on their bank credit lines to meet unexpected liquidity needs, loan commitments can experience sudden, correlated drawdowns. These drawdowns could

Figure 3.10. Large bank lending to nonbank financial firms: Committed amounts



be material relative to banks' available buffers of high-quality liquid assets (HQLA) and thus could generate liquidity pressures at large banks during times of financial stress. Some NBFIs—such as commodity trading firms—have been directly affected by the Russia–Ukraine conflict, but loan exposures of large U.S. banks to these firms are currently small.

4 | Funding Risks

Funding risks at domestic banks are low, but structural vulnerabilities persist at some money market funds, bond funds, and stablecoins

In 2021, the total amount of aggregate financial system liabilities that are vulnerable to runs increased 6.3 percent to \$19.1 trillion; that amount was equivalent to about 80 percent of nominal GDP (table 4.1 and figure 4.1).¹⁴ Banks relied only modestly on short-term wholesale funding and continued to hold large amounts of HQLA. Prime and tax-exempt MMFs as well as other cash-investment vehicles remained vulnerable to runs, and some open-end mutual funds continued to be exposed to redemption risks because of their holdings of illiquid assets. The stablecoin sector continued to grow rapidly and remains exposed to liquidity risks. While a few signs of

Table 4.1. Size of selected instruments and institutions

Item	Outstanding/total assets (billions of dollars)	Growth, 2020:Q4–2021:Q4 (percent)	Average annual growth, 1997–2021:Q4 (percent)
Total runnable money-like liabilities*	19,149	6.3	4.9
Uninsured deposits	8,054	17.7	12.3
Domestic money market funds**	4,756	9.7	5.6
Government	4,228	14.7	16.1
Prime	441	-18.8	-1.1
Tax exempt	87	-17.7	-2.7
Repurchase agreements	3,635	-9.1	5.2
Commercial paper	1,014	2.8	2.3
Securities lending***	764	20.0	7.0
Bond mutual funds	5,368	8.5	9.3

Note: The data extend through 2021:Q4. Outstanding amounts are in nominal terms. Average annual growth rates are measured from Q4 of the year immediately preceding the period through Q4 of the final year of the period. Total runnable money-like liabilities exceed the sum of listed components. Items not included in the table are variable-rate demand obligations, federal funds, funding-agreement-backed securities, private liquidity funds, offshore money market funds, short-term investment funds, local government investment pools, and stablecoins.

* Average annual growth is from 2003:Q1 to 2021:Q4.

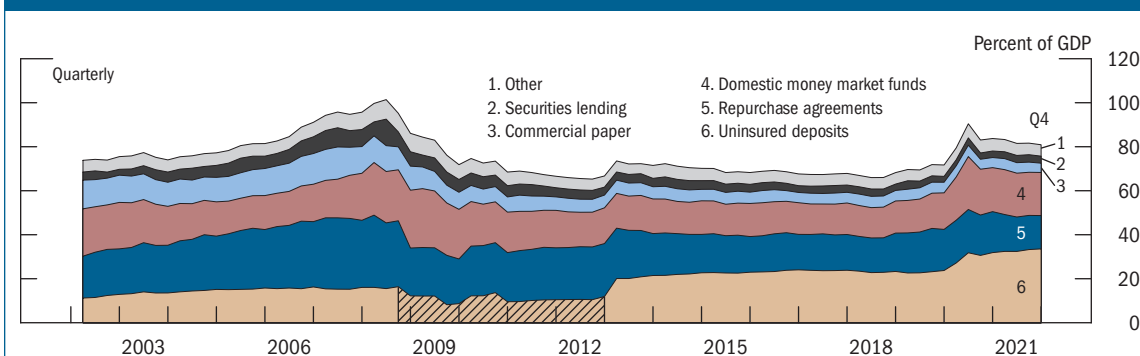
** Average annual growth is from 2001:Q1 to 2021:Q4.

*** Average annual growth is from 2000:Q1 to 2021:Q4.

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 Measures" (M3 monetary aggregate, 1997–2001); 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.

¹⁴ Table 4.1 and figure 4.1 do not include stablecoins.

Figure 4.1. Runnable money-like liabilities as a share of GDP, by instrument and institution



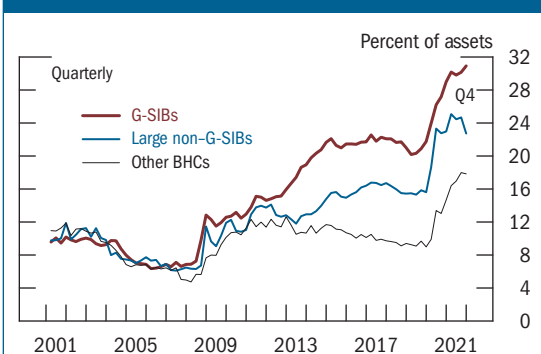
Source: Securities and Exchange Commission, Private Funds Statistics; iMoneyNet, Inc., Offshore Money Fund Analyzer; Bloomberg Finance L.P.; Securities Industry and Financial Markets Association: U.S. Municipal Variable-Rate Demand Obligation Update; Risk Management Association, Securities Lending Report; 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 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, Asset-Backed Commercial Paper Program Index; Bureau of Economic Analysis, gross domestic product via Haver Analytics.

funding pressures emerged after the Russian invasion of Ukraine, the effects in broad short-term funding markets have been limited to date.

Banks maintained high levels of liquid assets and stable funding . . .

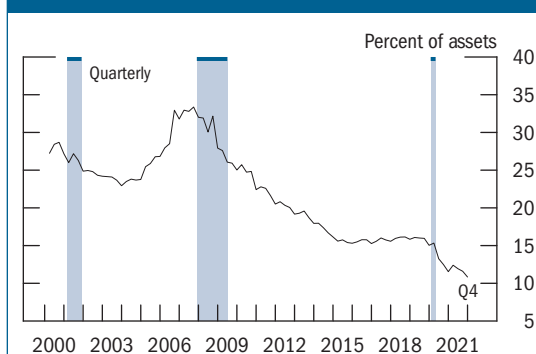
As a share of total assets, HQLA remained historically high at banks (figure 4.2). Reliance on short-term funding stayed near all-time lows (figure 4.3). Maturity transformation reached historically high levels, as large banks rapidly increased their holdings of low-risk, longer-duration securities funded by inflows of deposits. The increasing mismatch between the maturity profiles of assets and liabilities exposes banks to interest rate risk. However, the losses on securities holdings associated with rising interest rates could be at least partially offset by increasing net interest margins. Together with banks’ strong capital positions, the improved profitability could mitigate banks’ vulnerability stemming from maturity transformation.

Figure 4.2. Liquid assets held by banks



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

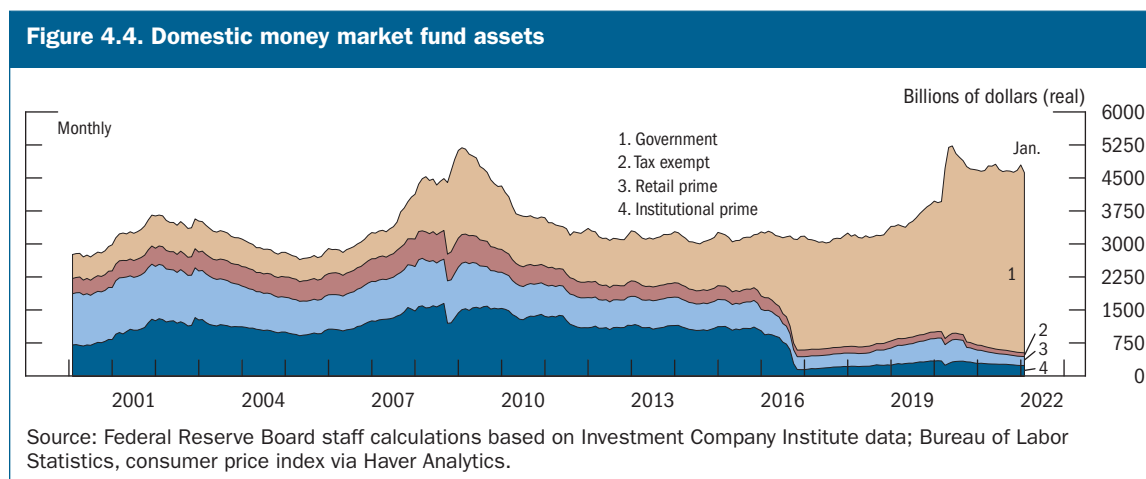
Figure 4.3. Short-term wholesale funding of banks



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

. . . but structural vulnerabilities remained at some money market funds and other cash-management vehicles

Assets under management at prime and tax-exempt MMFs, which began trending down in mid-2020, have continued to decline, on net, in recent months (figure 4.4). These MMFs remain a structural vulnerability due to their susceptibility to runs, and MMF reforms to mitigate this vulnerability continue to be a priority for domestic and international policymakers. In December, the SEC published for public comment a proposed MMF reform package that includes a requirement that those prime and tax-exempt funds that are offered to institutional investors adopt swing pricing, which, if properly calibrated, could reduce investors' incentive to run from funds amid stress.¹⁵ The proposal would also remove liquidity fees and redemption gate provisions in the existing rule, increase MMFs' minimum required liquidity buffers, and introduce additional reporting requirements.¹⁶



Other cash-management vehicles, including dollar-denominated offshore funds and short-term investment funds, also invest in money market instruments and are vulnerable to runs; moreover, these vehicles are less transparent and regulated than MMFs. Over the past six months, the assets under management at these vehicles remained at just over \$1 trillion. Currently, between \$330 billion and \$1 trillion of these vehicles' assets are in portfolios similar to those of U.S. prime MMFs, and a wave of redemptions from them could destabilize short-term funding markets.

The Russian invasion of Ukraine does not appear to have left a material imprint on broader short-term funding markets. Trading conditions have been stable, and while spreads on some types of commercial paper with maturities of 30 days or more increased notably, issuance continued and

¹⁵ Under the SEC's proposal for MMFs, swing pricing would reduce an MMF's price per share on days when it has costly net redemptions. The reduction in share price would be calibrated to pass on the costs associated with redemptions to redeeming investors.

¹⁶ For more information, see Securities and Exchange Commission (2021), "SEC Proposes Amendments to Money Market Fund Rules," press release, December 15, <https://www.sec.gov/news/press-release/2021-258>.

spreads remained well below the levels reached in March 2020. Domestic MMFs have no direct exposure to entities domiciled in Russia or Ukraine. Furthermore, Russian and Ukrainian entities had a very limited presence in short-term funding markets before the escalation of the Russia–Ukraine conflict. However, like domestic banks, MMFs and other cash-management vehicles could be affected indirectly through their exposures to European banks if the conflict intensifies in a way that causes significant adverse effects on the European economy or roils financial markets.

Stablecoins are also vulnerable to runs, and the sector continues to grow rapidly

The aggregate value of stablecoins—digital assets that are designed to maintain a stable value relative to a national currency or other reference assets—grew rapidly over the past year to more than \$180 billion in March 2022.¹⁷ The stablecoin sector remained highly concentrated, with the three largest stablecoin issuers—Tether, USD Coin, and Binance USD—constituting more than 80 percent of the total market value.¹⁸

Stablecoins typically aim to be convertible, at par, to dollars, but they are backed by assets that may lose value or become illiquid during stress; hence, they face redemption risks similar to those of prime and tax-exempt MMFs. These vulnerabilities may be exacerbated by a lack of transparency regarding the riskiness and liquidity of assets backing stablecoins. Additionally, the increasing use of stablecoins to meet margin requirements for levered trading in other cryptocurrencies may amplify volatility in demand for stablecoins and heighten redemption risks.¹⁹ The President’s Working Group on Financial Markets, the Federal Deposit Insurance Corporation, and the Office of the Comptroller of the Currency have made recommendations to address prudential risks posed by stablecoins.

On March 9, 2022, President Biden issued an executive order (EO) outlining a coordinated inter-agency approach for the responsible development of digital assets, which, together with related activities, have expanded considerably.²⁰ Additionally, some crypto-assets—such as Bitcoin—have experienced extreme price volatility. Among other things, the EO directs the FSOC to issue a report on the financial stability risks and regulatory gaps posed by digital assets and include recommendations for addressing these risks. The EO also encourages the Board to continue research on central bank digital currencies (CBDCs), including how they could improve the efficiency and reduce the costs of payment systems. For a broader discussion of CBDCs, see the box “[Central Bank Digital Currency and Financial Stability](#).”

¹⁷ See International Organization of Securities Commissions (2022), *IOSCO Decentralized Finance Report* (Madrid: IOSCO, March) <https://www.iosco.org/library/pubdocs/pdf/IOSCOPD699.pdf>.

¹⁸ See IOSCO, *Decentralized Finance Report*, in note 17.

¹⁹ See Gary B. Gorton, Chase P. Ross, and Sharon Y. Ross (2022), “Making Money,” NBER Working Paper Series 29710 (Cambridge, Mass.: National Bureau of Economic Research, January), <https://www.nber.org/papers/w29710>.

²⁰ See Executive Office of the President (2022), “Ensuring Responsible Development of Digital Assets,” Executive Order 14067 of March 9 (Document No. 2022-05471), *Federal Register*, vol. 87 (March 14), pp. 14143–52.

Box 4.1. Central Bank Digital Currency and Financial Stability

Recent technological advances have ushered in a wave of new private-sector financial products and services, including digital wallets, mobile payment apps, and new digital assets such as cryptocurrencies and stablecoins. These technological advances have also led central banks around the globe to explore the potential benefits and risks of issuing a CBDC.

A CBDC is a digital liability of a central bank that is widely available to the general public. In this respect, it is analogous to a digital form of paper money.¹ Today, Federal Reserve notes (that is, physical currency) are the only type of central bank money available to the general public. As a liability of the Federal Reserve, a CBDC would be the safest digital asset available to the general public, with no associated credit or liquidity risk. It could provide households and businesses with a variety of new financial products and services, support faster and cheaper payments (including cross-border payments), and expand consumer access to the financial system.

However, a CBDC could pose a variety of risks and would raise important policy questions, including how it might affect financial-sector market structure, the cost and availability of credit, the safety and stability of the financial system, and the efficacy of monetary policy.

Like other central banks, the Federal Reserve is engaged in research into this topic. The Federal Reserve's work focuses on how a CBDC could improve on an already safe, effective, dynamic, and efficient domestic payments system, with full recognition that the implications and risks must be thought through very carefully, including implications for financial stability.

In January, the Federal Reserve published a discussion paper as a first step in fostering a broad and transparent public dialogue about the potential benefits and risks of a U.S. CBDC.² The Federal Reserve does not intend to proceed with issuance of a CBDC without clear support from the executive branch and from the Congress, ideally in the form of a specific authorizing law.

Design of central bank digital currency

While no decisions have been made, the Federal Reserve's January discussion paper indicates that a potential CBDC would best serve the needs of the United States by being privacy protected, identity verified, intermediated, and transferable:

- **Privacy protected:** Protecting user privacy is critical. The Federal Reserve is researching technological and policy options for a robust privacy framework.
- **Identity verified:** A CBDC would need to comply with rules designed to combat money laundering and the financing of terrorism.
- **Intermediated:** Under an intermediated model, private-sector intermediaries would offer accounts or digital wallets to facilitate the management of CBDC holdings and payments.
- **Transferable:** A CBDC must be seamlessly transferable between customers of different intermediaries.

(continued)

¹ In the United States, money takes multiple forms. *Central bank money*, a liability of the central bank, comes in the form of physical currency issued by the Federal Reserve and digital balances held by commercial banks at the Federal Reserve. Central bank money has no associated credit or liquidity risk. *Commercial bank money* is the digital form of money that is most commonly used by the public. Commercial bank money is held in accounts at commercial banks, and it has little credit or liquidity risk. *Nonbank money* is digital money held as balances at nonbank financial service providers. These firms typically conduct balance transfers on their own books using a range of technologies, including mobile apps. Nonbank money may carry more credit and liquidity risk, depending on the design.

² See Board of Governors of the Federal Reserve System (2022), "Money and Payments: The U.S. Dollar in the Age of Digital Transformation" (Washington: Board of Governors, January), <https://www.federalreserve.gov/publications/files/money-and-payments-20220120.pdf>.

Box 4.1.—continued**Potential benefits and use cases**

The Federal Reserve is considering how a CBDC might fit into the U.S. money and payments landscape. A crucial test for a potential CBDC is whether it would provide benefits to households, businesses, and the overall economy that exceed any costs and risks and whether it would yield such benefits more effectively than other methods.

A CBDC has the potential to support financial stability. In a rapidly digitizing economy, the proliferation of new types of digital money, including stablecoins, could present risks to both individual users and the financial system as a whole. A CBDC could provide the public with broad access to digital money that is free from credit and liquidity risk.

A CBDC might also help level the playing field in payment innovation for private-sector firms of all sizes. A CBDC could serve as a safe and robust form of digital money that could allow private-sector innovators to focus on new access services, distribution methods, and related service offerings.

A CBDC might generate new capabilities to meet the evolving speed and efficiency requirements of the digital economy. Depending on the design, a CBDC may improve cross-border payments, support the dollar's international role, and promote financial inclusion.

Key risks and policy considerations

Although the introduction of a CBDC could benefit consumers and the broader financial system, such a potential step also raises complex policy issues and risks.

A CBDC could fundamentally change the structure of the U.S. financial system, altering the roles and responsibilities of the private sector and the central bank. A widely available CBDC could serve as a close substitute for commercial bank deposits or other low-risk assets such as government MMFs and Treasury bills. A shift away from these assets could reduce credit availability or raise credit costs for households, businesses, and governments. In times of stress, the ability to convert other forms of money into CBDC could make runs on financial firms more likely or more severe.

Additionally, depending on the design, a CBDC could affect the efficacy of monetary policy implementation. Any CBDC would also need to be extremely resilient to operational disruptions and cybersecurity risks, and it would need to strike an appropriate balance between safeguarding consumer privacy and affording the transparency necessary to deter criminal activity.

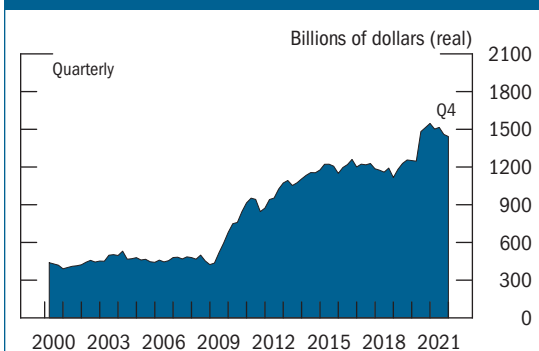
Next steps

The Federal Reserve has not advanced any specific policy outcome and will not be making any imminent decisions about the appropriateness of issuing a U.S. CBDC. Rather, it is seeking input from a wide range of stakeholders that might use a CBDC or be affected by its introduction.

Bond mutual funds experienced modest outflows and remained exposed to liquidity and interest rate risks

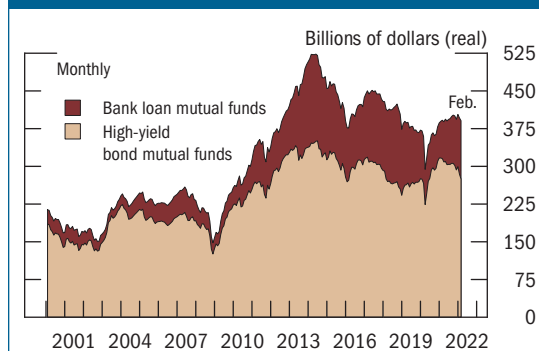
Mutual funds that invest substantially in corporate bonds, municipal bonds, and bank loans may be particularly exposed to liquidity transformation risks, given the relative illiquidity of their assets and the requirement that these funds offer redemptions daily. The aggregate value of U.S. corporate bonds held by mutual funds declined somewhat in the second half of 2021 but remained high compared with historical levels (figure 4.5). Total assets under management at high-yield and bank loan mutual funds, which primarily hold riskier and less liquid assets, remained high as of January 2022 (figure 4.6). Beginning in December 2021, U.S. investment-grade bond mutual funds experienced modest outflows, as increases in interest rates weighed on these funds' performance. Meanwhile, bank loan funds, which generally hold floating-rate instruments and are less prone to suffer losses when interest rates rise, attracted inflows (figure 4.7).

Figure 4.5. U.S. corporate bonds held by U.S. mutual funds



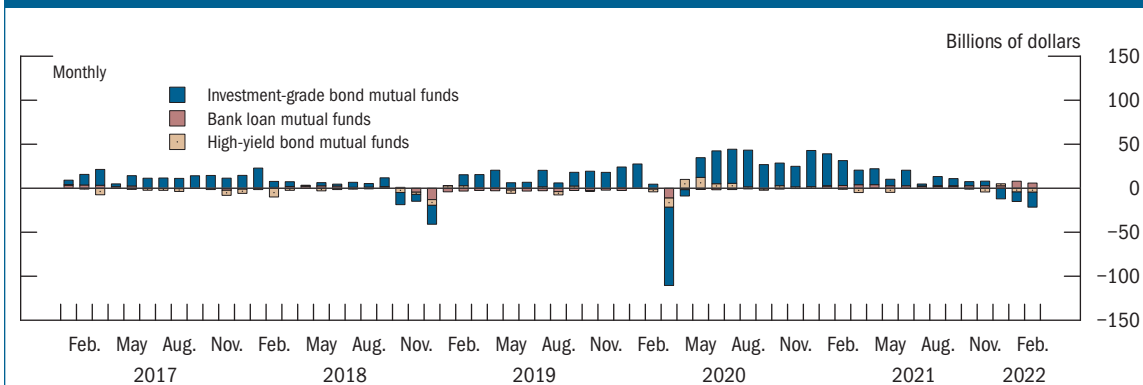
Source: Federal Reserve Board staff estimates based on Federal Reserve Board, Statistical Release Z.1, "Financial Accounts of the United States"; Bureau of Labor Statistics, consumer price index via Haver Analytics.

Figure 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.

Figure 4.7. Net flows to selected bond and bank loan mutual funds



Source: Investment Company Institute.

The Russian invasion of Ukraine may have increased the liquidity risks at mutual funds with exposures to Russia or European countries affected by the war. However, the number of U.S. mutual funds with direct exposures to Russian securities was small before the Russian invasion of Ukraine, and while these funds suffered losses on these securities following the invasion, they have continued to meet redemption requests to date.²¹

Central counterparties made larger margin calls amid elevated market volatility

Elevated market volatility driven by the Russian invasion of Ukraine—particularly in commodity markets—caused CCPs to make large margin calls, which put pressure on some clearing participants (see the box “[Commodity Market Stresses following Russia’s Invasion of Ukraine](#)”). To date, clearing members have been able to meet these margin calls, and, in general, CCPs effectively managed the increased risks and higher trading volumes. Based on the increase in initial margin observed at certain derivatives CCPs so far this year, prefunded resources at CCPs are expected to have increased since the latest observation in the fourth quarter of 2021, climbing further above pre-pandemic levels.²² Additionally, cash increased as a share of CCPs’ prefunded resources in the second half of 2021, and banks, which provide credit lines to CCPs, are well positioned to meet potential draws from CCPs due to high levels of HQLA. However, ongoing concerns remain around increased retail trading of equities and related derivatives, as well as concentration of clients at the largest clearing members.

Liquidity risks at life insurers continued to increase

Over the past decade, the liquidity of life insurers’ assets declined and the liquidity of their liabilities increased, potentially making it more difficult for life insurers to meet a sudden rise in withdrawals and other claims. On the asset side, life insurers increased the share of risky, illiquid assets—including CRE loans, less liquid corporate debt, and alternative investments—on their balance sheets (figure 4.8). At the same time, life insurers increasingly relied on nontraditional liabilities, such as funding-agreement-backed securities, Federal Home Loan Bank advances, and cash received through repurchase agreements and securities lending transactions. These liabilities, which are generally more vulnerable to rapid withdrawals than most policyholder liabilities, have grown steadily in recent years (figure 4.9).

²¹ Following the invasion, several Russia-focused equity exchange-traded funds (ETFs) listed in the United States began trading at significant premiums to their net asset values, reflecting market participants’ expectations that the ETFs’ sponsors would be forced to halt share creation due to the suspension of trading in their underlying securities and the effects of U.S. sanctions on the movement and ownership of Russian securities. On March 4, U.S. stock exchanges halted trading in five of these ETFs, although redemptions from these funds were still available, and spillovers to large, diversified emerging market equity ETFs that also hold Russian securities were limited.

²² Prefunded resources represent financial assets, including cash and securities, transferred by the clearing members to the CCP to cover that CCP’s potential credit exposure in case of default by one or more clearing members. These prefunded resources are held as initial margin and prefunded mutualized resources.

Figure 4.8. Less liquid general account assets held by U.S. insurers

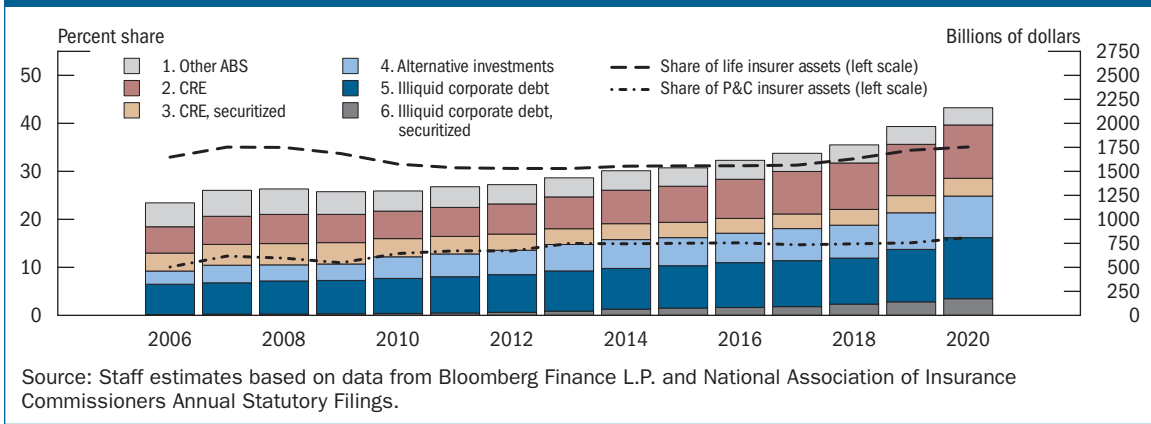
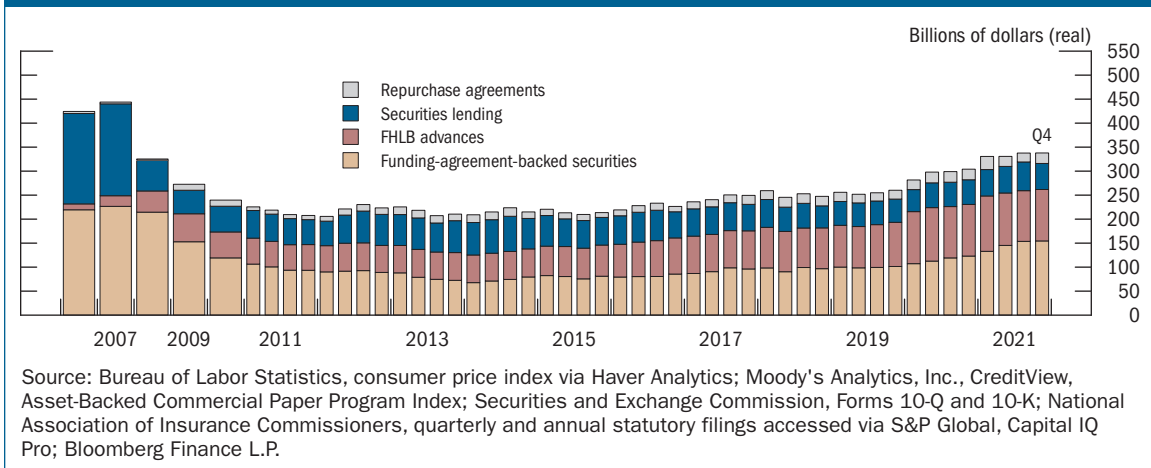


Figure 4.9. Nontraditional liabilities of U.S. life insurers, by liability type



Box 4.2. Commodity Market Stresses following Russia's Invasion of Ukraine

Russia's invasion of Ukraine and subsequent international sanctions disrupted global trade in commodities, leading to surging prices and heightened volatility in agriculture, energy, and metals markets. These markets include spot and forward markets for physical commodities as well as futures, options, and swaps markets that involve an array of financial intermediaries and infrastructures. Stresses in financial markets linked to commodities could disrupt the efficient production, processing, and transportation of commodities by interfering with the ability of commodity producers, consumers, and traders to lock in prices and hedge risks. Such stresses can also increase liquidity and credit risks for financial institutions that are active in commodity markets. To date, however, the financial market stresses do not appear to have significantly disrupted broader economic activity or created substantial pressure on key financial intermediaries, including banks.

Commodity price dynamics since the invasion

Russia is a major global exporter of oil, natural gas, and certain metals. The invasion and sanctions disrupted supplies of some commodities. Although Russian energy exports have generally kept flowing, market participants are highly concerned with future prospects. In addition, both Russia and Ukraine are major exporters of grain, and the ongoing war as well as sanctions on Belarus's fertilizer exports are seen as likely to disrupt future production of grain and other agricultural commodities.

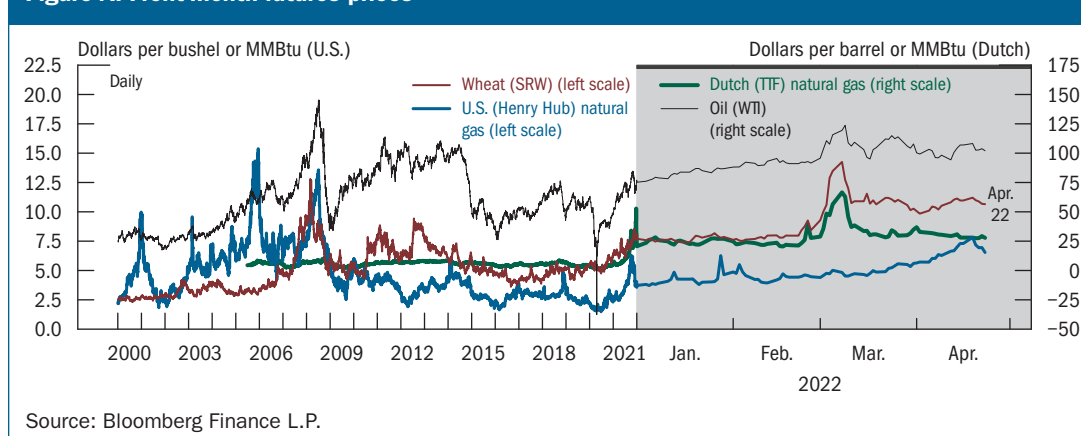
In this environment, prices for many commodities have risen sharply, on net, and fluctuated dramatically in response to geopolitical developments (figure A). A notable exception has been natural gas for delivery in North America, where the price has been relatively stable due to limited capacity for shipping North American natural gas to Europe to replace Russian exports.

Commodity trading, clearing, and settlement

The simplest commodity transactions occur in spot markets, where a seller immediately delivers the commodity to a buyer for cash. A buyer and a seller who wish to plan ahead can also engage in a bilateral forward contract, establishing a price and future date at which delivery will occur.

(continued)

Figure A. Front-month futures prices



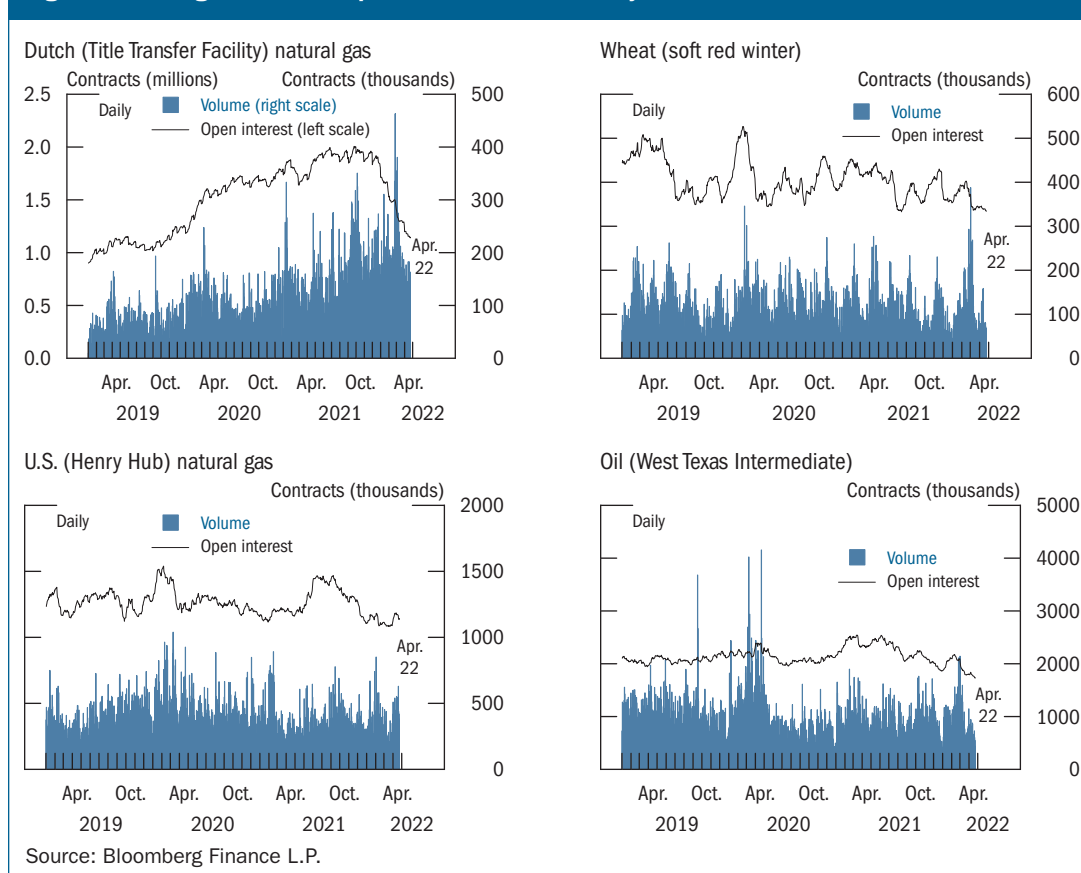
Box 4.2. —continued

Commodities are also traded on futures exchanges, which standardize contract terms (such as expiration dates and the precise definition of the reference commodity) and establish trading rules (such as limits on the size or speed of price changes). Since the invasion, for most commodities, futures trading volumes and open interest—the number of contracts outstanding at the end of the day—have remained in normal ranges. However, in the key contract for natural gas in Europe, trading volume spiked to unprecedented levels in late February and early March, indicating rapid changes in market participants’ positions. This spike occurred even as open interest continued to trend downward for the year to date as participants somewhat reduced their exposure to the market on net (figure B).

Futures are cleared at CCPs, which stand between buyers and sellers to guarantee that contracts will be fulfilled. To manage their risks, CCPs require initial margin (that is, collateral posted to the CCP), collect variation margin (that is, daily or more frequent cash payments to cover mark-to-market changes in value), and maintain additional resources to cover losses in the event of a participant’s default. CCPs require participants to post sufficient initial margin to cover at least the 99th percentile of potential price changes over a defined period of risk, typically one or two days for commodity futures. Because the size of potential price changes can rise rapidly during volatile periods, CCPs typically set initial margin requirements above this minimum level when markets are calm, reducing the need to raise require-

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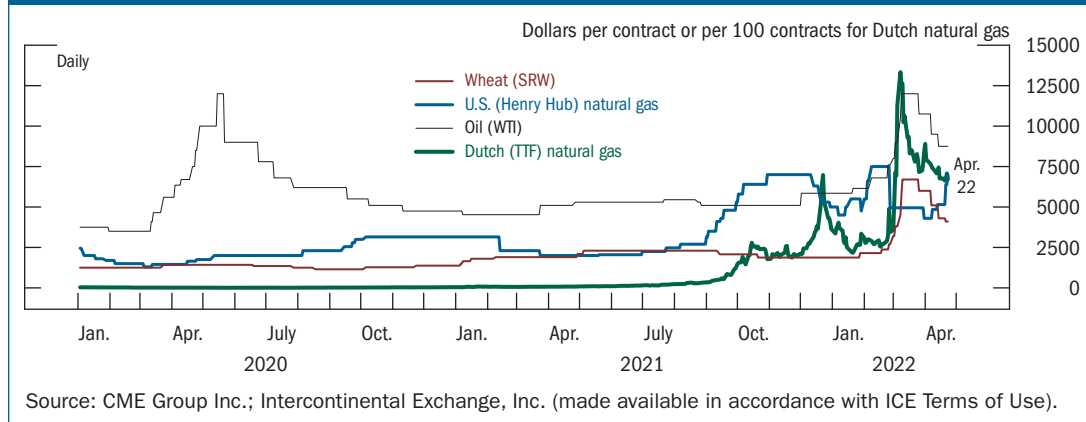
Figure B. Trading volume and open interest of commodity futures



Box 4.2.—continued

ments during stress. Still, as volatility rose in response to geopolitical developments in February and March, CCPs substantially increased initial margin requirements. The initial margin requirement tripled for the main wheat futures contract, and for oil it rose to match the May 2020 peak (figure C).

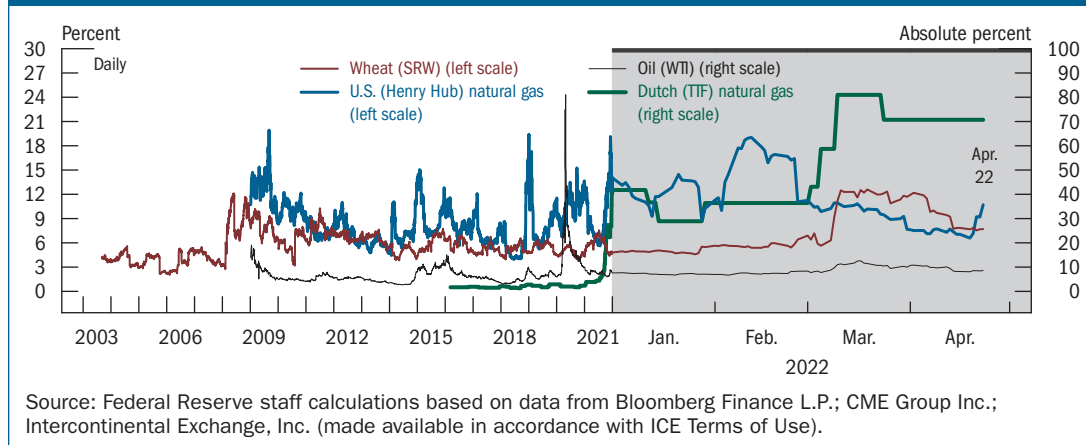
Figure C. Initial margin for front-month futures in dollars



The initial margin increases were partly due to increases in contract values, but requirements also rose as a percentage of contract values—a more precise indicator of the risk that collateral can absorb (figure D). For European natural gas, initial margin as a percentage of contract value had been rising since late 2021 and soared to 80 percent of the contract value as the Russian invasion continued. Initial margin as a percentage of contract value also reached the top of the historical range for wheat and U.S. natural gas but remained well below the 2020 peak for oil. Despite the margin increases, daily price moves in wheat futures exceeded the CCP’s initial margin requirement at the contract level on seven trading days from February 22 through the end of the first quarter, far above the expected frequency for a 99 percent coverage level.

(continued)

Figure D. Futures margin as a percentage of contract value



Box 4.2.—*continued*

Commodity futures can be cash settled or physically settled. For a contract settled in cash, participants exchange payments at the expiration date based on a price for the underlying commodity. In a physically settled contract, participants who hold short positions at expiration deliver the commodity at a specified time and place in return for payment of the determined settlement price. Short sellers include commodity producers, such as farmers or miners, who are hedging the risk of a price decrease on their output, as well as traders speculating on the direction of prices. Short sellers who do not own a sufficient, immediately deliverable amount of the commodity generally seek to close their positions by buying an offsetting long contract before expiration. However, if the commodity is in limited supply, buying a long contract to offset a short may be expensive. Additionally, when market liquidity is constrained, covering by short sellers may cause prices to rise more sharply than normal.

In early March, at the London Metal Exchange, the prospect of interruptions in Russia's nickel exports generated heavy pressure on short sellers of nickel, whose concentrated positions appeared to amplify the shock. The exchange experienced unprecedented price spikes that caused severe financial stress for some participants. In order to recover, the exchange cancelled trades at the peak prices and called a multiday trading halt. In markets for other commodities, traders, exchanges, and CCPs managed through the stress without severe incidents.

Commodity derivatives, particularly swaps, are also traded in OTC markets. The terms of OTC commodity derivatives can be customized to help participants precisely hedge particular risks. OTC commodity derivatives are not always guaranteed by CCPs or subject to the same uniform risk-management rules as exchange-traded derivatives.

Implications for commodity producers and consumers

Businesses that produce commodities or that use commodities to produce other products and services often rely on futures to hedge price risk. For example, a wheat farmer or grain elevator may take a short position in wheat futures to hedge the risk of receiving a low price on the crop, while a flour mill may take a long position in wheat futures to hedge the risk of having to pay a high price for inputs. Commodity trading firms are also important users of commodity futures. These firms move commodities from producers to consumers, sometimes storing or processing them along the way. A trading firm's physical exposures can be both long (for example, ownership of a tanker full of oil) and short (for example, a commitment to deliver oil to a refinery) and, correspondingly, may be hedged with both short and long futures positions. A market participant that primarily uses futures to hedge its physical risks is known as a hedger.

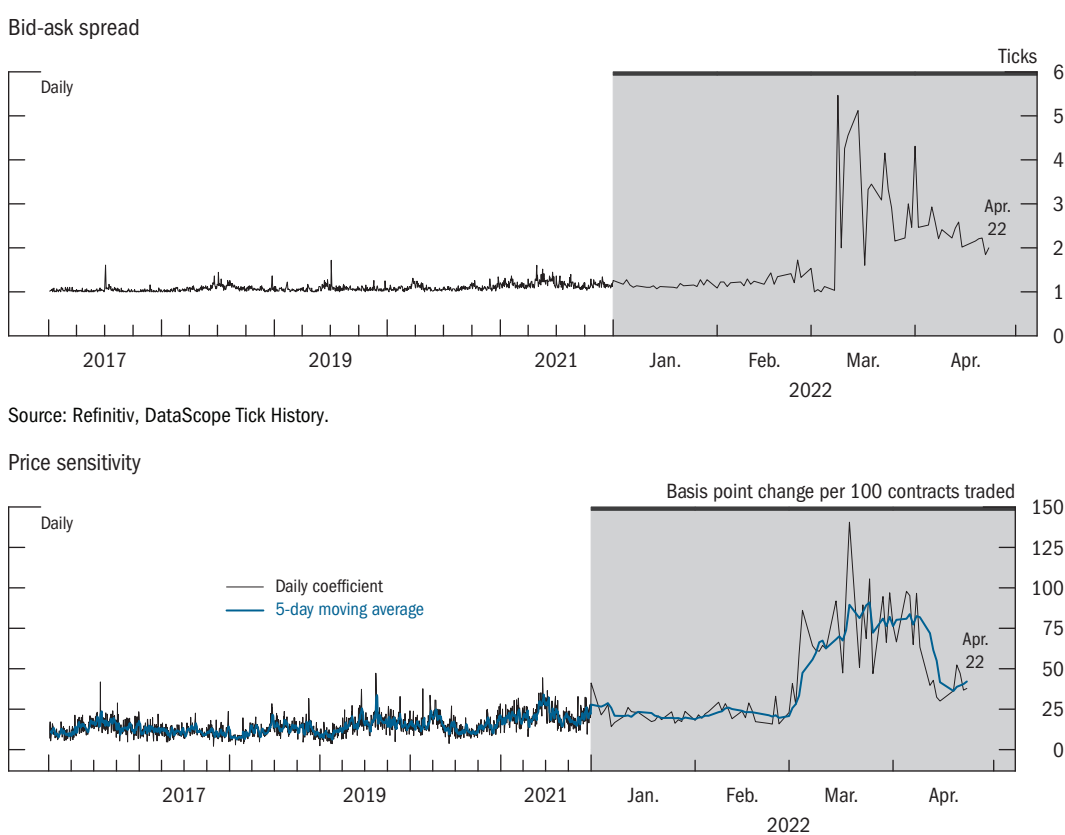
Recent developments increased the cost of hedging in commodity futures markets in three ways:

1. Producers and trading firms needed **funding liquidity** to make variation margin payments to CCPs on short futures positions after price increases, even as these hedgers' physical holdings gained in value. Obtaining such funding can be difficult or costly, especially for smaller firms or on short notice. For example, Peabody Energy, the United States' largest coal producer, announced in March that it obtained a \$150 million unsecured credit facility at a 10 percent interest rate to cover derivatives funding needs.
2. The **risk of futures positions** increased with higher volatility, even for participants whose combined physical and futures positions were perfectly hedged. The resulting higher initial margin requirements on exchange-traded futures meant that both short and long hedgers needed cash to post additional collateral to CCPs. In addition, some financial institutions reportedly asked customers to limit futures positions in light of the risks and associated capital requirements, which raise the institutions' costs of intermediating between customers and CCPs.

(continued)

Box 4.2.—continued

3. **Market liquidity**, the ease of entering or exiting a position, diminished as trading became more costly for end users and as market makers pulled back to manage their own risks. Bid-ask spreads widened, and the price effect of large trades increased (figure E; for more information, see the box “Recent Liquidity Strains across U.S. Treasury, Equity Index Futures, and Oil Futures Markets”). In wheat futures, for several consecutive days, the price rose by a daily limit set by the exchange. While these price limits were binding, trading volume appeared to be reduced, and for a time the May wheat futures price was significantly below implied prices in related markets, such as options, that were not subject to the same limits. Price changes also reached daily limits in corn futures at times.

Figure E. Wheat (soft red winter) futures liquidity measures

Source: Refinitiv, DataScope Tick History.

Source: Federal Reserve Board staff estimates based on data from CME Group, Inc., DataMine, <https://datamine.cmegroup.com>.

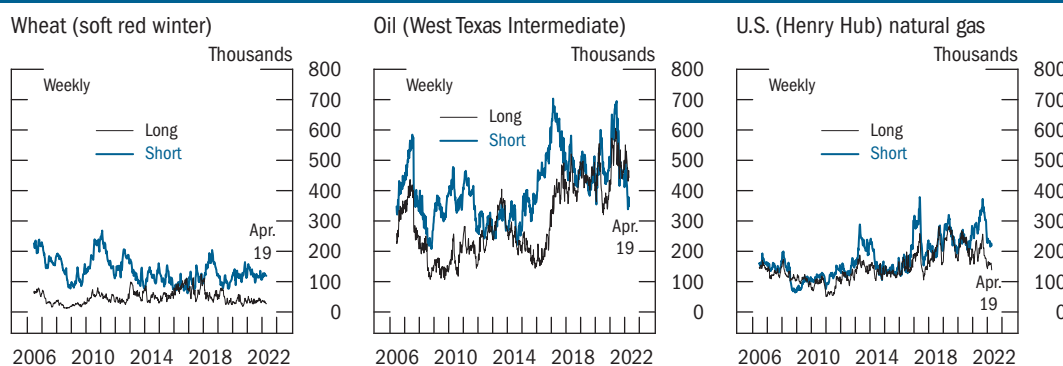
Businesses that produce or use commodities are potentially vulnerable to these financial stresses, but, so far, the stresses do not appear to have significantly altered their production or usage. Higher hedging costs could, in principle, deter commodity producers from making investments that would increase output, users from expanding factories that employ commodity inputs, or trading companies from shipping commodities around the world. Such reactions to higher hedging costs could conceivably reduce the supply of commodities or prevent them from being put to the most productive use. The first sign that higher hedging costs were weighing on end users would likely be decreases in commodity futures positions of producers, consumers, and other hedgers. To date, hedgers' positions in major U.S. com-

(continued)

Box 4.2.—continued

modity futures contracts remain within historical ranges, even as Russia's invasion of Ukraine has roiled commodity markets (figure F). As previously mentioned, open interest in the key Dutch natural gas futures contract has trended downward, but the data are not broken out to show how much of the decrease is in the positions of hedgers.

Figure F. Producer, merchant, processor, and user positions in commodity futures



Source: Bloomberg Finance L.P.

Implications for financial intermediaries

Financial institutions such as banks and broker-dealers can be exposed to risks in commodity markets as a result of the institutions' own trades or as a result of guaranteeing their customers' futures trades. Most participants access commodity futures markets through financial institutions that are members of the relevant CCP. Members must cover any margin calls that their customers fail to meet. In addition, if a customer fails to deliver a physical commodity, the clearing member is liable for the replacement cost of the missing goods.

Banks and dealers frequently use futures to offset the risks from customized OTC transactions with their clients. For example, a bank might enter an OTC swap with a mining company to allow the mining company to hedge the price risk on its metal output over multiple years. The bank could then use exchange-traded futures to hedge the price risk of the swap. As long as the customer paid the amounts due under the swap, the bank would be hedged against movements in the price of the metal. However, if the customer defaulted, the bank could be left with an unhedged or partially hedged futures position.

Pressures on most large banks from exposures to commodity markets so far have been modest relative to the banks' sizable capital and liquidity resources, in part because the most extreme volatility has been confined to specific commodity markets such as nickel, wheat, and European natural gas, and because clients have largely been able to cover their obligations. Nevertheless, commodity markets are stressed. Ongoing and more widespread extreme volatility associated with the Russian invasion of Ukraine or other adverse shocks could pose greater challenges, especially if major clients were to require significantly more liquidity or if defaults were to become widespread.

5 | Near-Term Risks to the Financial System

The Federal Reserve routinely engages in discussions with domestic and international policy-makers, academics, community groups, and others to gauge the set of risks of particular concern to these groups. As noted in the box [“Survey of Salient Risks to Financial Stability,”](#) contacts were mostly focused on the possible adverse effects of the Russia–Ukraine war, the downside risks of persistent inflation and monetary policy tightening, and an abrupt correction to valuations of risky assets. For the United States, concerns over cyber risk have increased following the invasion. Shocks caused by cyber events, especially cyberattacks, may spread through the financial system through complex and often unrecognized interdependencies across financial firms and market participants and, if sufficiently disruptive, can affect financial stability. Various U.S. government agencies and their private-sector partners are taking steps to further protect the financial system and other critical infrastructures against the increased risk of cyber-related incidents.

The following analysis considers possible interactions of existing vulnerabilities with four broad categories of risk, some of which were also identified in the survey conversations: risks emanating from the Russian invasion of Ukraine; the potential for a marked worsening of the U.S. economic outlook; stresses in China, including in the real estate sector; and stresses in other emerging market economies (EMEs).

Russia’s ongoing war in Ukraine could affect U.S. financial stability through multiple channels

The Russian invasion of Ukraine roiled financial markets, disrupted international trade, and prompted sharp increases in prices for oil and other commodities, pushing up global inflation further. (For more details on the associated stresses to financial market functioning, see the boxes [“Recent Liquidity Strains across U.S. Treasury, Equity Index Futures, and Oil Futures Markets”](#) and [“Commodity Market Stresses following Russia’s Invasion of Ukraine.”](#)) The hostilities have led to escalating sanctions on Russia and Russian countermeasures. Most U.S. and European banks and investors have modest direct exposures to Russia and Ukraine and to commodity prices. But a prolonged conflict, particularly if accompanied by severe and widespread commodity shortages, could lead to substantial volatility in commodity and financial markets, a downturn in economic activity concentrated in Europe, higher inflation and interest rates worldwide, and a broad pull-back from risk-taking, transmitting stress to institutions that are exposed. Through declines in both asset prices and the repayment capacity of borrowers, European banks would be particularly affected. Stresses in European financial institutions could affect U.S. financial institutions through their strong interconnections to European banks, including via dollar funding markets, and could

transmit to U.S. financial conditions through a pullback in lending from European banks to U.S. businesses and households.

Elevated and persistent inflation combined with a sharp rise in rates could pose risks to the economy and the financial system

In the United States, inflation has been higher and interest rates have risen more than was expected at the time of the last Financial Stability Report. Further adverse surprises in inflation and interest rates, particularly if accompanied by a decline in economic activity, could negatively affect the financial system. This combination could weaken the balance sheets of households and businesses, leading to an increase in delinquencies, bankruptcies, and other forms of financial distress. In particular, households could be affected by job losses, higher interest payments, and a reduction in house prices caused by higher mortgage rates and decreased housing demand. The resulting stresses may be especially pronounced for homeowners currently in mortgage forbearance or in the subprime and near-prime risk categories. Also, business credit quality could be eroded by a steep rise in rates that would increase business borrowing costs, which in turn could have negative consequences on employment and business investment. Additionally, a sharp rise in interest rates could lead to higher volatility, stresses to market liquidity, and a large correction in prices of risky assets, potentially causing losses at a range of financial intermediaries, reducing their ability to raise capital and retain the confidence of their counterparties.

Stresses in China, including in the real estate sector, could spill over to the United States

In China, debt levels are high in the real estate sector, where activity and prices turned down significantly last year (see the box “[Stresses in China’s Real Estate Sector](#)”). If this downturn intensifies, its effects on Chinese markets and financial institutions could be amplified by lockdowns or other disruptions to the economy from further flare-ups in COVID-19 cases, new regulatory restrictions (including further actions to curb the tech sector), or any pullback in trade or investment from other countries due to geopolitical motives or risk concerns. Given the size of China’s economy and financial system as well as its extensive trade linkages with the rest of the world, financial stresses in China could strain global financial markets through a deterioration of risk sentiment and disruptions to economic activity, potentially affecting the United States.

Inflationary pressures and adverse external shocks could lead to stresses in other emerging market economies that could affect the United States

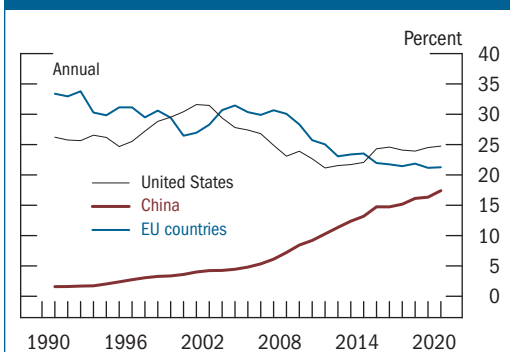
Increased debt levels in many EMEs since the onset of the pandemic have made these economies more vulnerable to adverse shocks. More recently, higher food and energy prices have worsened the terms of trade for some EMEs—particularly commodity importers—and could exacerbate social and political stresses and trigger a downturn in investor risk sentiment and capital outflows.

Meanwhile, ongoing policy rate hikes by many EME central banks, while necessary to reduce inflation to target levels, have been leading to tighter financial conditions and are weighing on economic activity. Reduced repayment capacity and higher debt-servicing costs for EME sovereigns and businesses could stress EMEs' financial systems. Widespread and persistent EME stresses could adversely affect the U.S. financial system, primarily through indirect channels, via effects on U.S. businesses with strong links to EMEs; direct financial exposures to EME businesses and sovereigns are small.

Box 5.1. Stresses in China's Real Estate Sector

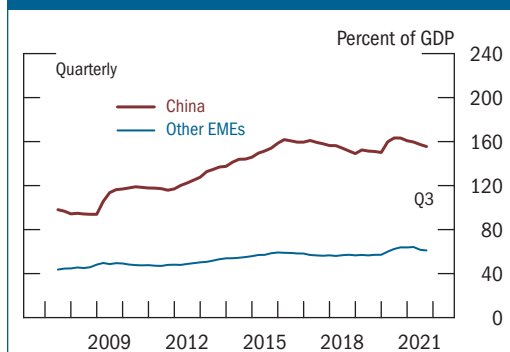
For the past several decades, expansionary policies in China have helped sustain rapid economic growth, which has outpaced that of most other countries. China's share of world GDP has reached about 17 percent (figure A). Credit to Chinese businesses has increased even faster, supporting GDP growth, but the resulting leverage in the corporate sector makes it increasingly vulnerable to shocks. Nonfinancial business credit in China has reached about 160 percent of GDP, a level that is much higher than in most other EMEs (figure B). Corporate indebtedness has become particularly high in China's real estate sector—which has been a key engine of China's rapid growth—and lending for property development and related activities has grown rapidly.

Figure A. Share of world gross domestic product



Source: World Bank, World Development Indicators Online, <https://databank.worldbank.org/source/world-development-indicators>.

Figure B. Credit to the nonfinancial business sector



Source: Bank for International Settlements.

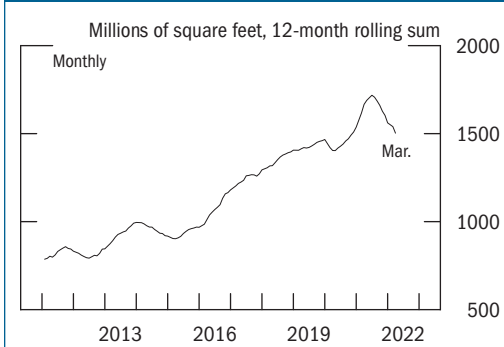
In the past few years, the Chinese government has tightened regulation of property markets, including the imposition of new constraints on home purchases, banks' property-sector exposure, and mortgage lending in some markets.¹ In August 2020, regulators announced further measures directly focused on property developers: progressively tighter restrictions on borrowing, based on specific prudential limits for leverage and liquidity (commonly known as “the three red lines”). In the longer term, these constraints should help keep leverage in check and increase the resilience of the property sector and the financial system.

Not long after these initiatives were implemented, property sales slowed sharply (figure C).² Home prices and construction activity also declined. Customers typically make payments to construction companies in advance of project completion, and adverse dynamics could be amplified if buyers lose confidence in developers' ability to complete housing units. There have already been payment defaults by several property developers and a sharp liquidity crunch for others with respect to both domestic

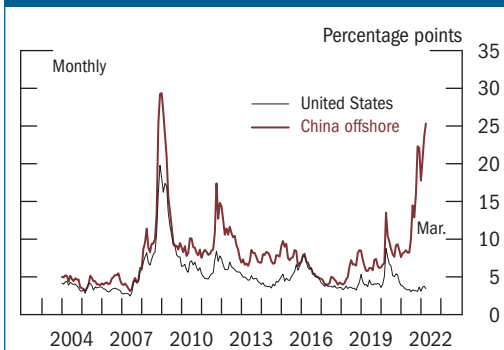
(continued)

¹ Concerns about large and rising financial and social imbalances, including housing affordability and the marked increase in income and wealth inequality that has occurred over time, also led the Chinese government to announce in 2021 a “common prosperity” drive for more equitable and sustainable long-term growth.

² The International Monetary Fund demonstrated that the red lines were binding on a significant segment of the property industry when introduced. See page 9 of International Monetary Fund (2022), “People's Republic of China: 2021 Article IV Consultation—Press Release; Staff Report; and Statement by the Executive Director for the People's Republic of China,” IMF Country Report No. 22/21 (Washington: IMF, January), <https://www.imf.org/-/media/Files/Publications/CR/2022/English/1CHNEA2022001.ashx>.

Box 5.1.—continued**Figure C. New property sales**

Source: National Bureau of Statistics of China via Haver Analytics.

Figure D. High-yield corporate bond yield spreads to similar-maturity U.S. Treasury securities

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

and offshore funding. After years of robust growth, domestic bank loans to property developers are declining, and bonds issued by some of the larger Chinese property developers in the offshore dollar market are trading at increasingly distressed levels this year (figure D).

Although the Chinese government has managed to contain its effects so far, a significant worsening of the downturn in property markets could affect China's financial system. Chinese banks have direct exposure to developers amounting to more than half of their Tier 1 capital and substantial indirect exposure to property markets from loans to other firms that are collateralized by real estate. Chinese banks are also exposed to real estate developers indirectly through bank-sponsored wealth-management products sold to retail investors. Local governments are also exposed to China's property market because they generate a significant portion of their fiscal revenues from land sales, and they too are highly leveraged. A broad estimate of local government debt that includes off-balance-sheet financing vehicles exceeded 70 percent of GDP last year.³ In December, the national government announced relaxed restrictions on bond finance by local governments in the first quarter of 2022, which should partially alleviate near-term pressures and provide funding for infrastructure investment. Local-government issuance appears to have been strong in the first quarter, and growth in fixed asset investment in China accelerated at the start of the year, reflecting the heavy front-loading of fiscal stimulus this year.

Spillovers to the United States so far have been limited in scope, in part because direct U.S. exposures to mainland China are relatively modest. U.S. bank exposures amount to less than

10 percent of their Tier 1 capital. Other U.S. investors also have limited exposure: Available data suggest holdings of Chinese securities (including securities issued through offshore affiliates) represent only about 1 percent of U.S. portfolio investment.⁴ In addition, recent research estimates that sales to China make up less than 5 percent of U.S. firms' revenues.⁵

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³ For details, see table 5 in IMF, "People's Republic of China," in note 2.

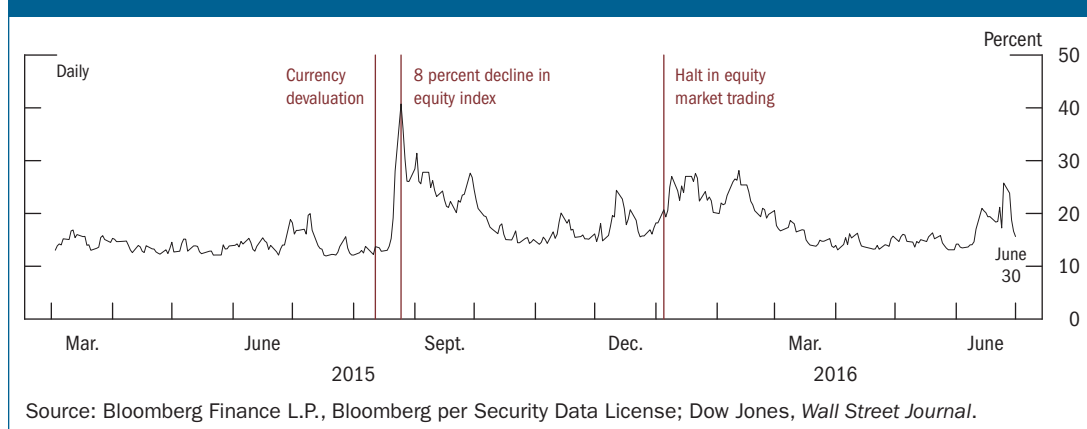
⁴ From Treasury International Capital (TIC) data by residence, adjusted to a nationality basis using the methodology of Carol Bertaut, Beau Bressler, and Stephanie Curcuru (2019), "Globalization and the Geography of Capital Flows," FEDS Notes (Washington: Board of Governors of the Federal Reserve System, September 6), <https://doi.org/10.17016/2380-7172.2446>.

⁵ This value is estimated for 2016 to 2019, with firm-level revenue shares weighted by stock market capitalization. For methodological details, see Carol Bertaut, Beau Bressler, and Stephanie Curcuru (2021), "Globalization and the Reach of Multinationals: Implications for Portfolio Exposures, Capital Flows, and Home Bias," *Journal of Accounting and Finance*, vol. 21 (November), pp. 92–104, <https://doi.org/10.33423/jaf.v21i5.4738>.

Box 5.1.—continued

But if the property market fallout intensifies and leads to significant strains at Chinese banks that reduce bank lending and GDP growth, the transmission of stresses to the United States could be strong through both real and financial channels—notably trade and global risk sentiment. The trade channel is significant, given China’s large role in the global economy, and Federal Reserve staff research finds a negative Chinese GDP surprise tends to decrease both global commodity prices and the volume of trade among other countries.⁶ Risk sentiment can also be a significant international spillover channel, and past periods of acute stresses in China have roiled global markets, such as in 2015, when a change in the Chinese government’s exchange-rate-management mechanism heightened concerns about Chinese growth (figure E).⁷ The consequent acceleration of capital outflows and sharp correction in Chinese equity prices were accompanied by volatility in global and U.S. markets and a sizeable appreciation of the dollar.

Figure E. S&P 500 return option-implied volatility and China events



⁶ For details, see Shaghil Ahmed, Ricardo Correa, Daniel A. Dias, Nils Goernemann, Jasper Hoek, Anil Jain, Edith Liu, and Anna Wong (2019), “Global Spillovers of a China Hard Landing,” International Finance Discussion Papers 1260 (Washington: Board of Governors of the Federal Reserve System, October), <https://doi.org/10.17016/IFDP.2019.1260>.

⁷ See Ahmed and others, “Global Spillovers of a China Hard Landing,” in note 6.

Box 5.2. Survey of Salient Risks to Financial Stability

As part of its market intelligence gathering, staff from the Federal Reserve Bank of New York solicited views from a wide range of contacts on risks to U.S. financial stability. From late January to mid-April, the staff surveyed 22 contacts, including professionals at broker-dealers, investment funds, research and advisory organizations, and universities. Since the previous survey results published in November, the Russian invasion of Ukraine has emerged as a top source of risk, raising short-term concerns over higher energy prices and cyberattacks as well as long-term concerns of foreign divestment from U.S. assets. Risks related to persistent inflation and tighter monetary policy, the most cited potential shock from the fall 2021 survey, remained top of mind in the spring 2022 survey, contributing to heightened concerns over risk asset valuations and corporate fundamentals. A number of risks that ranked highly last year declined in prominence, including diminished concern over the effect of COVID-19, climate-related shocks, and cryptocurrencies or stablecoins. This discussion summarizes the most cited risks in this round of outreach.

Russian invasion of Ukraine

A majority of respondents cited the situation in Ukraine as a substantial source of uncertainty with high potential for financial disruptions. Many were attentive to the adverse effects of a large rise in energy prices, including increased short-term inflationary pressures, negative effects on global growth, vulnerabilities at energy-sensitive corporates, and the potential for acute distress at CCPs or exchanges. Contacts also highlighted the risk of distress at European banks due to exposure to Russia or to heavily affected European firms. Additionally, while cyberattacks have appeared on the list of the most cited potential shocks in previous reports, discussion of cyber risk in this survey round was focused largely on Russian state-sanctioned cyber threats as an escalation of the conflict.

Several respondents raised concerns regarding longer-term structural consequences of sanctions on Russia, with particular attention given to the decision to restrict access to foreign reserves and the SWIFT (Society for Worldwide Interbank Financial Telecommunication) payments system. These actions were seen as increasing the risk of a retreat by some countries from reliance on the U.S. dollar and potential foreign divestment of U.S. assets, most notably sales of U.S. Treasury securities by foreign holders.

Persistent inflation and monetary tightening

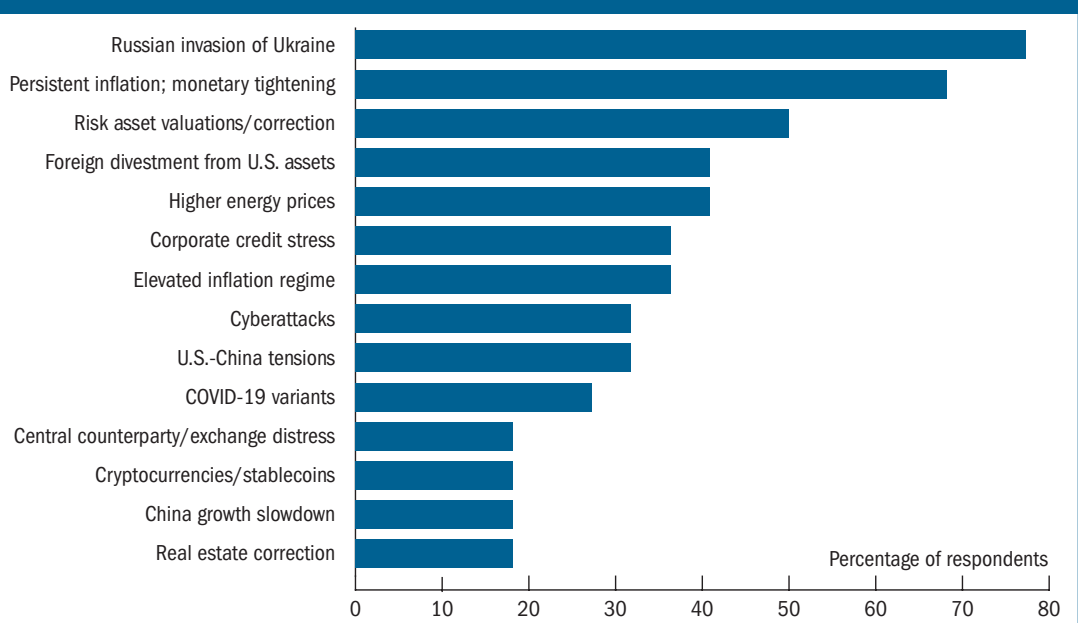
Respondents remained concerned about the prospect of inflationary pressures being more persistent than anticipated, requiring a sharper tightening of monetary policy than reflected in market prices. Many observed that this tightening may occur amid a weakening economic environment, amplifying its negative effect. Several contacts noted the global nature of tighter monetary policy and the potential for tighter financial conditions to cause strains in corporate and sovereign debt markets. A number of respondents were focused on the possibility of a large correction in risk asset prices, noting that valuations in U.S. equity and corporate credit markets appeared elevated despite clear signals that monetary policy would continue to tighten.

Many respondents also highlighted the potential for longer-term structural risks to emerge as a result of persistent inflation. Chief among these risks was the possibility of a significant increase in medium- and long-term inflation expectations triggering sharp movements in financial markets, with some noting this could weigh heavily on the exchange value of the U.S. dollar. A few respondents also voiced concern over the potential for central banks to lose credibility if they are unable to rein in inflation or provide monetary accommodation in the face of weaker growth while inflation remains high.

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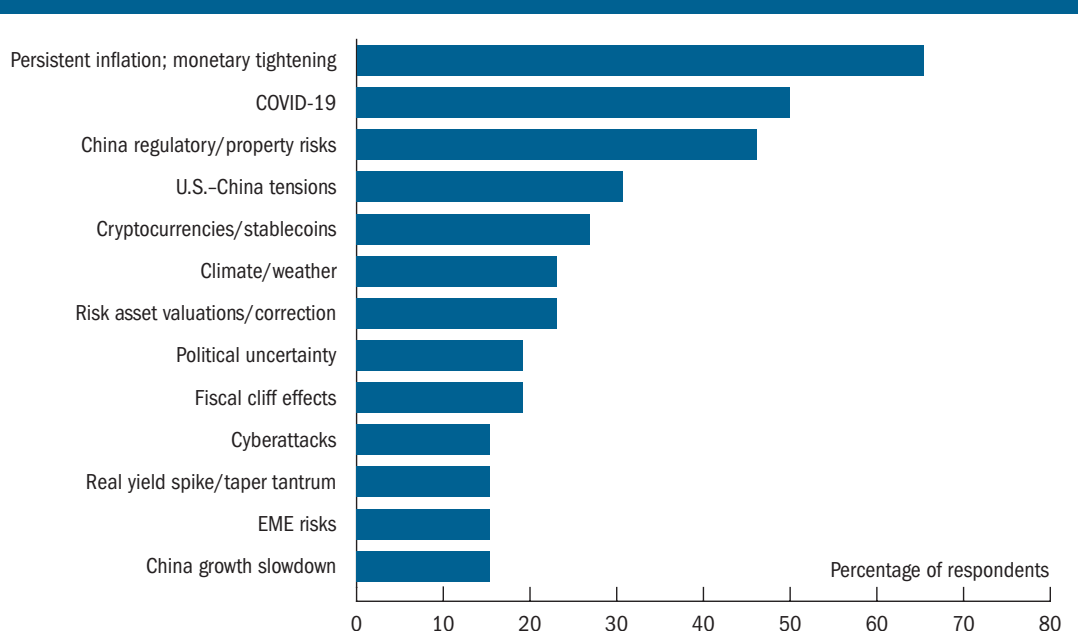
Box 5.2.—continued

Figure A. Spring 2022: Most cited potential risks over the next 12 to 18 months



Source: Federal Reserve Bank of New York survey of 22 contacts from January to April.

Figure B. Fall 2021: Most cited potential risks over the next 12 to 18 months



Source: Federal Reserve Bank of New York survey of 26 contacts from August to October.

Appendix | Figure Notes

Figure 1.1. Yields on nominal Treasury securities

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

Figure 1.2. Term premium on 10-year nominal Treasury securities

The data extend through April 25, 2022. Term premiums are estimated from a 3-factor term structure model using Treasury yields and Blue Chip interest rate forecasts.

Figure 1.3. Implied volatility of 10-year swap rate

The data extend through April 22, 2022. Implied volatility on the 10-year swap rate, 1 month ahead, is derived from swaptions. The median value is 81.14 basis points.

Figure 1.4. Treasury market depth

Market depth is defined as the average top 3 bid and ask quote sizes for on-the-run Treasury securities.

Figure 1.5. Corporate bond yields

The data extend through April 22, 2022. The triple-B series reflects the effective yield of the ICE Bank of America Merrill Lynch (BofAML) triple-B U.S. Corporate Index (COA4), and the high-yield series reflects the effective yield of the ICE BofAML U.S. High Yield Index (HOA0).

Figure 1.6. Corporate bond spreads to similar-maturity Treasury securities

The data extend through April 22, 2022. The triple-B series reflects the option-adjusted spread of the ICE Bank of America Merrill Lynch (BofAML) triple-B U.S. Corporate Index (COA4), and the high-yield series reflects the option-adjusted spread of the ICE BofAML U.S. High Yield Index (HOA0).

Figure 1.7. Excess bond premium

The excess bond premium (EBP) is the residual of a regression of corporate bond spreads on controls for firms' expected defaults. By construction, its historical mean is zero. Positive (negative) EBP values indicate that investors' risk appetite is below (above) its historical mean.

Figure 1.8. Secondary-market spreads of leveraged loans

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. B-rated spreads begin in July 1997. The line break represents the data transitioning from monthly to weekly in November 2013.

Figure 1.9. Forward price-to-earnings ratio of S&P 500 firms

The figure shows the aggregate forward price-to-earnings ratio of S&P 500 firms, based on expected earnings for 12 months ahead. The median value is 15.42.

Figure 1.10. Spread of forward earnings-to-price ratio of S&P 500 firms to expected 10-year real Treasury yield

The figure shows the aggregate forward earnings-to-price ratio of S&P 500 firms based on expected earnings for 12 months ahead. Expected real Treasury yields are calculated from the 10-year consumer price index inflation forecast, and the smoothed nominal yield curve is estimated from off-the-run securities. The median value is 4.77 percentage points.

Figure 1.11. S&P 500 return volatility

The data extend through April 22, 2022. Realized volatility is computed from an exponentially weighted moving average of 5-minute daily realized variances with 75 percent of the weight distributed over the past 20 business days.

Figure 1.12. Commercial real estate prices (real)

Series are 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. Capitalization rate at property purchase

The 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. Change in bank standards for commercial real estate loans

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–April 2020. Survey respondents to the Senior Loan Officer Opinion Survey on Bank Lending Practices are asked about the changes over the quarter.

Figure 1.15. Farmland prices

The data for the United States start in 1997. Midwest index is a weighted average of Corn Belt and Great Plains states derived from staff calculations. Values are given in real terms. The data extend through July 2021. Data are annual as of July. The median value is 2,815.95 dollars.

Figure 1.16. Farmland price-to-rent ratios

The data for the United States start in 1998. Midwest index is the weighted average of Corn Belt and Great Plains states derived from staff calculations. The data extend through July 2021. Data are annual as of July. The median value is 18.02.

Figure 1.17. Growth of nominal prices of existing homes

The data extend through January 2022 for Case-Shiller, February 2022 for CoreLogic, and March 2022 for Zillow.

Figure 1.18. House price valuation measure

Valuation is measured as the deviation from the long-run relationship between the price-to-rent ratio and the real 10-year Treasury yield.

Figure 1.19. Selected local housing price-to-rent ratio indexes

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.

Box 1.1. Recent Liquidity Strains across U.S. Treasury, Equity Index Futures, and Oil Futures Markets**Figure A. Market depth**

Market depth is computed as the average of the posted quote sizes at the best bid and ask prices.

Figure B. Market depth and volatility in oil futures

Intraday volatility is calculated daily from 1-minute intraday returns. Market depth is computed as the average of the posted quote sizes at the best bid and ask prices. The data sample is from January 1, 2007, to April 22, 2022. The blue dots are days since the Russian invasion of Ukraine, starting from February 24, 2022. The black dots are all other days before February 24, 2022.

Figure C. Bid-ask spreads

Bid-ask spreads are expressed as a multiple of tick size (minimum price increment). The tick size for the 2-year Treasury note is $1/256$ of a dollar per \$100 of par value, while that for the 10-year Treasury note and the 30-year Treasury bond is $4/256$ of a dollar per \$100 of par value. The tick size for the S&P 500 E-mini futures contract is \$0.25 per index point, and that for the West Texas Intermediate crude oil futures contract is \$0.01 per barrel.

Figure D. Bid-ask spreads for oil futures

Bid-ask spreads are expressed as a multiple of tick size (minimum price increment). The tick size for the West Texas Intermediate crude oil futures contract is \$0.01 per barrel.

Figure E. Bid-ask spreads and market depth for the 10-year Treasury note

Market depth is computed as the average of the posted quote sizes at the best bid and ask prices.

Box 1.2. LIBOR Transition Update**Figure A. Transition progress in several markets is near completion**

FRNs are floating-rate notes; ARMs are adjustable-rate mortgages; SOFR is the Secured Overnight Financing Rate.

Figure B. Syndicated lending

SOFR is the Secured Overnight Financing Rate. The key identifies bars in order from left to right.

Figure 2.1. Private nonfinancial-sector credit-to-GDP ratio

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–April 2020. GDP is gross domestic product.

Figure 2.2. Nonfinancial business- and household-sector credit-to-GDP ratios

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–April 2020. GDP is gross domestic product.

Figure 2.3. Growth of real aggregate debt of the business sector

Nominal debt growth is seasonally adjusted and is translated into real terms after subtracting the growth rate of the price deflator for the core personal consumption expenditures price.

Figure 2.4. Net issuance of risky business debt

Institutional leveraged loans generally exclude loan commitments held by banks. The key identifies bars in order from top to bottom (except for some bars with at least one negative data value).

Figure 2.5. Gross balance sheet leverage of public nonfinancial businesses

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. The new accounting standard requires operating leases, previously considered off-balance-sheet activities, to be included in measures of debt and assets.

Figure 2.6. Interest coverage ratios for public nonfinancial businesses

The interest coverage ratio is earnings before interest and taxes divided by interest payments. Firms with leverage less than 5 percent and interest payments less than \$500,000 are excluded.

Figure 2.7. Default rates of leveraged loans

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–June 2009, and February 2020–April 2020.

Figure 2.8. Distribution of large institutional leveraged loan volumes, by debt-to-EBITDA ratio

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. The key identifies bars in order from top to bottom.

Figure 2.9. Total household loan balances

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 2021 dollars using the consumer price index.

Figure 2.10. Estimates of new mortgage volumes to households

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 1 year ago. The data are converted to constant 2021 dollars using the consumer price index. The key identifies bars in order from left to right.

Figure 2.11. Mortgage loss mitigation and delinquency

Loss mitigation includes tradelines that have a narrative code of forbearance, natural disaster, payment deferral (including partial), loan modification (including federal government plans), or loans with no scheduled payment and a nonzero balance. Delinquent includes loans reported to the credit bureau at least 30 days past due.

Figure 2.13. Estimates of housing leverage

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 Zillow 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. Consumer credit balances

The data are converted to constant 2021 dollars using the consumer price index. Student loan data begin in 2005.

Figure 2.15. Auto loan balances

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 2021 dollars using the consumer price index.

Figure 2.16. Auto loss mitigation and delinquency

Loss mitigation includes tradelines that have a narrative code of forbearance, natural disaster, payment deferral (including partial), loan modification (including federal government plans), or loans with no scheduled payment and a nonzero balance. Delinquent includes loans reported to the credit bureau as at least 30 days past due. The data for auto loans are reported semiannually by Risk Assessment, Data Analysis, and Research until 2017, after which they are reported quarterly. The data for delinquent/loss mitigation begin in the first quarter of 2001.

Figure 2.17. Credit card balances

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 2021 dollars using the consumer price index.

Figure 2.18. Credit card delinquency rates

Delinquency is at least 30 days past due, excluding severe derogatory loans. 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 4 quarters.

Figure 3.1. Common equity Tier 1 ratio of banks

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: March 2001–November 2001, December 2007–June 2009, and February 2020–April 2020.

Figure 3.2. Ratio of tangible bank equity to assets

The data are seasonally adjusted by Federal Reserve Board staff. Sample consists of domestic bank holding companies (BHCs), intermediate holding companies (IHCs) with a substantial U.S. commercial banking presence, and commercial banks. 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. Bank equity is total equity capital net of preferred equity and intangible assets. 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–April 2020.

Figure 3.3. Borrower leverage for bank commercial and industrial loans

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. Change in bank lending standards for commercial and industrial loans

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–April 2020.

Figure 3.5. Leverage at broker-dealers

Leverage is calculated by dividing total assets by equity.

Figure 3.6. Leverage at insurance companies

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 primarily doing business in the U.S. are included. Based on U.S. insurance assets as of the most recent year end. The figure reflects an update in methodology from the corresponding chart in the November 2021 *Financial Stability Report*.

Figure 3.7. Change in the use of financial leverage

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

Figure 3.8. Gross leverage at hedge funds

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. The mean is weighted by net asset value. The data are reported on a 2-quarter lag, starting in the first quarter of 2013.

Figure 3.9. Issuance of non-agency securitized products, by asset class

The data from the first quarter of 2022 are annualized to create the 2022 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 2022 dollars using the consumer price index. The key identifies bars in order from top to bottom.

Figure 3.10. Large bank lending to nonbank financial firms: Committed amounts

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 2018: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. BDC is business development company.

Figure 3.11. Growth of loan commitments to and utilization by nonbank financial institutions in the fourth quarter of 2021, by sector

2021:Q4-over-2020:Q4 growth rates as of the end of the fourth quarter of 2021. REIT is real estate investment trust; PE is private equity; BDC is business development company; SPE is special purpose entity; CLO is collateralized loan obligation; ABS is asset-backed securities. The key identifies bars in order from left to right.

Figure 4.1. Runnable money-like liabilities as a share of GDP, by instrument and institution

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 4.2. Liquid assets held by banks

Sample consists of domestic bank holding companies (BHCs), intermediate holding companies (IHCs) with a substantial U.S. commercial banking presence, and commercial banks. 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. 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.

Figure 4.3. Short-term wholesale funding of banks

Short-term wholesale funding is defined as the sum of large time deposits with maturity less than 1 year, federal funds purchased and securities sold under agreements to repurchase, deposits in foreign offices with maturity less than 1 year, trading liabilities (excluding revaluation losses on derivatives), and other borrowed money with maturity less than 1 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–April 2020.

Figure 4.4. Domestic money market fund assets

The data are converted to constant 2022 dollars using the consumer price index.

Figure 4.5. U.S. corporate bonds held by U.S. mutual funds

The data show holdings of all U.S. corporate bonds by all U.S.-domiciled mutual funds (holdings of foreign bonds are excluded). The data are converted to constant 2021 dollars using the consumer price index.

Figure 4.6. Bank loan and high-yield bond mutual fund assets

The data are converted to constant 2022 dollars using the consumer price index. The key identifies series in order from top to bottom.

Figure 4.7. Net flows to selected bond and bank loan mutual funds

Mutual fund assets under management as of February 2022 included \$2,537 billion in investment-grade bond funds, \$275 billion in high-yield bond funds, and \$116 billion in bank loan funds. The key identifies series in order from top to bottom.

Figure 4.8. Less liquid general account assets held by U.S. insurers

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

Figure 4.9. Nontraditional liabilities of U.S. life insurers, by liability type

The data are converted to constant 2021 dollars using the consumer price index. FHLB is Federal Home Loan Bank. The key identifies series in order from top to bottom.

Box 4.2. Commodity Market Stresses following Russia's Invasion of Ukraine

Figure A. Front-month futures prices

The data for Dutch natural gas start in 2005. Dutch Title Transfer Facility (TTF) natural gas is quoted in euros per megawatt hour; the price has been converted into dollars per metric million British thermal units (MMBtu). SRW is soft red winter. WTI is West Texas Intermediate. The shaded area with a top cap represents an expanded window focusing on the period from January 1, 2022, onward.

Figure C. Initial margin for front-month futures in dollars

SRW is soft red winter; WTI is West Texas Intermediate; TTF is Title Transfer Facility.

Figure D. Futures margin as a percentage of contract value

SRW is soft red winter. The data for U.S. (Henry Hub) natural gas and West Texas Intermediate (WTI) oil start in 2009. The data for Dutch Title Transfer Facility (TTF) natural gas start in 2016. The shaded area with a top cap represents an expanded window focusing on the period from January 1, 2022, onward.

Figure E. Wheat (soft red winter) futures liquidity measures

The shaded area with a top cap represents an expanded window focusing on the period from January 1, 2022, onward. Bid-ask spreads are expressed as a multiple of tick size (minimum price increment). The tick size for soft red winter wheat futures is 1/4 of \$0.01 (\$0.0025) per bushel.

Box 5.1. Stresses in China's Real Estate Sector

Figure A. Share of world gross domestic product

National gross domestic product figures are converted to U.S. dollars at market exchange rates. The European Union (EU) aggregate continues to include the United Kingdom in 2020.

Figure B. Credit to the nonfinancial business sector

Credit is defined as total credit to the private nonfinancial business sector. The “Other EMEs” category consists of Argentina, Brazil, Chile, Colombia, the Czech Republic, Hungary, India, Indonesia, Israel, Malaysia, Mexico, Poland, Russia, Saudi Arabia, South Korea, Thailand, and Turkey. GDP is gross domestic product; EMEs are emerging market economies.

Figure D. High-yield corporate bond yield spreads to similar-maturity U.S. Treasury securities

As of March 2022, the ICE China Dollar High Yield Index (ticker ECNH) contained \$58.9 billion in property-firm bonds out of a total face value of \$80.4 billion for bonds in the index.

Figure E. S&P 500 return option-implied volatility and China events

Vertical lines indicate a currency devaluation on August 11, 2015; an 8 percent decline in the Shanghai Composite Index on August 24, 2015; and a temporary halt in equity market trading on January 4, 2016.

Box 5.2. Survey of Salient Risks to Financial Stability

Figure A. Spring 2022: Most cited potential risks over the next 12 to 18 months

Responses are to the following question: “Over the next 12 to 18 months, which shocks, if realized, do you think would have the greatest negative effect on the functioning of the U.S. financial system?”

Figure B. Fall 2021: Most cited potential risks over the next 12 to 18 months

EME is emerging market economy. Responses are to the following question: “Over the next 12 to 18 months, which shocks, if realized, do you think would have the greatest negative effect on the functioning of the U.S. financial system?”

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