

ANNUAL REPORT

— 2023 —





OFFICE OF THE DIRECTOR LETTER

It is my pleasure to deliver the Office of Financial Research's 2023 Annual Report to Congress.

Approaching my second year as Acting Director of the OFR, I continue to lead the talented and dedicated OFR staff with a principal focus on supporting the Financial Stability Oversight Council (Council) and its member agencies.

As noted in this year's report, the information we cover describes our research and analysis as of September 30, 2023, the end of the fiscal year (FY). In an ever-changing environment, however, we recognize that much has evolved since that time. The OFR will continue to monitor and analyze risks to financial stability, remaining agile to identify and examine emerging threats as they arise now and in the future.

This year brought certain challenges in the financial sector—as global unrest continued and a regional banking crisis put us all on heightened alert. Our report this year shows that risk overall remains elevated, and multiple indicators suggest an economic slowdown as ongoing inflation and geopolitical unrest persist. Labor markets are strong, but financial conditions continue to tighten.

Fiscal Year 2023 has been marked by significant progress and transformation at OFR, showcasing our unwavering commitment to enhancing financial research, fostering collaboration, and increasing awareness of financial stability risks. The workforce of the OFR delivered on its mission in a few critical ways, and I would like to reflect on those accomplishments.

Throughout this year, the OFR contributed to financial stability by increasing transparency within a vital component of the U.S. financial system, building a data collection utility to securely accept and store confidential data, advancing a platform for interagency collaborative financial stability

research and data sharing, and fostering partnerships to develop greater depth and breadth of research.

Non-centrally Cleared Bilateral Repo

The OFR maintained a sharp focus on the U.S. repurchase agreement (repo) market, in recognition that a stable, well-functioning repo market is critical to U.S. financial stability. In early January, following last year's non-centrally cleared bilateral repo (NCCBR) pilot collection, the OFR sought public comment on a proposed rule to establish an ongoing, daily data collection of NCCBR transactions in the U.S. repo market. The NCCBR segment of the market makes up the majority of repo activity by several key categories of institutions, such as primary dealers and hedge funds, and has been of particular interest to the Council. The proposed collection is designed to close the remaining critical gap in regulators' information on the repo market.

We received public comments on our proposed rule in March 2023, with many acknowledging the importance of bringing greater transparency to this segment of the multi-trillion-dollar repo market. As this report goes to press, we anticipate the publication of a Final Rule in early 2024.

At the same time, OFR researchers were able to use the NCCBR pilot data to provide early insights in advance of an ongoing collection. We examined why volumes are particularly high in this market segment in a May 12, 2023 brief, which provided regulators and policymakers with the most comprehensive, granular view of the repo market to date.

Data Collection Utility

With our increasing focus on providing the Council and its member agencies with data, we began development of a data collection utility. The utility leverages efficient, cloud-based technology to securely receive, authenticate, and store submissions from external entities. It will allow for greater flexibility for financial industry participants reporting data, enabling manual and automated submissions. This year, we completed the initial build and testing, with production planned for early 2024. Once fully operational, the OFR will be even more well-positioned to support the Council as needed with data collections, surveys, and pilots.

Financial Stress Index

Internationally, 2023 was the year of transition from the London Interbank Offered Rate (LIBOR) to the Secured Overnight Financing Rate (SOFR), marking a fundamental shift in global financial markets. One of OFR's online monitoring tools is the Financial Stress Index (FSI), which represents a daily, market-based snapshot of stress in global financial markets using 33 economic indicators—including seven that were based on LIBOR. In anticipation of this year's transition, we replaced these indicators with new ones based on SOFR and other recommended rates, seamlessly transitioning the monitor to allow for meaningful comparisons of financial stress levels across time, including both before and after the LIBOR transition.

JADE

Last year, we delivered a cutting-edge pilot – a data and analytics hub to support the integration of multidisciplinary data with financial data in a collaborative research environment. This year, we moved into full-scale production and launched the Joint Analysis Data Environment (JADE). JADE is an innovative platform that combines high-performance computing, analytical software, and analysis-ready data to support collaborative financial stability research among Council member agencies. The OFR designed JADE to support research on all manner of financial stability topics, although the first initiative identified for JADE is climate-related financial risk.

Recent stress events in the financial system demonstrate the need for regulators to be able to collaborate at a moment's notice because threats can arise from multiple sources and across jurisdictional boundaries. JADE will help to transform the way regulators collaborate, streamlining regulators' access and providing the platform for more comprehensive risk measurement and monitoring.

The initial phase of JADE was officially launched in July of 2023 and represents a milestone in the OFR's mandate to support the Council and its member agencies. The OFR made JADE available to users from two Council member agencies in FY 2023 and expects to expand access to other member agencies over the subsequent months. As technology and the financial system evolve, the creation and delivery of JADE reflects the OFR's commitment to keeping pace and providing the platform to execute its mandate to support the Council and its member agencies' priorities.

Partnerships

Throughout the years, the OFR has also had the incredible privilege to partner with many great organizations. This year, as emerging risks continue to evolve, we have created a few more strategic partnerships, including with the National Science Foundation (NSF), the National Bureau of Economic Research (NBER), and the Defense Advanced Research Projects Agency (DARPA).

By partnering with NBER in 2023 through the catalyzed partnership with the NSF, the OFR is expected to gain important insights from the uniquely specialized research community to inform cutting-edge topics related to financial stability and expand the reach of frontier research. The funding provided by the OFR allows the NBER to convene a conference and fund research projects related to areas identified by the OFR as critical areas of need.

Cyber threats continue to be a serious and evolving threat to financial stability. To increase visibility in this area, the OFR partnered with the Defense Advanced Research Projects Agency (DARPA) to develop research on risks to the U.S. financial system from a cyberattack.

In conclusion, this year was marked with significant accomplishments, a number of which have transformed the OFR's ability to more fully execute its statutory mandates. The OFR and its staff remain steadfast in our efforts to advance the understanding of financial stability and contribute to the financial well-being of our nation. These accomplishments underscored our dedication to providing the financial community with tools, resources, and insights.

As we move into the new fiscal year, our commitment to advancing financial research, fostering collaboration, and enhancing transparency remains unwavering. We look forward to building on these achievements and continuing to support the evolving needs of the Council and its member agencies.

A handwritten signature in black ink, reading "James D. Martin". The signature is fluid and cursive, with the first letters of each word being capitalized and prominent.

James D. Martin
Acting Director



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EXECUTIVE SUMMARY

The OFR 2023 Annual Report discusses the Office’s assessment of risks associated with the U.S. financial system and reviews the performance of the OFR. We summarize the report’s findings in this section.

Financial Stability Risks to the U.S. Economy

Financial stability risks have increased since last year’s report and remain elevated in 2023. Multiple indicators signal an upcoming economic slowdown—potentially magnified by persistent inflation, ongoing geopolitical risks, and global conflicts. The strength of the labor markets has offset the probability of a recession in the United States in the near term, but the persistence of higher interest rates has created more challenging financial conditions and raised the prospect of a recession in the medium term (see **U.S. Economy**).

To manage core inflation, the Federal Reserve and other central banks are intent on keeping policy rates higher for longer. This policy posture has the effect of increasing borrowing costs for both companies and households, potentially dampening economic growth. Higher rates and the Federal Reserve’s quantitative tightening have been accompanied by volatility in the bond and equity markets. U.S. federal government deficits and bond yields have increased, causing investors to focus on the federal government’s ability to finance its spending needs. Treasury yields have risen sharply for 2-, 5-, and 10-year Treasuries, eclipsing 4.5% for the first time since 2007 (see **Treasury Market**).

After the fiscal and monetary stimulus programs associated with the COVID-19 pandemic ended in 2021, the Federal Reserve began monetary tightening in 2022. That reversal in policy may have caused turbulence in the banking, funding, and real estate markets in 2023. Several regional banking institutions failed or self-liquidated in the first half of 2023—largely due to an influx of deposits during the pandemic, followed by the banks’ failure to manage interest rate risks as financial conditions reversed. Many banks’ fixed-income securities portfolios showed large unrealized losses due to rising rates, and banks that had to sell securities to repay depositors sold those securities at a loss. In some cases, those losses contributed to the demise of certain banks (see **Banks**).

Banks experienced a large-scale outflow of deposits, with much of the funds going into MMFs and other investment vehicles. In contrast, the asset management industry has become increasingly concentrated. Assets under management for the industry ranged between \$78 - \$114 trillion, up from approximately \$24 trillion in 2008 (see **Short-term Funding** and **Asset Management**). Assets in MMFs totaled \$6.16 trillion at the end of September.

Credit risks have built up in the CRE sector as borrowing rates have increased, pushing valuations significantly lower. Of particular concern is the decline in valuations of office space, as vacancy rates have increased following the rise of the WFH trend. While CRE loan default rates continue to be relatively low, they are expected to rise significantly as leases come up for renewal. Regional, smaller, and community banks are more exposed to CRE lending and, therefore, more vulnerable to increasing default rates than the largest banks (see **Commercial Real Estate**).

Banks also provide substantial lending to small and medium-sized companies, and tighter credit conditions as banks curtail lending can potentially destabilize such companies with weaker balance sheets. Similar trends exist in the leveraged loan markets, where borrowing costs have risen sharply during a period of weaker earnings growth. This combination has weakened interest coverage ratios and increased the risk of default (see **Nonfinancial Corporate Credit**).

The inventory of homes for sale remains tight, pushing prices higher, while mortgage rates have reached their highest levels in 23 years. The confluence of these two factors has eroded home affordability (see **Residential Real Estate**). As labor markets remain tight, consumer spending and liquidity remain resilient, but consumer debt has risen while household savings have declined. This is particularly true for households with weaker credit. Delinquencies for certain segments have reverted to prepandemic levels, though they remain within historically low ranges overall (see **Household Credit**).

The property insurance sector is facing unprecedented stress that is expected to continue for an extended period. While P&C insurers have benefited from increased investment income from rising interest rates, this benefit has often been offset by rapidly rising claims costs, especially in property-exposed lines such as homeowners' insurance. While insurers may have been able to pass some of their increased costs on to consumers, some insurers have instead opted to exit certain states more prone to natural catastrophes (see **Insurance**).

Hedge funds' short Treasury futures positions have grown considerably since April 2022. This is consistent with (1) the re-emergence of the Treasury cash-futures basis trade or (2) funds placing large directional bets that Treasury yields will continue to rise. While it is difficult to separate the drivers of the growth in futures positions, both strategies can result in large losses that stem from and exacerbate Treasury market instability. In March 2023, the level of Treasury market implied volatility exceeded those seen in March 2020—when a flight to cash led to the unwinding of positions to meet margin payments, which put more downward pressure on Treasury prices, thus increasing Treasury yields (see **Hedge Funds**).

Risks continue to evolve, particularly in digital assets and cybersecurity. Over the past year, turmoil in the digital assets markets has exposed and even increased the high level of interconnectedness between digital asset firms and traditional markets, highlighting the impact of digital assets on financial institutions. Meanwhile, financial institutions have faced cybersecurity threats from financially motivated groups. The percentage of organizations affected by ransomware has risen from 79% to 87% in 2023. This surge in ransomware attacks has resulted in the highest proportion of data breaches in the financial services industry since 2018 (see **Digital Assets and Cybersecurity Risks in Financial Institutions**).

The U.S. economy remains among the most robust relative to the rest of the world. On the other hand, European economies are bearing the brunt of the effects of Russia’s war against Ukraine, with the German economy officially entering a recession in 2023. Other large European economies are also beginning to falter as their consumers see a decline in economic growth coupled with persistently high inflation. A protracted conflict in Ukraine may increasingly cause harmful effects on the economies and populations of Europe, raising the risks to U.S. financial stability. Emerging markets grapple with high commodity prices, a strong dollar, and unsustainable debt burdens. Tensions between the U.S. and China, plus China’s economic slowdown and deepening debt problems, also contribute to global economic uncertainty. In September, the yuan depreciated as low as 7.3415 per dollar, its weakest close since December 2007. A rapid depreciation of the yuan can cause large disruptions in U.S. markets, given the large dollar reserves held by China’s central bank and China’s large holdings of U.S. debt (see **Foreign Economies**).

Status of the Office of Financial Research

During FY 2023, the OFR launched several initiatives to advance the financial stability research, analysis, data collection, data-sharing, and monitoring capabilities of the OFR and the Council and its member agencies.

Following the OFR’s successful NCCBR pilot in FY 2022, we issued an NPRM in January 2023 to further our efforts to improve transparency and fill a data gap in the U.S. repo market that was highlighted by the March 2020 Treasury market disruptions.

After the NCCBR pilot, the OFR began building the DCU to facilitate the collection of any type or volume of data directly from external entities under OFR rules, voluntary data pilots, and surveys, as well as in other circumstances. In 2023, the OFR completed the DCU’s initial build and testing. The DCU is expected to go into production in early 2024, and the Office may use it for the NCCBR collection.

We made additional efforts to improve the OFR’s data infrastructure by updating and reformatting the IDI based on inputs and edits received by Council member agencies.

In July 2023, the OFR launched JADE—a secure, cloud-based platform designed to provide Council member agencies with access to analysis-ready data, analytical software, and high-performance computing. JADE will allow Council member agencies to jointly analyze financial stability risks and enable collaborative, interdisciplinary research on financial stability.

The OFR enhanced certain of our monitors. We updated the FSI to prepare for the transition from USD LIBOR to the SOFR. The Office also upgraded the BSRM’s data-sourcing process to improve efficiency.

The OFR focused on enhancing its data standards and the FIRD. Through the NITRD program, the Office was one of several agencies to partner with the White House Office of Science and Technology Policy and the NSF to develop the National Standards Strategy for Critical and Emerging Technologies, which was released in May 2023. In addition, we completed the integration of the ACTUS standard with the FIRD.

The OFR continued to engage our leadership and staff and use our Integrated Planning approach to strategize the work needed to advance our mission and align resources to achieve our goals. The Office used a portion of our funding from the Financial Research Fund to expand our in-house data collection capabilities and operationalize JADE.

We also made progress on our workforce plan and grew our team by 12%, allowing us to close gaps in subject matter expertise and fill critical leadership positions. To address workforce development and training gaps, the Office invested in employee learning and development and enterprise-wide learning opportunities, such as data analytics training and change management.

The OFR made significant efforts to modernize our technology by optimizing our cloud environments, investing in cybersecurity services to ensure the protection of our data, and implementing Zero Trust cybersecurity capabilities. We developed a completely cloud-based environment for JADE using Zero Trust architecture capabilities.



THE OFFICE OF FINANCIAL RESEARCH

The Office of Financial Research was established by the Dodd-Frank Wall Street Reform and Consumer Protection Act (Dodd-Frank Act) and is charged with:

Support to the Financial Stability Oversight Council (Council) in their primary purposes of:

- Identifying risks to the financial stability of the United States (U.S.) that could arise from the material financial distress or failure, or ongoing activities, of large, interconnected bank holding companies or nonbank financial companies or that could arise outside the financial services marketplace.
- Promoting market discipline by eliminating expectations on the part of shareholders, creditors, and counterparties of such companies that the U.S. government will shield them from losses in the event of failure.
- Responding to emerging threats to the stability of the U.S. financial system.

OFR's duties in support of the Council include:

- Collecting and providing data to the Council and member agencies.
- Standardizing the types and formats of data reported and collected.
- Performing applied research and essential long-term research.
- Developing tools for risk measurement and monitoring.
- Publishing the results of activities, research, and other related services to financial regulatory agencies.
- Assisting member agencies in determining the type and formats of data authorized by the Dodd-Frank Act collected by member agencies.

Pursuant to the Dodd-Frank Act, the Council consists of ten voting members and five nonvoting members and brings together the expertise of federal financial regulators, state regulators, and an insurance expert appointed by the President.

The voting members include:

- the Secretary of the Treasury, who serves as the Chairperson of the Council;
- the Chair of the Board of Governors of the Federal Reserve System;
- the Comptroller of the Currency;
- the Director of the Consumer Financial Protection Bureau;

- the Chair of the Securities and Exchange Commission;
- the Chairman of the Federal Deposit Insurance Corporation;
- the Chairman of the Commodity Futures Trading Commission;
- the Director of the Federal Housing Finance Agency;
- the Chairman of the National Credit Union Administration; and
- an independent member having insurance expertise who is appointed by the President and confirmed by the Senate for a six-year term.

The nonvoting members, who serve in an advisory capacity, include:

- the Director of the Office of Financial Research;
- the Director of the Federal Insurance Office;
- a state insurance commissioner designated by the state insurance commissioners*;
- a state banking supervisor designated by the state banking supervisors*; and
- a state securities commissioner (or officer performing like functions) designated by the state securities commissioners*.

*Note: The state insurance commissioner, state banking supervisor, and state securities commissioner serve two-year terms.

Abbreviations for Council Member Agencies and Member Agency Offices; additionally refer to Appendix A - Abbreviations and Acronyms for all others:

Department of the Treasury (Treasury)

Board of Governors of the Federal Reserve System (Federal Reserve)

Office of the Comptroller of the Currency (OCC)

Consumer Financial Protection Bureau (CFPB)

Securities and Exchange Commission (SEC)

Federal Deposit Insurance Corporation (FDIC)

Commodity Futures Trading Commission (CFTC)

Federal Housing Finance Agency (FHFA)

National Credit Union Administration (NCUA)

Office of Financial Research (OFR)

Federal Insurance Office (FIO)

Statutory Requirements for the Annual Report

Section 154(d) of the Dodd-Frank Act requires the OFR to submit a report to Congress.

Subparagraph (1) requires no later than 120 days after the end of the fiscal year, the Office will submit a report to Congress.

Subparagraph (2) requires each report to assess the state of the U.S. financial system, including:

- (a) an analysis of any threats to the financial stability of the U.S.;
- (b) the status of the efforts of the Office in meeting the mission;
- (c) key findings from the research and analysis of the financial system by the Office.

PART ONE:

RISKS TO U.S. FINANCIAL STABILITY



Economic Indicators

U.S. Economy

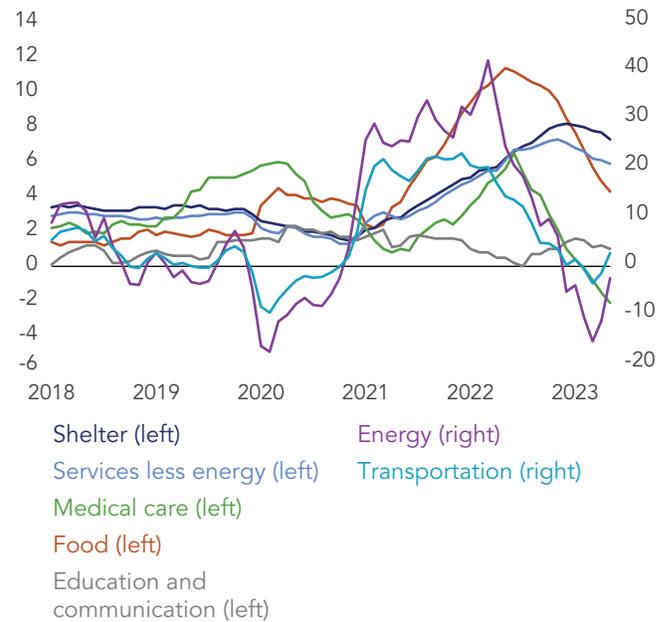
The current U.S. macroeconomic environment is characterized by a robust labor market and sustained consumer demand that managed to prevent a recession despite a prolonged period of rising interest rates, high cost-of-living increases and stresses in the banking sector. However, warnings abound, and a high degree of economic uncertainty paints a mixed picture for the medium term. While the overall macroeconomic risks to U.S. financial stability remained elevated, specific market forecasts for growth and unemployment all point to positive growth in the second half of 2023.

Inflation

Various measures of price increases remained elevated and above the Federal Reserve's target. As of September 2023, CPI inflation has risen 3.7% over the previous 12 months, while core CPI inflation (less food and energy) was up 4.1% over the same period. PCE inflation, the preferred metric the Federal Reserve used, was up 3.5% over the 12 months preceding August 2023. While the CPI is significantly down from its January 2023 reading of 6.4% and PCE inflation is down from its January 2023 reading of 5.4%, both are still above the YOY inflation target of 2%, which guides monetary policy.

High prices affected household balance sheets throughout the year, and downward pressures on aggregate demand are expected as a result (see **Figure 1**). Food price inflation was 10.1% YOY in January and stands at 3.7% as of September 2023. Service prices have increased 5.7% YOY as of September, down from 7.2% at the beginning of the year. Shelter

Figure 1. Inflation by Category (percent)



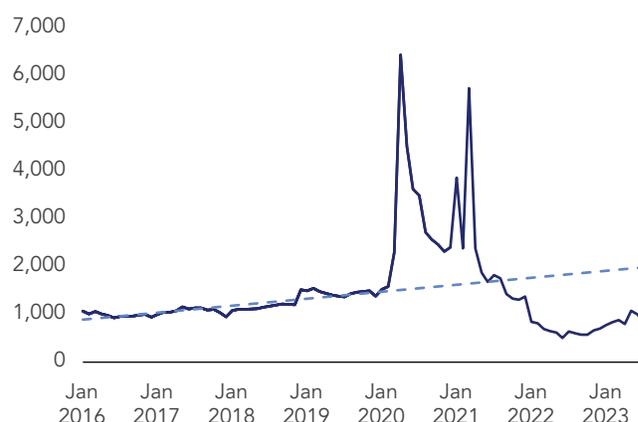
Note: Twelve-month percentage change, selected categories.

Sources: BLS, OFR

costs rose by 7.2%, and transportation costs have decreased significantly from the elevated levels recorded in 2022, even experiencing a slight deflation in Q2. Food, services, and shelter prices have been the main drivers of inflation in 2023. Durables and other goods haven't seen the same level of inflation, and energy costs have decreased, with gasoline price inflation currently at -3.0% YOY. Medical care and electricity inflation fell, while education and communications costs haven't risen significantly. Nevertheless, the price increases for food, services, and shelter will likely translate into diminished demand and tight household balance sheets throughout the year.

Despite high prices, retail consumption growth has been strong throughout the year but is beginning to slow. The August retail sales report showed an increase of 0.6% month over month and up 2.2% for the June through August period over the same period a year ago. In contrast, retail sales over Q1 2023 were up 5.4% from the previous year's period. Some of this growth was fueled by households' excess savings, partly due to the large fiscal stimulus enacted during the COVID-19 pandemic. However, these savings diminished through the year, and retail consumption growth began cooling. Estimates of accumulated excess savings,¹ in nominal terms, totaled around \$2.1 trillion through August 2021, which is shown by the area above the trend line but below the personal savings data series in **Figure 2**. After August 2021, aggregate personal savings began to dip below the pre-pandemic trend, signaling that households were drawing down pandemic-related savings to support their consumption. Should the recent pace of drawdowns persist, households won't be able to tap into their excess aggregate savings to support growing spending throughout the year.

Figure 2. Personal Savings (\$ millions)



Note: Trend implied by 24 months of data prior to March 2020. See Abdelrahman and Oliveira (2023) for details.

Sources: BEA, OFR

Forecasters expect inflation to remain elevated in the short run but then decline; consumer price inflation is projected to stay near 4% through the rest of 2023 and decrease to 2.6% YOY in 2024.² Other metrics of inflation expectations, such as the ATSI curves and the Federal Reserve's projections of Core PCE inflation, similarly project that inflation will be below 2.5% in 2024. The monetary picture remains murky as the impact of monetary tightening begins to show results with its usual lags; therefore, relying on forecasts is becoming increasingly problematic. Forecast misses can be worrisome because they could lead to sudden mispricing of risky assets as new information comes in. Also, inflation expectations generally remain somewhat anchored to the Federal Reserve's 2% inflation target. This indicates that the recent period of high and volatile inflation had a muted effect on expectations despite inflation metrics being above 5% at times. This is important for financial stability because unanchored inflation expectations could lead to higher and even more volatile inflation.

Labor Markets

Following a year of tight labor market conditions and historically low unemployment, recent data point to an easing in labor market conditions consistent with a slowdown in wage growth and economic conditions. Job openings have declined, with data in August 2023 showing a near two-year low of 9.6 million openings, down from a peak of 12.1 million in March 2022. Nonetheless, unemployment and labor force participation are at their strongest levels since the COVID-19 pandemic. The unemployment rate in August was 3.8%, the highest in 2023 but still near historic lows, while labor force participation is near 62.8%, the highest level post-pandemic, as report-

ed by the BLS. Hiring slowed throughout the year, but the layoff rate has not significantly increased. The unemployment rate was remarkably resilient throughout the year through September, never rising above 3.8% since March 2022.

Monthly job gains have begun to slow but remain elevated; the August 2023 employment report showed an increase of 227,000 jobs, compared with the average monthly gain of 256,000 over the first half of the year. Sectors experiencing upward employment trends include professional and business services, health care, leisure and hospitality, social assistance, government, and the financial sector. Average hourly earnings increased only 0.2% month over month in September 2023, far below the average monthly increase of 0.37% over the previous 12 months. As **Figure 3** shows, job openings have begun to decline from their post-pandemic peak. In addition, layoffs have started to increase slowly, although they are still below prepandemic levels.

These data all point to a labor market that seems to be adjusting relatively painlessly to the Federal Reserve’s tightening of monetary policy. Wage growth slowed and is expected to continue slowing; forecasters project employment costs to grow by 4.4% in 2023 and 3.3% in 2024, down from 4.9% in 2022.

Interest Rates

Market participants generally expect the interest rate–hiking cycle to be over, with interest rates remaining higher for longer due to the strength of labor markets and the overall economy. Nevertheless, certain participants failed to adapt to the rising-rate environment. Beginning in March 2023, certain banks experienced stress due to the rise in rates, but the broader economy was largely unaffected (see **Banks**). Market forecasts and the Federal Reserve’s own projections stipulate that the current target range of 5.25% to 5.5% is near where rates are expected to finish during this hiking cycle. In their June meeting, the Fed-

Figure 3. JOLTS Job Openings and Layoffs (thousands)



Note: Seasonally adjusted. Pandemic peak is off chart.

Sources: Job Openings and Labor Turnover Survey, BLS, OFR

eral Reserve signaled that they would pause the interest rate–hiking cycle for now, but they may enact future rate increases as deemed appropriate using a data-dependent approach focusing on economic activity as well as inflation.³ As of September, forecasters and market participants largely expect the federal funds rate to remain unchanged for the rest of the year.

The federal funds rate increased by 500 basis points over the past year. This action tightened credit conditions and cooled off inflation. In addition, this rapid pace of rate hikes affected rate-sensitive asset values (such as the values of fixed-rate securities, loans, and leases). Also, the Federal Reserve engaged in QT through this hiking cycle, shedding assets from its balance sheet at a rate of around \$90 billion monthly. The Federal Reserve’s balance sheet is about \$8 trillion as of this writing, down from about \$9 trillion a year ago. This operation also contributed to repricing bonds and other fixed-rate securities while removing the Federal Reserve as Treasuries and MBS’s biggest and most reliable buyer (see **Treasury Market**).

High-interest rates remain a potential vulnerability. Markets predict that the Federal Reserve will begin cutting rates at some point next year, while the Federal Reserve’s own predictions are that rates must remain at a higher level for some time. Should interest rates remain closer to the Federal Reserve’s projections, the market will be forced to reprice expectations for interest rates, with potential implications for liquidity and financial stability.

Growth

The economy proved to be remarkably resilient. Estimates of GDP growth for 2023 are between 1% and 3%. However, forecasters have a much dimmer outlook for next year.

As previously mentioned, several metrics of activity have begun to cool off. Credit tightening will continue as monetary policy works its way through the economy. Capital goods orders and shipments appear to have peaked through this year, with business capital investment falling in real terms as prices continue to rise. Inflation is projected to remain elevated in the short term, dragging consumption and retail sales down as households make careful choices with their budget.

Private sector forecasts see GDP growth near 1.9% for 2023 and hovering above 0.5% for 2024. The unemployment rate is expected to inch up to 4.4% in 2024. More stresses in the banking sector or bond markets could exacerbate this situation.

Box Topic: OFR FSI and Indications of Stress in Funding and Safe Assets

The OFR FSI is a daily market-based snapshot of stress in global financial markets. It is constructed from 33 financial market variables, such as yield spreads, valuation measures, and interest rates. The OFR FSI is positive when stress levels are above average and negative when stress levels are below average. A higher value indicates higher financial stress.

According to the OFR FSI, financial stress in the United States was significantly elevated in 2022 and the first half of 2023. However, financial stress was below average since June 2023. The primary drivers of the elevated stress in 2022 and early 2023 were heightened volatility,

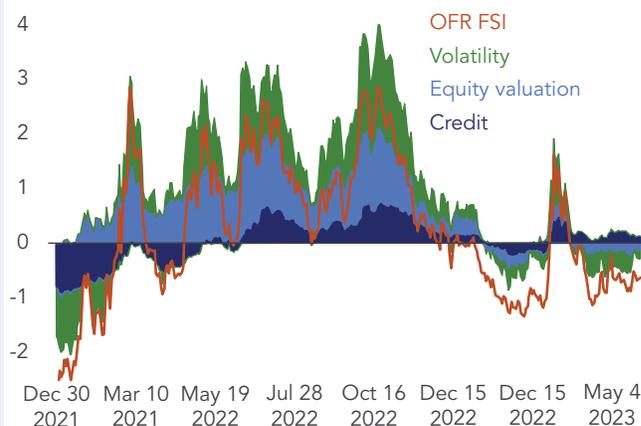
a deterioration in credit quality, and drops in equity valuations. This is apparent in **Figure 4**, which plots the OFR FSI over time and the contributions of those variables pertaining to credit, equity valuation, and volatility. The figure depicts the contributions of the different classes of variables as a stacked plot, with the sum of all contributions being equal to the level of the OFR FSI.

On the other hand, in **Figure 5**, we see that stress indicators pertaining to funding and safe-asset markets have remained relatively stable. However, it is crucial not to perceive current stability as an indicator of future stability. The OFR FSI represents a current-state assessment of the economy and is not a predictive tool.

The OFR FSI serves as a valuable mechanism for detecting ongoing stress and identifying areas that require attention. Throughout 2022, as well as in March and April of 2023, the FSI was elevated due to stress and increased volatility in credit and equity markets. Continued monitoring of these indicators will help policy-makers and financial institutions stay vigilant and proactively address potential vulnerabilities, which will, in turn, safeguard the overall financial stability of the United States.

Seven of the 33 variables constituting the initial 2017 version of the OFR FSI were based on now-obsolete reference rates, such as the USD LIBOR. This year, in conjunction with the cessation of USD LIBOR and as detailed in an OFR working paper,⁴ the OFR released an updated version of the OFR FSI⁵ that replaced obsolete variables with ones based on robust alternative reference rates, such as the SOFR. As demonstrated in the working paper, this new version of the OFR FSI behaves similarly to the previous version, allowing for near-seamless comparison of the FSI's mea-

Figure 4. Volatility, Elevated Credit Risk, and Decreased Equity Valuations Have Pushed Up the OFR FSI



Source: OFR

Figure 5. OFR FSI Measures of Stress in Funding and Safe-asset Markets Are Not Elevated



Source: OFR

sure of stress before and after the update. This successful transition reflects the OFR FSI's ability to adapt to the changing landscape of reference rates, enhancing its ability to capture and reflect market stress levels.

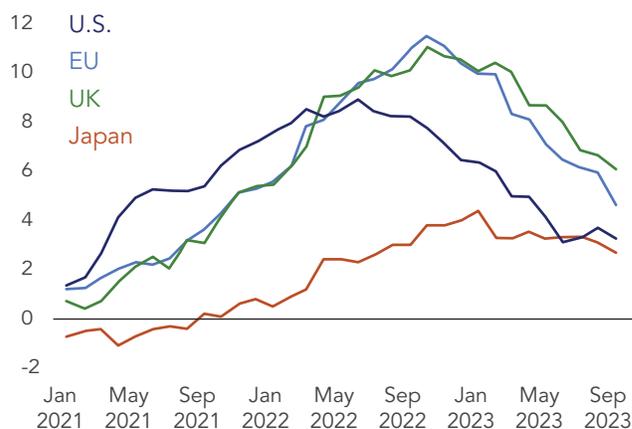
Foreign Economies

Persistently high inflation among advanced economies, including the U.S., the UK, and the EU, poses significant risks to financial stability. Higher-than-expected inflation can lead to further interest rate rises, which could increase insolvency risk for corporations, especially financial institutions. Higher interest rates increase funding costs and decrease asset values, thus threatening financial institutions' resilience. Because of the large exposures to the EU that banks and bank holding companies have via debt and derivatives claims, as well as the interdependency in the real economy via trade, these same vulnerabilities in the EU are important for the U.S., given the risk of large spillover effects.

Although the pace of inflation has slowed since the beginning of 2023, it remains well above target rates (see **Figure 6**). The pace of core inflation in the EU continued to increase as late as January, primarily driven by persistently high energy costs (see **Commodities Markets**) and above-average price increases in more than 90% of core items. At the beginning of the year, the European Commission projected slightly elevated growth and a moderation in inflation for 2023, but recent developments indicate ongoing inflationary pressures in the EU and the UK. The ECB faced the challenge of balancing fighting inflation with managing the associated risks of higher interest rates.

In 2022, sovereign debt yields across the eurozone diverged, raising the borrowing costs of fiscally weaker eurozone countries relative to those of stronger countries. This increased fragmentation risk prompted the ECB to announce its TPI in July 2022. The TPI enables the Eurosystem, which is composed of ECB members whose currency is the euro, to

Figure 6. Consumer Prices Relative to 12 Months Prior (percent change)



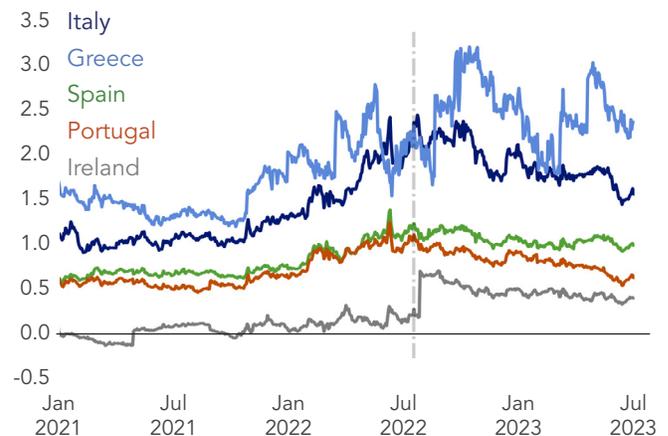
Sources: Refinitiv, OFR

“make secondary-market purchases of securities issued in jurisdictions experiencing a deterioration in financing conditions not warranted by country-specific fundamentals.”⁶ Since July 2022, the trend of rising yield dispersion seems to have slowed, with a mild reversal with respect to Portuguese, Irish, and Italian sovereign debt. **Figure 7** depicts this trend; it plots spreads on the yields of 10-year GIIPS bonds and 10-year German Bunds.⁷ The vertical dashed line marks the announcement day of the TPI. Since then and through the first half of 2023, the spreads on Irish, Italian, Portuguese, and Spanish bonds have shrunk. The yields on Greek debt remain high relative to those of German Bunds.

We detect a similar trend by observing CDS spreads. Changes in these spreads can measure increases in sovereign-debt default risk. **Figure 8** plots the cumulative change in five-year CDS spreads on German debt and the debt of GIIPS countries since the beginning of 2021. This chart suggests that credit risk may have risen in late 2021 and the first half of 2022. Again, a vertical dashed line marks the announcement day of the TPI. Credit spread trends in the months since that day indicate that credit risk has dropped or at least stopped increasing in many of these countries.⁸

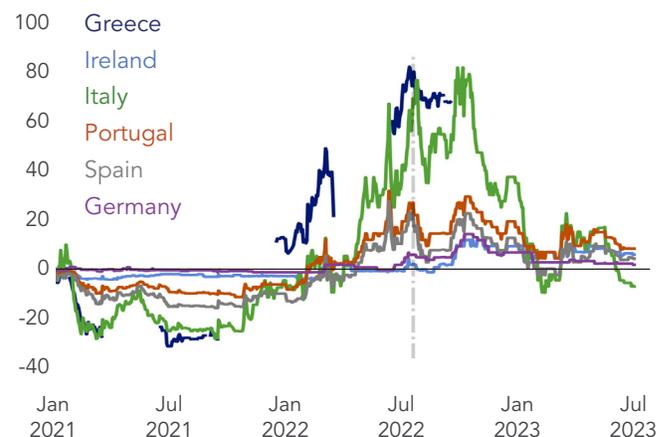
EU labor markets exhibited strong performance, with the unemployment rate reaching a new all-time low of 5.9% as of July 2023. This is despite lower growth and faltering business confidence. In 2022, business confidence in Germany hit its lowest point since 2020, according to the IFO Business Climate Index for Germany. As of June 2023, confidence levels partially recovered, as measured by this index, but businesses remain skeptical about the upcoming six months. Meanwhile, some similar trends exist in the UK. Business confi-

Figure 7. 10-year Bond Yield Spread over Germany (basis points)



Sources: Refinitiv Datastream, OFR

Figure 8. Cumulative Change in 5-year CDS Spreads on Sovereign Debt (basis points)



Note: Senior CR14 5-year USD CDS, mid spread. Cumulative difference since Jan 1, 2020.

Sources: Reventiv, OFR

dence in the UK has increased steadily since the beginning of 2023, according to the Institute of Directors' Economic Confidence Index, after steep drops following the October 2022 Gilt crisis.⁹ The index shows that the economic outlook has returned to levels seen immediately before Russia's war against Ukraine began in 2022.

More broadly, the IMF raised its global growth outlook for 2023 due to "surprisingly resilient" demand in the U.S. and Europe, easing energy costs, and the reopening of China's economy after the relaxation of COVID-19 pandemic restrictions. While global growth is still expected to slow to 2.9% in 2023 from 3.4% in 2022, this forecast marks an improvement compared with the October 2022 prediction of 2.7% growth. These factors provide a slightly positive outlook for the global economy despite the challenges posed by inflation and other vulnerabilities.

Nevertheless, this slightly positive economic outlook remains threatened by elevated geopolitical risks, particularly those associated with Russia and China. The continuation of Russia's war against Ukraine has led to continuing supply chain frictions and uncertainty. Tensions with China, plus its slowdown and deepening debt problems, also contribute to global economic uncertainty. For example, in September 2023, the yuan dropped as low as 7.3415 per dollar, its weakest close since December 26, 2007. A rapid depreciation of the yuan can cause large disruptions in U.S. markets, given the large dollar reserves held by the People's Bank of China and the large amounts of U.S. debt owned by China. According to holdings estimates by the Treasury, China's holdings of Treasury securities in January 2023 totaled \$859.4 billion, down from \$1,033.8 billion as of January 2022. Given the potential for future selloffs, this situation must

be carefully monitored. These risks can have far-reaching implications for financial stability, trade relations, and overall global economic growth. The evolving geopolitical landscape necessitates careful monitoring and proactive measures to mitigate potential disruptions that could undermine the stability of the U.S. financial system.

Nonfinancial Corporate Credit

The health of nonfinancial businesses has important implications for assessing financial stability. Stress in the business sector can amplify stresses in the overall economy and the financial system through at least two risk transmission channels:

1. The counterparty channel is the mechanism through which lenders are adversely affected by companies that default.
2. The economy channel is the mechanism through which business spending and investment changes can adversely affect the real economy.

Two salient vulnerabilities could amplify business credit risks:

1. Small and midsize companies face a challenging funding environment as banks tighten lending standards.
2. Highly leveraged borrowers are at a higher risk of default, given higher interest rates, tighter credit conditions, and a slowing economy.

These risks could cause default rates to be much higher than projected, imposing losses on lenders and investors. Additionally, these risks could adversely affect the economy via lower employment and capital spending.

Bank Business Lending

Regional, small, and community banks play important roles in corporate lending—originating slightly over half of all C&I loans held by U.S. banking institutions, with universal and large banks originating the remainder.

Businesses of all sizes depend on banks for C&I loans. Small companies depend more on bank loans than larger companies, which have more funding opportunities, such as capital markets. While small companies have access to other sources of credit (such as suppliers, finance companies, marketplace lenders, family, and friends), small and regional banks are critical funding sources. Banks with less than \$250 billion in assets account for about two-thirds of small-business C&I loans, and banks with less than \$10 billion in assets account for approximately 30% of small-business C&I loans.¹⁰

Bank lending conditions began to tighten well before the banking stress in 2023. The Federal Reserve's January 2023 SLOOS, which covered bank-lending conditions between October and December 2022, noted that a "significant net share of banks reported having tightened standards on C&I loans of all sizes."¹¹

This tightening continued into 2023, as noted in the subsequent April survey, which covered January through March and overlapped the collapse of SVB, and as noted in the July survey, which covered conditions through June. Both surveys indicated that banks expect to tighten lending standards over the remainder of 2023 due to a less favorable or more uncertain economic outlook and an expected deterioration in collateral values. This is significant for small businesses, which often rely on lines of credit to finance working capital and capital projects. Surveys also indicate that demand

for C&I loans is weaker, which is not surprising, given the sharply higher cost to borrow and economic uncertainty.

The overall effect of tighter credit conditions and weaker loan demand is a reduction in business lending and, ultimately, business spending. C&I outstanding loans grew in excess of 10% YOY through March 2023, but growth slowed to 1% by August 2023.

For several reasons, businesses will likely continue to face challenging credit conditions. First, banks face pressure from investors and regulators to shore up balance sheets and reduce risk. Second, regulatory changes brought about by the March 2023 regional banking crisis could curtail lending. Third, monetary policy may remain tight due to ongoing inflation concerns. Finally, deposit outflows from banks into money-like assets, such as government MMFs, mean fewer funds are available for banks to loan to companies.

Highly Leveraged Companies

Vulnerabilities within the corporate sector threaten financial stability when leverage is at an extreme high and risk premiums are at an extreme low. Leverage is a current concern because it is high among speculative-grade and unrated borrowers. However, risk premiums are above cyclical lows (see **Corporate Credit Markets**).

Highly leveraged companies are vulnerable within the broader corporate sector (i.e., small, medium, and large corporations). Tighter lending conditions pose a particular problem for many companies that borrow in the leveraged finance market. This market provides funding to larger corporate borrowers with high-yield credit ratings, but it also funds middle-market and smaller companies that typi-

cally have weaker credit profiles. The common thread among these large and small leveraged borrowers is that they have limited buffers to weather economic downturns. Also, their business models are dependent on favorable financing conditions.

Tighter credit conditions have coincided with some weakness in corporate earnings. As a result, according to Moody's, the trailing 12-month default rate for high-yield issuers (i.e., larger corporate issuers of bonds and loans) increased from a cycle low of 1.2% in early 2022 to 4.8% in August 2023. Moody's forecasts that default rates will continue to rise, peaking at 5.6% in early 2024. Even with this higher trend, the projected default rate remains well below levels reached in historical credit cycle downturns. Default rates among private companies have also increased YOY.

The *leveraged finance market* consists of the traditional high-yield bond market and four types of leveraged loan markets. These five markets (see **Figure 9**) total \$4.7 trillion, or approximately 31% of overall nonfinancial corporate debt. This share increased steadily over the last two decades, a period characterized by declining interest rates and relatively loose lending conditions.

The term *leveraged loans* is typically used in reference to the \$1.4 trillion institutional loan market (i.e., corporate loans originated by bank syndicates that trade in the secondary market). However, the leveraged loan market is much larger than only institutional loans, as shown in **Figure 9**. Private debt, composed of nonbank lenders such as private debt funds and business development companies, grew rapidly over the past decade and is quickly approaching the size of the institutional-loan and high-yield bond markets.

Figure 9. U.S. Leveraged Finance Market, Year-End 2022

Leveraged Loans		High-yield Bonds
Middle-market Loans	Broadly Syndicated Loans	
Business Development Companies (BDC) \$240 bil.	Pro Rata \$770 bil.	\$1,240 bil.
Private Debt Funds \$1,050 bil.	Institutional \$1,410 bil.	

Note: Data as of year-end 2022, except pro rata (Q3 2022). Private debt includes dry powder.

Sources: Haver Analytics, ICE Data Services, Pitchbook LCD, Preqin, Shared National Credit Program, OFR

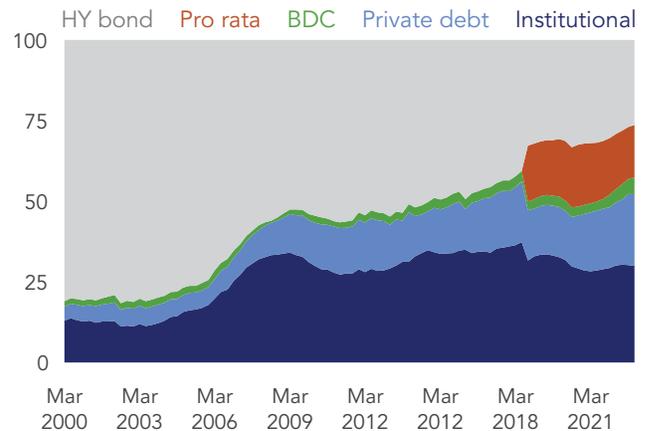
Given the higher-rate environment and potential for slower economic growth, four key vulnerabilities, discussed later in this section, are associated with the leveraged finance market:

1. Floating-rate debt (leveraged loans) is at risk due to higher rates.
2. There are more low-rated leveraged loan debtors than ever before.
3. There are many more highly leveraged companies now than historically.
4. There is a record share of companies with very low-interest coverage.

Floating-rate debt (leveraged loans) is at risk due to higher rates. We estimate that the leveraged loan component of the broader leveraged finance market is roughly 74%, compared with approximately 20% in 2000 (see **Figure 10**). This increase was driven by rapid growth in both private debt and institutional loans. These loans have floating-rate coupons, although some are fixed-rate. Meanwhile, most corporate bonds have fixed-rate coupons. The yield for floating-rate loans comprises a credit spread applied to an underlying reference rate. As reference rates surged in 2022, loan coupon rates (which reset monthly or quarterly, depending on the loan agreement) also surged. As a result, interest burdens sharply increased over the past year.

There are more low-rated leveraged loan debtors than ever before. Single-B and lower-rated borrowers constitute almost 72%—a proportion substantially higher than before the pandemic—of the par value of the \$1.4 trillion U.S. institutional loan market (see **Figure 11**). These lower-rated companies are more vulnerable to downgrades and defaults during weaker economic periods. For example, as interest rates increased in 2022, the ratio of ratings downgrades to upgrades increased sharply. In 2023, downgrades contin-

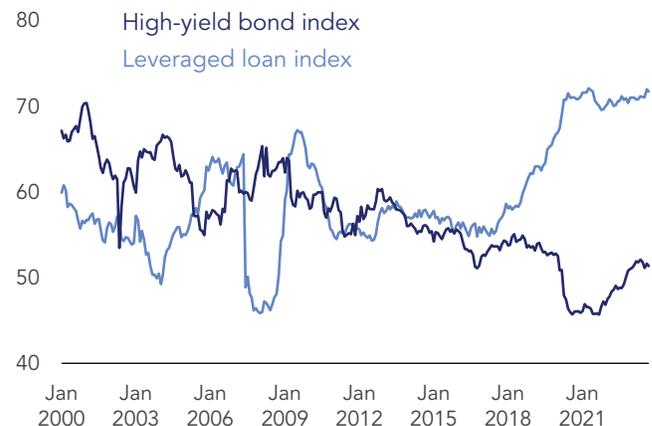
Figure 10. Floating-rate Share of U.S. Leveraged Finance Debt



Note: Data as of year-end 2022, except pro rata (Q3 2022). Pro rata not available before 2018.

Sources: Haver Analytics, ICE Data Services, Pitchbook LCD, Prequin, Shared National Credit Program, OFR

Figure 11. Share of B-rated and Below Debt (percent)



Note: Data as of September 2023.

Sources: Pitchbook LCD, ICE Data Services, OFR

ue to surpass upgrades. PE firms back many of these lower-rated issuers. Often, PE-backed borrowers have little to no junior debt to absorb credit losses. As a result, senior secured creditors are more vulnerable to lower recovery rates upon default.

There are many more highly leveraged companies now than historically. The *debt ratio* is the ratio of gross debt to EBITDA. The share (issuer count) of noninvestment-grade companies with debt ratios over 6:1 is 53%, which is down from a record 55% at the end of 2022 but well above the 29% historical average since 1990. This high share is a function of historically low interest rates and investor reach for yield following the 2007-09 financial crisis. For an extended period after the 2007-09 financial crisis, the U.S. economy experienced its longest expansion on record, and *real* risk-free rates were very low and often negative. Lending conditions were very favorable, enabling many more companies to access debt. While this favorable borrowing environment supported innovation and employment, it resulted in many more highly leveraged companies. In more recent years, before the backup in interest rates last year, some companies locked in lower-cost fixed-rate debt via the issuance of high-yield bonds. As this debt matures in the coming years, refinancings may pose a problem if interest rates remain at current levels.

There is a record share of companies with very low interest coverage. The share (issuer count) of noninvestment-grade companies with very low levels of interest coverage recently reached a record high of over 20%. When operating earnings are below interest expenses, a firm's coverage ratio is below one. In other words, the company must rely on funding sources other than operating income to meet its interest obligations. When firms

have low coverage ratios over multiple years, they are often referred to as *corporate zombies*, which we define as firms that experience three consecutive years of low (i.e., under one) coverage ratios, consistent with our reporting in prior OFR Annual Reports.

This share increased during the COVID-19 pandemic recession in 2020 because extraordinary fiscal and monetary policies suppressed default rates, enabling many more firms to continue operating. The share of companies with low interest coverage has continued to climb since then, accelerating over the past year as interest costs have surged.

Assessing the corporate-zombie share for private companies is more difficult because financial statements of private companies are not public. However, according to Lincoln International, when accounting for the current level of loan reference rates for a full one-year period, nearly 45% of companies could not cover their debt-servicing obligations.¹² In other words, the sharp rise in interest rates has adversely affected highly leveraged private companies even more than their public-company counterparts—an unsurprising outcome that is nevertheless challenging to such private firms.

In summary, rather than the corporate sector being a primary source of systemic risk, it is more likely an amplifier of other economic and financial system stresses. Tighter credit conditions and higher borrowing costs are testing many firms' business models, and stresses at regional banks raise concerns about a reduction in borrowing availability for smaller companies. A protracted downturn and much higher default rates are not the current market expectations for 2024, but the vulnerabilities noted above amplify this tail risk scenario.

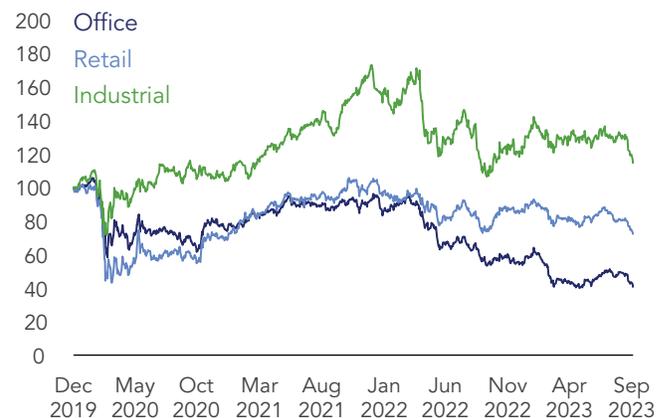
Commercial Real Estate

The U.S. CRE market faces increased financial uncertainty due to higher interest rates, higher risk premiums, and reduced bank risk appetite,¹³ resulting in tighter credit. Although the multifamily and industrial sectors, plus certain retail CRE sectors, continue to perform well, the office sector is facing more difficult financial conditions and is struggling with weak demand stemming from an increase in WFH trends as tenants look to reduce footprints and improve efficiency. U.S. financial institutions hold more than \$5.6 trillion of mortgage debt secured by CRE, and prior CRE downturns generated financial instability.¹⁴ Like many markets, CRE is multifaceted, and to understand the threat to financial stability it poses, we must evaluate each of its sectors individually.

The performance of the FTSE NAREIT real estate investment trust composite indexes summarizes current investor sentiment toward the CRE sectors (see **Figure 12**). From the end of Q1 2020 through September 2023, the industrial index gained 34%, and the retail index gained 48%. During the same period, the office composite index declined by 39%. From the beginning of the year through September 2023, the office composite index declined 21% while the other indexes posted gains. Higher interest rates continue to temper CRE lending, refinancing, and valuation. Higher rates increase borrowing costs, thus lowering debt service coverage ratios (a key CRE loan covenant) and negatively affecting the financing and refinancing of CRE. In a higher for longer interest rate environment, CRE investors and lenders face ongoing uncertainty and a higher risk premium.

The risk premium required to hold and lend on CRE is elevated because of uncertainty

Figure 12. NAREIT Real Estate Indexes



Note: Data are indexed to Dec 31, 2019 = 100. Data as of Oct 3, 2023.

Sources: Bloomberg Finance L.P., OFR

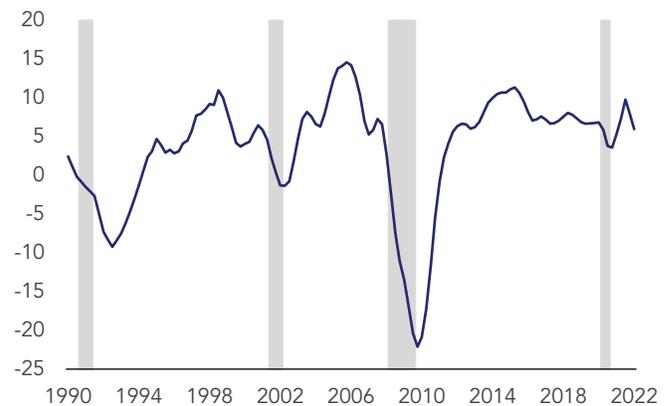
about the timing and level of future interest rate increases, plus the fact that investors are grappling with uncertainty about the health of the U.S. economy and future economic growth, which are key drivers of CRE demand. Finally, the March 2023 regional banking crisis increased focus on risks stemming from banks' capitalization, loan portfolios, and access to liquidity. These concerns appear to have made bank CRE lending more deliberative and risk averse. All these factors have tempered CRE valuations (see **Figure 13**).

Although the financial and economic environment affects all CRE sectors similarly, each sector has specific factors that affect its performance and outlook. Next, we review the CRE sectors individually.

Multifamily. The multifamily sector continued to benefit from the ongoing housing shortage in the U.S. Outsize demand pushed down vacancy rates and drove robust rent growth in 2022. However, demand declined toward the end of the year despite ongoing job creation and healthy consumer balance sheets. It appears that many young adults (between the ages of 18 and 29), who likely would have rented apartments instead, continued to move back in with their parents. This is even true of college graduates. In 2022, nearly half of all young adults lived at home—a proportion not seen since the Great Depression.¹⁵ After such a robust period of growth, the market is showing signs of normalization. The national vacancy rate for multifamily was 5.1% at the end of September 2023, according to Moody's Analytics.

Industrial. Fueled by e-commerce and an everything-on-demand economy, the industrial sector has been booming for several years. Robust demand, led by logistics firms and retailers, pushed vacancies to all-time lows. The

Figure 13. Composite YOY Change in CRE Valuations (percent)



Note: Shaded areas are U.S. recessions.

Sources: Real Capital Analytics, OFR

vacancy rate for distribution and warehouse space was 4.6% at the end of Q3 2023—near a record low because the rate has steadily declined each quarter since the end of 2020. Low vacancy drove rental growth to a record pace. While rent growth remained strong during the first half of 2023, the growth rate is expected to slow.¹⁶ With such strong demand, new properties increasingly capitalize on market strength. Roughly 20% of industrial developments under construction are larger than 500,000 rentable square feet, compared with approximately 5% of existing inventory. Consequently, construction activity will remain robust but should moderate over time as supply meets demand.¹⁷ New deliveries will bring some relief to markets with vacancy rates of less than 1%, although such tightness will continue to push many tenants to those secondary markets with greater availability.¹⁸

Retail. Though somewhat diminished due to the rapid growth of e-commerce (which accounts for approximately 15% of U.S. retail sales), the retail sector remains strong, especially for goods and services that favor or even require in-person visits. For example, trips to nail salons, barbershops, and sports bars remain popular. As a result, the retail sector recovered from the COVID-19 pandemic and 2021–22 supply chain issues faster than many anticipated, and consumers returned to spending in physical locations, including bars and restaurants. That will benefit retail real estate boasting such offerings. However, performance should continue to be uneven. While foot traffic at suburban shopping centers returned to 2019 levels, foot traffic at urban shopping centers remains well below 2019 levels. This reflects the increased prevalence of the WFH trend, which has hurt the office sector.¹⁹

Office. The WFH trend created conditions for potential consolidation of the office sector. Negative office space absorption and the increase in office space available for sublease suggest that current demand is weak. Furthermore, indications that actual office occupancy by workers remains at or below 50% signal that employers lease significantly more space than they currently need (see **Figure 14**). If firms reduce their office space requirements to reflect the reality of employees' WFH preferences, office demand could suffer a structural contraction. High-quality space will likely outperform as the flight to quality continues, with high rents and low vacancy rates for best-in-class assets. However, second-generation space will struggle to backfill, with an increase in demolitions and conversions.

Three factors should temper financial stability concerns for the office sector:

1. Office CRE is less than one-quarter of total U.S. CRE market debt.
2. Office lease terms can run up to 10 years or more, so any structural reduction in office demand will occur over time as leases renew.
3. Economic growth over time will create employment, including office jobs. An expanding workforce may offset some of the negative office absorption generated by WFH.

As of Q2 2023, U.S. financial institutions held more than \$4.6 trillion of mortgage debt secured by CRE. Depositories held approximately 38% of this debt, with the Enterprises guaranteeing or holding 21% and insurers holding 15%. **Figure 15** shows that 13% of CRE mortgage debt was packaged into CMBS or ABS. Within depositories, smaller banks with less than \$100 billion of assets held a higher concentration of CRE loans than larger

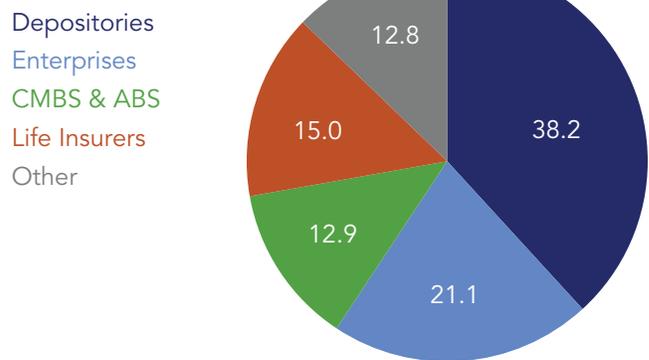
Figure 14. Estimated Office Space Occupancy (percent)



Note: Kastle Back to Work Barometer.

Sources: Haver Analytics, OFR

Figure 15. Distribution of Holders of Debt Secured by CRE



Note: Data as of Jun 30, 2023.

Sources: MBA, OFR

banks. The bulk of CRE debt held by GSEs was multifamily. Insurers had less credit risk exposure than other CRE lenders because they require low loan-to-value and high debt service coverage ratios, making their loans relatively lower risk. As a result, insurers expect to benefit from their relatively conservative lending practices in a CRE market downturn. Insurers owned a wide range of debt backed by CRE, with CMBS debt being the largest portion. Insurers held substantial amounts of multifamily-backed and office property-backed loans. Insurers are only modestly exposed to retail and hotel properties because they have perceived these sectors as higher risk. Life insurers' 60+ day CRE delinquency rate was low at 0.14% as of June 30, 2023, but it was up from 0.04% in June 2022.

CRE lenders that assume larger amounts of credit risk, typically private-debt investment funds and subordinated CMBS tranche investors, will absorb substantial credit losses as defaults materialize. These lenders represent a smaller share of the overall market, although the exact percentage is unknown. CMBS investments at the highest risk of principal losses are those primarily backed by higher-risk properties, such as obsolete office buildings and weak shopping malls. Alternative lenders have expanded their CRE-lending market share in recent years because they are more willing to assume credit risk than regulated financial institutions. These yield-driven debt investors will likely face the largest losses in a CRE market downturn.

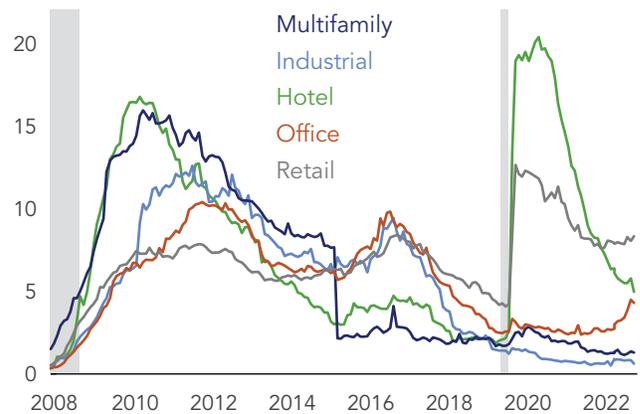
With interest rates elevated and the economy slowing down, we expect to see increasing pressure on the CRE market, causing loan performance degradation at CRE lenders. Lender losses are likely concentrated in the weakest properties and the most aggressive lenders. As illustrated by the CMBS market,

CRE loan delinquency rates remain relatively modest compared with past peaks, but they are expected to rise as loans become troubled due to the previously discussed market pressures (see **Figure 16**). Overall, financial stability risks arising from the CRE market are expected to be moderate because most CRE sectors, with the exception of the office sector, appear to be performing well, and office loans constitute less than one-quarter of total CRE mortgage debt exposure. However, those financial institutions with significant office exposure, including some smaller depositories and banks specializing in office loans, may face headwinds. As prior CRE sector downturns have occurred, default rates and loss costs will rise for lenders. However, losses should remain below levels, which could cause widespread financial stability concerns because most sectors (excluding the office sector) continue to exhibit strong performance.

Household Credit

Despite changing economic conditions, household sector vulnerabilities remain moderate and have not materially changed over the past year. Indicators of household leverage remain stable and at low levels. Household debt service payments as a percentage of disposable income have been mostly flat and have remained in a historically low range YOY, moving slightly from 9.85% in Q2 2022 to 9.83% in Q2 2023. In contrast, household debt balances grew to historic highs, and most of the growth over the past year came from households with weaker credit. Delinquency rates for most household debt product categories also reverted to prepandemic levels. Despite this, household liquidity positions remain relatively robust for now. Continued deterioration in economic conditions and other broad shocks that adversely affect household

Figure 16. CMBS 60+ Day Delinquency Rate (percent)



Note: Moody's conduit DQT defines delinquent loans as loans that are 60 or more days in payment arrears; performing matured; nonperforming matured; foreclosure in progress; or real-estate owned (REO). Conduit loans only. Shaded areas indicate recessions. Data as of Jul 31, 2023.

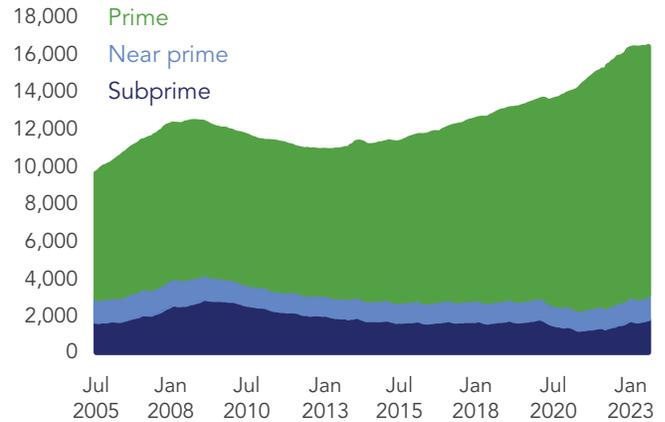
Sources: Moody's Investors Service, OFR

liquidity positions represent the household sector’s most significant threats to financial stability.

Aggregate household debt balances grew to \$16.3 trillion in nominal dollars through August 2023, growing 3.7% YOY. At the same time, household debt continues to grow more slowly compared with the broader economy. The household debt-to-GDP ratio dropped to 73.1% in Q1 2023, compared with 73.4% in Q1 2022. Both of these ratios are relatively low for the period since the 2007-09 financial crisis. Debt balances grew relatively rapidly for households with weaker credit over the past year (see **Figure 17**). Debt balances for subprime households grew 21.1% over the past year, and current levels are now comparable to prepandemic levels. For comparison, debt balances for prime households, which currently account for 81.1% of aggregate balances, grew 1.9% over the past year but are 27.1% higher than prepandemic levels.

Delinquency rates began approaching prepandemic levels over the past year. While noncurrent rates for first-lien mortgages and home equity loans remain relatively low, the delinquencies of some consumer loan categories are now at or above 2019 levels (see **Figure 18**). One reason for these patterns is differences in underwriting standards among loan categories. Looking at delinquency rates by credit quality indicates similar patterns in delinquency rates across loan categories for similar credit score types. Additionally, delinquency rates are now comparable to prepandemic levels. The exception is student loans, where delinquency rates remain very low irrespective of credit score due to public forbearance programs. With the sunset of these programs in October 2023, additional financial burdens are expected for some households and may potentially exacerbate

Figure 17. Household Debt Balances (\$ billions)



Note: Data through August 2023. Subprime represents a credit score between 580 and 619. Near prime is a score between 620 and 659. Prime is a score between 660 and 719.

Sources: Equifax Information Services LLC, OFR

Figure 18. Household Delinquency Rates (percent)

Product	Overall	Subprime	Near Prime	Prime
First Mortgage	1.5	19.3	1.3	0.1
Home Equity	1.5	16.2	1.4	0.1
Auto	3.8	18.2	1.2	0.1
Bank Card	4.2	19.9	0.6	0.1
Consumer	3.6	17.7	1.0	0.1
Student Loan	0.5	1.7	0.4	0.1

Note: Data through August 2023. Subprime represents a credit score between 580 and 619. Near prime is a score between 620 and 659. Prime is a score between 660 and 719.

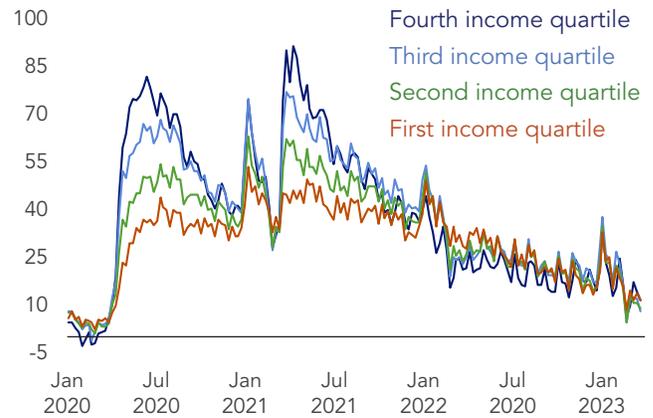
Sources: Equifax Information Services LLC, OFR

delinquency trends in other loan categories. However, struggling borrowers are subject to an *on-ramp period* when missed payments will not adversely affect credit records for the first year. Additionally, some borrowers may be eligible for further payment deferrals or need-based payment programs.

Rising delinquency rates may be a symptom of deterioration in household balance sheets. Households with weaker credit are, on average, relatively more constrained, so rising delinquency rates for such households generally indicate a broader erosion of household liquidity positions. Indicators of household liquidity conditions have remained robust, despite volatility in the financial markets over the past year. According to data from the Federal Reserve, household deposits and other investments in money-like securities declined by 2.8% YOY as of Q2 2023 but remain more than one-third higher than 2019 levels. These trends are consistent with those found in other data sources. Based on data from the JPMorgan Chase Institute, household checking account balances as of March 2023 are 10% to 15% higher (or more) than in 2019. Disaggregated data indicate that liquidity conditions at all income levels have stronger liquidity positions than they did before the COVID-19 pandemic (see **Figure 19**). For more in-depth analysis, for model-based estimates of current household liquidity conditions that account for inflationary pressures, plus other factors affecting household balance sheets (see **Box Topic: Estimating Household Liquidity Conditions**).

Finally, households can also rely on credit lines as a source of liquidity in response to balance sheet shocks. Utilization rates of bank cards and HELOCs increased over the past year, reversing their downward trend since 2020. The previous decline was attributed in

Figure 19. Change in Cash Balances from 2019 (percent)



Note: Cash balances include both checking and savings accounts. Data through March 2023.

Sources: JPMorgan Chase Institute, OFR

part to governmental pandemic-era programs because at least some households probably chose to pay down debt balances using the influx of funds. Bank card utilization is 21.2% as of August 2023, compared with 19.9% one year prior. Bank card credit limits grew by 9.6% overall. HELOC utilization is 45.7%, compared with 44.5% one year earlier, while loan limits grew by 7.9% overall. Home values have broadly appreciated since 2019, providing many households with higher collateral values to borrow against. Despite this, overall home equity limits have only grown by 4.0% during this period. With higher rates expected to persist in the intermediate term, households may be more likely to rely on HELOCs than cash-out refinancing for equity extraction.

With deterioration in conditions expected to continue, households will need to increasingly draw on liquidity buffers, which remain modestly elevated relative to 2019 levels. Factors contributing to the rapid depletion of those reserves and general stress to household balance sheets pose potential threats to financial stability. While delinquency rates reverted to prepandemic levels for certain segments, they remain historically low overall. Additionally, there is a relatively low share of households with weaker credit now, compared with previous economic downturns.

Box Topic: Estimating Household Liquidity Conditions

A large number of academic studies focused on household leverage as an explanation for the prolonged recession following the 2007–09 financial crisis. However, recent studies argued for the importance of household liquidity,²⁰ which mitigates the impact of economic shocks on aggregate demand and affects both financial and economic stabili-

ty. On the one hand, during the pandemic, households received unprecedented liquidity injections through various government transfer programs, including EIP and CTC. On the other hand, in addition to the financial hardships associated with the pandemic, households were confronted with generational inflationary pressures and other challenges that adversely affected liquidity. Limited data availability poses a challenge to analyzing the cumulative effects of these factors and current household liquidity conditions.

This section describes a new approach to monitoring and analyzing current household liquidity conditions. Due to data limitations, obtaining timely estimates of household liquidity conditions is difficult. Also, traditional aggregate-based measures are often multifaceted and difficult to interpret. A model-based approach that aims to address these challenges is described here.

As a baseline, data from the 2019 SCF is used to characterize the distribution of household liquidity conditions (see **Figure 20**). Specifically, the number of months of expenditures that each household in the data could cover with savings, or the expenditure coverage ratio (ECR), is calculated. Households with three or fewer months' worth of savings are typically regarded as liquidity constrained. The data indicate a bimodal distribution regarding household liquidity conditions, with 42.9% of households experiencing some degree of liquidity constraint and 38.46% of households having at least one year's worth of savings.

The extent to which liquidity injections from the pandemic-era government transfer programs benefit household liquidity positions remains a key policy question that must be answered. One advantage of the SCF data is that it provides sufficient details for each

household to properly account for the size of the payments based on income and family size. This is important because there is likely to be variation along this dimension among existing liquidity levels. **Figure 20** indicates that the payments represented a sizable portion of household expenditures. Adding the total payments to existing savings decreases by more than half the fraction of households unable to cover more than three months of expenses with savings, bringing that fraction down to 20%. The liquidity injections disproportionately impacted households with the lowest liquidity levels. The payments represented an average of 4.5 months of household expenditures with only up to one month's expenses as of 2019.

It is clear that these payments were economically meaningful during the COVID-19 pandemic, but to what extent have households been able to maintain favorable liquidity conditions until the present? To estimate current household liquidity conditions, a model-based approach was developed that accounts for the impacts of government transfer payments and other sources of liquidity against the inflationary effects on a broad range of expenditure categories. One can estimate current liquidity conditions by employing a model that incorporates aggregate trends to project household balance sheets and expenditure fields in the SCF data.

Estimates for the current period suggest that the cumulative effects of the shocks to household liquidity buffers and expenditures have had a slightly positive impact on household liquidity relative to 2019 levels (see **Figure 21**). A larger fraction of households can now cover more than three months of expenses using their savings. For example, there has been a roughly 1% decrease in the fraction of households that cannot cover more than three

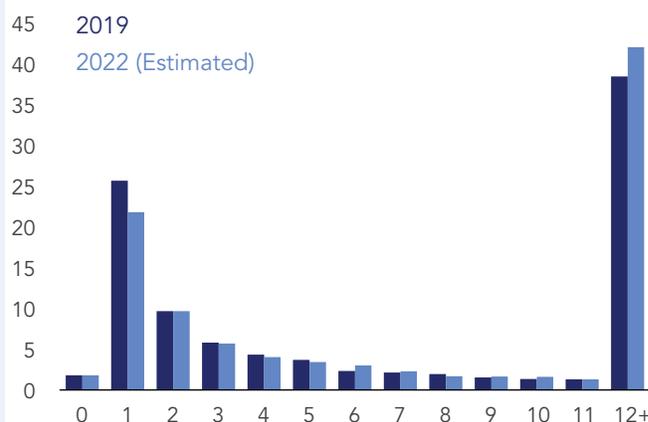
Figure 20. Household Liquidity with COVID-19 Interventions (percent)

ECR (months)	2019	2019 with EIP and CTC
0	1.82	0.03
1	25.66	1.31
2	9.67	6.66
3	5.79	9.36
4	4.32	8.69
5	3.69	7.06
6	2.32	6.3
7	2.15	4.89
8	1.95	4.08
9	1.52	2.98
10	1.34	3.02
11	1.3	2.2
≥12	38.46	43.42

Note: Expenditure Coverage Ratio (ECR) measures the number of months a household can cover expenses. It is calculated by dividing total liquid assets by monthly expenditure.

Sources: SCF, OFR

Figure 21. Projected Liquidity Conditions (percent of households)



Note: X-axis measured in months of covered expenses.

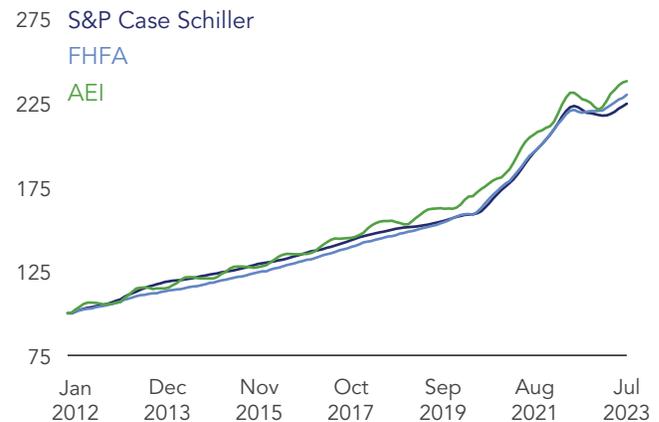
Sources: SCF, OFR

months of expenditures. Consistently, there has been a 1.3% increase in the fraction of households that can cover at least one year of expenditures.

Residential Real Estate

The residential real estate market has important implications for financial stability because the value of homes underpins credit risk for mortgages. When a house's price rises, a borrower has little incentive to default on their mortgage—but when a house's value falls below the amount owed, it may be in a borrower's best interest to default. Changes in house prices are, therefore, key determinants of mortgage default and foreclosure rates. Because mortgage loans and MBS constitute large shares of the portfolios of financial institutions, including banks and insurance companies, a wave of mortgage defaults could have financial stability implications. Additionally, interest rates and liquidity affected the price of MBS when rising interest rates led to a decline in the value of banks' securities portfolios and ultimately to the failure of several banks (see **Banks**). Home prices have steadily increased for some time (see **Figure 22**). During the prepandemic period, from 2012 to 2019, home prices increased by approximately 6% annually. From 2020 through 2022, home prices on a national level increased by about 13% annually. From January through July 2023, however, average home prices appreciated at a lower rate of 3% because mortgage rates had begun increasing in 2022, when the Federal Reserve began raising interest rates to combat inflation and also began QT (see **Box Topic: Federal Reserve Balance Sheet—Mortgage-backed Securities**). The indexes show moderate price declines beginning in July 2022 and continuing through January 2023, with modest price

Figure 22. Home Price Appreciation Indexes



Note: Jan 1, 2012 = 100. Data as of July 30, 2023.

Sources: S&P Case Schiller through FRED, FHFA, American Enterprise Institute, OFR

appreciation resuming in February 2023. Despite mortgage rates reaching their highest level in 23 years and a brief six-month decline in housing price appreciation in 2022, home prices continue to increase.²¹

The recent strength in housing markets may be attributed to factors such as a persistent lack of supply, high increases in rental payments, and widespread WFH and hybrid work arrangements that increased the demand for homes.²² More recently, the supply of existing homes in certain areas may have been artificially suppressed because many homeowners were reluctant to move because that would entail higher mortgage payments due to increased mortgage rates. The lack of supply boosted the prices of existing homes, affecting their affordability.²³ In addition to the increased demand for housing, inflation and construction costs may have contributed to increased home prices (see **Box Topic: Construction Costs for New Housing**).

Box Topic: Construction Costs for New Housing

Much of the narrative surrounding the COVID-19 pandemic house price boom focused on high demand for housing paired with low supply. Some factors driving demand during this time included remote work, fiscal stimulus, and low mortgage rates. Typically, this would incentivize new construction, but until recently, increases in supply have been lacking. Economists recently highlighted local land use regulations and, in some cases, limited land availability as key barriers to new supply coming onto the market.

One factor that received comparatively little attention is the role of construction costs. *Construction costs* include the price of labor and materials used to build housing structures

(see **Commodities Markets**). If construction costs rise with house prices, then there is a relatively low market incentive for new construction, compared with a scenario in which house prices rise but construction costs remain low.

Some trends emerge from analyzing house price appreciation measures from the FHFA²⁴ and construction cost measures from the BEA (see **Figure 23**). While house prices increased nationally by 39% between February 2020 and March 2023, construction costs rose by 31%. Total inflation was 16% over the same period. The gap between house price appreciation and construction costs was 8%, indicating that much of the run-up in house prices matched increases in construction costs.

Figure 23. Housing and Construction Costs (YOY change)



Sources: BEA, BLS, FHFA, OFR

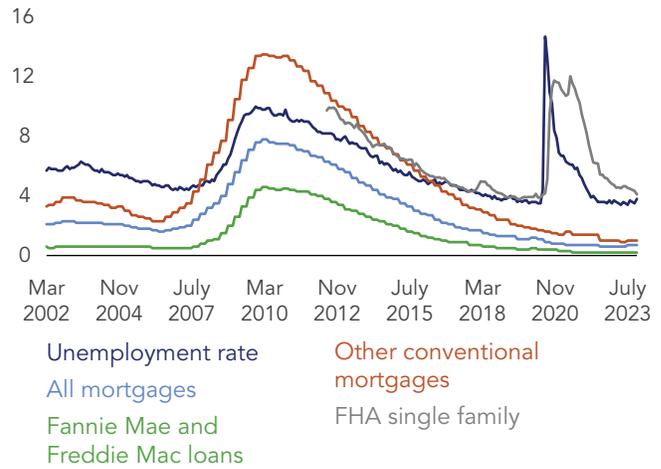
Construction costs have been higher than inflation for some time. In 2015, when inflation was near zero, both house prices and construction costs were higher. For most of 2018, while house prices were appreciating at a robust 6% per year, construction costs were rising similarly. Then, with the onset of the pandemic, house prices, construction costs, and overall inflation increased substantially.

The run-up in house prices between 2020 and 2023 occurred simultaneously as high inflation and construction costs increased.

The financial stability implications appear limited, and the rise in costs could lead to healthier housing markets. By limiting new supply, high construction costs could reduce overbuilding, particularly if the recent demand increases prove to be temporary. So, while high construction costs may keep prices high in the short run, it also may prevent substantial declines in prices in the longer run and contribute to a “soft landing” from the COVID-19 pandemic boom. This suggests less downside risk in house prices with a corresponding lower probability of negative equity for mortgage holders.

Mortgage delinquencies track labor markets (see **Figure 24**), and as a result, there are generally low delinquency rates among all types of mortgages. The most recent exception was during the COVID-19 pandemic when the unemployment rate was high. However, many homeowners fell behind on their mortgage payments were not considered delinquent due to widespread forbearance programs.²⁵ The MBA reported that the delinquency rate for mortgage loans on residential properties was 3.37% at the end of Q2 2023. This rate was down 19 basis points from Q1 2023 and down 27 basis points YOY. The mortgage delinquency rate fell to its lowest level since the MBS survey began in 1979.²⁶ Mortgage delinquencies are likely to rise if labor markets substantially slow and unemployment rises. Many distressed homeowners have accumulated sufficient home equity to avert foreclosure actions. Given the tight housing supply, they may easily sell their homes but have difficulty finding housing alternatives

Figure 24. Mortgage Delinquency and Unemployment Rates



Note: Data as of Aug 30, 2023. Mortgage delinquency rates are for loans that are 90+ days delinquent, plus loans that are in foreclosure, bankruptcy, or deed in lieu.

Sources: BLS through FRED, National Mortgage Database, U.S. Dept. of HUD/FHA, OFR

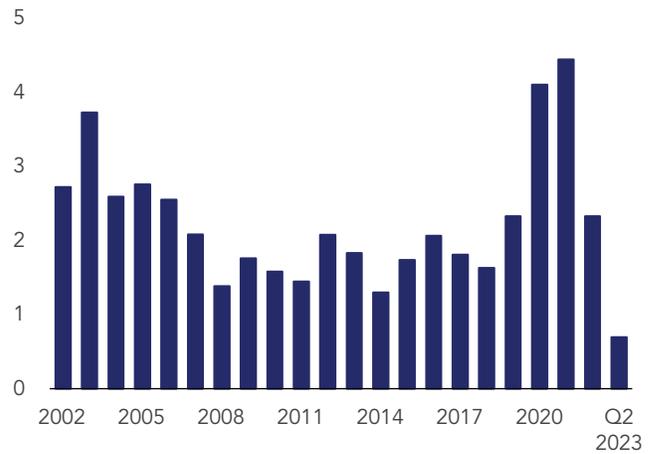
because home purchases and rents have increased over time.

The lack of home sales reduced the demand for purchase mortgages. At the same time, the run-up in mortgage rates reduced demand for refinancing existing mortgages. The overall mortgage volume for 2022 was \$2.2 trillion, or roughly half of the 2021 record volume of \$4.4 trillion (see **Figure 25**). Lending volume has further decreased through Q2 2023, given higher mortgage rates.

The increase in home prices allows for the buildup of home equity. Lower home sales volumes, coupled with higher interest rates, dramatically reduced residential mortgage lending and refinancing activity but had the opposite effect on home equity lending. Home equity lending activity for 2022 increased by about 49% over 2021 volumes (see **Figure 26**).

Higher equity in homes cushions lenders and other holders of mortgages in the event of borrower defaults. While higher home prices benefit lenders and mortgage holders, they exacerbate the affordability problem, especially for low-income and first-time home buyers. Higher home prices also place a greater debt burden on new-home buyers, who need to finance their higher-priced homes with larger mortgages. Mortgage payments represent the highest monthly debt burden for many households.²⁷ Widespread mortgage defaults and declining home prices played a pivotal role in the period leading up to the 2007-09 financial crisis.

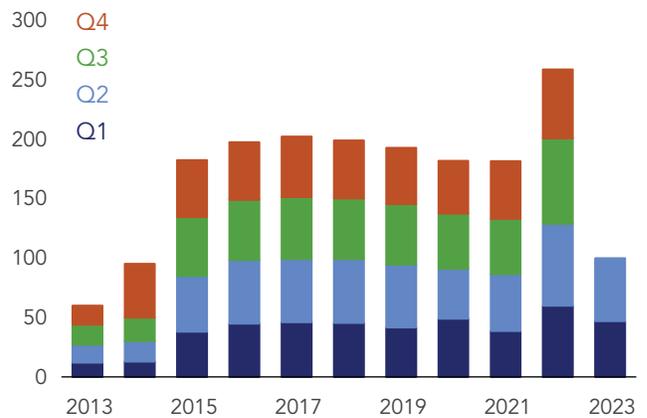
Figure 25. Residential Mortgage Lending (\$ trillions)



Note: Originations represent first-lien mortgages only.

Sources: Inside Mortgage Finance, OFR

Figure 26. New Home Equity Lending (\$ billions)



Note: 2023 values represent activity through Jun 30, 2023. Values represent new draws on home equity lines of credit and new closed-end second mortgage originations.

Sources: Inside Mortgage Finance, OFR

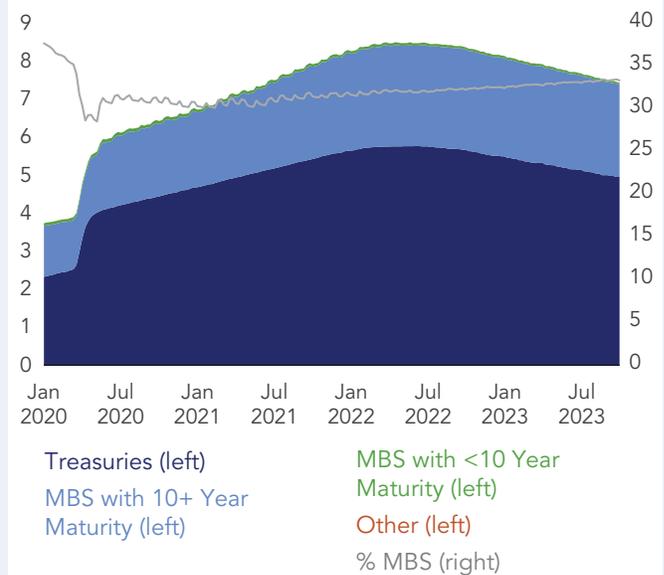
Box Topic: Federal Reserve Balance Sheet—Mortgage-backed Securities

The Federal Reserve added almost \$1.5 trillion in MBS to its balance sheet between March 2020 and May 2022. Peak purchases occurred at the onset of the COVID-19 pandemic, with the Federal Reserve purchasing almost \$200 billion per month between March 2020 and May 2020 to ease the stress on dealers' balance sheets.²⁸ Between July 2020 and November 2021, the Federal Reserve purchased \$40 billion in MBS per month in addition to reinvesting principal payments received. The Federal Reserve slowed its rate of purchases in November 2021 but did not officially start reducing balance sheet holdings until June 2022. Since June 2022, the Federal Reserve has allowed up to \$17.5 billion (\$35 billion starting in September 2022) of MBS to run off its balance sheet, though the actual amount has not yet hit the cap in any month.

As of September 2023, the Federal Reserve held almost \$2.5 trillion in MBS, equivalent to almost 30% of the total supply. **Figure 27** shows that 98% of the Federal Reserve's MBS holdings have maturities greater than 10 years. Over the long term, the Federal Reserve stated that it plans to hold primarily Treasury securities, which means lowering its MBS holdings.²⁹ However, MBS as a percentage of the Federal Reserve's total balance sheet assets may increase over the next three years because of MBS's longer maturities.³⁰ Since June 2022, this fraction has been relatively stable at 30% (see **Figure 27**). The Federal Reserve has not communicated plans to sell its MBS holdings. However, Chair Jerome Powell has indicated that it may consider doing so in the future.³¹

A real estate investment firm report finds an excess MBS supply between \$225 billion and

Figure 27. Assets Held Outright on the Federal Reserve Balance Sheet (\$ trillions); MBS as a Percentage of Total Assets (percent)



Sources: FRBSTL, OFR

\$420 billion per year over the next two years because of the Federal Reserve's balance sheet runoff. It remains to be seen which private entities will step in to absorb this excess supply. The report finds that banks, the GSEs, and real estate investment trusts are not able to greatly increase their MBS holdings.³² Liquidations resulting from the regional bank failures in March 2023 may provide a test case on whether the private market is capable of absorbing excess MBS supply. The FDIC is in the process of liquidating \$114 billion in MBS acquired upon receivership from SVB and SB, and this sale has not caused any significant negative market impact thus far.³³

Financial Markets

Short-term Funding

Short-term funding markets support core functions of the financial system, providing liquidity to borrowers and allowing banks, corporations, financial firms, and other investors to meet immediate and near-term cash needs. Disruptions in funding markets can present serious financial stability risks because they jeopardize the ability of firms to borrow in these markets.

Short-term funding markets present four risks:

1. A protracted period of low interest rates and the Federal Reserve's quantitative easing facilitated risk-taking and potential duration mismatch.
2. Market liquidity may deteriorate more than expected.
3. The market remains vulnerable to liquidity and maturity transformation mismatches for banks and nonbanks.
4. There is still uncertainty related to the Federal Reserve's monetary policy and its impact on growth, inflation, market sentiment, and market liquidity.

The Federal Reserve is maintaining a monetary-tightening stance to combat inflation. From March 2022 to September 2023, the central bank increased the EFFR target range by 525 basis points. The rapid pace and magnitude of the rate increases created challenges for banks and nonbank financial institutions that rely on short-term funding markets.

The Federal Reserve primarily controls the policy rate in the interbank market by adjusting the supply of reserves in the banking system through changes to the IORB (the ceiling on

rates) and by engaging in repurchase agreements through its ON RRP to reinforce the floor on policy rates. The system transacts its ON RRP operations at a specified rate with eligible nonbank counterparties such as MMFs and GSEs.

At the onset of the pandemic in March 2020, the Federal Reserve cut interest rates and injected massive amounts of liquidity into the financial system through asset purchases and special lending facilities, which drove down yields. An additional stimulatory effect were fiscal measures that led to a surge in cash to households and institutions and ultimately to a surge in bank deposits and reserves. As the central bank began QT to normalize its balance sheet in 2022, bank reserves declined through year-end. Aggregate reserves deposited at the Federal Reserve Banks remain significant and account for around 14% of the assets of the entire banking system. However, as QT continued, funding rates increased as market participants competed for increasingly scarce liquidity pools in the market. There were signs that funding was getting tighter as deposit outflows led banks to sell securities inventories, draw on reserves, and pursue other financing alternatives. The regional banking turmoil that began in March 2023 reversed the overall decline in reserves by approximately \$400 billion as banks bolstered reserves deposited at the central bank by pursuing other short-term borrowings, including the central bank's liquidity facilities.

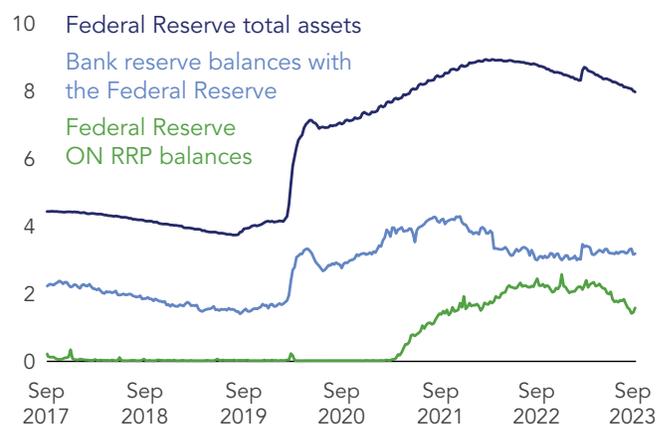
The ON RRP rate is currently set 10 basis points below the IORB to enhance the central bank's influence over short-term rates, such as the overnight general collateral rate. Daily ON RRP volume has averaged over \$2.0 trillion over the past year, up from zero at the start of the pandemic.

While the ON RRP facility has become an important monetary-policy tool for the central bank to keep short-term rates from falling below the federal funds rate, it increases the Federal Reserve’s footprint in funding markets, potentially crowding out private money-like liabilities issued by financial and nonfinancial firms. During periods of elevated stress, the potential rapid take-up at the ON RRP facility could magnify flight to quality and contribute to a rapid decline in short-term funding available to private firms. For example, the Federal Reserve’s H.4 data show an increase in ON RRP utilization during the March 2023 banking system stress (see **Figure 28**).

As the central bank continued to hike policy rates through 2022 and early 2023, commercial bank deposit rates increased slower than comparable market rates. For instance, the cost of interest-bearing deposits was about 0.26% at the end of 2020, compared to 0.75% at the end of 2022. Consequently, the gap between deposit rates and money-like assets widened. Some depositors began to move their cash balances away from banks to higher-yielding investments. The exodus of deposits accelerated in the second half of 2022. As a result, banks increased their reliance on other borrowings and used cash balances to meet liquidity needs. Some banks had to sell securities to fund deposit outflows. After the banking stress that began in March 2023, consumers moved deposits from banks to a combination of alternative financial products such as MMFs and Treasury bills.

As deposits left several banks at a record pace, federal government agencies took action to restore confidence and minimize contagion risk to other regional and smaller banks. A number of banks tapped the Federal Reserve’s emergency lending facilities to improve liquidity and or make up for funding shortfalls.

Figure 28. Bank Reserve Balances with the Federal Reserve Banks, ON RRP Balances, and Total Federal Reserve Assets (\$ trillions)



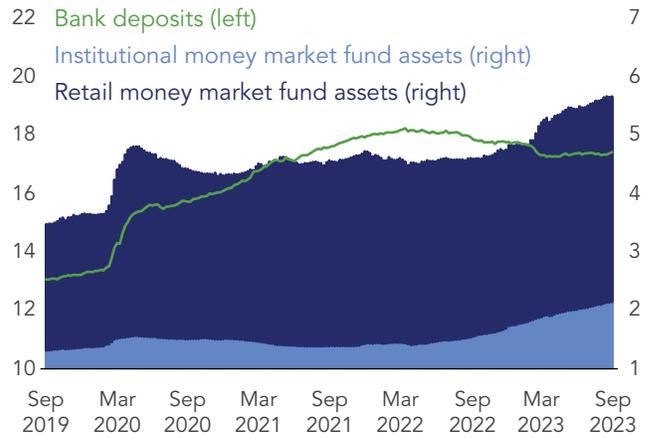
Note: Data through Sep 27, 2023.

Sources: FRBNY, Bloomberg Finance L.P., OFR

The FDIC also protected uninsured deposits at certain failed banks. These actions appear to have eased depositor concerns.

Deposits are the largest source of funding for banks and a source of liquidity for individuals and corporations. Historically, banks have been slow to adjust deposit rates when the Federal Reserve is hiking interest rates, and there is typically a lag of several months between the first interest rate hike and when yield-sensitive cash investors begin to shift out of bank deposits and into alternative financial products, such as Treasury securities and MMFs. The size and speed of recent interest rate hikes were unprecedented and accelerated the shift. Total bank deposits at U.S. commercial banks peaked at over \$18.1 trillion in April 2022 before declining to \$17.3 trillion in September 2023 (see **Figure 29**).³⁴

Figure 29. U.S. Commercial Bank Deposits and MMF Assets (\$ trillions)



Note: Weekly MMF assets are based on the Investment Company Institute’s Weekly Survey. Data as of Oct 4, 2023.

Sources: Bloomberg Finance L.P., Federal Reserve, Investment Company Institute, OFR

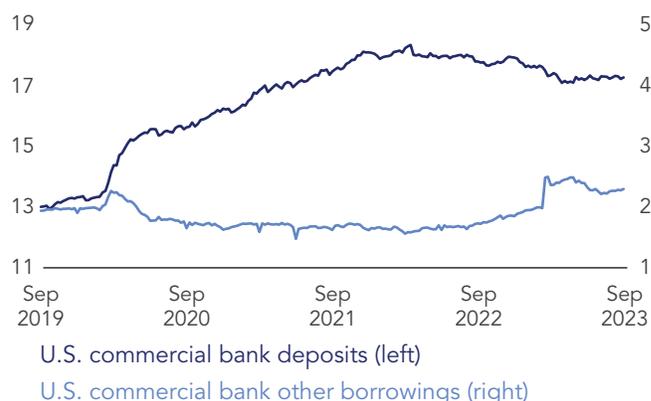
As the risk of uninsured deposit flight from regional banks further accelerated following the failure of SVB and SB, some banks sold assets or replaced their deposit funding with relatively more expensive borrowings, such as FHLB advances.³⁵ The bank deposits and borrowings series in **Figure 30** includes deposits plus other borrowing sources. As the level of deposits fell, other borrowings rose. FHLB borrowing—an indirect measure of the degree to which banks and other members turn to wholesale funding to meet liquidity needs—rose over the past year by nearly \$200 billion, or 19% (see **Figure 31**).

Secured borrowing from the FHLBs provides a lower-cost and more stable alternative to unsecured bank borrowing, such as the issuance of commercial paper. However, FHLB advances are indirectly funded by MMFs. Potentially, this creates stress on the FHLBs because MMF shares are redeemable on demand.³⁶

With over \$6 trillion in net assets as of September 30, 2023, MMFs are important lenders in short-term markets.³⁷ OFR analysis indicates that money market mutual funds benefited from the continued differential between MMF yields and general deposit rates.

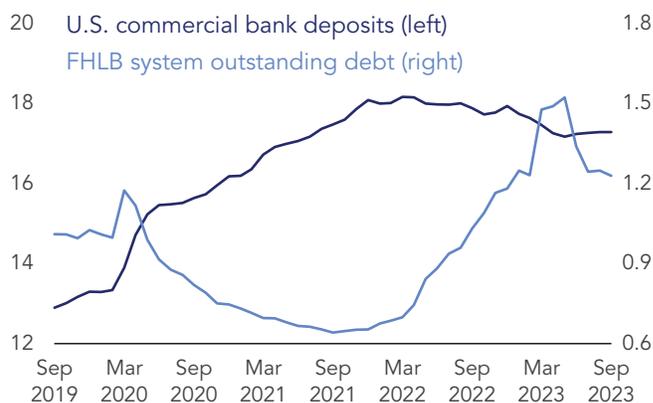
MMFs compete for deposits with other cash management instruments and have historically experienced growth in periods of rising market rates because of their ability to quickly pass market rate increases on to fund investors.

Figure 30. U.S. Commercial Bank Deposits and Other Borrowings (\$ trillions)



Sources: Federal Reserve, Bloomberg Finance L.P., OFR

Figure 31. U.S. Commercial Bank Deposits and FHLB Debt (\$ trillions)

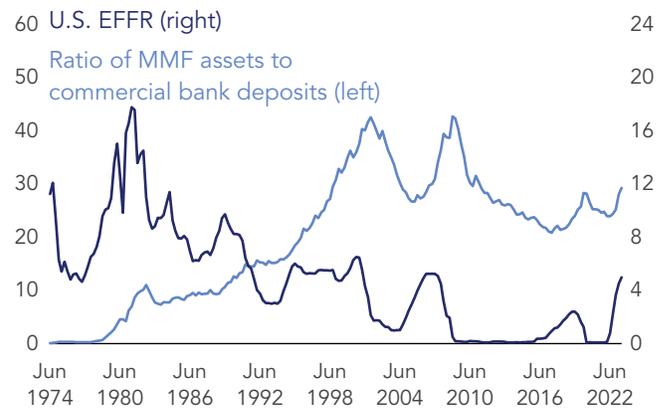


Sources: Federal Reserve, FHLB Office of Finance, Bloomberg Finance L.P., OFR

The first MMF was launched in 1971, but MMFs did not experience their first period of rapid growth until 1974 and early 1975. That was because of Regulation Q's strict ceiling on the interest rates that insured depository institutions were permitted to pay to depositors. In the high-interest-rate environment that existed during this period, money market rates of return rose well above this ceiling—so to benefit from these higher rates, many customers withdrew their assets from deposit accounts and placed their funds into MMFs. Explosive growth in MMFs occurred again in the late 1970s and early 1980s when very high money market rates produced large differences between the rates of return being paid by MMFs and depository institutions. This trend has persisted over most rate-hiking cycles (see **Figure 32**). However, the increasing awareness of alternative money market rates through numerous internet sources and the utilization of mobile banking and information-sharing applications can accelerate bank customer deposit withdrawals because (1) these communication platforms can quickly coordinate customer sentiment and set off chain reactions and (2) the mobile banking platforms enable withdrawals at faster speeds.

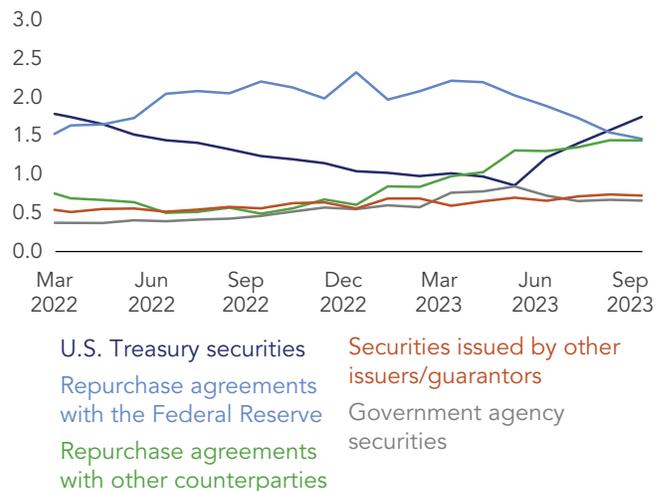
In the first nine months of 2023, MMF assets rose about \$864 billion, or 17%, to a record \$6.16 trillion. This was largely because MMF yields are six to eight times more than deposit rates.³⁸ A portion of the increase in MMF assets circulated back into the banking system through the purchase of FHLB discount notes and lending through the tri-party and cleared bilateral repurchase agreement markets (see **Figure 33**). However, some funds left the banking system as MMFs invested cash in the Federal Reserve's ON RRP, Treasury bills, and other short-term U.S. government obligations offering higher yields.

Figure 32. The Ratio of MMF Assets to U.S. Commercial Bank Deposits and the U.S. EFR (percent)



Sources: Haver Analytics, Federal Reserve Financial Accounts of the United States, Bloomberg Finance L.P., OFR

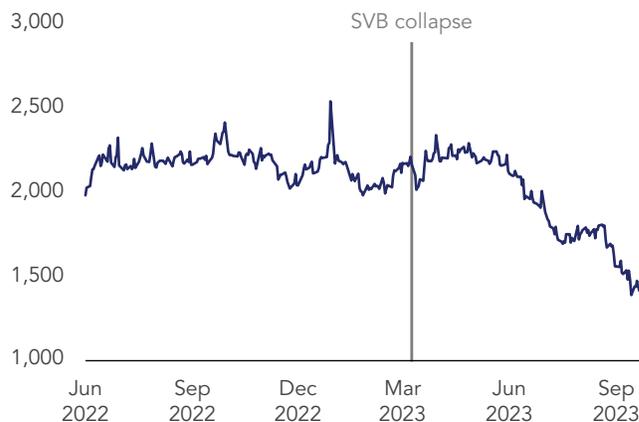
Figure 33. U.S. MMF Assets by Select Holding Types (\$ trillions)



Sources: SEC Form N-MFP, OFR

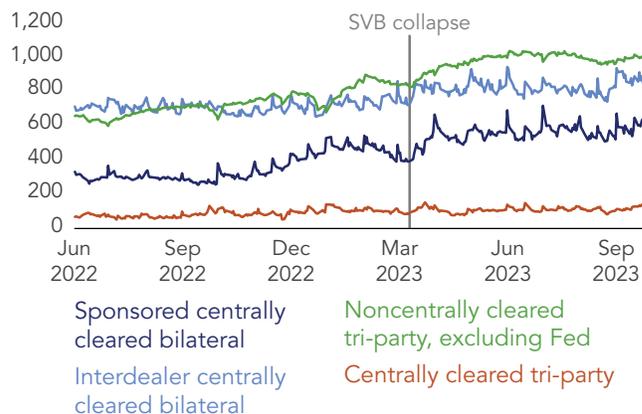
MMFs are key participants in the repo markets, accounting for over 47% of the lending in this funding segment.³⁹ MMFs are primarily active in three different repo markets: (1) the noncentrally cleared tri-party repo market, (2) the FICC-sponsored repo market, and (3) direct dealings with the Federal Reserve via the ON RRP. While volumes at the ON RRP facility are still large, they are not very elevated relative to Q4 2022 (see **Figure 34**).⁴⁰ Instead, much of the extra funds were invested in other repo markets. The tri-party market saw a roughly \$200 billion increase in daily transaction volume since the beginning of the year, while activity in the FICC-sponsored repo markets increased by approximately \$400 billion over the past year (see **Figure 35**).

Figure 34. Daily ON RRP Repo Transaction Volume (\$ billions)



Source: FRBNY, OFR

Figure 35. Daily Overnight Repo Transaction Volume in Different Market Segments (\$ billions)



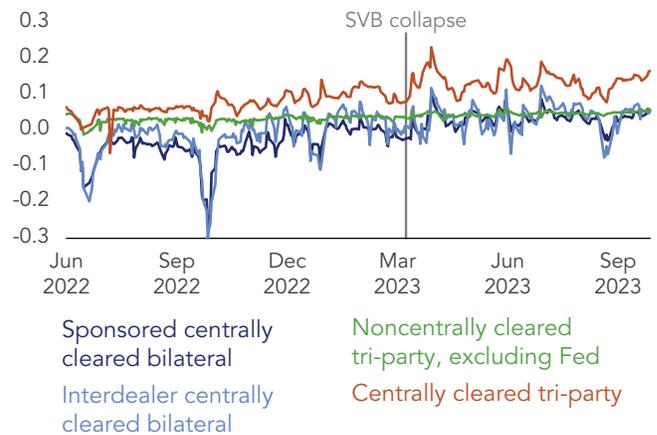
Source: FRBNY, OFR

These other repo markets withstood the recent volatility in the banking sector relatively well. Rates in the interdealer markets briefly increased after the failure of SVB (see **Figure 36**) but quickly reverted to their previous levels. However, MMF repo lending to primary dealers may still pose a financial stability risk as dealers pass these dollars on to riskier institutions, such as hedge funds. Because it is difficult to see what kinds of risks are building up in these low-visibility markets, it is important for regulators to use market data to see what types of institutions dealers are lending cash to so that the regulators can properly assess sources of potential short-term funding disruptions.

The counterparties receiving these inflows from MMFs are very large dealers that are subsidiaries of commercial banks. These dealers are subject to interest rate and liquidity concerns similar to those of their commercial bank affiliates. Dealers typically take cash inflows from MMFs and lend them to clients in the FICC-sponsored and NCCBR markets. Cash borrowers in the NCCBR market are usually leveraged institutions such as hedge funds. Market volatility can prompt such borrowers to deleverage, which in turn can amplify price volatility in key asset markets, such as those for Treasuries.

An example of a typical investment strategy by one of these client institutions is the *Treasury cash futures basis trade*, in which a hedge fund will try to profit from price differences between a Treasury futures contract and a Treasury security (from a corresponding set of securities that can be delivered into the futures contract). The hedge fund uses the repo market to fund the Treasury security leg of the trade. In volatile markets, hedge funds may decide to unwind basis trades. This unwinding can cause significant price pressures and make the

Figure 36. Overnight Repo Rates in Different Market Segments (percent, less federal funds rate)



Note: Rates weighted by trade volume.

Source: FRBNY, OFR

Treasury market more fragile during moments of stress. There is good evidence, for example, that the unwinding of cash futures basis trade positions contributed to the price pressures in the Treasury market in March 2020.

Over the past year, hedge funds' short Treasury futures positions and sponsored repo borrowing significantly increased (see **Figures 37** and **70**) to levels similar to those before March 2020. This evidence suggests that cash futures basis trade volume substantially increased and may expose the financial system to the same risks as in March 2020.

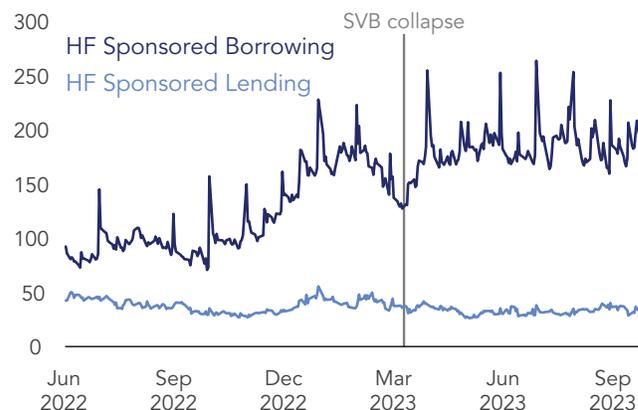
The NCCBR market is one of the primary sources of hedge fund leverage, and it, therefore, represents an important channel through which instability could propagate to the larger economy. Unfortunately, real-time data do not exist. As a result, market participants and regulators may not be fully aware of the potential risks that could be building in this market segment. The OFR seeks to bridge this data gap through its NCCBR data collection, which is anticipated to begin in 2024.

In summary, the repo markets have functioned effectively YTD, avoiding the volatility seen in bank deposit funding. However, it is important to highlight that while we have not seen any financial risks take shape in these markets, there may be unseen financial stability risks building up in the economy that are not easy to anticipate and that are invisible to policy-makers and regulators. The OFR will continue to use its resources to track these potential risks and communicate them to other government agencies as they arise.

Treasury Market

The \$33 trillion U.S. Treasury market, of which \$26 trillion is marketable debt held by the public, finances the U.S. government and

Figure 37. HF Outstanding Volume in DVP-sponsored Trades (\$ billions)



Source: FRBNY, OFR

serves as a benchmark risk-free investment for market participants. In addition, the Treasury market, which is considered the world's deepest and most liquid securities market, plays an important role in the U.S. and global financial systems. It includes markets for outright purchases and sales of securities (or cash transactions), repos, and futures on Treasury securities. Because of the Treasury market's central role in U.S. financial markets, stress in this market can threaten financial stability.

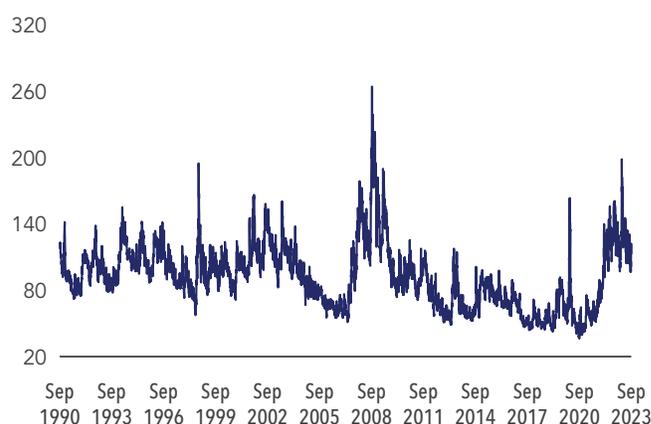
Market Liquidity

Volatility in the Treasury market rose over the past year as the Federal Reserve tightened monetary policy. The spike in interest rate volatility at the short end of the yield curve during the March 2023 banking sector turmoil exceeded levels seen during the March 2020 COVID-19 pandemic due in part to uncertainty about the path of monetary policy. The strain in the Treasury market spilled over into the large universe of dollar-denominated fixed-income derivative instruments.

The ICE BofA Bond Market Option Volatility Estimate Index, an indicator of Treasury market interest rate volatility and bond market stress, remained at higher levels than the long-term average and at levels higher than observed during the previous QT period in 2017–19. The index increased sharply in March 2023 before declining thereafter (see **Figure 38**).

Over the past few years, liquidity conditions in the Treasury market weakened across a range of metrics. Because there are several aspects to liquidity, Treasury market liquidity measurement can take multiple forms, such as volume-based measures.⁴¹ TRACE data on trading volumes in the Treasury market suggest that it remains well-functioning, partic-

Figure 38. The MOVE Index (basis points)



Note: The MOVE (ICE BofA U.S. Bond Market Option Volatility Estimate) Index measures the market's expectation of implied volatility of the U.S. bond market using 1-month U.S. Treasury options weighted for 2, 5, 10, and 30 year contracts.

Source: Intercontinental Exchange Inc., Bloomberg Finance L.P., OFR

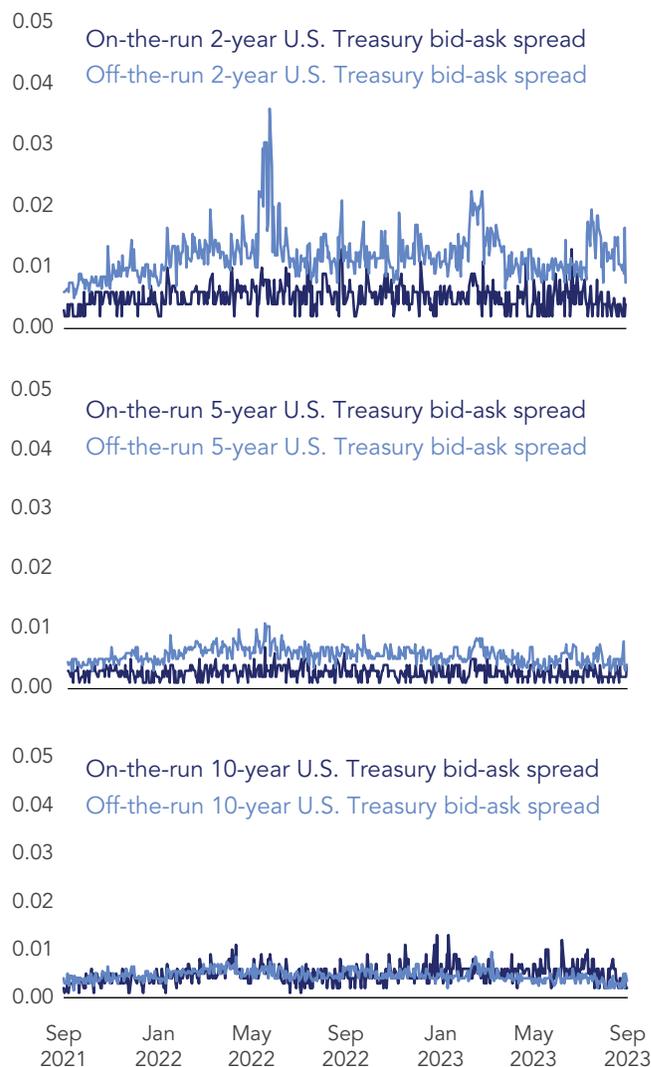
ularly during periods of stress. For instance, during the peak of the COVID-19 pandemic, more than \$1 trillion was traded daily. More recently, trading volumes again increased to similar levels during the banking crisis. This suggests that investors can generally transact large volumes of Treasury securities.

However, *turnover* (total value of trades divided by the value of Treasuries outstanding) in the Treasury market has declined as growth in aggregate issuance has outpaced growth in aggregate trading volumes. Turnover varies depending on the type of Treasury security. For example, on-the-run Treasuries (recently issued) turnover many times daily, while off-the-run Treasuries (not recently issued) have lower turnover.

Consistent with the increase in market volatility, the cost of transacting in Treasury securities increased. Bid-ask spreads across on-the-run Treasuries increased earlier this year, particularly for shorter maturities (see **Figure 39**). Historically, there is a strong correlation between Treasury market volatility and measures of market liquidity, such as bid-ask spreads. Typically, liquidity measures weaken during periods of high volatility, such as last spring. Weaker liquidity measures seen in March did not appear to be significantly worse than what would be expected, given the very high volatility at that time.

The Treasury market weathered another debt limit impasse during 2023. Concerns about a technical default weighed significantly on the short end of the Treasury bill market, leading to significant pricing dislocations before the debt limit issue was settled in early June. These types of pricing discrepancies and dislocations can have significant consequences for the functioning of the Treasury market and could have long-term consequences for investor appetite for U.S. debt.

Figure 39. Bid-ask Spreads for On- and Off-the-run U.S. Treasury Securities (basis points)



Note: Off-the-run Treasury security bid-ask spread is an average bid-ask spread of the most recently auctioned off-the-run security and the second most recently auctioned off-the-run security of a given maturity.

Sources: Bloomberg Finance L.P., OFR

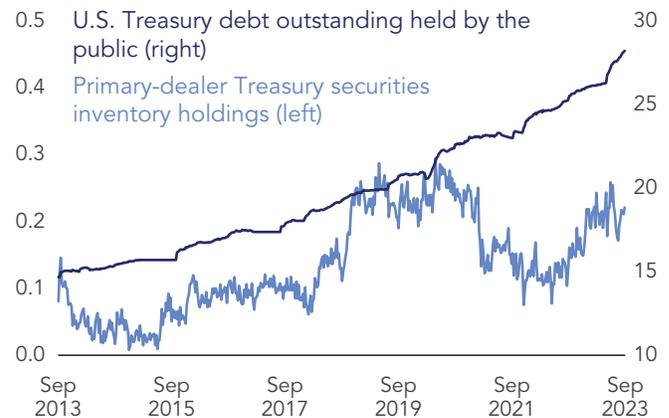
Market Structure

Treasury securities transactions are conducted across multiple venues, including interdealer trading on electronic platforms and dealer-to-customer on a bilateral basis electronically or by voice order. The market makers in these venues provide liquidity to the Treasury market. Primary dealers make markets in Treasury securities by standing ready to buy and sell securities at specified prices. Through these sales and purchases, the dealer can facilitate transactions with customers by taking temporary positions in the securities. In doing so, the dealer earns a bid-offer spread but consumes capital to facilitate the principal transaction. The cost of capital and the economics of these trades have evolved over the past two decades with technology developments, competition from new market makers, and regulation.

Figure 40 shows the growth in U.S. Treasury debt held by the public and primary dealer Treasury inventory, the latter historically viewed by some as a measure of dealers' willingness and capacity to intermediate trading in the Treasury market. The total supply of Treasury securities has increased by over 210% since 2008, while primary dealers currently hold less than 1% of the U.S. Treasury debt held by the public. The reduced share of U.S. Treasury debt held by dealers doesn't necessarily reflect the level of intermediation. Instead, it could reflect dealers' intermediating more on an agency basis where the dealer matches the buyer and seller without any balance sheet risk to facilitate market making, rather than a principal basis.

Technological advances facilitate electronic trading, enabling many market participants, including PTFs, to move quickly in and out of the market. The growth of electronic trading,

Figure 40. U.S. Treasury Debt Outstanding Held by the Public and Primary-dealer Treasury Holdings (\$ trillions)



Sources: FRBNY, U.S. Treasury, Bloomberg Finance L.P., OFR

along with other developments, including changes in regulation, have led to increased participation from PTFs, particularly in on-the-run securities. In contrast to traditional dealers, PTFs generally do not hold positions overnight and can operate with low capital relative to the size of their trading activity. PTFs typically execute a little more than half of Treasury trading activity on electronic interdealer broker platforms. It is important to understand how the sizable participation of PTFs in the Treasury market affects liquidity during periods of stress. While PTFs improve daily liquidity, there are cases where the consistency and depth of liquidity they add to the market are less clear. For example, during the flash rally on October 15, 2014, PTFs tended to manage their exposure to Treasury market volatility by reducing the volume of limit orders they supply to the market. While PTFs reduced the size of their limit orders, bank dealers widened their bid ask-spreads.

Other examples include the March 2020 and March 2023 market disruptions. The PTF share of Treasury trading on electronic interdealer broker platforms temporarily fell from 60% to 45% during March 2020.⁴² In contrast, during the banking stress of March 2023, the PTF share of activity on electronic interdealer-broker platforms rose from just over 50% to 60%.⁴³

Moreover, technology and the increased role of electronic trading platforms are reducing the size of transactions (i.e., trade size). This is also the case in other markets. When transactions are conducted at lightning-fast speed using electronic platforms, the transactions tend to get smaller.⁴⁴ One potential implication of smaller trade size is that large trades may take more time to complete.

Lastly, the Federal Reserve extended liquidity to help the functioning of the Treasury market

at the beginning of the COVID-19 pandemic. As a result, the central bank became one of the biggest holders of Treasuries. The central bank is now conducting QT and gradually reducing its footprint in the Treasury market.

Potential Market Reforms

The U.S. Treasury Department along with the SEC, Federal Reserve, CFTC, and the Federal Reserve Bank of New York, acting together as the IAWG on Treasury Market Surveillance, have led the charge on potential Treasury market structure reforms to increase resiliency in times of stress. Recommendations made in 2021 include the following: 1) expanding the Federal Reserve's standing repurchase agreement facility to ensure repo financing of Treasuries remains in sufficient supply, 2) increasing clearing of Treasury transactions at a clearing house to remove the risk of counterparty failures, 3) improving the resilience of market intermediation, including expanding all-to-all trading, increasing netting efficiencies in the purchase and delivery of Treasuries, increasing transparency of risk distribution among participants, and increasing self-regulation, 4) increasing and coordinating regulation, in particular around non-dealers such as PTFs, and 5) increasing overall reporting and transparency of trading activities. The SEC has also taken steps to bolster Treasury market resiliency by issuing three proposals in 2022. In September 2022, the SEC proposed rule amendments that would facilitate additional clearing of Treasury securities transactions and improve the risk management practices for CCPs in the Treasury market. Many Treasury repo and reverse repo transactions now clear bilaterally with a clearing agency, of which there is currently only one: the Depository Trust & Clearing Corp's FICC. The proposed regulation would require clearinghouse members to clear

eligible secondary market transactions in U.S. Treasury cash and repo.

Earlier in 2022, the SEC issued proposals pertaining to other IAWG recommendations: enhancing oversight of Treasury trading platforms under Regulation ATS and requiring U.S. Treasury liquidity providers to register as dealers. The latter reflects legislators' intent that firms engaging in liquidity-providing roles in the securities markets, including the U.S. Treasury market, be registered with the SEC.

Corporate Credit Markets

Credit markets help companies borrow to grow their businesses and provide opportunities for investors to deploy capital. In addition, credit markets enable borrowers to access a broader spectrum of lenders as investors in their debt, and they diversify the provision of credit in the economy, making it more competitive and resilient. These markets also spread the resulting credit risk across a wide range of investors who desire to hold this risk. Examples include corporate bonds, bank-syndicated loans, and private debt markets. In the United States, capital raised by companies in these markets substantially exceeds that sourced from the traditional banking system. Thus, having healthy and resilient credit markets is critical to support growth in the real economy and promote financial stability.

This section addresses debt issuance trends and corporate credit vulnerabilities stemming from market risk. *Market risk* is the risk that an asset's price will change by an unexpected magnitude. Market prices fluctuate for many reasons, including changes in investors' perceptions of credit risk (see **Nonfinancial Corporate Credit**). Price declines alone are insufficient to threaten financial stability, but they can prove destabilizing when there is

excessive leverage in the financial system. For example, large price declines can transmit stress to leveraged market participants who invest in credit markets, resulting in adverse feedback loops. These declines may prompt leveraged investors to sell, resulting in further price declines and more selling, adversely affecting market liquidity and price discovery.

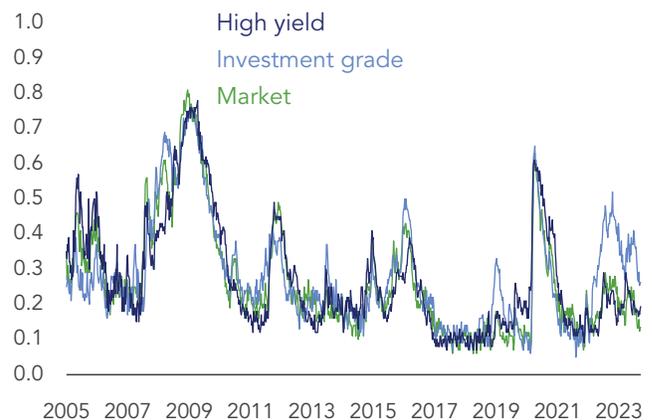
Overall, credit market functioning proved resilient despite banking stresses earlier in the year. For example, corporate bond market functioning moved closer to historical norms over the month of April, the month following the collapse of SVB, according to FRBNY’s CMDI.⁴⁵ The CMDI is a unified index that quantifies joint dislocations in the primary and secondary corporate bond markets. The index incorporates a wide range of indicators, including measures of primary-market issuance and pricing, secondary-market pricing and liquidity conditions, and the relative pricing between traded and nontraded bonds. As shown in **Figure 41**, as of late September, the market-functioning index is well below the distressed levels of 2020 and 2008.

Issuance

Corporate debt issuance stalled in March as market volatility increased when SVB collapsed. In fact, there was no high-yield bond issuance during the three weeks overlapping SVB’s collapse. March also represented one of the weakest months of the year for leveraged loan issuance, while investment-grade bond issuance was lower than a year ago.

Credit markets reopened in April and gained momentum as the year progressed. YTD investment-grade and high-yield bond issuance are up significantly compared to the prior year. However, leveraged loan issuance through September declined 35% from the comparable prior-year period. Further, the \$246 billion in leveraged loan issuance through the first three quarters of this year is the lowest since 2010.⁴⁶ Weakness in overall leveraged loan issuance stems from a few factors. First, demand for such financing is weaker due to fewer LBO and M&A deals. Second, bank risk appetite to underwrite leveraged loans

Figure 41. CMDI



Note: Data as of Sep 22, 2023.

Sources: FRBNY

decreased, given the recent regional banking turmoil. Third, higher interest rates mean fewer companies can afford to issue new debt. Fourth, larger companies increasingly turn to private credit to finance transactions that would have been done in the syndicated leveraged loan market in the past.

Data on private debt issuance is less accessible as this market is less regulated and opaque. According to Pitchbook LCD, direct lending YTD issuance, a key segment within private debt, is estimated at \$122 billion through September; this compares to approximately \$200 billion for the full year 2022. Private debt serves an important role in allocating capital by originating loans to corporate borrowers, primarily middle-market companies, that are generally too small to access credit in traditional capital markets.⁴⁷ Furthermore, as noted above, larger companies are increasingly borrowing in this market.

Private debt lenders are nonbank entities such as private debt funds and business development companies. U.S. assets under management of private debt funds now exceed \$1 trillion, up from under \$300 billion a decade ago, according to Preqin.⁴⁸ Business development companies manage an additional \$240 billion on top of this. Private debt is expected to continue to grow relative to traditional credit markets, making it more challenging for policymakers to monitor potential threats to financial stability. An important risk transmission channel may be the linkages with the real economy. Private credit provides financing to thousands of businesses. If numerous private-credit portfolio companies experience financial distress, decreases in employment and business spending would adversely affect the broader economy.

Market Risk

An important function of credit markets is *price discovery*, which is the process of determining the value of an asset in the marketplace through interactions between buyers and sellers. Credit markets perform this function by providing price signals to lenders and borrowers. These signals provide clues about credit availability, financial conditions, and expectations for economic growth.

Corporate debt is riskier than Treasuries. Thus, the yield on corporate debt is higher than that for risk-free securities of similar maturity. The difference in yields is called the *risk premium* or *credit spread*. Credit spreads widen when investors require greater compensation to hold risky debt, and they narrow when investors are more risk tolerant. Thus, both the level of and the movement in spreads contain important signals about credit availability, investor risk appetite, and the outlook for the business cycle and the real economy.

As of September 2023, spreads across every rating category have narrowed since the end of 2022. This narrowing has occurred during a period of rapidly rising risk-free rates and stands in contrast to other indicators that signal a weaker economic outlook, such as an inverted yield curve, an unprecedented contraction in the money supply, and persistent declines in leading economic indicators. Historically, spreads widen substantially in advance of expected economic weakness. Not only are spreads currently well below those preceding prior recessions, but they are also below the average spread for nonrecessionary months going back to 1996. For example, the ICE BofA U.S. High Yield Index spread ended September at 403 basis points, below the average during recessionary months (over 1,000 basis points) and nonrecessionary months (490

basis points). In short, the September level of credit spreads does not imply a heightened risk of a recession or credit cycle downturn.

During the height of regional banking stress, credit spreads were volatile in mid-March. They widened sharply following SVB's collapse before narrowing in subsequent months as regional bank concerns moderated. If the economic outlook were to weaken, then, based on history, spreads would likely significantly widen from the September level.

Periods of substantial spread widening can be destabilizing. Companies that need to refinance existing debt or issue new debt can face much higher borrowing costs in such periods. In extreme cases, companies may be unable to access credit. Lenders may also incur losses due to the value of existing debt holdings falling or borrowers defaulting on interest or principal obligations. Collateral values may also fall, reducing recovery rates for lenders. Finally, intermediaries may reduce market-making activity for investors who need to trade corporate bonds and loans during periods of extreme volatility. Such behavior adversely affects market liquidity and price discovery, two critical market functions.

Another type of market risk is *duration risk*, which measures bond price sensitivity to interest rate changes. Duration risk was a key factor behind the market decline last year when credit investors incurred historically large losses due to the sharp increase in risk-free rates. In contrast, duration could serve as a tailwind for fixed-income investors if inflation continues to moderate. If yields revert lower, the value of existing fixed-rate debt will increase. In fact, interest rate futures are priced in anticipation of Federal Reserve rate cuts in 2024. Lower rates would also ease financial conditions (all

else being equal), reducing the financing burden on firms that need to borrow.

Equity Markets

The equity market is the largest U.S. capital market, at approximately \$40 trillion in publicly traded U.S. corporate stock outstanding as of year-end 2022.⁴⁹ A healthy U.S. equity market is an important component of well-functioning capital markets, which provide basic services—such as capital allocation, price discovery, and liquidity provision—in the face of shocks.

Key participants in equity markets include corporate issuers and investors. Corporate stock issuers include U.S. companies that raise equity capital to finance operations, fund mergers and acquisitions, and invest in capital projects for future growth. Investors include individuals and institutions. Equity markets provide an important means for individuals to build wealth. According to the Federal Reserve's triennial Survey of Consumer Finances (2019), approximately 53% of U.S. households own equities, directly or indirectly. Institutional investors, such as mutual funds, pension funds, and hedge funds, are also large participants. These entities often invest on behalf of U.S. households.

Asset price volatility (market risk) is inherent in capital markets. While market risk is different from financial stability risk, market risk may interact with and reinforce other vulnerabilities to amplify financial stability risk. Financial stability vulnerabilities that stem from market risk are most salient when valuations and investor sentiment are both at extremes (preconditions for a bubble). While neither is the case today, valuations are more elevated, and market sentiment has improved relative to last year.

Valuations, which are high relative to historical averages, are supported by a favorable earn-

ings outlook. As of Q3 2023, trailing one-year S&P 500 earnings are estimated to have declined 3% from the prior earnings peak (Q3 2022), according to the consensus estimate. Looking forward, analysts see conditions improving and expect annual earnings to increase by 12% in 2024. However, other signs noted on the prior page (yield curve, money supply, and leading economic indicators) are much more cautionary. Historically, during recessions, the median earnings decline from peak to trough is 13% on an adjusted (i.e., consensus earnings, non-GAAP) and 18% on an operating (non-GAAP) basis. Currently, stock prices are vulnerable to a recession because both the P/E multiple and earnings would likely fall in such a scenario.

Positive investor sentiment is due to the favorable earnings outlook noted above. Also, the ability of the U.S. economy to sidestep a recession in the face of much higher interest rates has buoyed investor sentiment. Despite the improved equity market outlook, billions of dollars flowed into fixed-income markets this year, resulting in a new record of over \$6 trillion in MMF assets (as of September), according to the OFR's MMFM. If the outlook for equities remains upbeat, there is a large amount of cash on the sidelines that investors could deploy into stocks, providing further support to equity prices.

These are two signs that sentiment is not exuberant. First, YTD's IPOs are only modestly above the depressed level from a year ago. Second, margin debt outstanding declined 26% to \$689 billion (as of August) from its peak in October 2021.⁵⁰ Further, margin debt as a share of overall market capitalization is roughly 1.5%, which is slightly above the long-term historical average.

However, other forms of leverage, primarily derivatives, are not captured in margin debt. Some investors use derivatives to achieve larger exposures than otherwise possible. These leveraged investors, which include hedge funds and family offices, could be a source of fire-sale risk (e.g., Archegos Capital Management circa March 2021). One way to evaluate off-balance sheet leverage is to assess gross and net notional equity derivative exposures of large hedge funds.⁵¹ As of Q2 2023, the gross notional exposure of large hedge fund equity derivative positions, based on SEC Form PF reporting, exceeded \$1.8 trillion, which is 3% below the almost \$1.9 trillion peak in Q1 2022. While this measure does not differentiate between directional (risky) and hedged (less risky) positions, it provides a window into hedge fund off-balance sheet activity. Net notional exposures represent the difference between long and short exposures. This net measure declined substantially from the prior peak, indicating that hedge funds have reduced off-balance sheet leverage with respect to equities.⁵²

Another way to measure leverage is to compare hedge fund gross assets to net assets. Gross assets reflect the fair market value of a fund's assets (long and short positions captured on the balance sheet), while *net assets* are the fund's equity capital. The ratio of these two reflects balance sheet leverage. The median leverage ratio for equity strategy hedge funds is not high at 1.2. However, outliers—particularly those with significant AUM or large derivatives exposures—are more important for assessing threats to financial stability. The 98th-percentile equity strategy hedge fund is much more highly leveraged at a ratio of 3.9.

Commodities Markets

Stable commodity prices are important to financial stability for two key reasons. First, commodity prices feed into consumer goods. For example, 91% of U.S. natural gas is used in producing electricity and fertilizer, while copper and wood prices directly affect home-building costs. Second, volatile commodity prices can affect companies and traders that use derivatives to hedge and speculate on prices. When prices are volatile, additional collateral (margin) must be posted against trades. Large margin calls may be destabilizing if investors are forced to sell assets at a fire sale to meet margin calls.

Volatile commodity markets generally correlate with global recessions⁵³ because price volatility directly feeds into medium-term inflationary pressures.⁵⁴ When prices are volatile, corporations are likely to be more conservative with employment and investment decisions. Food and energy are two important and often volatile components of the CPI. These two categories compose over 21% of the CPI. The BLS CPI calculations weight food (14%) and energy (7.5%)⁵⁵ behind shelter (32.4%) and transportation commodities (7.7%).⁵⁶ Higher food and energy costs reduce consumers' ability to spend on other goods and services, particularly discretionary items.

During the 2020–22 period, commodity prices climbed 40% and exhibited a level of volatility that was significantly above the long-term (1981–2019) trend.⁵⁷ For example, in 2022 alone, the S&P GSCI index, which tracks commodity prices, climbed over 28% in the first half of the year and declined 15% in the second half, ending the year up 9%. The decline during the second half of 2022 was due, in large part, to the moderate North American and European winter and the reallo-

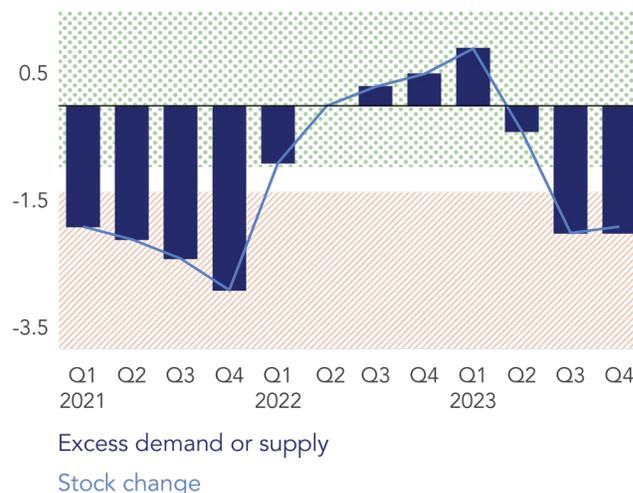
cation of the commodity trade.⁵⁸ During this period, commodities such as oil declined as supply increased and overall demand declined (see **Figure 42**). As central banks raised rates in 2023, commodity prices came under pressure, falling 12% in the first six months of 2023 as higher rates cut into overall demand.

Due to the Russian war against Ukraine, oil prices reached especially high levels in early 2022 before declining in late 2022 and the first half of 2023. Russia substantially increased oil exports to China (Russia’s largest trading partner), India, and Turkey, offsetting the significant decline in exports to Europe following the EU embargo on Russian oil. The G7-imposed price cap on Russian oil was successful in maintaining the quantity of Russian oil exports while limiting the price Russia received for those exports in the first half of 2023.

As of September 2023, the spot price of West Texas Intermediate crude oil was \$89, reflecting expectations that production will remain at current levels. Risks of higher prices include OPEC+ cutting production further, China’s economy growing faster than the projected 5%, and Russia cutting production beyond OPEC+ guidelines. Risks to the downside include disappointing world economic growth and greater Russian oil exports.

Another important energy commodity is natural gas, and its price stabilized after plunging from a 2022 high of \$10 to just over \$2 in early 2023. Prices in 2023 are nearly 20% below their 2015–19 averages because worldwide demand fell 2%, led by Europe’s 8% decline.⁵⁹ Lower European demand was due to a warm 2022–23 European winter, an increase in European energy conservation, and Europe’s acceleration of alternative-fuel use. Natural gas futures prices are expected to remain stable and below recent highs, which, given that natural gas

Figure 42. Change in World Oil Demand and Supply (million barrels per day)



Note: IEA forecast Q2 - Q4 2023. A background of green dots indicates a surplus and orange lines indicates a shortage.

Sources: World Bank, International Energy Association, OFR

accounts for 40% of U.S. electricity production, would assist in limiting inflation and contribute to more stable financial markets. Risks of higher natural gas prices could arise from a colder-than-expected 2023–24 winter, Russia further reducing gas exports to Europe,⁶⁰ and China’s economic growth exceeding its 5% forecast.

Overall, the near-term risks to the United States from higher energy prices remain low. Between 2018 and 2021, the United States became the largest oil producer because it increased shale production. However, shale production costs are relatively high, and profitable shale oil extraction requires elevated oil prices to break even.

As U.S. industries work toward net-zero carbon emissions by 2050, a goal announced by President Biden in January 2023,⁶¹ commodities used in the production of electronics are increasingly coming into focus. Copper, nickel, lithium, and rare-earth elements are increasingly important to the production of numerous products. Increased demand for these commodities is likely to push their prices higher. An inability of the United States to efficiently source such commodities could increase overall inflation and negatively affect U.S. jobs and the economy.

Digital Assets

Over the past year, the stress in the digital assets ecosystem triggered a round of liquidity and solvency concerns across the sector and heightened volatility in digital assets values. The cascade of events that followed each insolvency event highlighted the lack of transparency, complex corporate structures, governance issues, conflicts of interest, and interconnectedness between companies via opaque cross holdings and circular lending

practices. These practices include rehypothecation, in which collateral for a loan can be repledged against another loan, thereby increasing or multiplying leverage in the system.⁶² In addition, the bankruptcy proceedings that followed showed linkages between traditional banks, brokers, clearing firms, advisors, and crypto-asset firms. While the spillover to the traditional financial system is isolated to a subset of institutions, and credit losses are relatively limited for now, the spillover is larger than market participants anticipated. If the crypto markets become more interconnected, shocks in these markets could spread to the broader financial system (and vice versa) and affect financial stability.

Interconnections Between Digital Asset Firms

Interconnections between digital asset firms grew over the past year, organically and through acquisitions of and emergency lending to distressed firms. Ultimately, when FTX, one of the central players assisting distressed firms faced bankruptcy, these interconnections caused financial trouble to propagate to a large portion of the digital assets ecosystem and a subsection of traditional financial institutions, as detailed in the following paragraphs. Furthermore, the FTX bankruptcy exposed some additional interconnections that were present but previously unknown or opaque.

The bankruptcy of crypto-assets hedge fund Three Arrows Capital Pte Ltd (3AC) in early 2022 was due to its significant exposure to failed stablecoin TerraUSD⁶³ and its leveraged positions in a variety of crypto-assets. This bankruptcy revealed that 3AC owed over \$3.5 billion to its creditors, the majority of which were other crypto-assets firms, including Voyager Digital Ltd. (Voyager), Genesis Global

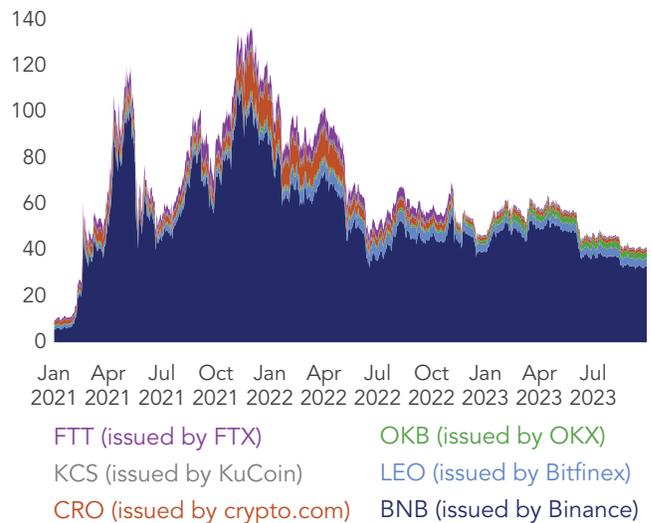
Capital, LLC (Genesis, a subsidiary of Digital Currency Group), and BlockFi.

FTX, the third-largest crypto exchange by volume, bailed out Voyager and BlockFi following their troubles with 3AC, temporarily providing relief while further increasing concentration among large crypto firms.⁶⁴ In November 2022, FTX and Alameda Research, its hedge fund affiliate, began experiencing their own issues as fraud allegations and governance issues came to light. FTX's troubles began in early November 2022 after a CoinDesk article revealed that a large portion of Alameda Research's assets were composed of FTT, a token issued by the FTX.⁶⁵ Unbeknownst to FTX customers, FTX lent billions of dollars of FTX customer funds to Alameda, collateralized by FTT. This led to questions about leverage and solvency at FTX and Alameda. Many FTT holders, including rival crypto exchange Binance, liquidated their FTT tokens, exacerbating an FTT price crash and illiquidity at FTX.

At the center of the liquidity issue was the quality of the assets on FTX's balance sheet. Most notably, there was undisclosed affiliate-related leverage and an overreliance on FTT, the native token mentioned previously. In early November 2022, FTT traded at \$26, with a market cap of \$3.5 billion. It subsequently lost over 90% of its value in the week of FTX's collapse.

Centralized exchange tokens are not unique to FTX—as of September 2023, they have a combined value of more than \$41 billion, with four exchange tokens having a market capitalization of over \$1 billion each (see **Figure 43**).⁶⁶ The largest of these, BNB coin (issued by Binance), has a market capitalization of over \$33 billion on its own, down from an all-time high of over \$100 billion in November 2021. Exchange coins or tokens operate like a

Figure 43. Market Capitalization of FTT and Other Top Centralized Exchange Tokens (\$ billions)



Sources: coinmarketcap.com, OFR

loyalty program by providing perks when customers use them to trade on the specified exchange—and importantly, they do not offer equity ownership in the issuing exchange.⁶⁷ Even so, FTX management regularly used FTT to collateralize loans, exposing the loan to wrong-way risk. When FTT's value came into question, and its price plummeted, FTX and Alameda quickly became insolvent as the value of their assets shrank. Because exchange coins are difficult, if not impossible, to intrinsically value, other exchanges relying on their own native coin could potentially face similar risks.

FTX's collapse had large spillover effects on the rest of the crypto ecosystem. BlockFi, which FTX had previously bailed out, filed for bankruptcy in late November 2022, citing exposure to FTX and Alameda.⁶⁸ Crypto lender Genesis had \$175 million in funds frozen on the failed FTX platform and was forced to suspend withdrawals shortly after FTX's collapse.⁶⁹ In January 2023, Genesis also filed for bankruptcy and was revealed to be FTX's largest unsecured creditor.⁷⁰ The list of FTX creditors was not confined to crypto firms—it also included traditional banks, technology companies, and individuals. In total, the top 50 FTX creditors were owed over \$3 billion.⁷¹

Interconnections with the Traditional Financial System

FTX's bankruptcy exposed the growing interconnectedness between digital asset firms and the traditional financial system, and its bankruptcy was also potentially a catalyst for some of the recent bank failures.

Some traditional banks, such as Silvergate, took deposits from digital asset firms such as FTX. Historically, these deposits were very volatile, and certain banks experienced sharp

outflows after FTX's bankruptcy. For example, in Q4 2022, Silvergate saw its deposits decrease by over \$8 billion, representing 68% of the bank's total deposits.⁷² Silvergate was forced to sell billions of dollars of securities at a loss and borrow billions from the FHLB of San Francisco to meet deposit outflows.⁷³ Another exposed bank, SB, attempted to distance itself from the crypto industry after FTX's collapse. In September 2022, crypto deposits represented 23.5% of SB's \$103 billion total deposits. In December 2022, SB said it hoped to decrease these deposits by \$8 billion to \$10 billion.⁷⁴ A New York State Department of Financial Services review on the closure of SB concluded that the public's perception of it as a crypto bank may have contributed to its eventual failure.⁷⁵

In March 2023, SB failed, and Silvergate self-liquidated.⁷⁶ Larger financial institutions—such as Goldman Sachs, JP Morgan, Fidelity, and BlackRock—were listed as either creditors or investors in FTX. Thus far, these larger institutions have not faced problems from the crypto fallout, given their relatively minimal exposure. According to the FDIC, more than 130 banking institutions, including several G-SIBs, were engaged in crypto-related activities or planned to engage in them as of February 2023.⁷⁷ For example, in October 2022, the Bank of New York Mellon launched a digital asset platform that provides custodial and transfer services to holders of Bitcoin and other cryptocurrencies. In addition, Goldman Sachs expressed interest in expanding its portfolio of crypto firms, especially when valuations decreased after FTX's collapse.⁷⁸ Heightened interest from traditional financial institutions may accelerate the growth of the digital asset ecosystem while increasing the level of interconnectedness and the potential for larger spillover effects between the two markets, thus affecting financial stability.

Stablecoins and CBDCs

Stablecoins are marketed as digital assets that experience significantly less volatility than other crypto assets like Bitcoin and Ether. The issuer aims to achieve price stability by linking the value of their coin to the value of a reference asset or pool of assets, such as fiat currency, commodities, or other crypto assets. Certain stablecoins, including the largest by market capitalization, promise to redeem their coins on demand at a constant value in fiat currency. However, some stablecoins are pegged to assets that can lose value or become difficult to access or sell during periods of market stress. Therefore, stablecoins possess structural vulnerabilities like those of banks, MMFs, and other vehicles that offer on-demand repayment of the customer's investment.⁷⁹

Stablecoins can serve as an important connection between the digital asset universe and the traditional financial system—which also means that stablecoins provide a channel through which shocks may transmit between the two. Although stablecoins are still a small segment of the crypto-assets market, stablecoin market capitalization has increased by roughly 97% in the last two-and-a-half years, to \$124 billion outstanding as of September 2023.⁸⁰ Stablecoins are also among the most traded coins in the crypto-assets market.

The largest fiat-backed stablecoin issuers maintain reserves to assure holders of their ability to honor redemptions on demand and at par. The composition and extent of such reserves and the information the stablecoin issuer provides about the reserves have varied over time. The lack of transparency around reserve management and redemption terms, plus uncertainty about legal claims in the

event of insolvency, may exacerbate the potential for preemptive redemptions.

Over the past year, several fiat-backed stablecoins broke their peg following large redemptions. The three leading stablecoins experienced single-day redemptions exceeding 4% of their market capitalization.⁸¹ This is large compared to most traditional institutions that promise immediate liquidity at par.

The largest stablecoin by market capitalization, Tether, temporarily lost its peg shortly after the failure of FTX. Circle Internet Financial LLC—the issuer of USDC, the second-largest stablecoin by market capitalization—held deposits at all three recently failed banks noted previously, including over \$3.3 billion (or 8% of USDC's reserves) at SVB. On the day of SVB's failure, USDC fell to a low of \$0.87 as holders redeemed over \$2 billion. In addition, the two largest crypto exchanges—Binance Holdings Ltd. and Coinbase Global, Inc.—suspended customers' ability to redeem USDC stablecoins for U.S. dollars. USDC's loss of its peg precipitated selling among stablecoin holders on centralized and decentralized crypto exchange platforms. DAI, the fourth-largest stablecoin, also lost its \$1 peg and fell to \$0.90 because USDC stablecoins partially backed it. After the U.S. government announced that it would protect all depositors of two failed banks (i.e., SVB and SB) to avoid or mitigate potential adverse effects on the banking system, both stablecoins recovered their peg. Nonetheless, USDC's market capitalization steadily dropped from over \$43 billion in early March 2023 to under \$25.1 billion as of September 30, 2023.

Similar to private stablecoins, CBDCs seek to maintain a stable value. However, unlike private stablecoins, these are backed by the governments that issue them and do not require

a peg. A CBDC is a central bank liability. Many central banks are at some stage of exploring, creating, or piloting CBDCs. Over one-quarter of all central banks are developing CBDCs or running pilots. Those in the pilot phase include the Bank of Canada, the People's Bank of China, the Banque of France, and the United Arab Emirates Central Bank.

While introducing a CBDC might offer benefits, such as faster payment settlement, there remain a number of unknowns and risks, such as cyber threats, a single point of failure, and systemic risk. A number of central banks are continuing to research and understand the potential benefits and tradeoffs, and they are considering specific tradeoffs within the context of their individual jurisdictions, although much of their analysis remains abstract to experimental. Potential benefits and risks are likely to vary by domestic context (e.g., maturity and efficiency of existing payment system and effectiveness of existing monetary transmission channels).

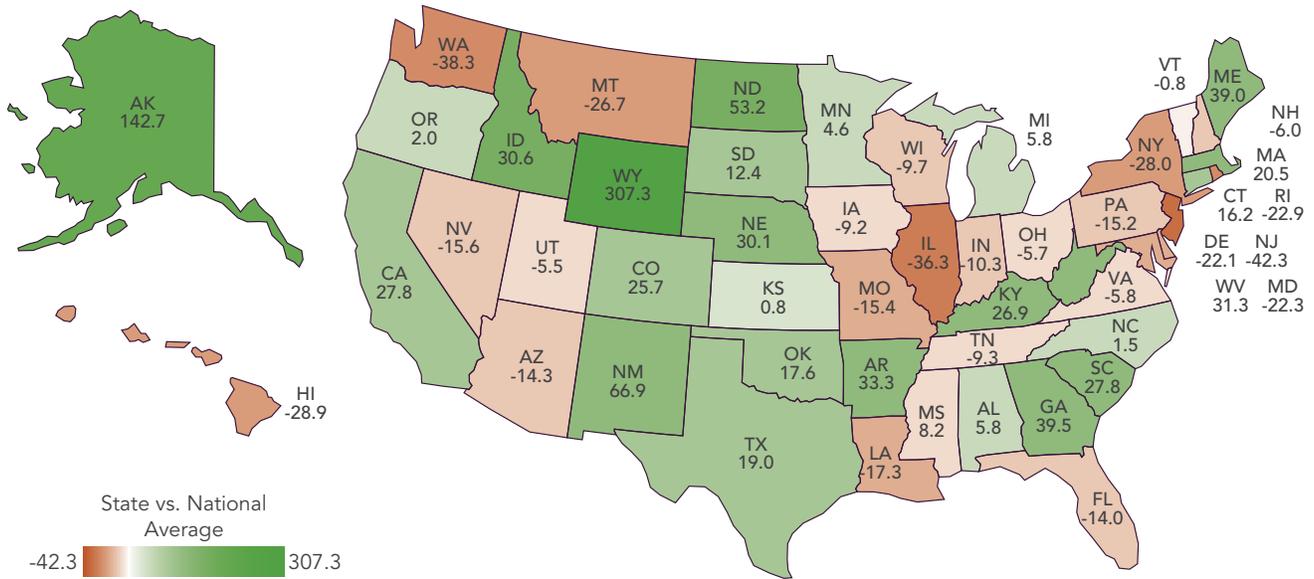
Municipal Debt Market

Local and state governments use the municipal debt market as one funding source for operations, infrastructure improvement projects, and community services. This \$4 trillion⁸² market is composed of a diverse set of issuers, including states, cities, toll roads, charter schools, and many others. Individual investors, pension funds, municipal bond funds, banks, and insurers are typical investors. A systemic disruption in the municipal debt market could reduce the ability of municipal issuers to fund or refinance projects at favorable rates. In turn, this could result in higher taxes, higher borrowing costs, and reduced community investment.

The overall health of the municipal debt market remains strong. Since 1970, municipal

bonds, as an asset class, have had a very low default rate of 0.08%. The market proved resilient during the COVID-19 pandemic, partly because many municipalities received federal assistance⁸³ to supplement revenue shortfalls caused by a loss of tax revenue when health restrictions closed local businesses. However, for issuers, the Federal Reserve's interest rate increases over the past 18 months have been a double-edged sword. This is because the increase in rates has resulted in higher borrowing costs yet reduced state and local governments' pension obligations.

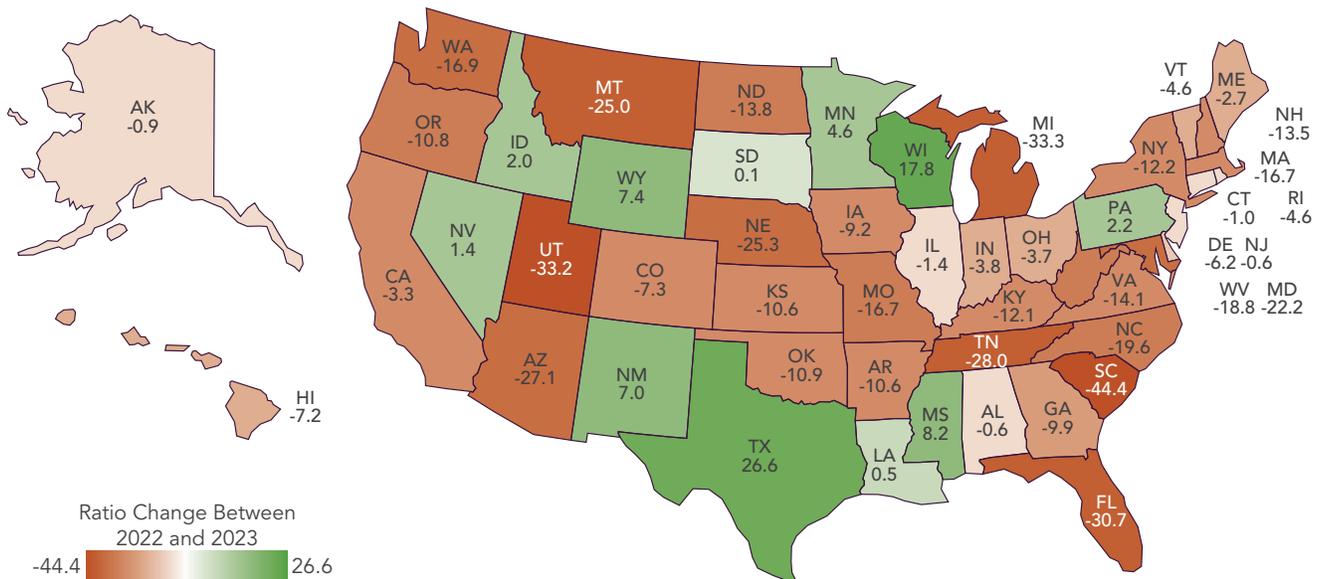
Figure 44. Days of General Fund Expenditures Held in Rainy Day Funds Less the National Median (days)



Note: National median is 42.3 days and national average is 53.5 days. Fiscal year 2022. Fiscal year for most states ends June 30.

Sources: Pew Trusts, OFR

Figure 45. 2022-23 Expected Change in Total State Balances as a Percent of Fund Expenditures



Note: The ratio is expressed as a percent of General Fund Expenditures. The number is the ratio change between 2022 and 2023, e.g. 25% (2022) and 20% (2023) would be expressed as -5.0.

Sources: Pew Trusts, OFR

For FY 2023, general revenues are projected to increase by 5.8%, which is slower than the last two years' rate of revenue growth.⁸⁴ In recent years, higher revenues allowed states to increase their *rainy day funds*, which helped balance short-term income and expense uncertainties. For 2023, the average state rainy day fund ratio (fund balance to expenses) is expected to increase to 11.9%, up from 2022's 11.6%. Comparatively, over a period of economic cycles and policy changes, the 20-year average ratio between 1988 and 2008 was 2.2%. Overall, more than 30 states had 2022 rainy day fund ratios that exceeded 10%.

Figure 44 depicts the number of days each state's rainy day fund balance would last based on the state's general fund expenditures. The number shown is the state's number of days minus the national median of 42 days.

A state's total balance of available funds, which includes rainy day funds and the state's ending balance,⁸⁵ provides additional insight into a state's fiscal health. Twenty years before the 2007-09 financial crisis, the average total balance was 8.3% of expenditures. This increased to an average of 12.7% between 2008 and 2023 (a higher percentage reflects a stronger fiscal condition.) During the COVID-19 pandemic, individual state balances initially declined in 2020 but then jumped from low double digits (12% to 14%) to a high of 35% in 2022. Contributing to this increase were changes in tax deadlines, state revenues exceeding expectations, and federal government assistance to state and local governments. The median ratio of state balances to expenditures is expected to decline to 27% in 2023 from 34% in 2022 (see **Figure 45**). The average number of days that each state could run on savings and ending balances, using FY 2022 data, stood at 126, and only a few states were below 100 days.

Although states benefited over the last few years from higher revenue, cost pressures are also increasing relative to expectations. No one issue is directly responsible; instead, expenses increased due to tight labor market conditions, supply chain problems, and increased commodity prices. Overall, state and local governments entered 2022's credit-tightening cycle in a strong financial position. As the economy slowed, state and local governments have employed levers to balance the budget.

Pension obligations, however, remain the largest long-term concern for most state and local issuers, even ahead of outstanding debt. Pensions are concerning because their liabilities are direct obligations of the underlying municipal issuers. Over 6,000 government-sponsored pension plans support nearly 26 million retired and active workers and hold over \$5 trillion in assets.⁸⁶ Reducing or altering pension plan benefits is challenging because such benefits are often enshrined in state law and practices, thus making it difficult for plan sponsors to reduce future benefits and liabilities. Over the long term, states and municipalities with large and underfunded pension obligations create risks for investors. A large pension plan failure could amplify perceived risks and raise borrowing costs for similar issuers.

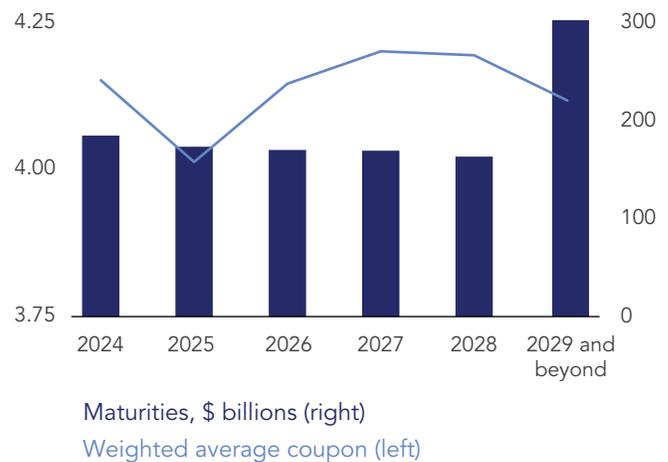
Pension plan balance sheets benefited from strong 2021 market returns, but as the target federal funds rate increased from 0.25% to 4.5% in 2022, pension plan returns declined by an estimated 7%.⁸⁷ The combination of investment returns, expected returns, contributions, and actuarial adjustments in the average public pension fund between 2020 and 2022 favorably increased the net funding ratio to 77% from 73%.⁸⁸ However, a reversal of recent positive investment returns during 2023 could

push the funding status lower. In addition, while fiscal stimulus provided states with available funds to make large catch-up contributions, a return to normal could pressure state coffers. For example, between 2007 and 2020, state and local government employers made catch-up contributions that grew at an annual rate of 7%, greater than twice the growth in state revenues. The recent increase in market volatility and higher rates placed increasing pressure on public pension funds to depend on fiscal discipline, putting additional stress on state budgets.⁸⁹

Higher interest rates are also likely to negatively affect municipal issuers. Nearly one million municipal bonds exist, almost half maturing between January 1, 2024, and December 31, 2029. Municipal bond maturities range from \$163 billion to \$175 billion per year over the next few years (see **Figure 46**). The average coupon⁹⁰ is 3.6%, but many are below 2%. Thus, a significant number of municipalities that roll over maturing debt could face higher interest payments.

Municipal debt issuers also face a host of other issues. Among the concerns is the aging U.S. infrastructure, which includes aviation, wastewater, and sixteen other main categories. The combination of weak structural integrity (e.g., bridges, dams, and other key infrastructure components) with increasingly strong and frequent climate events could negatively affect local and state issuers. Additionally, cybersecurity poses an increasing threat to municipalities, as highlighted when the Federal Bureau of Investigation announced⁹¹ that local governments were the second-most victimized group. This suggests municipalities will need to increase their cybersecurity spending.

Figure 46. Quarter of Munis Come Due in 5 Years (coupon, \$ billions)



Note: 2029 and beyond maturities exceed \$2.8 trillion. Weighted average coupon and par maturity excludes variable rate securities and includes taxable. 15% to 20% of securities for any given year are taxable issues.

Sources: Bloomberg Finance L.P., OFR

Financial Institutions

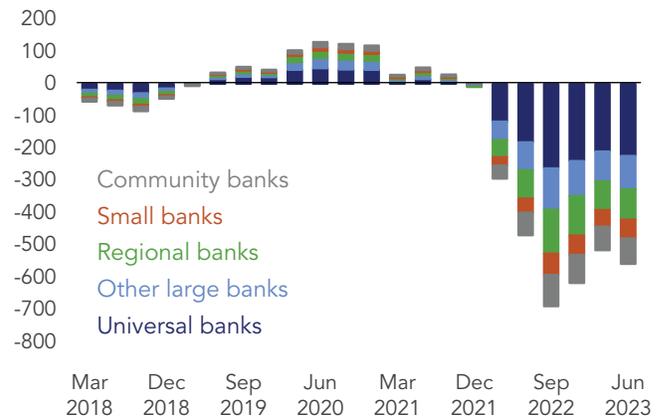
Banks

The banking sector plays a crucial role in providing credit to consumers, households, businesses, and other financial institutions that support the economy. U.S. banks⁹² entered a period of heightened economic and financial uncertainty in March 2022 when the FOMC began to raise interest rates. While increased interest rates generally improve banks' net interest margins, the rapid and steep monetary tightening negatively affected banks in two distinct and interconnected ways:

1. The rapid rise in rates generated a net outflow of deposits from banks. As interest rates rose through 2022 and early 2023, banks were slow to increase their yields on deposits. As a result, some depositors moved their cash out of banks to higher-yielding investments. Deposit outflows were also affected by a decline in household savings and increased consumer spending. Customer deposits represent the lowest borrowing costs for banks—and with marked deposit outflows, banks' funding costs increased, affecting overall profitability.
2. Rising interest rates led to increasing unrealized losses in banks' securities portfolios, which were mainly composed of fixed-income securities. Aggregate unrealized losses on banks' investment portfolios were \$558 billion at the end of Q2 2023 (see **Figure 47**), which represented 24.8% of banks' equity capital.⁹³

Banks had seen a steady inflow of deposits for some time, with a marked increase during the COVID-19 pandemic (see **Figure 48**). With the increased interest rates, many banks were slow

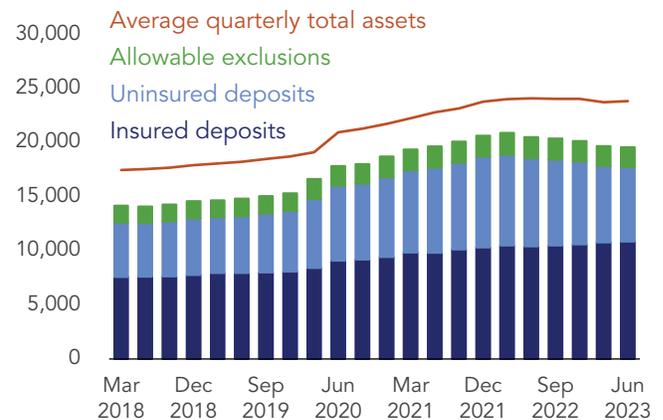
Figure 47. Unrealized Securities Gains by Bank Type (\$ billions)



Note: Data as of Jun 30, 2023. Unrealized securities gains or losses reflect changes in both the held-to-maturity and available-for-sale portfolios.

Sources: S&P Capital IQ Pro, OFR

Figure 48. Bank Assets and Deposits (\$ billions)



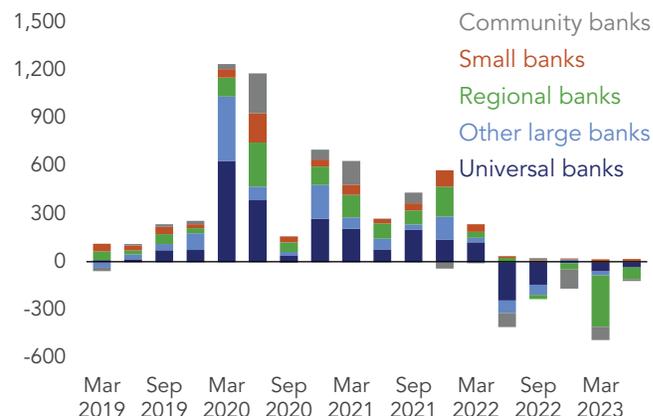
Note: Data as of Jun 30, 2023. Allowable exclusions include foreign deposits.

Sources: S&P Capital IQ Pro, OFR

to raise the rate of interest they paid on bank products, so they began to experience large deposit outflows. Initially, large and universal banks experienced higher deposit outflows than small and regional banks as customers sought higher-yielding alternatives, such as MMFs and Treasury securities.

Figure 48 shows an increase in the percentage of insured deposits for Q1 and Q2 2023 compared to year-end 2022. During the regional banking crisis that began in March 2023, federal government agencies invoked the systemic-risk exception that provided FDIC insurance coverage to all deposits, regardless of size, at certain failed institutions. Deposit outflows from the banking sector appeared to moderate toward the end of 2022, but deposit outflows from regional banks increased when the regional banking crisis began in March 2023 (see **Box Topic: Regional Banking Crisis** and **Figure 49**). Outflows at that time appear to be more related to solvency concerns than to the desire to earn higher yields, as depositors moved their funds out of regional banks and into large and universal banks. This trend appears to have reversed itself in the following weeks, but deposit outflows for regional banks continued to decline in Q1 and Q2 2023.

Figure 49. Quarterly Change in Deposits (\$ billions)



Note: Data as of Jun 30, 2023.

Sources: S&P Capital IQ Pro, OFR

Box Topic: Regional Banking Crisis

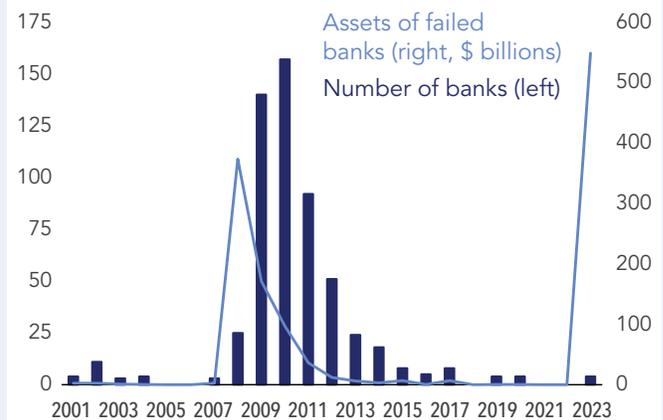
At the end of 2022, 39 banks were on the FDIC “Problem Bank List.”⁹⁴ This was the lowest number of banks on the list since the FDIC began publishing its QBP.⁹⁵ Through October 2, four banks failed in 2023: SVB, SB, First Republic Bank, and Heartland Tri-State Bank.⁹⁶ They had aggregate assets of \$549 billion (see **Figure 50**), which exceeds the \$545 billion in aggregate assets of the 165 banks that failed during the 2007-09 financial crisis.

On March 12, following the collapse of SVB and SB, the Federal Reserve, FDIC, and Treasury invoked the systemic-risk exception under the Federal Deposit Insurance Act. This allowed the depositors of SVB and SB to be protected by the FDIC DIF, regardless of account size. The Federal Reserve also announced a new BTFP for depository institutions, offering loans backed by pledged collateral, including U.S. Treasuries, agency debt, and MBS. The loans are offered at par value, regardless of the market value of the collateral, and they will be available for up to one year in term.

U.S. banks have largely seen increased interest income from the recent rise in interest rates. However, the higher rates have generated unrealized losses in many banks’ securities portfolios, which mostly consist of fixed-income securities. At the same time, bank customers began to redeploy deposits from banks to higher-yielding liquid investments such as MMFs and Treasury securities. These two trends made regional banks with large securities losses and a significant portion of uninsured deposits vulnerable to lack-of-confidence runs.

The failures of SVB, SB, and First Republic Bank were caused by a confluence of these factors. These failures were among the highest by historical standards: together, they

Figure 50. Bank Failures



Note: Data through Oct 2, 2023.

Sources: FDIC, OFR

represent the most significant series of bank failures in one year in U.S. history—and individually, they represent the second-, third-, and fourth-largest bank failures in U.S. history. The three banks held aggregate total assets of \$548.6 billion, surpassing the previous record bank failures in 2008 (\$373.6 billion) and 2009 (\$170.9 billion). Before the collapse of these three institutions, there had not been a U.S. bank failure since October 2020.

These banks failed because of four interconnected, precipitating factors:

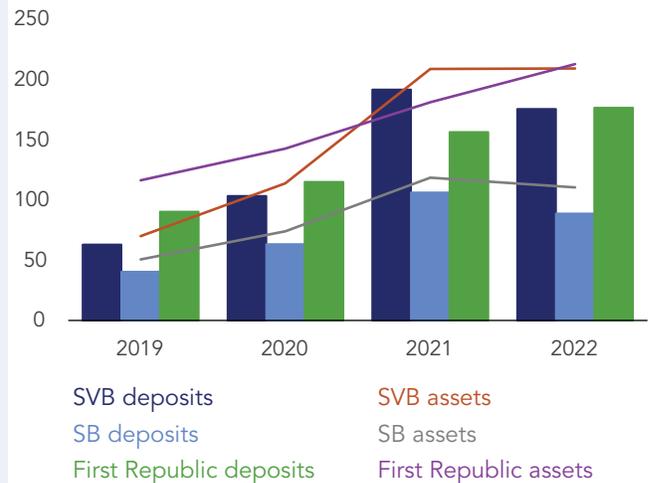
1. **Unrealized losses in securities portfolios.** As of December 31, 2022, SVB reported \$17.7 billion in unrealized losses, SB reported \$3.2 billion, and First Republic reported \$5.2 billion. The fair value of these securities generally equaled or exceeded their amortized cost at year-end 2021, but it significantly deteriorated in 2022, due to rising interest rates. Although these unrealized losses were substantial, they would not have been realized had the banks not sold the securities before maturity, assuming no credit event. However,

the banks did sell the securities to raise funds to repay outgoing depositors, and real losses ensued.

2. **Uninsured deposits.** As of December 31, 2022, 96% of SVB's deposits, 90% of SB's, and 68% of First Republic's were uninsured. Uninsured bank deposits exceed the threshold limit insured by the FDIC, making them vulnerable to losses in the event of a bank failure. Banks with a higher percentage of uninsured deposits are more susceptible to runs during lack-of-confidence events.
3. **Poor risk management.** SVB, SB, and First Republic experienced rapid deposit growth over the four years before their failures (see **Figure 51**). SVB's deposits grew 180% from year-end 2019 to 2022, SB's increased 119%, and First Republic's were up 96%. Banks purchased assets, primarily securities, to maintain leverage from the increased deposits. This created two problems: the banks purchased large amounts of securities at historically low interest rates, and the banks' asset-liability management systems did not keep up with this strong growth.
4. **Lack-of-confidence runs.** Factors 1 through 3 on this list made all three banks vulnerable to lack-of-confidence runs. When an event occurred, social media and payment technologies, along with concentrations in the deposit base, likely amplified, sparked, and facilitated the rapid withdrawal of deposits, which undermined investor confidence in the banks. This resulted in bank failures and the need for government intervention.

The failure and receivership of the three banks generated \$31.5 billion in estimated losses

Figure 51. Deposits and Assets of the 2023 Failed Banks (\$ billions)



Note: Data as of Dec 31, 2022.

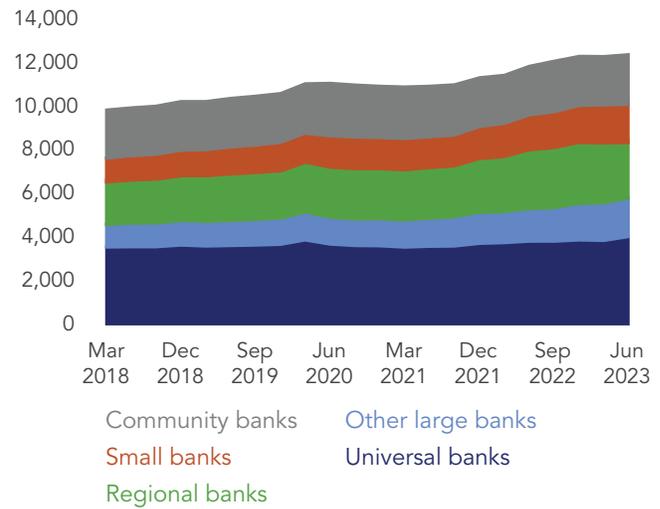
Sources: S&P Capital IQ Pro, OFR

to the FDIC's DIF. The estimated losses were \$16.1 billion for SVB, \$2.4 billion for SB, and \$13 billion for First Republic. On May 11, 2023, the FDIC announced a proposed rule for a special assessment to replenish the cost to the DIF from the invocation of the systemic-risk exception for SVB and SB's resolutions. The estimated losses are \$15.8 billion. As proposed, this assessment will be largely funded by banks with more than \$50 billion in assets. Uncertainty in the regional banking sector persisted for some time after the failures of SVB and SB, despite the extraordinary steps taken by the Federal Reserve, FDIC, and Treasury to contain the spillover effects. This is illustrated by the decline of the KBW KRX regional banking index. On March 1, 2023, the KBW KRX regional banking index had a value of 117 on March 1, 2023, and it fell to 94 on March 13, 2023. The value continued to decline and reached 77 on May 12, about two weeks after First Republic's failure.

Given the stress faced by the banks, there are concerns about banks' ability to provide credit amid rising interest rates and economic uncertainty. Historically, universal banks have had the most extensive lending portfolio. More recently, regional and community banks increased their lending, with the size of their loan and lease portfolios exceeding that of the universal banks (see **Figure 52**).

CRE lending by banks has received heightened scrutiny, given concerns about the economic outlook (see **Commercial Real Estate**). While all categories of banks have lending exposures to CRE, small and regional banks have outsized exposures relative to larger banks. That said, small and regional banks are less likely to have lending exposure to office buildings in central business districts, which are currently the primary vulnerability in CRE lending. **Figure 53** shows that CRE lending composes 10% of universal banks' lending portfolios, 8% of other large banks' lending portfolios, and 16% of regional banks' lending portfolios. CRE lending comprises 30% of small banks' and 31% of community banks' lending portfolios.

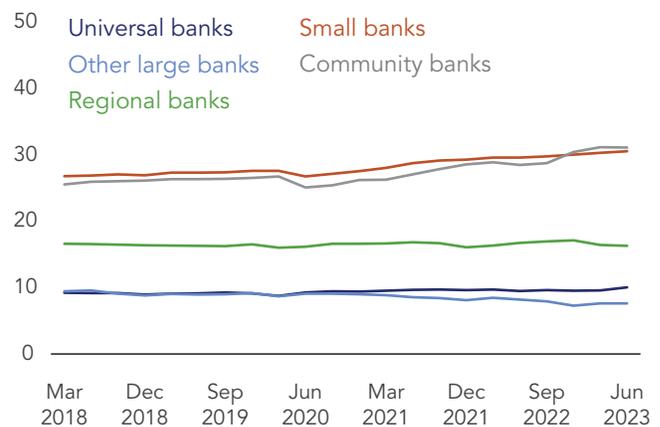
Figure 52. Bank Loans and Leases (\$ billions)



Note: Data as of Jun 30, 2023.

Sources: S&P Capital IQ Pro, OFR

Figure 53. CRE Lending as a Percentage of Domestic Offices' Total Loans and Leases



Note: Data as of Jun 30, 2023. CRE lending is comprised of multifamily, construction, and non-owner occupied loans and leases.

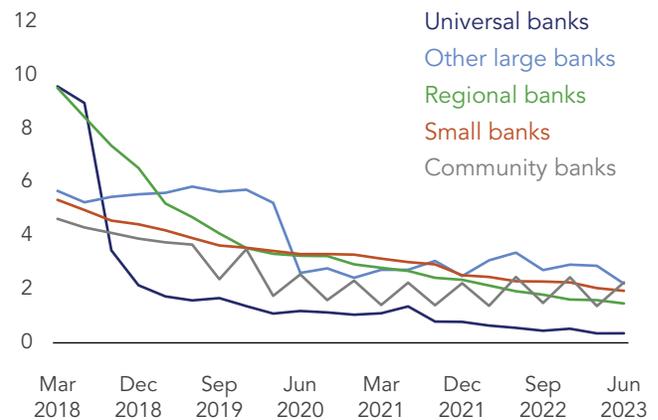
Sources: S&P Capital IQ Pro, OFR

Universal, regional, and small banks reduced their high-volatility CRE loans to less than 2% of their CRE lending. In comparison, other large banks have a CRE loan concentration of about 2.1%. Community banks have the highest levels at about 2.3% (see **Figure 54**). High-volatility CRE loans are generally construction loans for commercial properties that typically carry higher risk weightings than other types of commercial mortgage loans.

The Federal Reserve’s 2023 stress tests were performed on 23 of the largest U.S. and foreign banks and savings and loan holding companies. The tests showed that the banks have sufficient capital to absorb more than \$540 billion in losses and continue lending to households and businesses under stressed conditions. The severely adverse scenario modeled a severe global recession in which the unemployment rate was 10%, a 38% decline in the residential real estate market, and a 40% decline in the CRE market. This scenario also anticipated falling equity markets and widening spreads in corporate debt markets. Post-stress, Tier 1 risk-based capital ratios remained well above the required minimum levels.

Under the severely adverse scenario, \$424 billion of the \$541 billion of estimated losses was attributable to loans with an average loss rate of 6.4%. As a result, projected consumer loan losses represented 35% of total loan losses, as opposed to commercial loan losses, which constituted 45%. Within the loan portfolios, the largest losses occurred among commercial and industrial loans and credit cards, representing 40% of total loan losses.

Figure 54. High-volatility CRE as a Percentage of CRE Lending



Note: Data as of Jun 30, 2023.

Sources: S&P Capital IQ Pro, OFR

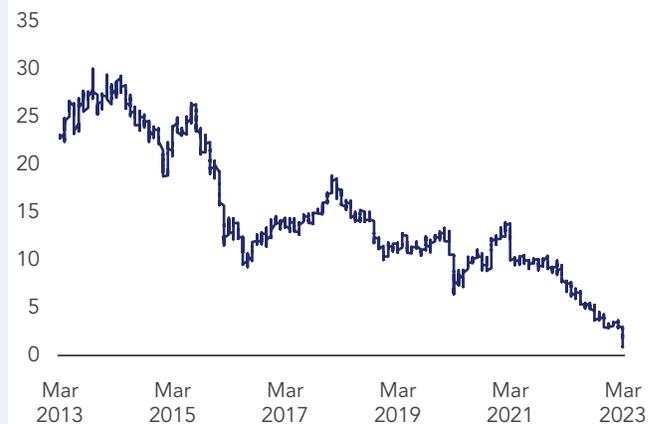
Box Topic: Credit Suisse

Credit Suisse struggled with credit quality, funding, management control issues, and public scandal for at least 10 years before its collapse. This was reflected in its share price, which began to fall in March 2014 (see **Figure 55**). The events leading to Credit Suisse's failure began on February 17, 2023, when Credit Suisse announced a \$7.6 billion loss for 2022, wiping out the prior decade's profits. Then, on March 14, 2023, Credit Suisse's auditor issued an "adverse opinion" on the effectiveness of Credit Suisse's internal controls. The next day, Credit Suisse's share price dropped nearly 25% after its largest investor, Saudi National Bank, said it would not provide more financial assistance. The market price of Credit Suisse's unsecured bonds was set to mature in 2027, then dropped to a low of 33% of their par value, down from 90% at the beginning of March.

The week of volatility following the failures of SVB and SB placed substantial stress on Credit Suisse. On March 15, the SNB and the Swiss FINMA, Credit Suisse's regulator, issued a joint statement in support of Credit Suisse, asserting that the problems faced by U.S. banks did not pose a risk of contagion for the Swiss financial markets.⁹⁷ The next day, Credit Suisse sought to shore up its finances by taking a loan of \$54 billion from SNB and repaying \$3.0 billion in debt—but that did not stop investors and customers from pulling their money out of Credit Suisse, with outflows topping \$11 billion during that week and almost \$69 billion during Q1 2023. As a result, on March 19, 2023, UBS announced that it would acquire Credit Suisse⁹⁸ for \$3.2 billion with the help of its central bank, the SNB.

The demise of Credit Suisse or any other G-SIB would typically raise significant con-

Figure 55. Credit Suisse Group Stock Price (dollars)



Sources: Bloomberg Finance L.P., OFR

cerns about U.S. financial stability. The specter of Credit Suisse's failure in the week following the collapse of SVB and SB exacerbated concerns regarding the financial stability of vulnerable U.S. banks. This was manifested by declines in the share prices of financial institutions, particularly those of vulnerable regional banks. Nevertheless, the support that SNB and FINMA provided for UBS's acquisition of Credit Suisse likely limited the contagion risk of Credit Suisse's demise to its U.S. and European counterparties, and it also likely muted any financial stability impacts on the U.S. and European financial markets. UBS announced that it completed its acquisition of Credit Suisse on June 12, 2023.

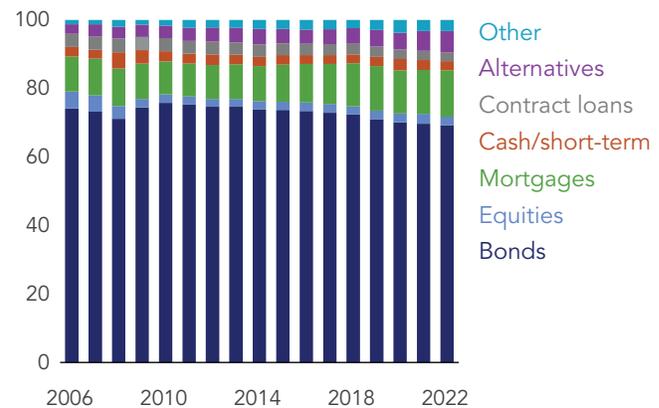
Insurance

Insurance companies are interconnected with other financial institutions and the financial markets through their investments and capital-raising activities. Insurers' cash and investment securities totaled approximately \$7.2 trillion at the end of 2022. Like banks, insurance companies have securities portfolios that are largely composed of fixed-income securities. Bonds currently comprise 69% of life insurers' investment portfolios and 55% of P&C insurers' investment portfolios.

Since 2007, historically low interest rates have negatively affected insurers' investment portfolios. Low rates have reduced insurers' profitability by depressing their investment income. Insurers have responded by assuming credit, liquidity, and maturity risks through less liquid and sometimes more complex securities. Bond holdings remain the largest share of insurers' investments (see **Figures 56** and **57**). The share of life insurers' holdings of bond investments has declined, their holdings of alternative investments have been slowly increasing, and P&C insurers have increased their bond holdings. Some insurers (mostly life insurers) have also increased their borrowings from the FHLBs, thus increasing the interconnectedness of the insurance sector and FHLBs. In many cases, insurers reinvest these FHLB advances in other higher-yielding assets to improve the yield of their overall investment portfolios.

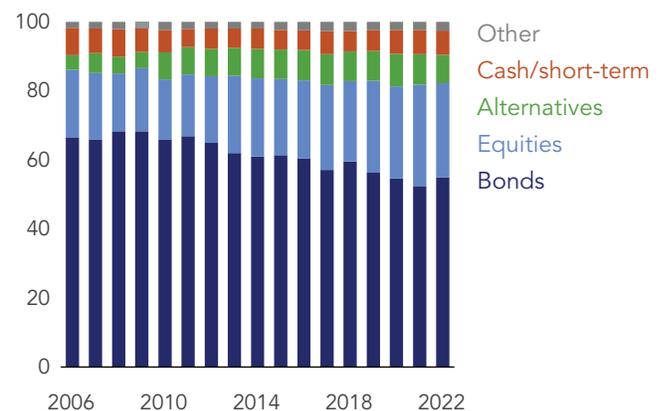
On a GAAP basis, rising interest rates have negatively affected market values of insurers' fixed-income investments. Cash and investments for life insurers were \$5.0 trillion at year-end 2022, a 3% increase from the previous year. Despite rising interest rates, the industry's investment yield declined to 4% from 4.2% a year earlier. The decline in life insurers'

Figure 56. Life Insurers' Investment Portfolios (percent)



Sources: S&P Capital IQ Pro, OFR

Figure 57. P&C Insurers' Investment Portfolios (percent)



Sources: S&P Capital IQ Pro, OFR

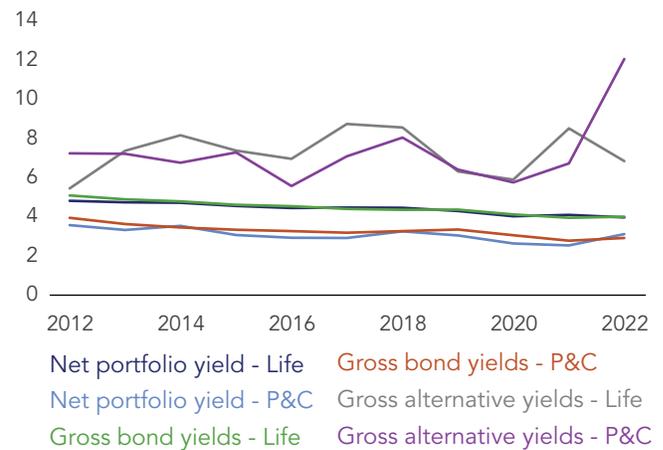
portfolio yield likely resulted from a decrease in yields from alternative investments compared with 2021 (see **Figure 58**). The longer duration of life insurers' investments indicates that yield improvements may take some time to improve. Many life insurers report higher yields on new investments than on their portfolio yields.

The P&C insurers' cash and investments remained almost flat at \$2.2 trillion. During 2022, allocations to bonds increased while common stock and alternative investment allocations declined. There was a marked improvement in the investment yield to 3.2% in 2022 from 2.6% a year earlier. This was likely due to the outsize increase in the yield for alternative investments to 12.1% from 6.8% in 2021 (see **Figure 58**).

While P&C insurers have benefited from increased investment income due to rising interest rates, this benefit has often been more than offset by rapidly rising claims costs, especially in property-exposed lines such as automobile and homeowners' insurance. The property insurance sector is facing unprecedented stress, which is expected to continue for an extended period. This stress has arisen from several factors, many of which are interconnected. Higher-than-expected inflation has rapidly raised replacement and repair costs. Meanwhile, insurers are incurring more frequent and more severe losses from catastrophic climate-related exposures such as hurricanes, severe convective storms, and wildfires. A rapidly growing number of properties are exposed to such losses.⁹⁹ Lastly, a challenging reinsurance market is making it more difficult and costly for primary insurers to offload risk to reinsurers to absorb large claims.

The P&C sector is exhibiting stress in multiple ways, including inadequate premium rates.

Figure 58. Insurer Investment Yields (per cent)



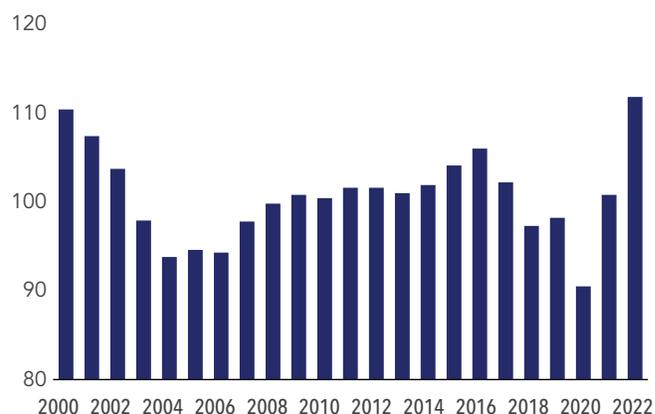
Sources: S&P Capital IQ Pro, OFR

There has been a rising number of P&C insurer failures, especially among insurers specializing in Florida markets.¹⁰⁰ Due to insufficient premium rates, the industry's poor financial performance is evidenced by the highest personal automobile net combined ratios¹⁰¹ in over 20 years (see **Figure 59**).¹⁰² Increasingly, the public sector is covering risks that private insurers are unable or unwilling to assume (see **Box Topic: Changing Flood Insurance Premiums Under Risk Rating 2.0**).

The P&C industry is responding to these challenges in a variety of ways. It is raising premiums to the extent permitted under insurance regulations (see **Figure 60**) and tightening the terms and conditions of insurance coverages. These measures include limiting coverage amounts, raising deductibles, increasing coinsurance, and requiring improved risk management by the insured.¹⁰³ Insurers are declining to write new policies or renew existing policies that they consider uneconomical. Nine of the twelve leading California personal lines insurers are either limiting or no longer writing new business in the state. Market contractions are also taking place in other states, such as Florida, Louisiana, and Colorado.¹⁰⁴ Local governments are changing laws and regulations affecting the insurance business—most notably in Florida, which amended its laws several times during 2022 to limit insurers' loss costs.¹⁰⁵ However, more needs to be done. In a growing number of states, state-sponsored residual market plans have grown in importance as private-sector insurance becomes increasingly difficult to obtain.

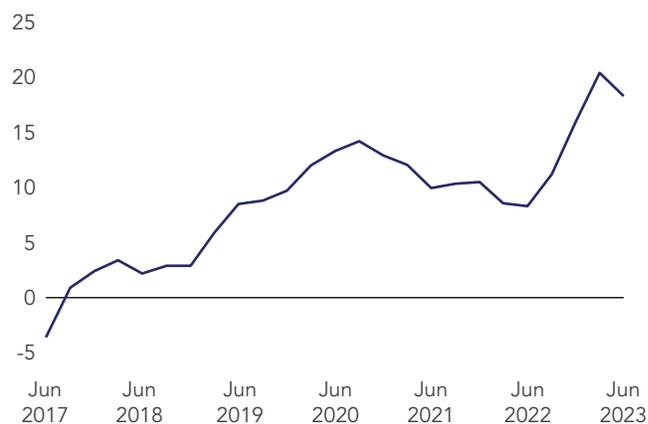
All of these changes are substantial for the insurance industry and its customers. Some changes encourage improved risk management and reduce losses when properties are physically modified, thereby limiting damage

Figure 59. U.S. Private Automobile Insurance Net Combined Ratio (percent)



Sources: S&P Capital IQ Pro, OFR

Figure 60. Quarterly Commercial Property Insurance Premium Changes (percent)



Sources: Council of Insurance Agents and Brokers, OFR

occurring from natural catastrophes. Examples are improving roofs, windows, and doors and raising a property's elevation. However, other changes increase insured premiums, add more restrictive policy terms, or, in some cases, there is an unwillingness for insurers to provide coverage at any price. These insurance changes may affect the economic value of real estate, which is considered to be at high risk. Reduced values can cause economic losses to property owners and, quite possibly, to lenders. Reduced values could also cause knock-on effects in areas where such occurrences are sufficient in magnitude to result in financial problems for the local government.

Box Topic: Flood Insurance Premiums Under Risk Rating 2.0

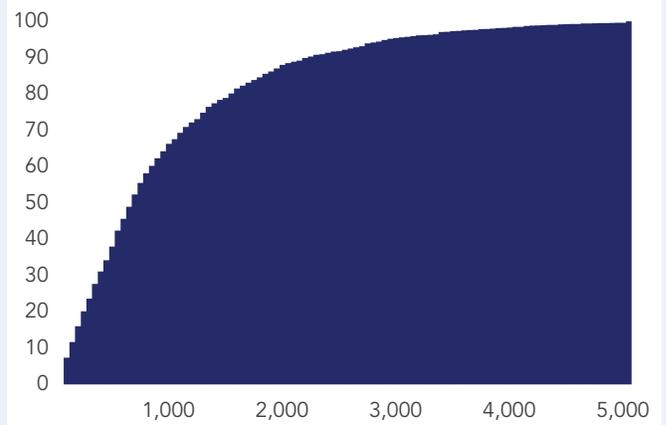
In April 2022, the NFIP fully phased in its RR2 pricing methodology for all new and renewing policies; before the implementation of RR2, the NFIP set insurance premiums using flood maps developed by FEMA. The old pricing model used several factors in determining premiums, including whether a property was located inside the estimated 1%-annual-chance-flood area. With RR2, the NFIP determines flood insurance premiums based on several factors, including properties' predicted risk according to a set of catastrophic-risk models, the NFIP's extensive claims database, and geospatial information. RR2 premiums should more closely reflect property-level flood risk by using more granular data than flood maps and incorporating determinants of risk beyond the 1%-annual-chance-flood area.¹⁰⁶

The NFIP is by far the largest provider of flood insurance in the United States, with over 4.7 million policies in force as of June 2023.¹⁰⁷ Therefore, RR2 represents a major repricing of flood risk in U.S. real estate markets. Although

an 18% cap on annual premium increases for renewing policyholders kept rate increases modestly in RR2's first year, most policyholders will continue to see their rates increase each year until they reach their *risk-based rate*, which is their full RR2 premium without any caps or subsidies.¹⁰⁸ FEMA data from September 2022 show a national average annual premium of \$888 for single-family homes. Under the new methodology, the cost of flood insurance would be \$1,808, on average, when all policies move to full risk-based rates.¹⁰⁹ Using the same FEMA data, in the future, 14% of policies across the country will be in zip codes where the average full risk-based premium will exceed \$3,000, compared with only 0.1% of policies reported in 2022. The increasing frequency and severity of flood events due to climate change may lead to future premiums rising to levels above today's risk-based rates.¹¹⁰

Figure 61 shows the cumulative distribution of projected premium changes between September 2022 rates and full risk-based rates calculated by the OFR. Over 90% of policies

Figure 61. Pending Premium Increases Under Risk Rating 2.0 (percent, dollars)



Note: Cumulative distribution of planned premium increases to NFIP under RR2 to full risk-based rates. See endnote 109.

Sources: FEMA, OFR

are in zip codes that would see higher average premiums with the transition to full risk-based rates. Approximately 20% of policies would see an average increase of over \$1,500 in their annual NFIP premiums.

Rising flood insurance premiums could affect financial stability through several channels. First, rising premiums could dampen residential home prices due to higher ownership costs. Several studies have found that past NFIP premium increases led to lower home prices, and future price increases will affect many more homes and impose substantially higher rates than past reforms.¹¹¹ These price effects will likely be most pronounced in coastal P&C markets, where premium increases will be the greatest. Florida homes with coverage from the state-operated CPIC must eventually carry flood insurance, regardless of whether they would normally be required by federal law or their lender. Lower home values could lead to tighter credit conditions in coastal areas and, along with the burden of higher premium payments, lead to mortgage defaults and distressed sales.

Second, rising premiums could depress the use of flood insurance outside the 1%-annual-chance-flood area, leading to more uninsured flood losses that could spill over to lenders and GSEs. Federal regulations require flood insurance on most mortgages inside this area but not outside, where take-up has historically been low. While RR2 replaces flood maps for setting premiums, the flood insurance purchase requirement remains solely determined by the 1%-annual-chance-flood area designation. It remains to be seen whether private flood insurers will absorb customers who leave the NFIP due to rising premiums. CoreLogic estimates that approximately half of the flood damages incurred during Hurricane Ian were uninsured.¹¹² Research finds that

uninsured flood losses lead to higher rates of delinquency, default, and loan modification among borrowers.¹¹³

Asset Management

The asset management sector has grown considerably over the past decade. It plays a key role in financing the U.S. economy and managing financial assets for individuals and corporations. Regulatory assets under management by U.S. asset management firms exceed \$114 trillion at the end of 2022, up from \$34 trillion at the end of 2008.¹¹⁴ As a result, financial stability trends will increasingly rely on the ability of these institutions to monitor and manage their risk-taking activities.

Asset management firms provide advisory services to clients through a variety of investment vehicles, including OEFs, ETFs, collective investment funds, hedge funds, special-purpose vehicles, and separate accounts for institutions and individuals. The advisors and the various vehicles are subject to different regulatory and disclosure requirements.¹¹⁵ Their investment decisions ultimately affect the supply of credit, asset valuations, and market liquidity.¹¹⁶

Asset managers' activities can contribute to systemic risk through interconnections with other financial institutions. Counterparties' connections and asset fire sales are two channels through which risks may be transmitted from asset managers to the broader financial system. Concentration continues to increase in the industry as a small number of asset managers control an increasing proportion of assets, with the 20 largest managers controlling over 40% of assets.¹¹⁷

MMFs and other open-end mutual funds (including exchange-traded funds) are increasingly being utilized to manage wealth

for individuals and corporations and provide investment capital to the U.S. financial system. Combined, these funds held more than \$32 trillion, or 24% of all U.S. financial sector assets as of June 30, 2023, compared with 17% in 2006 and 11% in 1993 (see **Figure 62**).

Figure 62. Financial Intermediation

	Outstandings at Year-end (\$ billions)						Percent of Total Financial Sector Assets					
	1974	1979	1993	2006	2019	2022	1974	1979	1993	2006	2019	2022
Total Financial Sector Assets	3,048	5,152	20,521	66,457	108,765	127,120	-	-	-	-	-	-
Monetary Authority	113	167	424	908	4,379	7,484	4	3	2	1	4	6
Depository Institutions	1,237	2,071	4,846	2,016	20,063	25,594	41	40	24	18	18	20
Insurance Companies ¹	325	581	2,390	6,769	11,202	11,867	11	11	12	10	10	9
Open-end Mutual and Exchange-traded Funds ²	46	105	2,187	11,118	26,337	29,285	2	2	11	17	24	23
Fixed-income Funds ^{3 4}	2	45	1,186	3,853	9,520	10,976	0	1	6	6	9	9
Closed-end Funds	9	8	116	297	279	252	0	0	1	0	0	0
Private and Public Pension Funds	997	1,532	5,654	13,397	24,458	26,308	33	30	28	20	22	21
Defined Contribution Funds	51	136	1,057	3,437	7,427	8,128	2	3	5	5	7	6
Government-sponsored Enterprises (GSE) ⁵	88	166	632	2,875	7,130	9,224	3	3	3	4	7	7
Agency- and GSE-backed Mortgage Pools	21	95	1,357	3,841	2,406	2,688	1	2	7	6	2	2
Asset-backed Securities Issuers	-	-	466	4,275	1,175	1,464	-	-	2	6	1	1
Other Financial Institutions ⁶	243	494	2,914	12,619	12,400	14,662	8	10	14	19	11	12
Rest of the world	181	391	2,649	14,019	35,276	41,552	6	8	13	21	32	33

Notes: ¹ Includes separate account assets. ² Open-end investment companies; excludes funding vehicles for variable annuities, which are included in the life insurance sector. ³ Bond funds excludes hybrid and other funds with debt security holdings. It also excludes other funds that hold debt securities. ⁴ Excludes other funds with debt security holdings. ⁵ Includes Federal Home Loan Banks. ⁶ Includes asset-backed securities issuers, real estate investment trust companies, securities brokers and dealers, holding companies, funding subsidiaries, and custodial accounts for reinvested collateral of securities lending operations.

Sources: Federal Reserve Financial Accounts of the United States, Investment Company Institute, Haver Analytics, OFR

U.S. bank balance sheets were historically viewed as the main provider of credit and transmitter of financial conditions such as monetary policy decisions, although their share of U.S. financial sector assets has declined over the past decade (see **Figure 62**). Instead, Federal Reserve Financial Accounts data show that funding has increasingly shifted to the asset management channel and specifically, mutual funds. Many funds offer daily liquidity to fund investors while holding assets that can take longer to sell in an orderly way. However, unlike banks, these funds do not have explicit access to the Federal Reserve lender-of-last-resort facilities. Given that mutual funds lack this guaranteed backstop and have structural liquidity mismatch, these funds may be vulnerable to runs during periods of heavy redemptions that reduce credit supply and amplify stress, which could be exacerbated by dealers' lower inventories of less-liquid securities.

OEFs are the largest subset of mutual funds.¹¹⁸ OEFs are companies that pool money from many investors, invest that money in securities such as stocks, bonds, other types of obligations, or a combination of different assets, and give investors fund shares representing partial ownership of the funds and any gains the funds generate. A key characteristic of OEFs is *redeemability*, which is investors' ability to sell their shares back to the funds on any given day, with the assurance that the funds can meet the redemption within seven days, regardless of the value and liquidity of their assets.

Unlike other securities, OEFs do not trade on an exchange and generally do not trade in the OTC market. OEF shares are sold by the fund directly or through intermediaries, and the fund redeems them at a price that is related to the fund's NAV, which is the value of all its

holdings minus its liabilities divided by the number of shares it has issued.

U.S. mutual funds generally take the form of a corporation or business trust, have no employees, and are usually organized by the *asset manager*. The use of external service providers is not unique to the asset management industry. However, this structure can contribute to risk-taking if asset managers' interests are not aligned with those of investors and if asset managers do not appropriately understand, manage, and monitor risks.

Money Market Funds

MMFs are a subset of open-end mutual funds. However, unlike other open-end funds, MMFs seek to maintain a stable NAV or share price.¹¹⁹ As a result of MMFs' stable NAV, many investors view MMFs as an alternative to bank deposits and use them as cash management tools. However, MMF shares may not be cash equivalents to the extent that they invest in certain securities that cannot be liquidated at par under all market conditions. MMF shares also do not carry the same protections as insured bank deposits. Some assets held by MMFs have limited secondary-market liquidity and are often held to maturity. The limited liquidity of many money market instruments creates a first-mover advantage that generates run risk whenever investors believe conditions are deteriorating, which can exacerbate moves in asset prices.

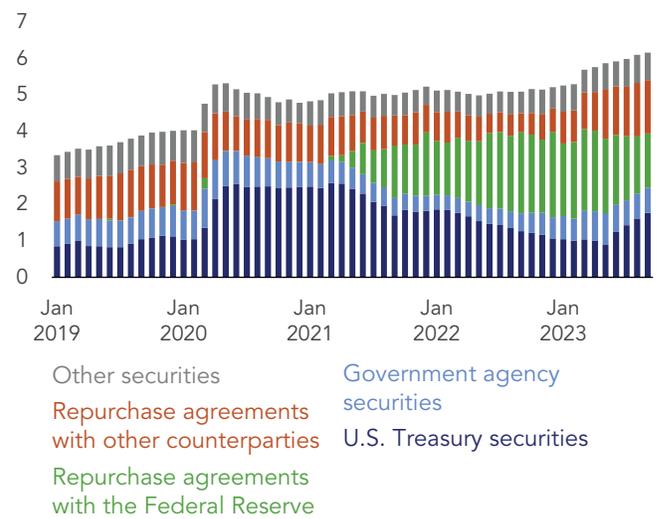
To mitigate these risks, the SEC approved amendments to rules¹²⁰ governing MMFs in July 2023. The rules bolster funds' liquidity and impose liquidity costs on redeeming investors under certain circumstances.¹²¹ However, it is unclear whether the rules will discourage large outflows in the tail scenarios that prompted the amendments to the rules. The

effective date for the amendments to Forms N-MFP, N-CR, and PF is June 11, 2024. The effective date for the remaining amendments will be 60 days after publication in the Federal Register.

MMFs provide short-term financing to borrowers and are significant participants in the Treasury bill, repurchase agreement (repo), and commercial paper markets, although their relative holdings of each security type (and therefore, their presence in each of these markets) have shifted over time (see **Figure 63**). For example, commercial paper and unsecured deposits represented a larger share of MMF assets before the 2007–09 financial crisis than today. Repo agreements, specifically those with the Federal Reserve, account for over 30% of MMF assets.

After the disruptions caused by the March 2023 regional banking crisis, MMFs experienced an increase in inflows and reached a new record of \$6.16 trillion of AUM.¹²² This was partly due to MMFs’ attractive yields compared with the rates on bank deposits.¹²³ MMF AUM increased by \$399 billion in March 2023 (the second-highest period of inflows on record) and has increased by \$956 billion year-to-date in 2023, based on SEC Form N-MFP data. A portion of the increase in MMF assets was the purchase of FHLB discount notes, which in turn helped finance the banking system. Some of the cash through lending in the repo market was invested in the Federal Reserve’s ON RRP facility, which reduced the amount of private lending by money market investors to banks. The ON RRP facility offers MMFs a liquid investment at attractive risk-free yields, thereby minimizing net asset value volatility. The ON RRP facility allowed MMFs to minimize Treasury holdings risk through the debt ceiling debates in Q2 2023.

Figure 63. U.S. MMF Assets by Select Holding Types (\$ trillions)



Notes: Other securities includes securities issued by corporations, financial companies, municipalities, and other MMF structures.

Sources: SEC Form N-MFP, OFR

Open-end Funds

OEFs are pooled investment vehicles that generally offer shares to the public continuously. They issue redeemable shares, which means that except in extraordinary circumstances, shareholders of the fund can receive, upon demand, a pro-rata share of the fund's NAV.¹²⁴ This potential imbalance incentivizes investors to be first movers who can precipitate a run when they believe conditions are deteriorating or when access to their investments may be impeded, which can exacerbate moves in asset prices.¹²⁵

The nature and characteristics of OEFs' investment holdings and strategies have evolved to include less liquid debt securities, loans, commodities, and derivatives. According to Morningstar Direct, open-end bond funds accounted for 24% of total fund assets at the end of June 2023, up from 20% in 2008.

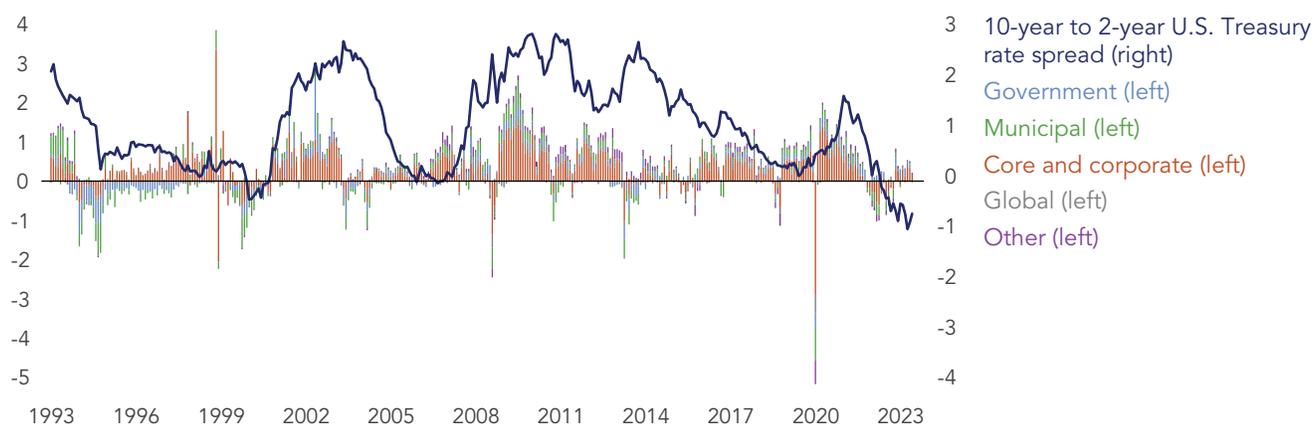
OEFs that hold less-liquid assets have structural vulnerabilities that are similar to those of MMFs. They offer on-demand redemptions to fund investors while holding relatively less-liquid debt assets that may be challenging to sell during stressful periods. This liquidity mismatch was evident at the start of the COVID-19 pandemic, given elevated OEF redemptions.

Most U.S. debt securities are traded infrequently (excluding U.S. Treasuries) and rely on dealer intermediation. These liquidity concerns explain both the appeal and the risks of bond funds—specifically, bond funds offer a more liquid alternative that is only possible because they engage in liquidity transformation.

The resilience of OEFs is now being tested again amid continued rising interest rates. Fund outflows have been increasing in recent

months, and that has the potential to amplify stress. Bond fund security holding values and investor flows are sensitive to interest rate increases (see **Figure 64**).¹²⁶ Still, prior periods of rising interest rates occurred when the market for bond funds was much smaller, and dealer inventories were much larger.¹²⁷ As a result, large redemptions could result in fire sales, which in turn could fuel further redemptions and potentially exhaust dealers' capacity to provide liquidity.

Figure 64. Bond Fund Asset-weighted Monthly Flow Rate and the 10-year to 2-year Treasury Rate Spread (percent)



Sources: Morningstar Direct, Bloomberg Finance L.P., OFR

MMFs and bond funds, including bond ETFs, hold more than \$10.8 trillion in U.S. financial sector assets, more than four times the level in 2008 (see **Figure 65**). Primary dealers' securities inventories have declined during this period. The reduction in dealers' inventories and their market making implies that market liquidity could be scarcer in periods of stress.¹²⁸

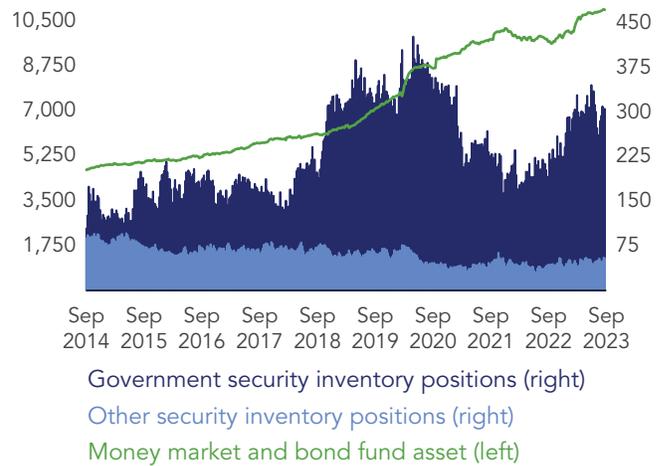
Open-end bond funds have recorded \$380 billion in outflows, or approximately 7% of total net assets, since the Federal Reserve began to raise interest rates in March 2022. In aggregate, funds saw steady outflows through 2022, although the actual magnitude of the outflows varies depending on the data and specific categories (e.g., investment grade, high yield, and broad market).¹²⁹ In stark contrast, U.S.-domiciled bond ETFs have seen \$192 billion in net inflows (see **Figure 66**).

OEF flows reversed and turned positive at the start of Q1 2023 as economic data stoked investor hopes of a Federal Reserve interest rate hike pause. The reversal is reflected in the modest improvement in OEF: Taxable (in dark blue) and OEF: Municipal (in green) cumulative fund outflows between January and March 2023. However, flows partially reversed in March as stress in the banking sector prompted a flight to safety, with large inflows into MMFs and government bond funds and outflows from corporate and broad-market fund categories. Available data suggest that the outflows have been mostly orderly, and any outflow pressures have not escalated into fund liquidity stress.¹³⁰

Exchange-traded Funds

ETFs are a subset of OEFs. They operate very much like other OEFs, with two critical differences:

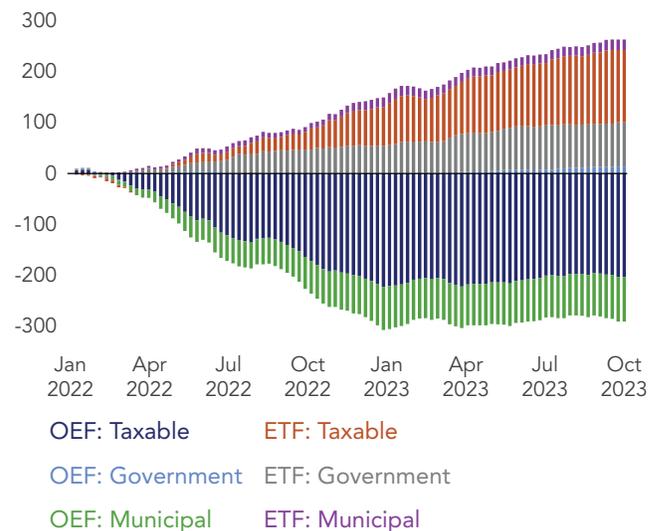
Figure 65. Primary-dealer Security Inventory Positions and Money Market and Bond Fund Assets (\$ billions)



Note: Money market and bond fund assets exclude funds that only report assets monthly or quarterly. Bond fund assets include open-end and exchange-traded. Data through Sep 27, 2023.

Sources: Haver Analytics, Emerging Portfolio Fund Research, FRBNY Primary Dealers Report, OFR

Figure 66. Cumulative Weekly Bond Fund Flows by Select Category Groups (\$ billions)



Note: Data as of Oct 10, 2023. Excludes funds (roughly \$1.9 trillion, or 33% of industry assets) that only report monthly or quarterly and MMF assets.

Sources: Morningstar Direct, OFR

1. ETFs are traded on securities exchanges, and their share prices are updated continuously throughout the day—while OEFs may be bought and sold at a price calculated just once a day after the close of business.
2. Many ETFs do not sell (also called creation) or redeem individual shares, except with APs in the primary market. As a result, investors ultimately rely on APs (rather than asset managers) to manage the liquidity in ETF shares when there is an imbalance between buyers and sellers in the secondary market.

Depending on the jurisdiction and the liquidity of the underlying securities, ETFs will transact “in kind,” “in cash,” or a combination of the two in the primary market. In the case of in-kind redemptions, ETFs exchange a basket of securities (rather than cash) for securities, and the AP bears the cost of holding the securities in inventory or disposing of them in the secondary markets. ETFs that invest in less-liquid securities, hard-to-obtain securities, or securities that cannot be readily transferred to APs may allow the AP to transact in cash, thereby transferring the transaction costs to the ETF.¹³¹

Assets have grown rapidly in ETFs due to (1) ETFs’ ability to purchase a diversified portfolio of securities more cheaply than buying the underlying assets and (2) ETFs’ potential for intraday trading. The popularity of ETFs has led to the creation of innovative and complex ETFs that use leverage or target thinly traded markets. According to Morningstar Direct data, these funds in aggregate held assets totaling \$1.7 trillion in September 2023, up from \$986 billion at year-end 2019 and \$118 billion at year-end 2008. Assets in ETFs that track fixed-income indexes are up 26-fold (2574%) since 2008 and 65% since the end of March 2020, driving the overall growth rate in ETFs.¹³²

Since the Federal Reserve began raising interest rates in March 2022, U.S.-domiciled bond ETFs have seen over \$300 billion in net inflows. This starkly contrasts with the pattern of outflows observed in traditional bond OEFs (see **Figure 66**). Nongovernment funds took in two-thirds of these inflows.

Bond ETF investors are usually drawn to the intraday liquidity these vehicles offer and the easy access they provide to less-liquid markets. Shares in ETFs are traded on an exchange throughout the day at market-determined prices—unlike mutual funds, whose shares can only be traded at the NAV calculated at the end of each business day.

However, an ETF’s incremental liquidity may not be stable over time because it relies on a relative balance between buyers and sellers in the secondary market. In the case of selling or buying pressures, the secondary-market liquidity may be insufficient and may, therefore, necessitate tapping liquidity in the primary market through the creation or redemption of ETF shares. This provides liquidity, but at a higher cost that is in line with the liquidity cost prevailing in the underlying bond market. The larger the liquidity mismatch between the ETF and the underlying securities, the greater the liquidity costs if ETF secondary-market liquidity evaporates.¹³³

This was evident in the early days of the COVID-19 pandemic. In early March 2020, extraordinary volatility in U.S. financial markets diminished the ability of market makers to price assets within ETF bond portfolios. During this episode, the arbitrage mechanism failed to prevent the market price of some ETFs from diverging significantly from the value of their underlying portfolios, leading to significant volatility. The ETF share price discounts persisted until the Federal Reserve

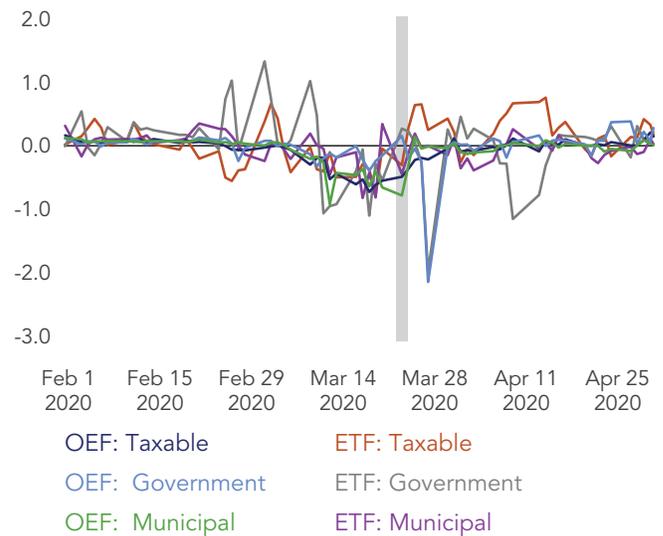
intervened on March 23, 2020. This also tempered heavy ETF fund investor redemptions. Morningstar Direct data show that bond ETFs lost roughly 3.4% of their assets to outflows between March 9 and 20 but recorded a positive 0.7% flow rate during the subsequent five days. In comparison, bond mutual funds lost 3.8% of assets to outflows during the same week and lost an additional 1.7% of assets in the same subsequent five days (see **Figure 67**). However, the Federal Reserve's actions may have enhanced the attractiveness of ETF structures and thus may have altered investors' expectation of liquidity assistance from the government during future crises and the pricing of risk.

Passively Managed Funds

Passively managed funds, which include OEFs and ETFs but exclude separately managed accounts, continued to attract inflows in 2023. In Q3 2023, aggregate assets in passive funds totaled \$11.9 trillion, or 49% of U.S. fund assets. That is up from \$1.1 trillion at year-end 2008 and \$8.4 trillion at year-end 2019 (see **Figure 68**). Net assets of passively managed equity funds have surpassed those of actively managed equity funds. Meanwhile, passively managed bond funds are gaining ground on actively managed funds; passive bond funds are attracting cumulative net inflows, while active bond funds are registering net outflows.

Fund sponsors and market participants promote the fact that passive funds have lower costs than active funds and, therefore, deliver higher returns per dollar invested than active funds do in the aggregate. However, passive funds introduce the possibility of market distortions, including crowding and illiquidity.¹³⁴ There is growing evidence that passive investing may lead to less efficient prices and

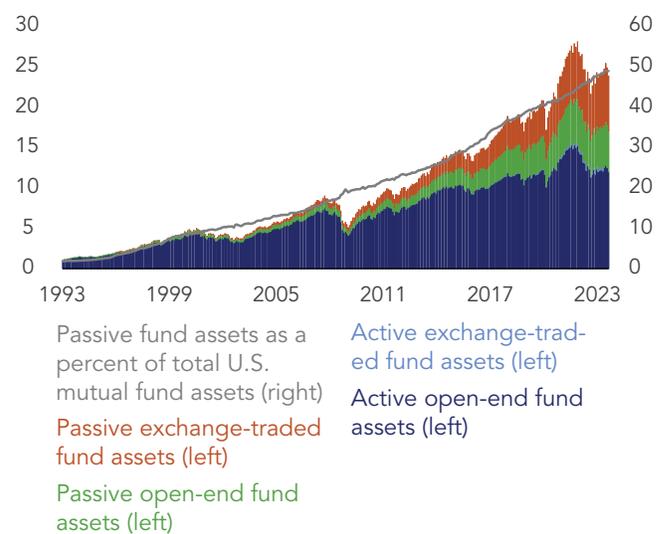
Figure 67. OEF and ETF Estimated Daily Flow Rates (percent)



Note: Excludes funds (roughly \$1.9 trillion or 37% of industry assets) that only report monthly or quarterly. Gray line represents the Federal Reserve's announcement of extensive new measures to support liquidity in the bond market (see <https://www.federalreserve.gov/newsevents/pressreleases/monetary20200323b.htm>).

Sources: Morningstar Direct, OFR

Figure 68. Passive and Active OEFs and ETFs (\$ trillions, percent)



Note: Data as of Oct 11, 2023. Excludes MMFs, funds of funds, and Feeder funds.

Sources: Morningstar Direct, OFR

increase market fragility associated with lower liquidity.

Most passive funds buy and sell based on the market capitalization weights of their respective indexes. This can lead to *momentum bias*, in which fund managers must buy (or sell) the fastest-appreciating or fastest-depreciating index components, thus exacerbating the highs and lows of asset price cycles. This can also result in the buying and selling of stocks in sectors with high passive ownership.¹³⁵

Other risks, including increases in industry concentration and financial market interconnectedness through securities lending activities, have been highlighted by academics and regulators. As previously noted, passive funds are attractive to investors because of their low fees. However, passive-fund managers incur trading costs in creating and maintaining passive funds that mirror their respective indexes. Constituent share repurchases, seasoned equity offerings, and mergers and acquisitions can trigger changes in an index. These trading costs can be as large as 20 to 30 basis points for funds that track the S&P 500 and even larger for funds that track less-liquid underlying securities. Some of these costs are offset by activities such as securities lending, in which passive funds temporarily lend out their securities to other market participants for a fee.¹³⁶ Most passive funds engage in securities lending, which makes such activities a source of interconnectedness and financial risk (counterparty and leverage) that can add to market fragility.

Assets under management for passive-strategy fund managers are more concentrated than active ones. A shift to passive strategies increases concentration. According to Pensions & Investments Research Center data, three investment companies managed nearly 75% of

all index products at year-end 2022. The size and concentration of passive-fund managers serve as a potential source of risk by amplifying the potential stress caused by idiosyncratic risks, such as an operations failure or a breach of fiduciary duty, that undermine investor confidence and lead to large redemptions.¹³⁷

Hedge Funds

Hedge funds are pooled investment vehicles that employ various trading strategies to maximize risk-adjusted returns for their investors. Despite their size and propensity to augment positions using leverage, they are less regulated than other types of asset managers. Hedge funds are closely linked to a variety of financial institutions, including the dealer subsidiaries of G-SIBs, who often provide leverage and serve as counterparties. Trading losses incurred by hedge funds may force the rapid unwinding of large, leveraged positions and, thus, may have the potential to propagate market volatility, fire sale dynamics, and significant counterparty losses. These risks are especially pronounced in periods of high interest rate uncertainty and market volatility because asset prices are liable to change rapidly.

Balance sheet leverage for a hedge fund can be measured by dividing its GAV by its NAV. The average industry leverage, defined as the GAV-weighted average of leverage across all funds, has declined from 7.9x in Q4 2021 to 6.6x in Q2 2023. Despite this decrease, the amount of credit extended to borrowers has increased from \$3.26 trillion to \$3.59 trillion over this period. Another trend that emerged is an increasing concentration in the hedge fund industry. According to regulatory data, the ten largest funds held 23.3% of total gross asset value in Q2 2023, compared with 19.3% at the end of Q4 2017. Such concentration generates systemic risk because it may be

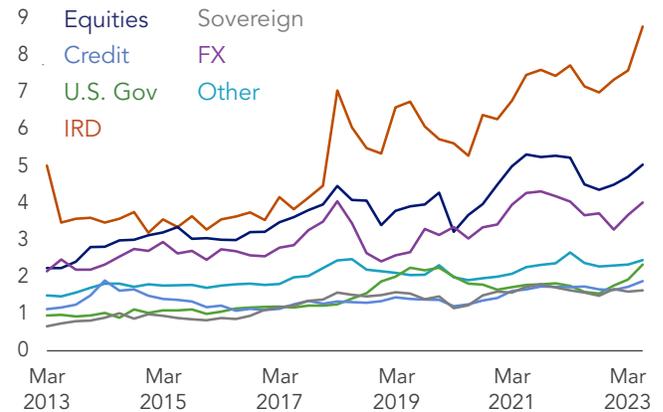
difficult to unwind large holdings of certain assets, and the exit of particular funds could cause disruptions that spill over across the markets in which those funds play central roles.

One method of assessing the size and distribution of hedge fund positions is GNE, defined as the absolute value of short and long positions in each asset class, including derivatives.¹³⁸ Total GNE as of Q2 2023 has declined slightly over the past two years, driven by decreases in equity and foreign-exchange exposures (see **Figure 69**). IRDs remain the largest single asset class and make up a larger share of portfolios than in prior years. The relative growth of IRDs is consistent with heightened interest rate uncertainty, while a decline in equities accords with poor stock market performance in 2022, which eroded valuations.

Hedge funds' short Treasury futures positions have grown considerably since April 2022 (see **Figure 70**), consistent with the re-emergence of the Treasury cash-futures basis trade; alternatively, this growth may partially reflect funds placing directional bets that Treasury yields will continue to rise.¹³⁹ While it is difficult to separate the drivers of the growth in futures positions, both strategies may result in large losses that stem from and exacerbate Treasury market instability.¹⁴⁰ In March 2023, Treasury market implied volatility exceeded that seen in March 2020, when a flight to cash led to the unwinding of positions to meet margin payments, which put more downward pressure on Treasury prices and thus increased Treasury yields.

In March 2023, the demises of SVB and SB engendered fears of a larger banking crisis, and the subsequent flight to safety led to increased demand for Treasuries. Because yields are inversely related to prices, the resulting

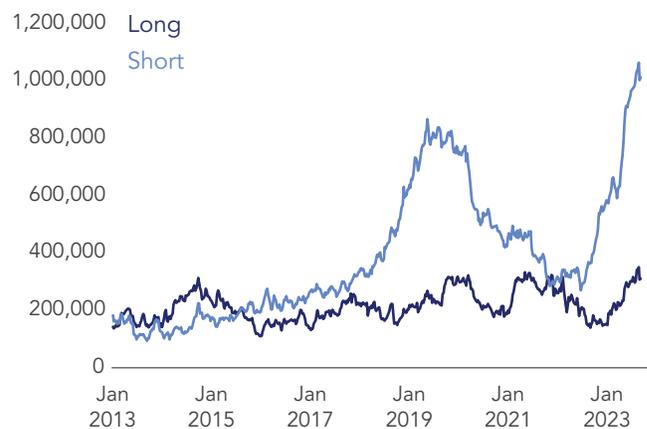
Figure 69. Gross Notional Exposures by Asset Class (\$ trillions)



Note: Data as of Jun 30, 2023. Exposures represent the absolute values of long exposures and short notional exposures as reported on Form PF, questions 26 and 30 (excluding repo positions).

Sources: SEC Form PF, OFR

Figure 70. Leverage Funds' Total Notional Exposure to Treasury Futures (\$ millions)



Note: Data as of Sep 5, 2023. Values are summations of notional value of leverage funds' positions.

Sources: CFTC Commitment of Traders data accessed through Bloomberg Finance L.P., OFR

price appreciation caused a decline in Treasury yields. Data from Hedge Fund Research indicates that funds performed poorly during the episode. Macro strategy funds experienced the largest loss, with a March return of -2.7%, which was the tenth-worst single monthly return since January 1990.

Credit Suisse also came under pressure in March and was subsequently acquired by UBS (see **Box Topic: Credit Suisse**). Credit Suisse had traditionally been a prominent lender to hedge funds, but the amount of credit it extended declined significantly after the Archegos episode in March 2021 (see **The Collapse of Archegos** in OFR Annual Report 2021). The bank's demise does not appear to have had a significant impact on hedge funds. Credit rationing remains a potential concern, however, particularly given the concentration of lending to hedge funds by other large banks. **Figure 71** shows that G-SIBs constitute 83% of all lending to hedge funds. A reduction of credit provision by one of these banks could cause fund deleveraging and, thus, fire sales.

Central Counterparties

Since the 2007-09 financial crisis, financial firms have been incentivized to clear their trades through CCPs. The central role CCPs play in clearing trades, and the resulting concentration of risk, has made CCPs key institutions in the global financial system. Globally, there are over 100 CCPs that clear a wide variety of financial instruments, including derivatives, equities, and commodity futures. The notional value of such contracts has grown substantially in recent years.

CCPs benefit financial stability by providing increased transparency in members' positions and reducing redundant financial obligations.

Figure 71. Counterparty Exposures to Hedge Funds (\$ billions)



Note: Data as of Jun 30, 2023. Form PF, question 47.

Sources: SEC Form PF, OFR

However, they also create potential instabilities by concentrating risk. Conditions of severe market stress can lead to large and sudden demands for margin payments from CCP members or clients that, if not paid in a timely fashion, can put a CCP at risk of default.

CCPs have a variety of resources in place to cope with such stresses. These resources provide successive lines of defense against potential defaults and are collectively known as a CCP's *default waterfall*, which stipulates the sequence of financial resources that a CCP can draw upon to cover the unsatisfied financial obligations of one or more defaulted clearing members.

The size and composition of default waterfalls differ significantly among the different CCPs that clear different types of financial instruments and are located in different geographical areas. **Figure 72** shows the composition of the prefunded portions of the waterfalls of CCPs in Europe, Asia, and North America, as well as among interest rate, currency, commodity, credit, and equity asset classes.

There is substantial variation among CCPs in the amount of capital, or "SITG," that is at risk in the default waterfalls. There are differences among regions in the composition of the waterfalls, but in all cases, SITG represents a very small proportion of the waterfall. This is particularly striking in the cases of Europe and North America as compared with Asia. There is also substantial variation depending on the financial instruments that are cleared. Commodities clearing has a higher proportion of SITG in the waterfall when compared with interest rate, currency, credit, and equity clearing.

The differences in pre-funded resources among regions have remained stable over time (see **Figure 73**). However, Asia and Europe have seen a noticeable trend toward

lower proportions in the default fund relative to the initial margin.

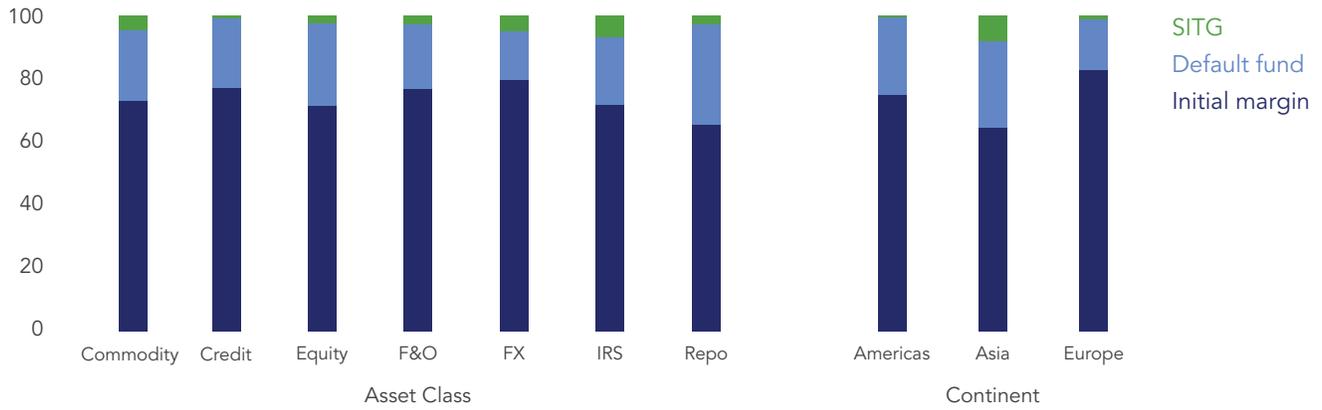
Differences in the sizes and compositions of CCP waterfalls should have an impact on potential CCP default probabilities. There is no way to measure these probabilities empirically because CCP failures rarely occur. However, confidential survey data collected by the Federal Reserve provide quarterly estimates of CCP default probabilities as calculated by CCP members. Because of the difficulty of validating these measures, the trends may be informative but should be interpreted with caution.

Broadly, large US banks report increasing risk perceptions of CCPs globally over the past two years but declining perceptions of risk in CCPs over the past six months. The recent reversal has offset much of the increased risk in the median CCP but not for the CCPs with the greatest perceived risk. These patterns are particularly pronounced in Asia and Europe. And they are true among the subset of CCPs operating in commodities markets.

The recent rise in the estimated CCP default probabilities may be in part a response to the near collapse of the LME in March 2022. Nickel prices more than quadrupled between March 7-8, 2022, resulting in margin calls that some members were unable to meet. Instead of following the waterfall protocol, the LME chose to cancel a number of trades and close the market for a week. The alternative would have been to declare several members in default, which would have required auctioning their (short) positions, thus exacerbating the upward price spiral and increasing margin calls on the other members.

The elevated default probabilities among commodity CCPs in recent months are likely to persist in the coming year. The onset of Rus-

Figure 72. CCP Prefunded Resources, 2Q 2023 (percent)



Sources: Clarus CCPView, OFR

Figure 73. CCP Prefunded Resources by Continent (percent)



Sources: Clarus CCPView, OFR

sia's war against Ukraine contracted the global nickel supply and put stress on the LME. This conflict does not appear to have an imminent resolution. Moreover, persistent supply chain stresses contribute to commodity price risk globally.

The LME incident highlighted several risk factors that apply to CCPs more generally. One factor is that members can split their positions across multiple CCPs and maintain uncleared OTC contracts, which limits the ability of any CCP to assess the concentration risk posed by its members. A second factor is that CCP members often have cross-default agreements with other CCPs, which specify that a default at one of them triggers a default of all. These arrangements can contribute to systemic risk by exacerbating price moves when the positions of a defaulting member are liquidated.

Cybersecurity Risks in Financial Institutions

The financial services sector is one of the most interdependent and interconnected sectors in the economy. Cybersecurity threats have the potential to affect financial stability by disrupting the systems, networks, and critical infrastructure that financial institutions rely on to provide essential services to businesses and individuals. Financial institutions face cybersecurity threats from geopolitically motivated hacktivists and financially motivated OCGs, frequently exploiting known vulnerabilities in critical controls such as access management, software configuration, and technology asset management.¹⁴¹ *Ransomware attacks*, which extort organizations by restricting access to their critical data and systems, have become pervasive cyber risks. According to Splunk, a leading cybersecurity software provider, the percentage of businesses victimized by ran-

somware attacks has risen from 79% to 87% in 2023.¹⁴²

Financial institutions are attractive targets for ransomware because they house valuable customer data. Community banks face heightened vulnerability compared with larger financial institutions because of their limited information security resources and greater reliance on third-party service providers, which, in turn, are susceptible targets for ransomware attacks.¹⁴³ Financial institutions that migrate to cloud services for data processing and storage increase the number of entry points that, if not properly secured, could be used by an attacker to gain access to data and other systems.¹⁴⁴

Ransomware attacks have become easier and more cost-effective to execute, primarily due to the emergence of RaaS. This criminal business model involves individuals or groups specializing in specific aspects of compromising a victim's cybersecurity and selling or renting their services to other criminals. In many cases, accessing a victim's network costs less than one dollar.¹⁴⁵ Access costs are low due to the effectiveness of simple social-engineering tactics like email phishing, which has been further enhanced by generative AI in creating convincing lures. For attackers, the economics of ransomware increasingly resemble purchasing a lottery ticket.¹⁴⁶ While most attacks may fail, the sheer volume of attempts increases the chances that a few will succeed, often resulting in significant ransom payments worth hundreds of thousands of dollars. Paying the ransom does not always lead to a resolution of the threat. The attackers may use the victim's stolen data to discover additional security weaknesses that they can later exploit themselves or sell as initial access information to other criminals.¹⁴⁷

In 2023, the financial services industry experienced an average total cost of \$5.9 million per

data breach, which is 33% higher than the average cost per breach across all industries and second only to that of the healthcare industry. On the other hand, after adjusting for inflation, there has been a steady decline in the average cost of a data breach in the financial services industry since 2018.¹⁴⁸ This decline reflects, in part, a stronger focus on IT operations resilience within the financial sector and a greater awareness of the ransomware threat, especially after high-profile incidents in 2021, such as the Colonial Pipeline ransomware case. Increasingly, cybersecurity experts acknowledge that service disruptions are inevitable and that the speed and effectiveness with which institutions handle such incidents are crucial to damage control and overall defense. The attack on Ion Group earlier this year reminded financial institutions of the critical importance of system redundancy and resiliency (see **Box Topic: Ion Group Attack**).

There are encouraging signs of recent improvements in information security across industries, particularly in the use of AI in cybersecurity. Tools like automated anomaly detection have helped decrease the average global *dwell time*, which measures the number of days an attacker remains undetected on a network, to an all-time low of 16 days in 2022.¹⁴⁹ AI-driven patch management also assists defenders in prioritizing and deploying patches faster. According to a study by Verizon, 91% of identified vulnerabilities were fixed within one day of discovery in 2022, compared with only 54% in 2021.¹⁵⁰

AI also poses a challenge to cybersecurity. Financial applications that integrate AI may be exposed to attacks that exploit an AI's unanticipated behavior.¹⁵¹ Generative AI, in particular, has the potential to make malicious code easier to develop and more adaptive to cyber defenses.¹⁵² The rapidly improving ability of

some AIs to create highly convincing digital forgeries of a person's face and voice is a challenge to the identity verification protocols that secure systems against unauthorized access and prevent fraudulent transactions.

Cyber Insurance Industry

Cyber insurance plays an important role in cyber risk management for many types of institutions by providing coverage that helps offset financial losses incurred by the victim of a cyberattack and third parties also affected. Cyber insurance can help firms that have been attacked avoid financial distress, thereby mitigating systemic risk that could originate from a firm's insolvency or inability to make payments. Although cyber insurance does not eliminate cyber risks, it allows organizations to be better prepared for dealing with cyber risk's potential financial ramifications. Insurers face challenges in managing the aggregate amount of financial cyber risk that they assume from insureds and the direct risk of a cyberattack on their own systems.

Cyber insurance demand continues to grow as organizations' awareness and understanding of the numerous cyber-related risks they face increase daily. However, cyber insurance is also becoming more expensive and harder to obtain. Commercial cyber insurance is generally sold as standalone policies, and insurers generally offer their own unique policy forms. For those seeking to purchase cyber insurance, making comparisons among different insurers' policies can be challenging.

The strong growth in the size of the cyber insurance market is a result of both the increasing number of policies written and the higher cost of such policies. Until recently, cyber policy premiums had been growing at double-digit and triple-digit rates, depending

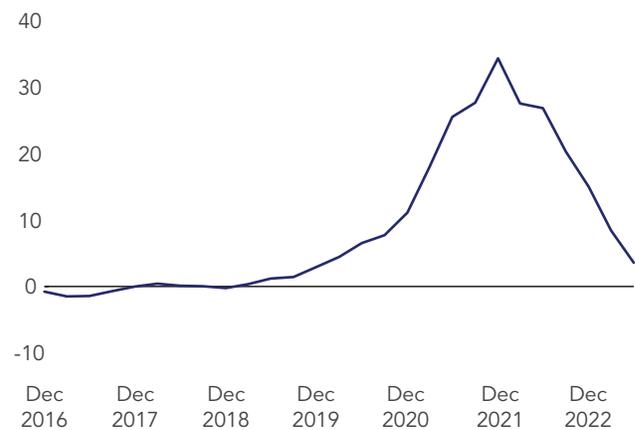
upon the risk-and-loss profile of the insured (see **Figures 74** and **75**). Growth in the cyber insurance market has been partially limited by insurers controlling their exposures through techniques such as higher deductibles, co-insurance, and lower policy limits, which also encourage enhanced risk management by the insureds. Insurers typically evaluate applicants' cybersecurity defenses before agreeing to write a policy and determining the terms under which the coverage will be offered. Displaying good cyber hygiene, such as promptly patching software and not having open external ports, is an important factor that insurers review before offering coverage.

The cyber insurance market has recently become a bit more buyer-friendly as new insurers join the market and buyers improve their cybersecurity defenses.¹⁵³

The cyber insurance industry's biggest concern is attacks made by actors affiliated with a nation-state that could inflict widespread damage.¹⁵⁴ In an effort to manage such risk, Lloyd's of London requires that any cyber insurance coverages written through its platform limit coverage of state-sponsored cyberattacks that result in a significant impairment to the target state.

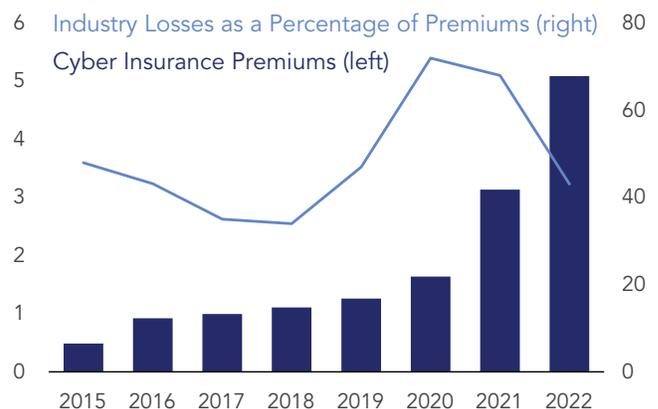
Insurers manage their assumed risk through a variety of methods that are continuously developing. As risks evolve and grow, insurers are becoming increasingly careful in managing the gross amount of the cyber risk exposure they assume and the details of that exposure. Reinsurance is a major risk management tool. A leading reinsurance broker reports that about half of its clients' direct cyber insurance has been reinsured, but cyber reinsurance availability remains limited, particularly at the high end of cyber limits.¹⁵⁵ Capital markets solutions have begun to provide reinsurance

Figure 74. Quarterly Cyber Insurance Premium Changes (percent)



Sources: Council of Insurance Agents and Brokers, OFR

Figure 75. Insurers' Cyber Insurance Results (\$ billions, percent)



Note: The loss ratio is based on the direct losses insurers incur, as well as their defense and cost containment expenses, divided by the premiums collected from clients. Loss ratio for standalone cyber only.

Sources: Fitch Ratings, OFR

coverage through specialized capital markets–funded products, such as various ILS, but these solutions are still nascent.¹⁵⁶

Finally, insurers are exposed to their own direct cyber risks. Insurers’ risks are enhanced because they serve as collection agents and evaluators of their clients’ cyber risks, making them attractive targets of breach-and-espionage attacks due to the information insurers maintain on their systems.

Cyber Policy Update

U.S. agencies have continued to strengthen cybersecurity practices within the financial system. In July 2023, the SEC adopted a final rule¹⁵⁷ to strengthen cybersecurity that the agency first proposed in March 2022.¹⁵⁸ The rule requires all public companies to disclose a material cyber incident in their 8-K filings, generally within four business days of determining an incident was material.¹⁵⁹ The required disclosure may be delayed if the U.S. Attorney General determines that the public release of such information may pose a national security risk.

In June 2023, the comment period closed on another proposed SEC rule that would strengthen cybersecurity practices for participants in securities markets—specifically, broker-dealers, the MSRB, clearing agencies, major security-based swap participants, national securities associations, national securities exchanges, security-based swap data repositories, security-based swap dealers, and transfer agents.¹⁶⁰ This rule would require the covered entities to “immediately” report cyber incidents to the agency and provide documentation of sound cyber hygiene.

To address ongoing and evolving technology issues, the CFTC reestablished its Technical

Advisory Committee in March 2023 and held an inaugural meeting following a two-year hiatus.¹⁶¹ The Committee is composed of external experts, and part of its mission is to provide insights that will help protect markets from increasingly sophisticated cyberattacks. The Treasury issued multiple sanctions against entities involved in cybercrime,¹⁶² including a joint action with the UK government against individuals involved in deploying Trickbot malware.¹⁶³ Finally, the Treasury has continued to conduct joint cyber exercises with partner foreign governments.¹⁶⁴

Box Topic: Ion Group Attack

On January 31, 2023, Ion Group, a UK-based financial software company, was forced to temporarily shut down its services due to a ransomware attack. The service outage affected banks and brokers in the United States and Europe, with 11 firms reportedly experiencing significant disruption as users of Ion’s XTP Cleared Derivatives (XTP) platform.¹⁶⁵ The platform provided end-to-end management of clients’ exchange-traded derivatives trading, including order management, execution, processing, and risk management analytics. While the attack did not rise to the level of having a systemic impact on U.S. financial stability, it underscored the importance of financial institutions prioritizing operational resiliency and monitoring the cyber risk associated with their reliance on third-party service providers.

LockBit, a RaaS group operating from Russia, claimed responsibility for the attack on Ion and demanded ransom payment within two days. On February 5, Ion initiated re-onboarding clients by restoring their data from backups captured several days before the attack. However, for XTP users, this process proved to be more time-consuming because all trades executed after the backup point and all trades

executed manually during the outage period had to be reentered, validated, and synchronized with clearinghouse data. This additional effort resulted in delays that prevented firms from accurately assessing some of their positions, causing the CFTC to postpone its weekly Commitments of Traders Report by three weeks.¹⁶⁶

The cyberattack on Ion reminds financial institutions that operational resiliency requires avoiding overreliance on a single provider without ready alternatives. It is highly likely that similar outages from other service providers will occur in the future. Therefore, financial institutions must make certain that their backup and disaster recovery plans not only focus on individual recovery time but also consider the recovery times of key counterparties and central services. This comprehensive approach will make businesses more likely to resume normal operations after their recovery.

PART TWO:

STATUS OF THE OFFICE OF FINANCIAL RESEARCH



Engaging and Serving Our Principal Stakeholder: The Financial Stability Oversight Council

The OFR (Office) engages and serves the Council and its member agencies by providing research and analysis to help identify threats to financial stability, fulfilling Council requests for research and analysis, and working with Council member agencies on research and data projects.

Key OFR Initiatives

By working closely with the Council, Treasury, and the Financial Research Advisory Committee (advisory committee), the OFR collaboratively identifies important issues that the Office needs to address. During FY 2023, the OFR launched several strategic initiatives that manifested in a variety of outputs, real-time monitors, research papers and briefs, Council support, data initiatives, and promotion of research around financial stability. These initiatives also addressed subject areas that are sources or targets of financial stability risk or that inform financial stability analysis.

These initiatives focused on the following:

- **U.S. Repo Market.** The OFR focused on improving transparency in the U.S. repo market, which is an integral component of the U.S. financial system that provides trillions of dollars of funding every day and facilitates trading in U.S. Treasuries and other securities. As a result, OFR researchers published two papers on the repo market.

The OFR also worked toward establishing an ongoing daily collection of data. While the OFR's cleared repo collection, which began in 2019, provides some visibility into this short-term funding market, the vast majority of these repos are being issued in the NCCBR market, where no regulator currently collects data.

In January 2023, the OFR issued a NPRM that proposed the Office fill this data gap and provide more insight into Treasury market functioning. The Office hopes this collection will help regulators and policy-makers prevent similar market disruptions by filling a gap in the data on how risks are building up in the financial system in real time.

- **JADE.** Officially launched in July 2023, JADE is the OFR-hosted platform designed for Council member agencies to analyze financial stability risks jointly. JADE will enable collaborative, interdisciplinary research on financial stability by providing Council member agencies with access to analysis-ready data, analytical software, and high-performance computing in a secure, cloud-based environment. While the OFR designed JADE to support research on a variety of financial stability topics, climate-related financial risk was the first initiative the Council identified for JADE.
- **Council Annual Report.** The OFR continued to assist the Council Secretariat by providing data, analysis, and other resources requested by the Council while preparing its annual report to Congress.

Financial Research Advisory Committee

The advisory committee provided advice to the OFR, bringing diverse perspectives from

the financial services industry and academia to inform the OFR's research and data agendas. We provided support for the advisory committee's biannual meetings, which covered the following in the past year:

- November 8, 2022: this virtual meeting included discussions of digital assets, decentralized finance, and inflation.
- May 23, 2023: this hybrid meeting included discussions of financial stability monitors, risk in the banking sector, and risk from nonbank financial institutions.

Financial Stability Conferences

The OFR recognizes the importance of exchanging ideas that inform processes for data collection, enhancing existing research, and promoting future collaborative research. To that end, the Office sponsors and hosts conferences, workshops, meetings, and seminars with external financial researchers and economists. OFR-hosted conferences included:

- **Annual OFR PhD Symposium.** The OFR hosts an annual conference for upper-year PhD candidates to present their research on financial stability and have their work reviewed and discussed by senior economists from the OFR and other federal agencies. The symposium took place on November 3, 2022.
- **Annual Financial Stability Conference.** The OFR and the Federal Reserve Bank of Cleveland co-host an annual conference focusing on topics such as changes in fiscal and monetary policy, innovations in technology and trade, and the projected economic impacts of these developments. The conference took place on November 16 and 17, 2022.

- **Inaugural Rising Scholars Conference.** For the first time, the OFR hosted an in-person conference in which a diverse group of individuals who received their PhD within the previous six years met experts in their field and received professional feedback on their work. Presentations covered a range of cutting-edge topics, from fintech and stablecoins to shadow banking and bank deposits, with a specific focus on how these issues could threaten financial stability. The conference took place on May 5, 2023.

In addition, OFR researchers presented their research at various external conferences, including:

- December 2022: Inaugural MIT Climate and Real Estate Initiative Symposium
- December 2022: Third Annual Boca Corporate Finance and Governance Conference
- December 2022: Public Sector Network's Government Innovation Conference
- December 2022: Financial Accounting and Reporting Section Midyear Meeting
- January 2023: American Economic Association Annual Meeting
- March 2023: Yale Jackson School of Global Affairs Conference—Financial Stability: Hidden Dangers and Future Directions
- March 2023: Southwest Finance Association Annual Meeting
- April 2023: University of Illinois Urbana-Champaign Research Workshop
- May 2023: The Hoyt Institute Conference on Climate Change
- June 2023: International Association of Deposit Insurers' Biennial Research Conference

- June 2023: Western Finance Association Annual Conference
- June 2023: International Association for Applied Economics Annual Conference
- September 2023: Washington Areas Network Economics Symposium at George Washington University

Publications by OFR Researchers

To promote transparency and engagement, the OFR prioritizes making most of the research available to the public. The OFR implemented several strategies to make research more accessible to a broader audience. We write the *OFR Blog* in plain language to facilitate an increase in the readership of our OFR working papers and redesigned our *Working Paper Series* cover sheets to summarize the authors' key findings and the relevance of the findings in plain language. Further, in August 2023, we expanded our social media presence by launching an official LinkedIn account, which the Office uses to update our followers about our research. We also used online services and tools that make it easier for the public to subscribe to our publications. Through these efforts, we distributed more updates on research and data initiatives to individuals who elected to receive news from the OFR than in previous years.

In addition to publishing our statutorily mandated Annual Report, OFR researchers published the following working papers and briefs—as well as the new *OFR Blog* series, which complements the working papers. All publications are available on the OFR website at www.financialresearch.gov:

- **OFR Working Papers¹⁶⁷**
 - “Digital Currency and Banking-Sector Stability,” March 22, 2023.
 - “Fragility of Safe Assets,” April 3, 2023.
 - “Can Supply Shocks be Inflationary with a Flat Phillips Curve?” April 20, 2023.
 - “Anatomy of the Repo Rate Spikes in September 2019,” April 25, 2023.
 - “Sustainability with Risky Growth,” May 16, 2023.
 - “Technology Shocks and Predictable Minsky Cycles,” June 12, 2023.
 - “The Transition to Alternative Reference Rates in the OFR Financial Stress Index,” June 27, 2023.
- **OFR Briefs¹⁶⁸**
 - “Why Is So Much Repo Not Centrally Cleared?” May 12, 2023.
 - “An Early Look into Digital-Assets Regulatory Data,” May 30, 2023.
 - “Work-from-Home and the Future Consolidation of the U.S. Commercial Real Estate Office Sector: The Decline of Regional Malls May Provide Insight,” August 24, 2023.
- **The OFR Blog¹⁶⁹**
 - “OFR’s Pilot Provides Unique Window Into the Non-centrally Cleared Bilateral Repo Market,” December 5, 2022.
 - “Hedge Fund Activities Can Influence the U.S. Treasury Yield Curve,” December 27, 2022.
 - “Risk Spotlight: OFR Identifies Three Ways DeFi Growth Could Threaten Financial Stability,” February 7, 2023.

- o “Risk Spotlight: Central Counterparties—Lessons Learned from LME’s Nickel Market Closure,” February 13, 2023.
- o “OFR Announces Events for New and Aspiring PhD Scholars,” February 28, 2023.
- o “Five Risk Areas that Financial Regulators Should Watch in 2023,” March 7, 2023.
- o “Risk Spotlight: Risk from the Real Estate Market is Limited, but Changes in Occupancy and Prices May Increase the Risk,” March 23, 2023.
- o “Five Office Sector Metrics to Watch,” June 1, 2023.
- o “Twelve Years of Promoting Financial Stability,” August 31, 2023.

Advancing Financial Stability Research

The OFR advances financial risk research in a wide range of areas critical to financial stability. We research and analyze data from across the entire financial system to identify vulnerabilities and underlying weaknesses. We also report on these risks to the Council on an ongoing basis, while leveraging collaborative partnerships to expand the scope of research.

Digital Assets

Digital assets have quickly come into focus as posing a potential risk to financial stability in the United States and abroad. The OFR is monitoring risks to provide insights that cut across segments of the financial system. Pursuant to the President’s [Executive Order on Ensuring Responsible Development of Digital Assets](#), the OFR participated in the Council’s

Interagency Digital Asset Working Group. We are exploring opportunities to learn about the new and unfamiliar business models that have arisen in the burgeoning digital assets market.

Cybersecurity Risks

Cyberattacks present an increasing threat to the global financial system. The OFR seeks to understand the relationship between cybersecurity and financial stability. The OFR acquired commercial cybersecurity assessment datasets and tools that provide insights into technological infrastructure and third-party vendor relationships of systemically important financial firms. We seek to understand how operational dependencies between institutions affect the likelihood that a cyber incident will produce cascading impacts and systemic financial risk.

Wholesale Funding and Liquidity Management

Wholesale funding includes several financing vehicles—such as interbank lending, repurchase agreements (repo), and debt securities issued for money market mutual funds—that banks and nonbanks use to expand their balance sheet. Our wholesale funding research focus expanded in 2023 to analyze the 2022 pilot repo data collection and issue an NPRM for the collection of data on NCCBR agreements.

The Office’s proposed rulemaking on NCCBR supplements a collection of cleared repo data and separate access to data on triparty repo agreements through the Federal Reserve. The proposed rulemaking would afford the OFR insight into all the major venues for wholesale funding in the United States. With this complete perspective in hand, we would be able to research topics such as financial intermediation, the financing of leverage, and the risks

associated with collateral and fire-sale effects, among other issues.

With access to collections and data acquisitions from other financial regulatory agencies, we seek to understand how financial institutions effectively manage liquidity needs and requirements.

Money Market Funds

The OFR's MMF Monitor provides critical insights into concentration and liquidity risk in short-term funding markets. Stresses on MMFs in March 2020 revealed continued structural vulnerabilities, which led to increased redemptions and stress in short-term funding markets. The FSB, working with IOSCO, is currently taking stock of the MMF policy measures adopted by FSB member jurisdictions and will issue a report by the end of 2023. The Office is undertaking a preliminary exploration of how to improve our current public monitoring.

Central Counterparties

Since the 2007-09 financial crisis, financial firms have been incentivized to clear their trades through CCPs, which have grown into key players in the global financial system. It is, therefore, crucial to assess the ability of CCPs to withstand severe market stress, which could lead to large and sudden demands for margin payments that are beyond CCPs' ability to make and could force CCPs to default. The OFR developed a new framework for assessing the adequacy of CCPs' risk management strategies and their ability to meet their obligations in conditions of severe financial stress. This is expected to provide valuable new information that is not currently available from other agencies and that will help Council member agencies understand the potential risks posed by CCPs, both in the United States and abroad.

Climate-related Financial Risks

Pursuant to the President's [Executive Order on Climate-Related Financial Risk](#), the OFR played a central role in developing the Climate-related Financial Risk: 2023 Staff Progress Report to the President in collaboration with other Council agencies. We also canvassed public and private data to provide Council member agencies with a comprehensive understanding of what data are and are not available, what perils exist, and how firms look at these data.

National Bureau of Economic Research Partnership

Catalyzed research partnership programs are an effective way to develop high-impact research-and-analysis products in frontier research areas. Due to data or expertise limitations, these partnerships are appropriate when other mechanisms for financial stability research sponsorship might not produce the same outcome with the same certainty or efficiency. The NBER—a nonprofit research organization committed to undertaking and disseminating unbiased economic research among public policymakers, business professionals, and the academic community—provides the OFR with such data, research skills, and expertise.

By partnering with the NBER through the catalyzed partnership with the NSF, the Office is looking to gain insight from the specialized research community that is actively involved in cutting-edge investigation and analysis of major economic issues, including those related to financial stability. This partnership allows our research staff to maintain focus on performing research in their areas of expertise and gain-

ing insights that will help them accomplish their mission of supporting the Council.

Intergovernmental Personnel Act Program

The IPA Mobility Program temporarily assigns personnel between the federal government and state and local governments, colleges and universities, Indian tribal governments, federally funded research and development centers, and other eligible organizations. The IPA program allows the Office to incorporate expertise from sources like the academic sector and Federal Reserve Banks to access individuals with relevant expertise.

Enhancing Our Monitors

The OFR continues to develop and enhance our tools for risk measurement and monitoring.

Short-term Funding Monitor

Short-term funding markets constitute the core of liquidity and maturity transformation in financial markets. They provide financing for financial institutions, serve as alternatives to deposits for cash investors, and can be used to obtain securities. However, these critical markets are vulnerable to disruptions as an unavoidable result of how they function. Problems facing financial institutions and other parts of the financial system often appear as stresses in short-term funding markets. As part of the OFR's mission to promote and monitor financial stability, we collect various data on these markets. The STFM presents and places these data in context with other data sources.

Financial Stress Index

The OFR FSI is a daily, market-based snapshot of stress in global financial markets. It distills information from multiple indicator categories and regions, offering insight into the drivers of financial stress. It helps the OFR monitor, compare, and understand financial-stress events. The OFR FSI offers improvements on other FSIs, including its decomposition into indicator categories and regions and its dynamic construction that allows for changes in variable composition and cross-asset relationships. Finally, empirical results suggest that the OFR FSI successfully identifies financial-stress events and helps predict changes in overall economic activity.

The OFR updated the FSI to prepare for the transition from the USD LIBOR to the SOFR. We constructed the new version of this monitor to seamlessly transition from the old LIBOR-based rates to the new robust SOFR reference rates, allowing for meaningful comparisons of financial-stress levels across time, including both before and after the LIBOR transition. This update reflects the successful adaptation of the OFR FSI to align with the changing landscape of reference rates, enhancing its ability to capture and reflect market stress levels.

Bank Systemic Risk Monitor

The OFR BSRM is a collection of key measures for monitoring systemic risks posed by the largest banks. The monitor consists of five different tabs that allow users to view Basel Committee on G-SIB Scores, U.S. G-SIB Surcharges, the OFR Contagion Index, the Leverage/Assets/Equity of the largest banks, and Short-Term Wholesale Funding in interactive, visual charts. The current version of the BSRM enhances and expands upon the [OFR G-SIB](#)

[Scores Interactive Chart](#). The Office began upgrading the data sourcing process to improve efficiency and resiliency of the product's data pipeline from unforeseen data types, structure, and format changes.

Improving Our Data Infrastructure

The OFR develops and implements techniques to ingest, clean, and aggregate data and then make it available to the OFR, the Council, and Council member agencies for analysis and research—thus creating what we call analysis-ready data.

In-house Data Collection

Following the successful completion of the NCCBR pilot, the OFR recognized the need for a solution supporting rapid data collection, surveys, and pilots. The DCU is designed to fulfill this need and will be operational by the end of Q2 2024. The DCU is expected to enable the OFR to collect data directly from external entities under OFR rules, voluntary data pilots, surveys, and other circumstances.

The requirements of the DCU are straightforward: to securely receive and store files and data from external entities. Additionally, the DCU verifies and authenticates submitters' credentials. Upon receipt of the files, the DCU sends a notification of acceptance or rejection of the submissions.

The technological needs of the DCU were defined in late 2022. The DCU infrastructure was set up with technologies already available to the OFR. Using existing technologies not only accelerates the DCU implementation but also facilitates the DCU's integration into the OFR technological landscape.

In 2023, the Office completed the initial build and testing of the file-level DCU criteria implementation. The DCU will go through a security assessment executed by the OFR's Information Security team, and after that, it is expected to go into production in early 2024. The DCU is a critical component of our data collection capabilities, and we may use it for the NCCBR collection.

Interagency Data Inventory

Updated annually, the IDI is a catalog of the data collected by federal financial regulators and may help Council member agencies identify data gaps and avoid duplication in designing new data collections. The inventory does not contain data but rather metadata on each collection. Each item in the inventory contains a brief description of the data collection and basic information on it, such as the collecting organization, the name and number of the form used to collect the data, and the type of collection (e.g., financial or supervisory). While these metadata are publicly available, they are sometimes difficult to find. The inventory allows users to easily search for what data collections exist to improve their research. Each Council member agency determines which of its data collections to include in the inventory.

The OFR updated the IDI with new inputs and edits from Council member agencies. Our updates include reformatting the IDI, condensing the data type columns from seven to one, including a new field to indicate whether a given dataset uses the LEI, and implementing drop-down selectors for several columns to make the information easier to find.

The IDI is being evaluated for improvements designed to convert it from a downloaded file into an interactive digital experience that could also improve the process of collecting inputs from Council member agencies.

Increasing Access to Data and the OFR's Data-sharing Capability

JADE

The OFR's JADE initiative will provide Council member agency researchers with shared access to high-performance computing, statistical software, data, and analytical support services in a secure, cloud-based environment for approved financial stability research. Phase 1 was released in July 2023, after conducting 14 weeks of rigorous user acceptance testing with seven Council member agencies to confirm the platform's capabilities. Onboarding of Council member agency researchers has begun, with plans to provide access to additional agencies in FY 2024.

Obtaining data for financial stability research can be a challenging and lengthy process due to three main dependencies: (1) data acquisitions, (2) extract, transform, and load operations, and (3) data curation and access. By centralizing these efforts for JADE for approved Council-sponsored projects, Council member agencies will be able to benefit from economies of scale, thereby reducing the cost, time, and effort involved in getting access to data, tools, and computing power for financial stability research.

Based on the President's [May 2021 executive order](#), JADE's initial focus is on supporting research into climate-related financial risk. Going forward, JADE will incorporate other data types to support interdisciplinary financial stability research based on Council priorities.

Enhancing Data Standards

U.S. and International Leadership in Financial Data Standards

The OFR continued to fulfill our mission to promote financial stability by delivering high-quality financial data standards to support the Council. We participated in U.S. and international standards development initiatives to promote and advocate for adopting financial data standards. Specific examples include the following:

- **LEI.** The OFR continued to lead and promote the adoption and expanded use of the LEI, an international data standard (ISO 17442) to identify legal entities in a financial transaction. As Treasury's representative to the ROC, we contributed to the decision-making of the ROC's Plenary and Executive Committee and as Chair of the Level 2 Working Group. Level 2 data are about an entity's direct and ultimate accounting consolidating parent. Additionally, as a member of the ROC's Data Quality Working Group, the OFR contributed to improving the quality of LEI data. This was accomplished via a survey of LEI issuers to identify key areas for analysis. Also, as of September 2023, more than 2.3 million LEIs have been issued worldwide, with approximately 12% having been issued to U.S. entities. The total number of LEIs issued represents a year-to-date increase of 8%, which follows a 12% increase in 2022.
- **ROC Secretariat.** The OFR continued in our role as Secretariat for the ROC by providing administrative and operational

support. During this time, we assisted in planning, tracking, and reporting on the work of the ROC's Plenary Committee, Executive Committee, and subcommittees. This included providing an OFR-hosted digital collaboration workspace.

International Organization for Standardization

The OFR continued contributing and providing leadership to ISO Technical Committee 68 Financial Services (TC 68). Specific examples of our work with the committee include the following:

- **WG 11 – ISO 17442 LEI Part 3.** The OFR contributed subject matter expertise to the group that is developing Part 3 of the ISO 17442 LEI standard. Part 3 will specify using *verifiable LEIs*, which are digital credentials that provide remote verification of legal entities owning LEIs.
- **WG 1 – ISO 20022 Semantic Models and WG4 – Revision of ISO 20022.** The OFR contributed subject matter expertise to the group that is working to advance the ISO 20022 standard, which is a common platform for developing messages for financial services. As a proof-of-concept, we provided a semantic model in OWL.
- **TG 1 – Communications.** The OFR continued to serve as Convenor of the Communications Group, responsible for sharing news and articles relevant to the work of TC 68. This information is shared via the group's newsletter and published on TC 68's website. This past year, TC 68 hosted four webinars introducing TC 68 members to the Ukrainian financial community.
- **AG 5 – Digital Currencies.** The OFR actively participated in the advisory group leading a TC 68-wide project on digital currencies. The group evaluates ISO standards to determine their fitness for digital currency processes. The OFR provided project management support and contributed to developing project documents and digital currency analysis. We proposed the formation of a joint working group to develop a standard vocabulary and taxonomy for digital currencies.

- **SLG – Strategic Leadership Group.** The OFR contributed to information sharing, planning, and decision-making in the Strategic Leadership Group. We also contributed to drafting resolutions for TC 68's plenary and status reports.
- **Liaison to TC 307 Blockchain and Distributed Ledger Technologies.** In 2023, the OFR was appointed as the ANSI (U.S.) Liaison representative between ISO TC 68 Financial Services and TC 307 Blockchain/Distributed Ledger Technologies. In this leadership role, we helped launch a working group to standardize the vocabulary and taxonomy for blockchain and Distributed Ledger Technologies in financial services. This will help create a common understanding of the terms and definitions and will enable greater interoperability and comparability for these data.

Accredited Standards Committee X9, Inc.

ASC X9 is accredited by the ANSI to develop and maintain voluntary consensus standards for the U.S. financial services industry and is the U.S. voting body to TC 68. The OFR continued to contribute to ASC X9 initiatives; specific examples include the following:

- **Board of Directors and Executive Committee.** The OFR continued to provide twice-yearly subcommittee reports to the

Board, as well as status reports on specific work in monthly Executive Committee meetings.

- **X9A Electronic and Emerging Payments Subcommittee.** The OFR was reelected to serve another term as Vice Chair of this subcommittee and lead regular reviews and reaffirmation of standards in our purview. Specific standards include electronic benefits transfers, financial transaction card message interchanges, and retail merchant codes. As part of this work, we led multiple subcommittees in a response for comment on the development of digital assets and CBDC from the NITRD program's fast-track action committee.
- **X9A1 Distributed Ledger Terminology Work Group.** The OFR continued to chair the subgroup and led the launch of a technical report ("Risk Assessment Framework for Bank Provided Crypto-Asset Custodial Accounts"). In parallel, the group launched a maintenance review of the X9.138-2020 Distributed Ledger Terminology standard. These standards will fill known gaps in emerging Distributed Ledger Terminologies and operational and technical risk assessments.
- **X9D Securities Subcommittee.** The OFR continued to chair this subcommittee and contribute as U.S. representatives to multiple ISO working groups and analyses.
- **ISO 24366 NPI Mirror Group.** The OFR continued to chair the X9D mirror group to SC 8/WG 7 NPI. In this role, we obtained the input of U.S. experts on the draft ISO Technical Report as the basis to develop Part 2 of the NPI standard.
- **Industry Forum for Financial Terms Harmonization.** The OFR continued to chair this forum, where members advanced their analysis of terms and definitions for

financial instruments to provide input for future releases of the FIRD. Separately, we launched a collaboration site for members to provide document comments and input to guide the future release of the FIRD.

Other Data Standards Initiatives

Under the auspices of the NITRD program, the OFR and other U.S. agencies partnered with the White House Office of Science and Technology Policy and the NSF to develop the National Standards Strategy for Critical and Emerging Technologies, which was released in May 2023. We also provided standards expertise to the National Objectives for Digital Assets Research and Development group and continued serving as subject matter experts in Treasury's Central Bank Digital Currency Working Group.

The Financial Data Transparency Act was signed into law by President Biden on December 23, 2022, as part of the National Defense Authorization Act and requires a joint rulemaking by the agencies listed in the Act. The result of the rulemaking will be standards for data collected by financial regulators and data collected on behalf of the Council, including a non-proprietary LEI available under an open license and machine-readable data. In 2023, OFR and the SEC co-led informal meetings with Council members from the eight covered agencies (Treasury, SEC, Federal Reserve, FDIC, CFPB, FHFA, OCC, and NCUA), to initiate analysis of the Act to meet the proposed rulemaking deadline of June 2024.

Enhancing the Financial Instrument Reference Database

Financial Instrument Reference Database

Data describing financial instruments are often complex, incomplete, and incompatible with each other. These weaknesses may impede companies and investors in managing their risk. The OFR developed the FIRD to address these issues.

The first phase of the FIRD established a set of granular data elements that are the basis for describing financial instruments. This foundational component is a data dictionary that leverages the ISO 20022 international standard for the development of financial messages, data elements of the FIX Protocol, and the data dictionary provided by the ACTUS Financial Research Foundation. Future phases of the multiyear rollout of the FIRD will build on this foundation. The FIRD provides the terms and definitions for five asset classes: Equity, Debt, Option, Warrant, and Future. Within the ACTUS Algorithmic Financial Contract Standard, the ACTUS Data Dictionary and the ACTUS Algorithms represent financial instruments by their contractual cash flow obligations. In FY 2023, we completed the integration of the ACTUS standard.

Improving Decision Making

The OFR is committed to evidence-based decision-making. The Office fosters a culture of

results, accountability, and high performance, using data to inform decision-making.

Integrated Planning and Enterprise Risk Management

The OFR's Integrated Planning program pulls together conversations about strategy, tactical planning, resources, organizational performance, and enterprise risk so that we can efficiently and effectively map the work needed to advance our mission. This enables transparent alignment of strategic priorities, the initiatives that advance those priorities, and the resources required to achieve them. During FY 2023, we sustained our focus on Integrated Planning by:

- continuing to use our Integrated Planning and Enterprise Risk Management approach to engage OFR leadership and staff on enterprise strategy and risk, tactical planning, resource management, and organizational performance management;
- leveraging executive and leadership planning retreats and quarterly enterprise strategy and risk discussions to identify strategic opportunities and risks, develop short and long-term plans, and use performance and other information to make data-driven decisions;
- mapping out the work needed to advance the OFR's mission and the resources to do so effectively, efficiently, and sustainably;
- piloting quarterly risk-focused discussions with staff-level subject matter experts to identify emerging issues and opportunities;
- piloting quarterly division-level leadership consultations on organizational performance, thus creating more opportunities to pivot and make trade-off choices in real time; and

- refining leadership data visualizations in support of evidence-based decision-making.

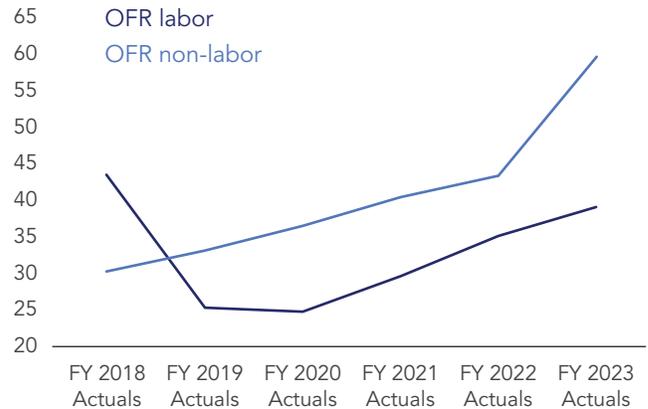
Investments

The OFR’s annual budget and workforce plan cascade from the OFR’s Integrated Planning activities. Pursuant to the Dodd-Frank Act, the OFR Director consults with the Council Chairperson to establish the OFR annual budget and workforce plan. The Office is funded through semiannual Financial Research Fund assessments.

For FY 2023, the OFR obligated \$98.9 million, 39% for labor and 61% for nonlabor expenses. This funding directly supported our strategic priorities and represents a 29% budget increase from FY 2022 to meet the priorities of the Council, Treasury, and the Administration. This increased funding enabled us to expand our in-house data collection capabilities and operationalize JADE, enabling collaborative, interdisciplinary research on financial stability by Council member agencies.

The OFR’s shared-services agreement with Treasury helps reduce or eliminate duplicative expenses in centralized services. The shared-services program cost \$8.9 million in FY 2023 for support services for the Office’s human capital (e.g., payroll, recruitment, benefits, agency-wide systems for training), finance (i.e., budget and acquisition), security processing, and travel programs. Support services also came from Treasury’s information technology shared services, Security Operations Center, and Continuous Diagnostics and Monitoring. These expenses reduce the need for duplicative functions and allow us to focus the efforts of our workforce on areas closest to our mission.

Figure 76. OFR Funds Obligated in FYs 2018-23 (\$ millions)



Source: OFR

Understanding Workforce Needs

The OFR continues to make significant progress on our *Workforce Plan 2020–2024* by addressing recruitment and workforce development and training gaps.

Recruitment

Recruitment remains a top priority for the OFR. In FY 2023, the Office grew our team by 12% and thus reduced gaps in subject matter expertise. We filled multiple critical leadership positions in the OFR's procurement and information technology programs. We also added considerable expertise and bench strength to its RAC, IT, and Operations teams.

OFR management is dedicated to developing and retaining a diversified workforce that exhibits increased morale, heightened creativity, and innovation. To support our diversification efforts, we continue to share job opportunity announcements broadly—including through our DEIA partners—and enlist advertising space from trade journals and social science communities to expand awareness of employment opportunities with the OFR. In addition, the Office has encouraged flexibility in work locations, broadening the applicant pool nationally to attract the best talent.

Staff Realignment

The OFR continues to transform our organization in support of the mission by deliberately realigning positions with mission priorities to help ensure appropriate resourcing. OFR leadership realigned positions within RAC, IT, and the Operations Division based on known and emerging strategic priorities for mission-driven research and analysis work sup-

porting our financial stability mandate. These changes allowed the Office to meet increased demand for OFR-sponsored data, research, and other services for the Council. The changes also help ensure we have the critical bench strength, organizational design, and expertise to carry out mission-essential functions.

Learning and Development

The OFR is committed to fostering a learning culture and growth mindset that aligns with our workforce strategy and supports our employees' learning and development needs. We continued to improve our comprehensive learning and development program via an OFR-specific learning and development needs assessment. This assessment targeted areas specific to the Office's unique mission and the technical needs of its staff. OFR management believes that strong investment in employee learning and development addresses potential skill gaps effectively and is a critical tool for recruiting and retaining world-class talent.

In addition to program development, we invested in several enterprise-wide learning opportunities, including but not limited to change management practitioner certification, agile mindset, and data analytics training. The Office also supported organizational memberships, such as with the NCMA, that connect the OFR team with leading practices in their respective disciplines.

Employee Engagement

OFR management strongly encouraged employee participation in the annual FEVS, and the Treasury's Inclusion Survey. OFR management reviewed the surveys to monitor progress toward improving the Office's organizational climate, fostering employee engagement, and maintaining a culture of

accountability and professionalism at every level of the organization. While the Office celebrates continued improvements, the OFR's leadership remains committed to focusing on organizational excellence in recruitment, retention, and employee development as one of our methodologies for enhancing employee engagement.

We partnered with the Treasury to continue enhancing our employee engagement and meet the President's Management Agenda, specifically by measuring metrics that aid in reducing employee engagement gaps. This effort focused on:

- improving the approach to human capital management to better attract, recruit, retain, and promote a diverse workforce;
- enhancing executive performance management practices and standards;
- leveraging training and development;
- improving the organizational climate; and
- reviewing the results of the annual FEVS and Treasury Inclusion Survey.

Modernizing Technology

The OFR made significant technological advances by optimizing our cloud environments, enhancing services while also lowering costs, and deploying new cloud services in support of JADE and the DCU. Building on the Office's successful migration from legacy data centers to the cloud, along with employing high-performance computing capabilities in the cloud, we were able to adopt forward-thinking strategies and the latest technologies to develop a completely cloud-based environment for JADE. We built the security infrastructure for JADE's internal environment by using our previous experience with Zero Trust architec-

ture capabilities. In addition, we automated services in core areas and continued expanding our investment in cybersecurity services to help ensure the protection and availability of OFR data.

Zero Trust

We prioritized the implementation of Zero Trust cybersecurity capabilities to mitigate agency cyber risk and help ensure the protection of data. The OFR is working to advance the understanding of Zero Trust foundational principles and their capabilities to help ensure the adoption of the core elements of Zero Trust architecture across the Office. Our goals include:

- meeting the mandates of the [Executive Order on Cybersecurity, Office of Management and Budget Zero Trust](#) (M-22-09 and related), and CISA Zero Trust Maturity Model v2.0;
- migrating from the legacy on-premises TIC to a fully compliant CISA TIC 3.0 architecture;
- mitigating cyber-related risk to the OFR's IT, digital, and cloud data, assets, capabilities; and
- enabling growth and deployment of new cloud-based OFR services while maintaining a high level of user experience.

The OFR is committed to making consistent progress toward accelerating the maturity of deployed Zero Trust capabilities. We are taking positive steps toward meeting our overall goal of identifying, analyzing, and addressing cyber risks using Zero Trust use cases, reference architectures, and solutions architectures.

As the OFR looks forward to the next steps in its Zero Trust lifecycle, we expect to:

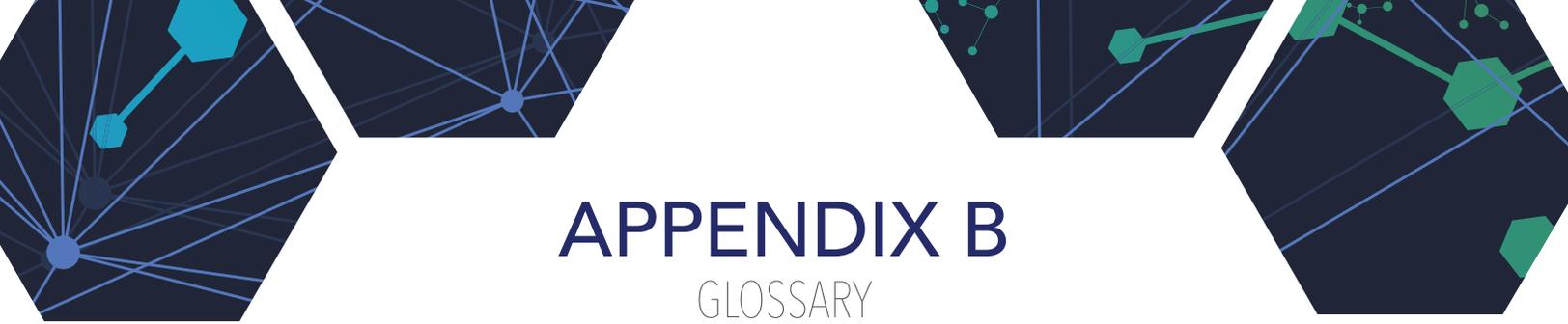
- continue uncovering and addressing complexities and dependencies within its fully cloud-based environment;
- use the knowledge, frameworks, and processes developed thus far to drive toward a more integrated Zero Trust architecture;
- provide a common experience for end-users and developers to take advantage of the opportunities identified in the solution architectures to continue to deploy Zero Trust risk mitigation capabilities; and
- incorporate lessons learned from the OFR environment and expand them to JADE.

APPENDIX A

ABBREVIATIONS AND ACRONYMS

ABS	Asset-Backed Securities	DIF	Deposit Insurance Fund
ACTUS	Algorithmic Contract Types Unified Standards	DVP	Delivery-versus-Payment
AI	Artificial Intelligence	EBITDA	Earnings Before Interest, Taxes, Depreciation, and Amortization
ANSI	American National Standards Institute	ECB	European Central Bank
AP	Exchange-Traded Fund	ECR	Expenditure coverage ratio
ATS	Alternative Trading System	EFFR	Effective Federal Funds Rate
ATSIX	Aruoba Term Structure of Inflation Expectations	EIP	Economic Impact Payments (aka “stimulus checks”)
AUM	Assets Under Management	ETF	Exchange-Traded Fund
BEA	Bureau of Economic Analysis	EU	European Union
Binance	Binance Holdings Ltd.	FDIC	Federal Deposit Insurance Corporation
BlockFi	BlockFi, Inc.	FDMA	Financial Data Multi-Agency
BLS	Bureau of Labor Statistics	FDTA	Financial Data Transparency Act
BNB	Binance Coin	FEMA	Federal Emergency Management Agency
BSRM	Bank Systemic Risk Monitor	FEVS	Federal Employee Viewpoint Survey
BTFP	Bank Term Funding Program	FFIEC	Federal Financial Institutions Examination Council
C&I	Commercial and Industrial	FHA	Federal Housing Authority
CBDC	Central Bank Digital Currency	FHFA	Federal Housing Finance Agency
CBOE	Chicago Board Option Exchange	FHLB	Federal Home Loan Bank
CCAR	Comprehensive Capital Analysis and Review	FICC	Fixed Income Clearing Corporation
CCP	Central Counterparty (clearing house)	FINMA	Financial Market Supervisory Authority
CDS	Credit default swap	FIO	Federal Insurance Office
CFPB	Consumer Financial Protection Bureau	FIRD	Financial Instrument Reference Database
CFTC	Commodity Futures Trading Commission	FIX	Financial Information eXchange
CISA	Cybersecurity & Infrastructure Security Agency	FRBNY	Federal Reserve Bank of New York
CMBS	Commercial Mortgage-Backed Securities	FRBSTL	Federal Reserve Bank of St. Louis
CMDI	Corporate Bond Market Distress Index	FRED	Federal Reserve Economic Data
CoVaR	Conditional Value-at-Risk	FSB	Financial Stability Board
COVID-19	Coronavirus Disease 2019	FSI	Financial Stress Index
CPI	Consumer Price Index	FTT	FTX Token
CPIC	Citizens Property Insurance Corporation	FTX	Futures Exchange
CPMI	Committee on Payments and Market Infrastructures	FY	Fiscal Year
CRE	Commercial Real Estate	G-SIBs	Global Systemically Important Banks
CTC	Child Tax Credits	GAAP	Generally Accepted Accounting Principles
DCU	Data Collection Utility	GAV	Gross Asset Value
DEIA	Diversity, Equity, Inclusion, and Accessibility	GCF	GCF Repo® Market
DGP	Data Governance Platform		

GDP	Gross Domestic Product	OEF	Open-end fund
GIIPS	Greek, Irish, Italian, Portuguese, and Spanish	OFR	Office of Financial Research
GNE	Gross Notional Exposure	ON RRP	Overnight Reverse Repurchase Agreement Program
GSE	Government-Sponsored Enterprise	OTC	Over-the-Counter
GWAC	Governmentwide Acquisition Contract	OWL	Web Ontology Language
HELOC	Home Equity Line of Credit	P&C	Property and Casualty
HUD	U.S. Department of Housing and Urban Development	P/E	Price-to-Earnings
IAWG	Inter-Agency Working Group	PCE	Personal Consumption Expenditures
IDI	Interagency Data Inventory	PE	Private Equity
ILS	Insurance-Linked Securities	PTF	Principal Trading Firm
IMF	International Monetary Fund	Q1	First Quarter
IORB	Interest on Reserve Balances	Q2	Second Quarter
IPA	Intergovernmental Personnel Act	Q3	Third Quarter
IPO	Initial Public Offering	Q4	Fourth Quarter
IRD	Interest Rate Derivative	QBP	Quarterly Banking Profile
ISO	International Organization for Standardization	QT	Quantitative Tightening
IT	Information Technology	RaaS	Ransomware as a Service
JADE	Joint Analysis Data Environment	RAC	Research and Analysis Center
KRX	Nasdaq Regional Banking Index	RMBS	Residential Mortgage-Backed Securities
LBO	Leverage Buyout	ROC	Regulatory Oversight Committee
LEI	Legal Entity Identifier	RR2	Risk Rating 2.0
LIBOR	London Interbank Offered Rate	S&P GSCI	Formerly the Goldman Sachs Commodity Index
LME	London Metal Exchange	SB	Signature Bank
M&A	Merger and Acquisitions	SCF	Survey of Consumer Finances
MBA	Mortgage Bankers Association	SDR	Swap Data Repository
MBS	Mortgage-Backed Securities	Silvergate	Silvergate Capital and Signature Bank
MMF	Money Market Fund	SITG	Skin in the Game
MMFM	Money Market Fund Monitor	SLOOS	Senior Loan Officer Opinion Survey
MOVE	Market Option Volatility Estimate	SNB	Swiss National Bank
MSRB	Municipal Securities Rulemaking Board	SOFR	Secured Overnight Financial Rate
NAV	Net Asset Value	SRF	Standing Repo Facility
NBER	National Bureau of Economic Research	STFM	Short-term Funding Monitor
NCCBR	Non-centrally Cleared Bilateral Repurchase Agreement	SVB	Silicon Valley Bank
NCMA	National Contract Management Association	TIC	Trusted Internet Connection
NCUA	National Credit Union Administration	TPI	Transmission Protection Instrument
NFIP	National Flood Insurance Program	TRACE	Trade Reporting and Compliance Engine
NITRD	Networking and Information Technology Research and Development	UBS	UBS Group AG (multinational investment bank)
NSF	National Science Foundation	UK	United Kingdom
NPI	Natural Person Identifier	USD LIBOR	U.S. dollar London Interbank Offered Rate
NPRM	Notice of Proposed Rulemaking	WFH	Work-from-Home
OCG	Organized Crime Group	YOY	Year-over-Year
		YTD	Year-to-Date



APPENDIX B

GLOSSARY

Accommodation

Expansionary monetary policy in which a central bank seeks to lower borrowing costs for businesses and households to make credit more readily available.

Activities-based approach

An approach to examining risks to financial stability by examining a diverse range of financial products, activities, and practices.

Adverse selection

When sellers have more information than buyers have, or vice versa, about some aspect of product quality. Adverse selection can impose a higher risk on the less-informed party.

Agency Mortgage-backed Securities

Securities made up of mortgages purchased by housing finance agencies Fannie Mae, Freddie Mac, and Farmer Mac, or guaranteed by housing finance agency Ginnie Mae. The agencies set underwriting requirements for the loans they will purchase or guarantee.

Alternative Reference Rates Committee

A committee that includes banks, asset managers, insurers, and industry trade organizations as well as federal and state financial regulators as ex-officio members; the committee chose the Secured Overnight Financing Rate (SOFR) as its recommended alternative to U.S. dollar LIBOR.

Aruoba-Diebold-Scotti Business Conditions Index

Index designed by Federal Reserve Bank of Philadelphia researchers to track real business conditions at high frequency by using a mix of economic and financial indicators.

Asymmetric information

When one party to a transaction has greater material knowledge than the other party.

Attestation

In an attestation engagement, a certified public accountant is engaged to issue or does issue an examination, review, or agreed-upon procedures report on subject matter, or an assertion about the subject matter that is the responsibility of another party. Under the Sarbanes-Oxley Act of 2002, independent auditors attest to and report on public company managers' assessments of internal controls over their companies' financial reporting.

Auditor opinion

Statements auditors include in their reports on company finances. Auditors issue adverse opinions when they have concerns that the statements have not been prepared along accepted principles or that the data supporting the statements have been misrepresented. They issue clean opinions when they find no significant exceptions to accepted accounting practices and disclosure requirements. Auditors issue opinions with an explanation for

various reasons, including when they want to call out something that might be material.

Authorized Participant

A liquidity provider to an exchange-traded fund. When there is a shortage of exchange-traded fund shares in the market, the authorized participant creates more shares. When there is an excess supply of shares, the participant redeems shares to reduce the number of shares on the market.

Bagehot's Dictum

Theory of Walter Bagehot, a 19th century writer and banker, who proposed central banks should lend freely and often against good collateral and at high interest rates to quell a financial panic.

Bail-in

The approach to a failed or near-failed entity in which its creditors write down their claims to make the entity solvent, as opposed to the provision of government support.

Bank for International Settlements

An international financial organization that serves central banks in their pursuit of monetary and financial stability, helps to foster international cooperation, and acts as a bank for central banks.

Bank holding company

Any company that has direct or indirect control of one or more banks and is regulated and supervised by the Federal Reserve under the Bank Holding Company Act of 1956. BHCs may also own nonbanking subsidiaries such as broker-dealers and asset managers.

Basel Committee on Banking Supervision

An international forum for bank supervisors that aims to improve banking supervision worldwide. The BCBS develops guidelines and supervisory standards, such as standards on capital adequacy, the core principles for effective banking supervision, and recommendations for cross-border banking supervision.

Basel III

A comprehensive set of global regulatory standards to strengthen the regulation, supervision, and risk management of the banking sector. The measures include bank and banking system regulation to strengthen firms' capital, liquidity, risk management, and public disclosures to reduce the banking system's vulnerability to shocks.

Blockchain

Common name for cryptographic distributed ledger technology used to record online transactions. Blockchains are the basis of cryptocurrencies.

Bond duration

The measure of a bond's market price sensitivity to interest rate changes, measured in years. Price risk rises as duration increases.

Brokered deposit

A government-insured deposit that a bank obtains through a brokerage. These funds may leave the bank quickly when a competitor offers a higher rate.

Business development company

Type of closed-end fund that primarily invests in small or developing companies. BDCs are often publicly traded companies and are regulated by the Securities and Exchange Commission.

The Three C's

Connectedness, correlation, and contagion – three key sources of systemic risk.

Call report

A quarterly report of a bank's financial condition and income that all federally insured U.S. depository institutions must file.

Capital

The difference between a firm's assets and its liabilities, capital represents the net worth of the firm or the firm's book equity value to investors.

Capital conservation buffer

Additional capital banks are required to hold outside periods of financial stress, meant to be drawn down during times of stress. This buffer is intended to prevent breaches of minimum required capital ratios.

Capital requirement

The amount of capital a regulator requires a bank to have to act as a cushion to absorb unanticipated losses and declines in asset values that could otherwise cause a bank to fail.

Coronavirus Aid, Relief, and Economic Security Act

The Coronavirus Aid, Relief, and Economic Security Act of 2020, stimulus legislation to buffer the consequences of the COVID-19 pandemic and related economic shutdowns.

Central clearing

A settlement system in which securities or derivatives of a specific type are cleared by one entity that guarantees the trades, such as a clearinghouse or central counterparty. Central clearing is an alternative to bilateral or

over-the-counter trading (see over-the-counter derivatives).

Central Bank Digital Currencies

A digital liability of a central bank that is widely available to the general public.

Central counterparty

An entity that interposes itself between counterparties to contracts traded in one or more financial markets. A CCP becomes the buyer to every seller and the seller to every buyer to help ensure the performance of open contracts.

Charge-off Rate

Realized loan losses as a percent of total loans. The net charge-off rate subtracts recoveries on written-down debt from gross charge-offs.

Circuit breakers

A market regulatory mechanism to stop trading in the public markets when prices of certain instruments drop more than a predefined amount.

Clearing

A system that transfers ownership of securities when they are traded and makes related payments.

Clearing bank

A commercial bank that facilitates payment and settlement of financial transactions, such as check clearing or matching trades between the sellers and buyers of securities and other financial instruments or contracts.

Clearing member

A member of, or a direct participant in, a central counterparty that is entitled to enter into a transaction with the CCP.

Coasean lens

A perspective of contemporary British economist and Nobel laureate Ronald Coase that deemphasized oversight and regulation in favor of rewarding accessible information in competitive markets to reveal systemic risk and create opportunity.

Collateral

Any asset pledged by a borrower to guarantee payment of a debt.

Collateralized Debt Obligation

Securities that hold a pool of debt and are sold to investors in tranches with varying levels of risk. Leading up to the 2007-09 financial crisis, many CDOs consisted of repooled residential mortgage-backed securities (RMBS).

Collateralized Loan Obligation

Securities that hold pools of corporate loans and are sold to investors in tranches with varying levels of risk.

Commercial Mortgage-Backed Securities

Securities collateralized by commercial mortgages.

Commercial paper

Short-term (maturity of up to 270 days), unsecured corporate debt.

Commercial Paper Funding Facility

A Federal Reserve facility that finances commercial paper issuance.

Committee on Capital Markets Regulation

An independent research organization created in 2006 and focused on policy reforms to develop efficient and stable capital markets.

Committee on Payments and Market Infrastructures

A standing committee of the Bank for International Settlements. Representatives are senior officials of member central banks. The CPMI promotes safety and efficiency of payment, clearing, settlement, and related activities, and it serves as a global standard-setting body in this area.

Comprehensive Capital Analysis and Review

The Federal Reserve's annual exercise to ensure that the largest U.S. bank holding companies have robust, forward-looking capital planning processes that account for their unique risks and sufficient capital for times of financial and economic stress. The CCAR exercise also evaluates the banks' individual plans to make capital distributions such as dividend payments or stock repurchases.

Concentration risk

Any single exposure or group of exposures to the same risk with the potential to produce losses large enough to threaten a financial institution's ability to maintain its core operations.

Conditional Value-at-Risk

CoVaR indicates an institution's contribution to systemic risk, calculated as the difference between value-at-risk (VaR) of the financial system when the firm is under distress and the VaR of the system when the firm is in its regular, median state.

Contingent Convertible Bonds

Hybrid capital securities structured as debt but that absorb losses in accordance with their contractual terms when the capital of the issuing bank falls below a certain level. Due to their loss-absorbing capacity, CoCos can be used to satisfy regulatory capital requirements.

Council of Economic Advisers

An agency within the Executive Office that advises the President of the United States on economic policy.

Countercyclical capital buffer

A component of Basel III requiring banks to build capital buffers during favorable economic periods. The buffers can be used to absorb losses in unfavorable periods.

Counterparty risk

The risk that the party on the other side of a contract, trade, or investment will default.

Covenant-lite loans

Loans that do not include or include weak versions of typical covenants to protect lenders, such as requiring the borrower to deliver annual reports or restricting loan-to-value ratios.

COVID-19

A highly contagious respiratory illness caused by a coronavirus and declared a pandemic in 2020 by the World Health Organization.

Credit Default Swap

A bilateral contract protecting the buyer against the risk of default by a borrower. The buyer of CDS protection makes periodic payments to the seller and, in return, receives a payoff if the borrower defaults. The protection buyer does not need to own the loan covered by the CDS.

Credit default swap spread

The premium paid by the buyer of credit default swap protection to the seller.

Credit gap

A metric in which the ratio of debt-to-gross domestic product (GDP) is measured against its statistically estimated long-run trend.

Credit rating agency

Private company that assesses the creditworthiness of a borrower or a financial instrument.

Credit risk

The risk that a borrower may default on its obligations.

Credit Risk Transfer Bonds

CRT bonds allow Fannie Mae, Freddie Mac, and sometimes reinsurance companies, to transfer mortgage credit risk to private investors.

Crypto asset

Digital financial assets (crypto assets) based on blockchain cryptographic technology. Bitcoin is the most widely used cryptocurrency.

Current Expected Credit Loss

Accounting framework for creating reserves for credit losses. Requires firms applying U.S. Generally Accepted Accounting Principles to hold credit loss allowances equal to expected credit losses for the lifetime of certain assets.

Cybersecurity risk

The vulnerability of information technology and computer systems to unauthorized access. Innovations such as quantum computing may increase the ability of nefarious players to access encrypted data.

Cybersecurity Assessment Tool

A tool designed to complement the National Institute of Standards and Technology's Cybersecurity Framework. The Federal Financial Institutions Examination Council developed the tool to help financial institutions identify and address cybersecurity risks and determine their level of cybersecurity maturity in addressing those risks.

Dash to cash

A simultaneous move by participants in money and capital markets to raise cash by selling assets, including Treasuries, and to withdraw from investment funds, creating volatility and price drops.

Debt securitization

The aggregating of debt instruments into a pool backing the creation of one or more securities.

Default waterfall

The financial safeguards available to a central counterparty to cover losses arising from the default of one or more clearing members.

Defensive draws

A strategy by borrowers to draw down their credit lines to raise cash in advance of need.

Defined-benefit pension plan

A plan where members' pension benefits are determined by formula, usually tied to years of service and earnings during service, regardless of the assets in the plan. This contrasts with a defined-contribution plan such as a 401-K, where benefits are determined by returns on a portfolio of investments.

Depository institution

A financial institution, such as a bank or credit union, that has liabilities in the form of deposits.

Depository Trust & Clearing Corporation

A company that processes and clears trades as the central clearing house for the U.S. capital markets and repository for the derivatives market.

Derivative

A financial contract whose value is derived from the performance of underlying assets or market factors such as interest rates, currency exchange rates, or commodity, credit, and equity prices. Derivatives transactions include structured debt obligations, swaps, futures, options, caps, floors, collars, and forwards.

Derivatives counterparties

Parties to a derivatives transaction, either trading with each other bilaterally (over the counter) or via a central counterparty.

Discount window

The Federal Reserve's traditional facility for making collateralized loans to depository institutions.

Disruption

A sudden decline in market prices due to a shock that upends the expected behavior of the financial system.

Distress Insurance Premium

A systemic risk indicator that measures the hypothetical contribution a financial institution would make to an insurance premium that would protect the whole financial system from distress.

Distress ratio

The portion of high-yield debt at face value trading at distressed levels.

Distributed ledger technology

See blockchain.

Dodd-Frank Wall Street Reform and Consumer Protection Act

Short name for the Dodd-Frank Wall Street Reform and Consumer Protection Act of 2010. The objective of the Act is to promote financial stability.

Dodd-Frank Act Stress Test

Annual large bank stress tests required by the Dodd-Frank Act. A 2018 law change means banks with assets less than \$100 billion no longer go through DFAST.

Duration risk

The risk associated with the sensitivity of the prices of bonds and other fixed-income securities to changes in the level of interest rates.

Economic Growth, Regulatory Relief and Consumer Protection Act of 2018

Law that adjusted some provisions of the Dodd-Frank Act, as well as instituting tax law changes.

Emerging markets

Developing countries where investments are often associated with both higher yields and higher risks.

European Central Bank's Public Sector Purchase Program (PSPP)

A process by which the ECB (or "Eurosysteem") buys assets, including sovereign bonds, to help maintain stability in various countries.

[The] European Securities and Markets Authority

The European Union's securities market regulator.

Eurozone or euro area

A group of 19 European Union countries that have adopted the euro as their currency.

Exchange-Traded Fund

An investment fund whose shares are traded on an exchange. Because ETFs are exchange-traded products, their shares are continuously priced, unlike mutual funds, which offer only end-of-day pricing. ETFs are often designed to track an index or a portfolio of assets.

Expenditure Coverage Ratio

A measure of the number of months a household can cover expenses with savings. It is calculated by dividing total liquid assets by monthly expenditures.

Fallen Angel

Bond downgraded from investment grade to non-investment grade.

Federal Deposit Insurance Corporation Improvement Act of 1991

A law that requires federal banking agencies to take action when an insured depository institution's capital declines below a predefined level, and in the case of bank failures, enact a resolution that is the least burdensome to taxpayers.

Federal Financial Institutions Examination Council

An interagency body that prescribes uniform principles, standards, and report forms for the

federal examination of financial institutions. The FFIEC makes recommendations to promote uniformity in banking supervision.

Federal Funds

Overnight interbank borrowing of reserves at the Federal Reserve.

Federal Funds Rate

Interest rate at which depository institutions lend fed funds to each other.

Federal Home Loan Banks

Eleven U.S. government-sponsored banks that provide funding for member financial institutions, mostly through advances secured by mortgages.

Federal Housing Finance Agency

Agency responsible for supervision, regulation, and housing mission oversight of Fannie Mae, Freddie Mac and the Federal Home Loan Bank System; it is also the conservator of Fannie Mae and Freddie Mac.

Federal Open Market Committee

Twelve-member body within the Federal Reserve System that sets national monetary policy, including setting the target range for the federal funds rate.

Federal Reserve's emergency section 13(3)

A section of the Federal Reserve Act that allows emergency lending from the Federal Reserve to financial institutions and others in "unusual and exigent circumstances" with the approval of the Secretary of the Treasury.

Feedback loop (negative)

The downward price pressure created when parties meet margin payment obligations on

some securities by liquidating positions in other related securities.

Financial contagion

When financial or economic shocks initially affect only a few financial market participants and then spread to other parts of the financial system and countries. The risk of contagion increases with the number and complexity of interconnections.

Financial crisis

A significant, sustained drop in asset prices, income streams, credit, and liquidity, resulting from an event that shocks the financial system, usually triggering government interventions and bailouts.

Financial Market Utility

As defined by the Dodd-Frank Act, "any person that manages or operates a multilateral system for the purpose of transferring, clearing, or settling payments, securities, or other financial transactions among financial institutions or between financial institutions and the person."

Financial stability

The condition in which the financial system can provide its basic functions, even under stress. Those basic functions are (1) credit allocation and leverage, (2) maturity transformation, (3) risk transfer, (4) price discovery, (5) liquidity provision, and (6) facilitation of payments.

Financial Stability Board

An international coordinating body that monitors financial system developments on behalf of the Group of 20 (G-20) nations. The FSB was established in 2009 and is the successor to the Financial Stability Forum.

Fintech

Financial technology, usually referring to firms that operate on technology-based business models.

Fire sale

The disorderly liquidation of assets to meet margin requirements or other urgent cash needs, which can drive prices below their fundamental value. The quantities sold are large relative to the typical volume of transactions.

Fiscal policy

Use of government spending and taxes to influence the economy.

Forbearance (debt forbearance)

An agreement between borrowers and lenders, or a government mandate, to suspend payments temporarily without being considered in default. Under the CARES Act, mortgage servicers were required to grant payment forbearance, for 180 days, to borrowers experiencing financial hardship and who had mortgages backed by the government.

Foreign and International Monetary Authorities Repo Facility

Allows foreign central banks and international monetary authorities with which the Federal Reserve doesn't have swap agreements to borrow dollars against Treasury securities.

Form N-MFP

A monthly disclosure of portfolio holdings submitted by money market funds to the Securities and Exchange Commission, which makes the information publicly available. SEC Rule 30b1-7 established the technical and legal details of N-MFP filings.

Form PF

A periodic report of portfolio holdings, leverage, and risk management submitted by hedge funds, private equity funds, and related entities. The report is filed with the Securities and Exchange Commission and the Commodity Futures Trading Commission, which keep the information confidential. The Dodd-Frank Act mandated the reporting to help the Council monitor financial stability risks.

Funding gap

The difference between rate-sensitive assets and liabilities. One measure of the funding gap ratio is liabilities due in one year minus liquid assets, divided by total assets.

Funding liquidity

The availability of credit to finance the purchase of financial assets.

Generally Accepted Accounting Principles

Accounting rules published in the United States by the Financial Accounting Standards Board.

Global Systemically Important Banks

Banks annually identified by the Basel Committee on Banking Supervision as having the potential to disrupt international financial markets. The designations are based on banks' size, interconnectedness, complexity, dominance in certain businesses, and global scope.

Government-Sponsored Enterprise

A financial service entity created by the federal government and perceived as being implicitly guaranteed by the government. The GSEs include Fannie Mae, Freddie Mac, Sallie Mae, Farmer Mac, the Federal Home Loan Banks, the Farm Credit System, and the National Veteran Business Development Corporation.

Gross Notional Exposure

A measure of total portfolio leverage, for example in a hedge fund. GNE is calculated as the summed absolute values of long and short notional positions, including both securities and derivatives.

Hacktivist

Someone who infiltrates computer systems and networks to promote a social or political agenda.

Haircut

The discount at which an asset is valued when pledged as collateral. For example, a \$1 million bond with a 5 percent haircut would collateralize a \$950,000 loan.

Hedge fund

A pooled investment vehicle available to accredited investors such as wealthy individuals, banks, insurance companies, and trusts. Hedge funds can charge a performance fee on unrealized gains, borrow more than half of their net asset value, short sell assets they expect to fall in value, and trade complex derivative instruments that cannot be traded by mutual funds (see qualified hedge fund).

Hedging

An investment strategy to offset the risk of a potential change in the value of assets, liabilities, or services. An example of hedging is buying an offsetting futures position in a stock, interest rate, or foreign currency.

High-frequency trading

The use of computerized securities trading platforms to make large numbers of transactions at high speeds.

High-Quality Liquid Assets

Assets such as central bank reserves and government bonds that can be quickly and easily converted to cash even during a stress period. U.S. banking regulators require large banks to hold HQLA to comply with the Liquidity Coverage Ratio.

High-yield debt

Bonds and other financial instruments rated below investment grade that pay a higher interest rate than investment-grade securities because of the perceived credit risk; also known as non-investment grade or speculative.

Incurred-loss accounting framework

An accounting framework for firms in which loan loss allowances are equal to the losses related to recognized credit impairments. Compare CECL.

Initial margin

A percentage of the total market value of securities an investor must deposit up front to purchase securities with borrowed funds.

Intraday credit

An allowance by banks for customers to borrow money or overdraw accounts during a single day, at no charge, as long as it is repaid by the close of business that same day.

Institutional loans

When referring to the leveraged loan market, term loans originated by bank syndicates and sold to institutional investors.

Interest coverage ratio

A calculation of earnings divided by interest expense. Interest expenses that are equal to or greater than earnings before interest and

taxes (EBIT) or earnings before interest, taxes, depreciation, and amortization (EBITDA) are unsustainable.

Interest rate swap

A swap in which two parties exchange interest rate cash flows, typically between a fixed rate and a floating rate (see swap).

Intermediation

Any financial service in which a third party or intermediary matches lenders and investors with entrepreneurs and other borrowers in need of capital. Often, investors and borrowers do not have precisely matching needs and the intermediary's capital is put at risk to transform the credit risk and maturity of the liabilities to meet the needs of investors.

International Monetary Fund

An international organization that provides credit to developing nations and those in economic distress, typically conditional on economic and financial reforms.

International Organization of Securities Commissions

IOSCO is the international body for securities regulators and is the recognized standard setting organization for the securities industry. IOSCO works closely with the G-20 forum of nations and the Financial Stability Board on global financial regulatory reforms.

Intervention

Action taken by the government to regulate or provide financing to unstable financial markets or institutions.

Inverted yield curve

When yields on long-term bonds are lower than those on short-term bonds, the yield

curve is said to be inverted. An inverted yield curve is seen as a sign of a possible recession.

Investment-grade debt

Securities that credit rating agencies determine carry less credit risk. Non-investment grade securities, also called speculative-grade or high-yield debt, have lower ratings and a greater risk of default.

Legal Entity Identifier

A unique 20-digit alphanumeric code to identify each legal entity within a company that participates in global financial markets.

Leverage

Leverage is created when an entity enters into borrowings, derivatives, or other transactions resulting in investment exposures that exceed equity capital.

Leverage ratios (banks, insurance companies, hedge funds)

For banks, the leverage ratio is the Tier 1 (highest quality) capital of a bank divided by its total assets plus its total exposures to derivatives, securities financing transactions, and off-balance-sheet exposures. For insurance companies, the leverage ratio is assets to policyholder surplus. For hedge funds, the leverage ratio is gross asset value divided by net asset value.

Leveraged loan

Broadly, leveraged loans are loans to companies with non-investment grade (below BBB) ratings. Often, a leveraged loan is a loan for which the obligor's post-financing leverage, as measured by debt-to-assets, debt-to-equity, cash flow-to-total debt, or other such standards unique to particular industries, significantly exceeds industry norms. Leveraged

borrowers typically have a diminished ability to adjust to unexpected events and changes in business conditions because of their higher ratio of total liabilities to capital.

Liquidity

A market is liquid when buyers and sellers can easily trade financial instruments in customary volumes without a material impact on price.

Liquidity Coverage Ratio

A Basel III standard that requires large banks maintain enough high-quality liquid assets to meet anticipated liquidity needs for a 30-day stress period.

Liquidity risk

The risk that a firm will not be able to meet its current and future cash flow and collateral needs even if it has positive net worth.

Liquidity transformation

Funding illiquid assets with liquid and demandable liabilities.

Living wills

Resolution plans required of U.S. banks with \$50 billion or more in total consolidated assets and nonbank financial companies designated by the Council for supervision by the Federal Reserve. Each living will must describe how the company could be resolved in a rapid, orderly way in the event of failure.

Loan-to-Value Ratio

The amount of a loan as a percent of the estimated value of the asset serving as the loan's collateral.

Lockdown

Stay-at-home orders from a government to its citizens.

Macroeconomic risk

Risk from changes in the macroeconomy or macroeconomic policy.

Macroprudential policy

Government policy promoting the stability of the financial system as a whole, in contrast to policy focused on individual markets or institutions.

Macroprudential supervision

Supervision to promote the stability of the financial system as a whole. See microprudential supervision.

Main Street Lending Program

Lending facilities created in 2020 to support small and medium-size businesses and non-profit organizations and their employees. These facilities include the Main Street New Loan Facility, the Main Street Expanded Loan Facility, the Main Street Priority Loan Facility, the Nonprofit New Loan Facility, and the Nonprofit Expanded Loan Facility.

Margin call

A requirement by a creditor that a borrower increase the collateral pledged against a loan in response to reductions in the collateral's value.

Margin requirement

Rules governing the necessary collateral for a derivative, loan, or related security intended to cover, in whole or in part, the credit risk one party poses to another.

Mark to market

Accounting for the value of an asset at its current market price rather than in other ways, such as historical cost.

Market discipline

The idea that markets can rein in risk through individual participants behaving in their own interest. This should result in markets pricing risk effectively and curbing excessive risk-taking. See moral hazard.

Market liquidity

The ability of market participants to sell large positions with limited price impact and low transaction costs.

Market-making

The process in which an individual or firm stands ready to buy and sell a particular stock, security, or other asset on a regular and continuous basis at a publicly quoted bid-ask prices. Market-makers usually hold inventories of the securities in which they make markets. Market-making helps to keep financial markets efficient.

Market risk

The risk that an asset's price will change and at unexpected magnitudes.

Maturity transformation

Funding long-term assets with short-term liabilities. This practice creates a maturity mismatch that can pose risks when short-term funding markets are constrained.

Metadata

Data about data. Metadata include information about the structure, format, or organization of other data.

Metadata catalog

An organized way to present metadata for discovery, exploration, and use of the related data.

Microprudential supervision

Supervision of the activities of a bank, financial firm, or other components of a financial system. See macroprudential supervision.

Monetary policy

Government or central bank use of interest rates and money supply or asset purchases to affect the economy.

Money Market Fund

A fund that typically invests in short-term government securities, certificates of deposit, commercial paper, or other highly liquid and low-risk securities.

Money Market Mutual Fund Liquidity Facility

A facility established in 2020 to allow the Federal Reserve Bank of Boston to provide loans to eligible financial institutions to purchase assets from certain types of money market funds.

Moral hazard

When people do not guard against risk because they expect someone else to pay for the losses arising from that risk.

Mortgage call report

A quarterly report of mortgage activity and company information created by state regulators and administered electronically through the Nationwide Mortgage Licensing System & Registry (NMLS).

Municipal Liquidity Facility

A program created in 2020 to allow the Federal Reserve to buy short-term debt issued by state and local governments with loss protection provided by the U.S. Treasury.

Multilateral organizations

Organizations formed by multiple countries to address international problems. Examples include the World Bank and the International Monetary Fund.

Mutual fund

A pooled investment vehicle that can invest in stocks, bonds, money market instruments, other securities, or cash, and sell its own shares to the public; regulated by the SEC.

Narrow spread

A small difference between buyers' and sellers' prices (the bid-ask) in a liquid market.

National Association of Insurance Commissioners

An organization that represents U.S. state insurance regulators. Through the NAIC, regulators establish accreditation standards and practices, conduct peer review, and coordinate their regulatory oversights of insurance companies.

National Institute of Standards and Technology

Cybersecurity Framework Voluntary guidance, based on existing standards, guidelines, and practices, for critical infrastructure organizations to better manage and reduce cybersecurity risk. The framework focuses on using business drivers to guide cybersecurity activities and considering cybersecurity risks as part of an organization's risk management process.

Nationally Recognized Statistical Rating Organization

Credit rating agency registered with and regulated by the SEC.

Net Asset Value

The value of an entity's assets minus its liabilities per share. For example, a mutual fund calculates its NAV daily by dividing the fund's net value by the number of outstanding shares.

Network model

A model consisting of a set of nodes, or financial institutions, and a set of payment obligations linking them, to show how financial interconnections can amplify market movements.

Non-investment grade debt

Instruments rated below investment grade that pay a higher interest rate than investment-grade securities because of the perceived greater credit risk; also known as speculative or high-yield debt.

Nonprofit New Loan Facility; Nonprofit Expanded Loan Facility

Facilities created by the Federal Reserve in the summer of 2020 to lend money to nonprofit organizations.

Notional derivatives exposure

The reference amount from which contractual payments will be calculated on a derivatives contract; generally not an amount at risk.

Off-balance-sheet

Assets or entities that are not recorded on a company's balance sheet. Rather, they are explained only in notes to financial statements.

Off-the-run Treasury securities

Treasury securities outstanding in the market that precede the most recent issue, usually traded less frequently than on-the-run securities.

On-the-run Treasury securities

The most recently issued Treasury securities. These are often traded more frequently than their off-the-run predecessors.

Operational risk

The risk of loss from internal control inadequacies or failures — problems of lapses by people, processes, or systems — or from external events.

Option

A financial contract granting the holder the right, but not the obligation, to engage in a future transaction on an underlying security or real asset. For example, an equity call option provides the right, but not the obligation, for a fixed period to buy a block of shares at a fixed price. A put option provides the right, but not the obligation, to sell an asset for a fixed period at a fixed price.

Orderly Liquidation Authority

Provision in the Dodd-Frank Act that allows the Federal Deposit Insurance Corporation to unwind a large, complex company. An OLA serves as a backup to bankruptcy court proceedings.

Originate

To extend credit after processing a loan application. Banks, for example, originate mortgage loans and either hold them or sell them to other financial market participants. The distribution can include a direct sale or a securitization.

Over-The-Counter Derivatives

Derivatives contracts negotiated privately between two parties, rather than traded on a formal securities exchange. Unlike standard exchange-traded products, OTC derivatives

can be tailored to fit specific needs, such as the effect of a foreign exchange rate or commodity price over a given period.

Overnight Indexed Swap

An interest rate swap in which a fixed-rate price index is swapped against the overnight reference rate.

Own Risk and Solvency Assessment

An internal process undertaken by an insurer or insurance group to assess the adequacy of its risk management and current and prospective solvency positions under normal and severe stress scenarios.

Pandemic

A disease or illness that affects a significant portion of the globe.

Passporting

Legal arrangement that allows firms from European Union nations to sell their services across the Union without having to comply with each country's separate regulations.

Pension Benefit Guaranty Corporation

Agency that insures pension benefits; it has two programs, one for single-employer pension plans and one for multiemployer plans, to pay benefits to retirees in private, defined-benefit pension plans when sponsors cannot pay.

Pension funded ratio

The ratio of a pension plan's assets to the present value of its obligations.

Pension Obligation Bonds

Taxable municipal securities issued by state or local governments to borrow to meet pension obligations.

Paycheck Protection Program Liquidity Facility

A program for the Federal Reserve to extend credit to lenders participating in the Small Business Administration's Paycheck Protection Program, which provides potentially forgivable loans to small businesses to fund their pay-rolls.

Pension risk transfer

The transfer of pension risk from a pension plan to another party, usually through insurance or annuity contracts, longevity swaps, or other contractual arrangements.

Pipeline risk

The risk that loans being accumulated for sale cannot be sold at the expected prices or at all.

Price discovery

The process of determining the prices of assets in the marketplace through the interactions of buyers and sellers.

Primary Credit Rate

The interest rate the Federal Reserve charges banks for discount window borrowings.

Primary dealer

Banks and securities broker-dealers designated by the Federal Reserve Bank of New York (FRBNY) to serve as trading counterparties when it carries out U.S. monetary policy. Among other things, primary dealers are required to participate in all auctions of U.S. government debt and to make markets for the FRBNY when it transacts on behalf of its foreign official accountholders. A primary dealer buys government securities directly and can sell them to other market participants.

Primary Dealer Credit Facility

A facility for the Federal Reserve Bank of New York to make collateralized loans to primary dealers, which are the banks and securities broker-dealers designated to serve as trading counterparties in carrying out U.S. monetary policy.

Primary Market Corporate Credit Facility

A Federal Reserve facility to provide credit to, and purchase new bonds from, large investment-grade corporations.

Prime broker

Companies that provide hedge funds and other investors with services such as lending cash and securities.

Qualifying hedge fund

Hedge fund advised by a large hedge fund adviser and with a net asset value of at least \$500 million. Large hedge fund advisers are advisers that have at least \$1.5 billion in hedge fund assets under management.

Real estate investment trust

Corporations that invest in income-producing real estate and pay most of their taxable income to shareholders as dividends.

Regulation SCI

A regulation adopted by the Securities and Exchange Commission that applies to entities that directly support six key securities market functions: (1) trading, (2) clearance and settlement, (3) order routing, (4) market data, (5) market regulation, and (6) market surveillance.

Reinsurance

The risk management practice of insurers to transfer some of their policy risk to other

insurers. A second insurer, for example, could assume the portion of liability in return for a proportional amount of the premium income.

Repurchase Agreement (repo)

A transaction in which one party sells a security to another party and agrees to repurchase it at a certain date in the future at an agreed price. Banks often do this on an overnight basis. A repo is similar to a collateralized loan.

Reserve requirements

The funds banks are required to hold on deposit with the Federal Reserve.

Residential Mortgage-Backed Securities

A security that is collateralized by a pool of residential mortgage loans and makes payments derived from the interest and principal payments on the underlying mortgage loans.

Resilience

Ability of the financial system or parts of the system to absorb shocks and continue to provide basic functions.

Resolution plans

Plans required of U.S. banks with \$100 billion or more in total consolidated assets and nonbank financial companies designated by the Financial Stability Oversight Council for supervision by the Federal Reserve. Each plan, or living will, must describe how the company could be resolved in a rapid, orderly way in the event of failure. See living wills.

Risk assets

Assets that carry risk of default. Such assets include loans, bonds, commodities, and other investment vehicles. U.S. Treasury securities are generally considered free of default risk.

Risk management

The business and regulatory practice of identifying and measuring risks and developing strategies and procedures to limit them. Categories of risk include credit, market, liquidity, operations, model, and regulatory.

Risk retention

When issuers of asset-backed securities must retain at least part of the credit risk of the assets collateralizing the securities. The regulation also prohibits a securitizer from directly or indirectly hedging the credit risk.

Risk spreads

The difference in yields of riskier assets versus perceived safer assets such as Treasuries and bank deposits.

Risk-based capital

Amount of capital a financial institution holds to protect against losses based on the risk weighting of different asset categories.

Risk-weighted assets

Bank assets or off-balance-sheet exposures weighted according to risk categories. This asset measure is used to determine a bank's regulatory risk-based capital requirements.

Runnable funding

Funds that can be withdrawn from a financial institution on short notice. Uninsured bank deposits, shares of money market funds, wholesale borrowings, commercial paper, and repurchase agreements are among runnable sources of funding.

Run risk

The risk that investors lose confidence in a market participant because of concerns about

solvency or related issues and respond by pulling back their funding or demanding more margin or collateral.

Sarbanes-Oxley Act of 2002

Law aimed at curbing corporate fraud exposed in several financial scandals, including those at Enron and WorldCom. The law laid out numerous accounting and accountability requirements for companies, managers, and accountants.

Search for yield (reach for yield)

Accepting greater risks in hopes of earning higher returns when interest rates on high-quality investments are low.

Secondary Market Corporate Credit Facility

A Federal Reserve facility to support trading of outstanding corporate bonds and corporate bond exchange-traded funds.

Section 13(3) authority

A section of the Federal Reserve Act that allows emergency lending from the Federal Reserve to financial institutions and others in “unusual and exigent circumstances” with the approval of the Secretary of the Treasury.

Secured Overnight Financing Rate

Interest rate benchmark used as an alternative to LIBOR to set rates on financial products. The SOFR, which is based on repurchase agreement (repo) rates, reflects the general cost of large bank borrowing that is backed by Treasury securities as collateral. The OFR’s repo data collection supports the production of the SOFR.

Securities lending/borrowing

The temporary transfer of securities from one party to another for a specified fee and time

period in exchange for collateral in the form of cash or securities.

Securities Information Processors

Established by Congress and the SEC, the SIPs link the activities of U.S. markets into a single data feed.

Securitization

A financial transaction in which assets such as mortgage loans are pooled, securities representing interests in the pool are issued, and proceeds from the underlying pooled assets are used to service and repay the securities.

Settlement

The process of transferring securities and settling by book entry according to a set of exchange rules. Some settlement systems can include institutional arrangements for confirmation, clearance, and settlement of securities trades and safekeeping of securities.

Shadow banking

Credit intermediation performed by nonbank companies or financed by runnable liabilities without a government guarantee.

Shock

A sudden change in fundamental economic drivers and expectations that can stress the economy and financial system.

Single-name CDS

A credit default swap where the underlying instrument is tied to one specific issuer or entity.

Skin in the game

When originators of loans or other risky instruments keep at least part of the risk for themselves.

Soft-landing

A cyclical slowdown in economic growth that avoids a recession.

Spread

The difference in yields between private debt instruments and government securities of comparable maturity.

SRISK

A systemic risk indicator based on the capital that a firm is expected to need if there is another financial crisis; short for "systemic risk."

Stable net asset value

A characteristic of some money market funds in which the value of a single share remains the same, usually \$1, even when the value of the underlying assets shifts.

Stablecoin

Variety of cryptocurrency that seeks to maintain a fixed value backed by reserves.

Standing facilities

Operations to execute monetary policies of the Federal Reserve and European Central Banks.

Stimulus

A fiscal or monetary policy to increase the cash flow in circulation and boost the economy.

Stress test

An exercise that shocks asset prices by a pre-specified amount, sometimes along with other financial and economic variables, to estimate the effect on financial institutions or markets. Under the Dodd-Frank Act, banking regulators

run annual stress tests of the largest U.S. bank holding companies.

Subcommittee on Quantum Information Science within the National Science and Technology Council

The SCQIS coordinates federal research and development in quantum information science and related technologies under the auspices of the executive branch's National Science and Technology Council's Committee on Science.

Supplementary leverage ratio

Under Basel III, the ratio of a bank's Tier 1 (high-quality) capital to its total leverage exposure, which includes all on-balance-sheet assets and many off-balance-sheet exposures.

Swap

An exchange of cash flows agreed by two parties with defined terms over a fixed period.

Swap Data Repository

A central recordkeeping facility that collects and maintains a database of swap transaction terms, conditions, and other information. In some countries, SDRs are referred to as trade repositories.

Swap execution facility

A trading platform market participants use to execute and trade swaps by accepting bids and offers made by other participants.

Society for Worldwide Interbank Financial Telecommunications (SWIFT)

Provides messaging services and interface software between wholesale financial institutions. SWIFT is organized as a cooperative owned by its members.

Syndicated loans

Financing provided by a group of lenders.

Systemic risk

Risk to systemwide financial stability.

Systemic risk indicators

Measures of the risks financial firms may pose to the financial system.

Tail risk

The perceived low-probability risk of an extreme event or outcome.

TED spread

The difference between three-month U.S. dollar LIBOR and Treasury bill rates.

Ten-year, 10-year forward rate

The interest rate investors expect to receive on 10-year Treasury securities in 10 years.

Term Asset-Backed Securities Loan Facility

A Federal Reserve facility to finance asset-backed securities, such as securitized equipment leases, as well as credit card, auto, and other loans.

Tier 1 Capital Ratio and Common Equity Tier 1 Capital Ratio

Two measurements comparing a bank's capital to its risk-weighted assets to show its ability to absorb unexpected losses. Tier 1 capital includes common stock, preferred stock, and retained earnings. Common Equity Tier 1 capital excludes preferred stock.

Too Big to Fail

The belief that the biggest financial firms will always be bailed out by the government if necessary. In 1984, the Comptroller of the Cur-

rency stated that the 11 largest banks could not be allowed to fail.

Total Loss-absorbing Capacity

A mix of long-term debt and equity that global systemically important bank holding companies are required to have to absorb losses and implement an orderly resolution without resorting to taxpayer-funded bailouts or extraordinary government measures.

Tranche

A portion of a securitized asset pool. From the French word meaning "slice."

Triparty repo

A repurchase agreement in which a third party, such as a clearing bank, acts as an intermediary for the exchange of cash and collateral between two counterparties. In addition to providing operational services to participants, agents in the U.S. triparty repo market extend intraday credit to facilitate settlement of triparty repos.

U.S. dollar swap line arrangements

Standing facilities with the Federal Reserve that allow key central banks to exchange domestic currency for U.S. dollars to satisfy dollar liquidity demand in their own markets.

Value-at-Risk

A tool for market risk management that measures the risk of loss of a portfolio. The VaR projects the maximum expected loss for a given time horizon and probability. For example, the VaR over 10 days and with 99 percent certainty measures the most one would expect to lose over a 10-day period, 99 percent of the time. The problem is the other one percent, see tail risk.

Variable annuity

A tax-deferred insurance company contract where the owner can choose investment options whose values fluctuate with the underlying securities, much like mutual funds. Variable annuities may also include guarantees of minimum payments, which may exceed the value of the investment accounts.

Variation margin

Payment made by clearing members to the clearinghouse based on price movements of the contracts these members hold. See initial margin.

VIX

Chicago Board Option Exchange (CBOE) Volatility Index, a measure of 30-day expected volatility in the U.S. stock market.

Volcker Rule

Provision of Dodd-Frank Act that limits proprietary trading by commercial banks and their affiliates.

Vulnerabilities

Underlying weaknesses that can render the financial system susceptible to instability.

Warehouse loans

A line of credit with a bank for nonbank lenders to use mortgages being accumulated for sale as collateral.

Weekly Economic Index

A Federal Reserve index of 10 daily and weekly economic indicators. It reflects what annualized percent change in gross domestic product would be if conditions persisted for a quarter.

Wholesale funding

Funding provided to financial and nonfinancial firms by sources such as federal funds borrowing, repurchase agreements, foreign deposits, brokered deposits, and other short-term borrowing to supplement other funding sources such as retail deposits and long-term debt. Firms have varying reliance on short-term wholesale funding.

Work from home (WFH)

Historically an unconventional alternative to working in corporate office space. As a result of COVID-19 and various lockdowns, WFH increased in 2020. WFH is possibly a long-term trend with significant implications for commercial real estate, telecommunications, and other sectors.

Yield curve

Graphical representation of the relationship between bond yields and their respective maturities. Generally, the curve slants up because longer-term bonds have higher yields than short-term debt securities. When that relationship does not hold, the yield curve is said to be inverted or flat.

Zero lower bound

Previously, zero was said to be the lowest interest rate possible, constraining options for monetary policy. Negative interest rates are now common internationally, though not in the United States. An international forum for bank supervisors that aims to improve banking supervision worldwide. The BCBS develops guidelines and supervisory standards, such as standards on capital adequacy, the core principles for effective banking supervision, and recommendations for cross-border banking supervision.

APPENDIX C

ENDNOTES

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36 Chartered by Congress to support mortgage lending, FHLBs have evolved into important providers of funding for banks, most notably through advances secured by mortgage collateral. FHLBs provide more than \$1 trillion in low-cost funding through advances, although they also lend through the repurchase agreement and federal funds markets. These banks are government-sponsored entities that are perceived by markets to have the implicit backing of the U.S. government. Thus, FHLBs can borrow cheaply in the wholesale funding markets and then provide low-cost funding to their members.

In March 2023, FHLBs issued \$247 billion in net debt at the height of the banking sector funding stress. This was the highest month-over-month increase in FHLB debt outstanding in the System's history. FHLB debt reached more than \$1.5 trillion at the end of May 2023, far surpassing the previous record high of \$1.3 trillion at the end of October 2008.

FHLBs issued short-term debt, largely purchased by MMFs, to fund lending activities. As of the end of March 2023, 75% of FHLB debt outstanding matured within one year while 62% of FHLB advances repaid in less than one year. MMFs held 46% of FHLB overall debt obligations and 58% of FHLB short-term debt at month-end March 2023. The issuance of short-term debt to fund significant loans to members resulted in a mismatch between the maturities of the FHLBs' assets (i.e., advances, securities, and cash) and liabilities. To mitigate this asset-liability duration mismatch and the potential for funding rollover risk and possible asset fire sales to repay maturing debt, the FHLBs employ the FHFA's liquidity and funding guidelines, which require each FHLB to maintain a positive net cash flow position while renewing all maturing advances and funding gap limits that restrict large maturity transformation.

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The Pension & Investments Research Center also provides datasets based on recurring surveys to illustrate developments in the asset management industry. Based on the vendor's most recent survey, U.S. asset management firms had \$77.4 trillion under management at year-end 2022.

115 Bank-administered collective investment funds are subject to prudential regulation, although the nature of regulation and supervision can vary, depending on whether the advisor has a state or national charter. Additionally, asset managers are subject to modest capital requirements at the state level.

116 A defining characteristic of the asset management industry is that they provide advice to others or issuing reports or analyses regarding securities for a fee, which is usually linked to the level of assets under management. The asset manager's client can be on an individual basis, meaning the clients are separately advised, on what securities to buy, sell, and retain. Asset manager's clients can also be investment funds or entities, which pool contributions of capital from numerous investors and manage the contributed assets as a single account, on a fully discretionary basis. The separate account and the private or public fund are merely efficient mechanisms that enables an asset manager to render investment advisory service in a cost-efficient manner.

In some cases, the client has ultimate discretion for each security transaction. However, many advisory contracts are drafted with a broad grant of discretion to give the adviser maximum flexibility, bypassing the client's need to review and approve each transaction. These discretionary arrangements can allow the asset manager to act on behalf of the investor with the power to affect the rights and duties of the investor.

117 Willis Towers Watson Public Limited Company, Thinking Ahead Institute. *The world's largest 500 asset managers: A Thinking Ahead Institute and Pensions & Investments joint study*. London, UK: TAI, 2022. https://www.thinkingaheadinstitute.org/content/uploads/2022/10/PI-500-2022_final_1013.pdf. The sector concentration mostly results from the trend toward index-linked investment products, which benefited a few asset managers.

118 Mutual funds are divided into three types:

OEFs, which offer shares continuously and grant investors a right to redeem their shares on demand at their current value.

Closed-end funds, which do not offer redemption rights to investors (who may exit the fund only by selling shares on an exchange, as they would a corporate security) and do not offer shares for sale continuously.

ETFs, which are open-end funds that issue shares traded on an exchange and do not sell or redeem individual shares except with authorized participants (APs).

119 Methods of achieving a stable price per share include the utilization of amortized cost or penny rounding of the share price and sponsor support. The Investment Company Act of 1940 and other applicable rules generally require mutual funds to calculate current NAV per share by valuing their portfolio securities for which market quotations are readily available at market value and valuing other securities and assets at fair value, as determined in good faith by their board of directors. In Investment Company Act Release no. 8757, the SEC permitted MMFs to determine their NAV using valuation methods that facilitate the maintenance of a stable share price (see <https://www.sec.gov/rules/final/1983/ic-13380.pdf>). While the SEC changes in 2014 required institutional prime and tax-exempt funds to float their NAV, the fluctuations in the floating NAV of MMFs have typically been minuscule, allowing for penny rounding of the per-share price of the funds (see <https://www.sec.gov/files/rules/final/2014/33-9616.pdf>).

120 SEC, MMF Reforms: Form PF Reporting Requirements for Large Liquidity Fund Advisors; Technical Amendments to Form N-CSR and Form N-1A, Release No. IC-34959 (July 12, 2023), <https://www.sec.gov/news/press-release/2023-129/>.

121 The adopted rules include:

removing the ability of MMFs to impose liquidity fees and redemption gates when they fall below certain liquidity levels, while preserving the discretion to impose liquidity fees on nongovernment funds;

increasing the required minimum level of daily and weekly fund liquidity for all MMFs; and

mandating that institutional prime and tax-exempt funds impose a liquidity fee under certain circumstances, in lieu of the proposed swing-pricing framework.

The rules also permit stable-NAV funds to institute a reverse distribution or similar mechanism during a negative interest rate environment to maintain a stable \$1 share price.

122 SEC Form N-MFP as of September 30, 2023.

123 As of May 31, 2023.

124 Section 22(e) of the Investment Company Act of 1940 generally prohibits funds from suspending redemptions or delaying the payment of the redemption proceeds for more than seven days. As a matter of practice, open-end funds typically pay proceeds within one to two days of the redemption request. OEFs may suspend redemptions only in extremely limited circumstances, such as if the SEC declares an emergency.

125 OEFs are required to process shareholder redemptions at a price based on the next calculated NAV on the day when the redemption order is placed. Currently, the redeeming shareholder can escape the potential negative financial impact caused by its redemption order because the fund has yet to record the financial implications of any securities sale transactions necessary to honor the redemption request. Rather, these costs are borne by the remaining shareholders, and thus, the redemption potentially dilutes the value of the shares of the remaining shareholders. This possibility of dilution creates an incentive for shareholders to redeem their shares before others to avoid the transaction costs, especially if the redeeming shareholders anticipate large outflows from the fund. In times of market stress (or other negative developments), this *first-mover incentive* can contribute to large outflows from the fund, akin to a bank run.

126 In particular, securities with longer maturities are more sensitive to rising interest rates. According to Morningstar Direct data, the average duration of U.S. bond fund assets is 4.7 years.

127 Dealer inventories are an indicator of dealers' ability to intermediate in the fixed-income markets.

128 Historically, in fixed-income markets, banks and other large intermediaries were counted on to fill the role of market maker, provide liquidity, and keep the markets functioning smoothly. Over time, however, banks' and other intermediaries' ability and willingness to do these things has waned, due to the same perceived risks of stressed markets that drove market participants to seek liquidity in the first place. Additionally, empirical evidence suggests that the Volcker Rule has led dealers to further reduce their bond market liquidity provision in stress periods. See Bao, Jack, Maureen O'Hara, and Xing (Alex) Zhou. 2018. "The Volcker Rule and corporate bond market making in times of stress." *Journal of Financial Economics* 130, no. 1 (October): 95–113.

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130 Funds have a number of tools to meet redemption requests, although current fund reports lack details. Under normal circumstances, funds are able to meet a large redemption request (or other liquidity call) by drawing on cash, cash-equivalent holdings, and income earned on investments (although the last of these does not generate immediate liquidity). Remaining liquidity needs could be met by selling securities with embedded gains, drawing on temporary lines of credit that are available to the "fund complex" to meet "temporary" redemption needs, and preexisting interfund lending arrangements. Some fund complexes also rely on cross-trades based on SEC Form N-CRS filings.

During stress periods, the funds can request SEC exemptive relief to provide affiliate support. On March 26, 2020, SEC staff issued no-action relief to affiliates of funds to allow them to purchase debt securities from the funds, temporarily eliminating the need to request relief.

If the aforementioned are not available or have been depleted, the fund board can also choose to suspend redemptions and proceed to liquidate the fund. If the fund board chooses to liquidate, the fund can attempt an in-kind prorated distribution. This depends on investors' ability and willingness to liquidate the underlying securities themselves. However, such actions could have a spillover effect.

131 ETFs that create and redeem in cash have the ability to offset some or all of the transaction costs by charging a redemption transaction fee. Many funds charge up to 2% on assets. However, the fee may be insufficient to cover transaction costs in periods of market stress.

132 According to Morningstar Direct data.

133 The availability of primary market liquidity assumes the APs are able and willing to perform arbitrage at a profit. This is not always possible, particularly in periods of market stress when the price of an asset can be volatile or market dysfunction can make liquidity difficult to measure and the AP may be under pressure to tighten their own securities inventory risk limits.

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