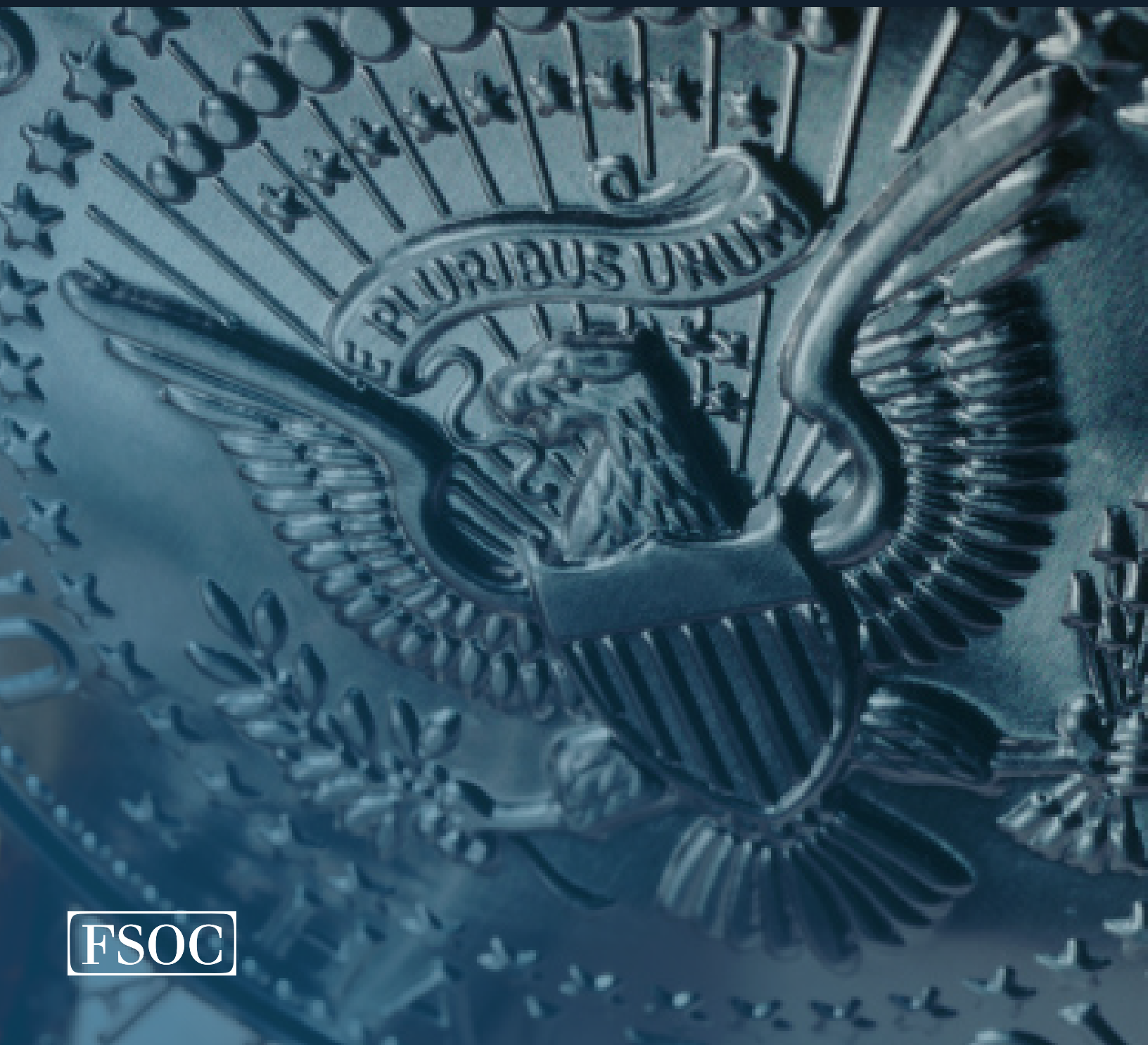
2022

ANNUAL REPORT

FINANCIAL STABILITY OVERSIGHT COUNCIL



FSOC

Embargoed until the FSOC meeting adjourns on December 16, 2022.

Financial Stability Oversight Council

The Financial Stability Oversight Council (Council) was established by the Dodd-Frank Wall Street Reform and Consumer Protection Act (Dodd-Frank Act) and is charged with three primary purposes:

1. To identify 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.
2. To promote 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.
3. To respond to emerging threats to the stability of the U.S. financial system.

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 are:

- 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, are:

- 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.

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

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Statutory Requirements for the Annual Report

Section 112(a)(2)(N) of the Dodd-Frank Act requires that the Council's annual report address the following:

1) the activities of the Council;
2) significant financial market and regulatory developments, including insurance and accounting regulations and standards, along with an assessment of those developments on the stability of the financial system;
3) potential emerging threats to the financial stability of the United States;
4) all determinations made under Section 113 or Title VIII and the basis for such determinations;
5) all recommendations made under Section 119 and the result of such recommendations; and
6) recommendations—
    a) to enhance the integrity, efficiency, competitiveness, and stability of United States financial markets;
    b) to promote market discipline; and
    c) to maintain investor confidence.

Approval of the Annual Report

This annual report was approved by the voting members of the Council on December 16, 2022.

Abbreviations for Council Member Agencies and Member Agency Offices

- 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)

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1 Member Statement

The Honorable Nancy Pelosi
Speaker of the House
United States House of Representatives

The Honorable Kevin McCarthy
Republican Leader
United States House of Representatives

The Honorable Kamala D. Harris
President of the Senate
United States Senate

The Honorable Charles E. Schumer
Majority Leader
United States Senate

The Honorable Mitch McConnell
Republican Leader
United States Senate

In accordance with Section 112(b)(2) of the Dodd-Frank Wall Street Reform and Consumer Protection Act, for the reasons outlined in the annual report, I believe that additional actions, as described below, should be taken to ensure financial stability and to mitigate systemic risk that would negatively affect the economy: the issues and recommendations set forth in the Council's annual report should be fully addressed; the Council should continue to build its systems and processes for monitoring and responding to emerging threats to the stability of the U.S. financial system, including those described in the Council's annual report; the Council and its member agencies should continue to implement the laws they administer, including those established by, and amended by, the Dodd-Frank Act, through efficient and effective measures; and the Council and its member agencies should exercise their respective authorities for oversight of financial firms and markets so that the private sector employs sound financial risk management practices to mitigate potential risks to the financial stability of the United States.

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Janet L. Yellen
Secretary of the Treasury
Chairperson, Financial Stability Oversight Council

Jerome H. Powell
Chair
Board of Governors of the Federal Reserve System

Michael J. Hsu
Acting Comptroller of the Currency
Office of the Comptroller of the Currency

Rohit Chopra
Director
Consumer Financial Protection Bureau

Gary Gensler
Chair
Securities and Exchange Commission

Martin J. Gruenberg
Acting Chairman
Federal Deposit Insurance Corporation

Rostin Behnam
Chairman
Commodity Futures Trading Commission

Sandra L. Thompson
Director
Federal Housing Finance Agency

Todd M. Harper
Chairman
National Credit Union Administration

Thomas E. Workman
Independent Member Having Insurance Expertise
Financial Stability Oversight Council

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2 Executive Summary

The Council's 2022 annual report reviews significant financial market developments, describes potential emerging threats to U.S. financial stability, identifies vulnerabilities in the financial system, and makes recommendations to mitigate them. Significant unaddressed vulnerabilities could potentially disrupt the provision of critical financial services, such as the clearing of payments, provision of liquidity, and the availability of credit needed to support economic activity. The annual report also summarizes notable regulatory developments and reports on the activities of the Council.

Since last year's report, U.S. economic growth has slowed, reflecting a confluence of factors, including the unprovoked Russian war against Ukraine in February and the Federal Reserve's tightening of monetary policy to reduce inflation. Russia's war has caused the deaths of tens of thousands of people and displaced millions more, and energy and food prices have climbed. Meanwhile, supply chain disruptions lingered even as the acute phase of the COVID-19 pandemic passed. Global growth also slowed amid heightened economic uncertainty and contributed to financial and economic stress.

Inflation rose globally, and the Federal Reserve and other major central banks tightened monetary policy. The target range for the federal funds rate was at its effective lower bound at the beginning of 2022, and by November, the Federal Reserve had raised the target range to 3.75% to 4%. The Federal Reserve also began to reduce the size of its balance sheet, which had expanded notably due to its response to the market turmoil at the onset of the COVID-19 pandemic in March 2020.

Financial conditions tightened sharply as Treasury yields rose, corporate and mortgage risk spreads widened, and equity prices fell. The 10-year nominal U.S. Treasury security yield rose to its highest level since 2007. Economic uncertainty led to implied interest rate volatility in the Treasury market as measured by the Merrill Lynch Option Volatility Estimate (MOVE) index to reach levels last seen in early 2020. The dollar's exchange value against a basket of major currencies appreciated notably and remains at two-decade highs. Corporate bond spreads widened to levels near longer-run historical averages. Broad equity market indexes dropped considerably, and the CBOE Volatility Index (VIX), which provides a market estimate of the expected volatility of the Standard and Poor's (S&P 500) Index, periodically rose above 30, a level commonly considered as elevated by market participants.

Reflecting greater market volatility, liquidity in fixed-income markets has declined, although investors continue to be able to execute trades, albeit at somewhat higher costs. Bid-ask spreads in Treasury markets widened, and market depth measures worsened, though levels are much lower than seen in March 2020. Liquidity in other markets deteriorated, particularly those most directly affected by commodity and agricultural price shocks. Corporate bond bid-ask spreads also widened, although they remained below the levels seen at the onset of the COVID-19 pandemic.

Nonfinancial firms, commercial real estate borrowers, and municipalities faced higher borrowing costs in capital markets. Even so, bank lending remains robust, and in particular, lending to nonbank financial institutions (NBFIs) continued to increase notably. In the residential real estate market, mortgage rates rose sharply, the rate of house price increases slowed, and prices dropped in some markets. As a result, while aggregate mortgage credit grew, the pace of new mortgage originations decelerated amid higher rates.

Some commodity markets experienced significant strains, especially at the onset of Russia's war against Ukraine. The price of oil rose notably, and natural gas prices jumped sharply, particularly

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in the European market. Global agricultural commodity prices surged, with the price of wheat, a major export good for Ukraine and Russia, increasing relatively more than other products. Pressures in the London nickel market led to price spikes and a multi-day trading halt at one exchange.

The decline in traditional asset prices was magnified in crypto-asset markets. Widely-traded crypto-assets experienced sharp price drops, with Bitcoin losing more than half of its value, and there were runs at multiple algorithmic stablecoins. Meanwhile, in November, crypto-exchange FTX and some affiliated firms declared bankruptcy. Alongside these developments, consumer and investor complaints about crypto activities continue to mount. While the scale of crypto-asset activities has increased significantly in recent years, interconnections with the traditional financial system are currently relatively limited, so these events left little imprint on broader financial markets.

In the United Kingdom (UK), a steep rise in UK government bond (gilt) yields following the announcement of a new fiscal package in September 2022 led to broad-based forced selling by leveraged UK liability-driven investment funds. In line with its financial stability objective, the Bank of England purchased gilts to help restore market functioning and reduce any risks from contagion to credit conditions for households and businesses. This targeted action helped to limit spillovers, including to U.S. markets.

Amid heightened geopolitical and economic shocks and persistent inflation, risks to the U.S. economy and financial stability have increased even as the financial system has exhibited resilience to date. The U.S. banking system has significantly higher capital and liquidity levels than before the 2008 financial crisis, which has increased its ability to absorb potential losses and disruptions in funding markets. Asset valuation pressures have moderated, leaving markets less susceptible to an abrupt repricing of risk. The U.S. markets and financial firms largely shrugged off the volatility prompted by the leveraged-induced forced selling in the UK. More generally, despite the wave of shocks this year, destabilizing spirals at U.S. levered intermediaries appeared to be absent. U.S. central counterparties for commodities ably managed the heightened volatility witnessed earlier this year, and initial and variation margins built up to guard against risk. Households still have significant savings, and aggregate household balance sheets are solid. Businesses have considerable cash buffers and can service debt burdens. That said, a shock leading to unexpected interest rate increases or other market turmoil could lead to increases in defaults or difficulties servicing debt burdens, including for residential or commercial real estate exposures.

The Council has identified 14 specific financial vulnerabilities. This report reviews these vulnerabilities, which fall into a range of broader categories: financial risks, financial institutions, financial market structure, operational and technological risks, and climate-related financial risk. This report also describes the Council's recommendations for mitigating the identified vulnerabilities.

Financial Risks

The Council has identified five vulnerabilities associated with market and credit risk: Commercial Real Estate, Residential Real Estate, Nonfinancial Corporate Credit, Short-term Wholesale Funding Markets, and Digital Assets.

Because of their scale and leverage, the commercial real estate (CRE) and residential real estate sectors have the potential to increase risks to U.S. financial stability significantly. Uncertain economic conditions and rising borrowing costs have increased risk in both sectors. The Council recommends supervisors and financial institutions monitor exposures and ensure the adequacy of credit loss allowances.

Rising interest rates and slower economic growth have led to an increase in the credit risk of some nonfinancial corporate borrowers. If credit quality worsened significantly, a potential wave of defaults could lead to large redemptions at investment funds with significant liquidity mismatches, and in turn, disrupt market functioning. The Council recommends that

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member agencies continue to monitor leverage and encourage entities exposed to corporate credit risk to review their risk-rating methods and, if applicable, assess the adequacy of their allowances for credit losses.

Short-term wholesale funding markets are critical for financing U.S. businesses and the government. Reflecting ongoing market volatility and shifts in monetary policy, the Council recommends close monitoring of short-term funding market conditions and actions to mitigate vulnerabilities, and supports efforts by financial regulators to strengthen market functioning, including during periods of stress. Where a lack of data prevents close monitoring, proposals should be developed to collect the necessary data, such as the efforts by the OFR to improve the collection and transparency of non-centrally cleared bilateral repo markets data.

The Council's *Report on Digital Asset Financial Stability Risks and Regulation*, published in October, concluded that crypto-asset activities could pose risks to the stability of the U.S. financial system if their interconnections with the traditional financial system and their scale grow without appropriate regulation. The existing regulatory structure covers large parts of the crypto-asset ecosystem. The Council emphasizes the importance of continued enforcement of existing rules and regulations in applying these existing authorities. The report also identifies gaps in the regulation of crypto-asset activities in the United States. To address the gaps in the regulatory framework, the Council recommends the passage of legislation providing for rulemaking authority for federal financial regulators over the spot market for crypto-assets that are not securities, steps to address regulatory arbitrage, and an assessment of whether vertically integrated market structures can or should be accommodated under existing laws and regulations. Finally, the Council recommends bolstering its members' capacities related to data and to the analysis, monitoring, supervision, and regulation of crypto-asset activities.

Financial Institutions

The Council has identified vulnerabilities related to three types of financial institutions: Large Bank Holding Companies (BHCs), Investment Funds, and Central Counterparties (CCPs).

Large BHCs perform essential banking functions such as providing credit to commercial and retail borrowers, helping firms raise capital, hedging risk, providing asset management and custody services, and facilitating clearing and settlement. The stability of these organizations is critical to the global financial system. Large BHCs face a challenging environment that includes rising interest rates, increased concerns about the economic outlook and its potential impact on credit quality, and continued cyber security threats. The Council recommends that banks and banking supervisors assess the adequacy of their capital, including unrealized losses on securities portfolios. The Council encourages agencies and financial institutions to ensure their stress-testing methodologies reflect plausible tail risks given changing economic conditions. The Council also recommends that banking agencies continue monitoring bank exposures to NBFIs, including assessing how banks manage their exposure to leverage in the nonbank financial sector.

The Council has identified vulnerabilities in hedge funds, open-end funds, certain collective investment funds, and money market funds (MMFs) due to their scale, leverage, interconnectedness, and ability to engage in liquidity and maturity transformation. Some of these vulnerabilities have the potential to amplify shocks, including recent unexpectedly persistent inflation and the associated rise in interest rates. The Council supports the initiatives by the SEC and other agencies to address risks in hedge funds, including proposed data collection improvements for Form PF. The Council will continue to review the findings of its Hedge Fund Working Group (HFWG) as they are developed. The Council recommends that the SEC and other relevant regulators consider whether additional steps should be taken to address these vulnerabilities. In light of the growth of collective investment funds (CIFs), regulators should consider whether the regulatory differences between the regimes governing CIFs and mutual

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funds increase the risks of regulatory arbitrage. Meanwhile, the Council supports the SEC's efforts to improve the resilience and transparency of MMFs and strengthen short-term funding markets. The Council will continue to monitor initiatives relating to MMF reforms.

Since the 2008 financial crisis, firms have become increasingly incentivized through regulatory reforms to use CCPs instead of bilateral contracts, making CCPs key actors in the global financial system. Central clearing protects against defaults among counterparties whose failure could threaten financial stability but simultaneously makes the central counterparty vulnerable to a shock. For example, earlier in the year, as commodity price volatility surged following Russia's war against Ukraine, several commodity-focused CCPs were forced to raise initial margins suddenly and substantially. Despite the stress on some CCPs, there was limited impact on the broader financial system. The Council recommends that the CFTC, Federal Reserve, and SEC continue to coordinate the supervision of all CCPs designated by the Council as financial market utilities (FMUs) that are systemically important. CCP supervisory agencies should continue to work with the FDIC to support CCP resolution planning. In addition, member agencies should continue working with global counterparts and international standard-setting bodies to identify and address areas of concern. Finally, the Council encourages cooperation in the oversight and regulation of systemically important CCPs, and continued progress in advancing recovery and resolution planning for systemically important CCPs.

Financial Market Structure

The Council has identified three vulnerabilities associated with financial market structures: Treasury Markets, Alternative Reference Rates, and the Provision of Financial Services by Nonbank Financial Institutions.

The Treasury market plays a critical role in financing the federal government, supporting the broader financial system, and implementing monetary policy. While the Treasury market has shown resilience in the face of increased uncertainty and volatility in 2022, the official sector should seek continual improvements that strengthen the Treasury market to keep pace with changing technology and trading patterns to ensure that the Treasury market continues to fulfill these vital purposes. The Council supports efforts by Treasury to improve transparency in post-trade transactions in the cash market for Treasury securities.

Since 2013, the Council has identified LIBOR as a key risk to financial stability, bank safety and soundness, and market integrity. Most LIBOR rates are no longer published, and the remaining U.S. dollar (USD) LIBOR rates are similarly due to end as of June 30, 2023, marking the end of LIBOR. Given the large volume of legacy USD LIBOR contracts outstanding, the Council advises firms to take advantage of any existing contractual terms or opportunities for renegotiation to transition their remaining legacy LIBOR contracts before June 30, 2023. The Council advises responsible parties to communicate any outstanding decisions regarding the rates to which outstanding legacy LIBOR contracts will transition and any necessary conforming changes well in advance of June 2023.

NBFIs increasingly provide financial services traditionally provided by banks. The emergence of nonbank financial institutions in certain markets has increased competition, fostered innovation, and enhanced access to capital markets. However, it has introduced vulnerabilities related to leverage and liquidity mismatches to the broader financial system, and rising interest rates or a broader economic downturn could further amplify these vulnerabilities. The Council recommends that member agencies leverage existing authority to ensure that the same activity with the same risk, when conducted by different entities, has the same regulatory outcome. The Council also encourages relevant federal and state regulators to continue coordinating closely to collect data, identify risks, and strengthen oversight of nonbank companies involved in the origination and servicing of residential mortgages. This year, the Council's nonbank mortgage servicing task force was re-established to analyze nonbank servicer risks and concerns. Finally, the Council recommends agencies ensure that the largest and

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most complex nonbank mortgage companies are prepared should delinquencies and subsequent foreclosures increase as interest rates rise.

Operational Risk and Technological Risk

The Council has identified cybersecurity and third-party service providers as vulnerablities.

A grave cybersecurity incident could potentially threaten the stability of the U.S. financial system through at least three channels: (1) disrupting key institutions with few or no substitutes, such as central banks, exchanges, payment clearing and settlement systems, or other critical service providers; (2) compromising the integrity of data that is critical to the stable functioning of financial firms and the system; and (3) causing a loss of confidence among a broad set of market participants. Thus far, there have been few successful cyberattacks against the U.S. financial system related to Russia's war against Ukraine, and they have proven to be negligible in both disruption and impact. Maintaining and improving the cybersecurity resilience of the financial sector requires continuous assessment of cyber vulnerabilities and close cooperation across firms and governments within the U.S. and internationally. The Council supports ongoing partnerships between federal and state government agencies, private firms, and international partners. It encourages the Financial and Banking Information Infrastructure Committee (FBIIC) to continue working closely with member and state agencies, the Department of Homeland Security (DHS), law enforcement, and industry partners to conduct regular cybersecurity exercises. The Council recommends that agencies carefully consider how to share information, including confidential supervisory and classified information, and supports additional work to understand and mitigate the financial stability risks associated with cybersecurity.

The Council has identified the financial sector's concentrated dependency on a limited number of third-party service providers as a potential risk to financial stability. The Council supports federal banking regulators continuing to coordinate third-party service provider examinations, working collaboratively with states, and identifying additional ways to support information sharing among state and federal regulators. The Council recommends Congress pass legislation that ensures that the FHFA, NCUA, and other relevant agencies have adequate examination and enforcement powers to examine certain services of third-party service providers to banking organizations.

Climate-related Financial Risk

Climate change is an emerging threat to U.S. financial stability. The physical and transition risks associated with climate change could contribute to financial instability through numerous channels, including financial intermediaries experiencing significant losses, the impairment of financial market functioning, or the sudden and disruptive repricing of assets. Climate-related financial risks can affect households, communities, businesses, and governments by damaging property, impeding business activity, impacting income, and altering the value of assets and liabilities. These risks may lead financial institutions or insurance providers to pull back from credit or insurance provisions, potentially amplifying the initial climate-related shock and harming financial stability. Over the last year, Council members have made significant progress in improving their capacity to assess and address climate-related financial risks. The Council supports member agencies' continued efforts to: address climate-related data gaps; promote consistent, comparable, and decision-useful disclosures; improve assessments of climate-related financial risks and vulnerabilities; and incorporate climate-related financial risks into their risk management practices and supervisory expectations for regulated entities where appropriate.

Council Activities

The Council, as charged by the Dodd-Frank Act, works to identify risks to U.S. financial stability, promote market discipline, and respond to emerging threats to the financial stability of the U.S. financial system. It serves as a vital forum for collaboration, discussion, risk analysis, and policy formulation among the U.S. financial stability

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and regulatory community. In 2022, the Council has focused on four key priorities to address risks and vulnerabilities in the financial system: (1) nonbank financial intermediation, (2) Treasury market resilience, (3) climate-related financial risk, and (4) digital assets.

The Council continues to assess the vulnerabilities posed by three types of NBFIs: open-end mutual funds, hedge funds, and money market funds. In February, the Council issued a public statement describing the risks associated with NBFIs and expressing support for continued efforts to mitigate those risks. Of particular note, over the last year, the Council's HFWG has developed an interagency risk monitoring system to assess hedge fund-related risks to U.S. financial stability. In addition, in June 2022, the Council restarted the Nonbank Mortgage Servicing Task Force meetings.

Enhancing the resiliency of the Treasury market remains a priority for the Council. The Council continues to support efforts across the U.S. Treasury and through the Interagency Working Group on Treasury Market Surveillance (IAWG) to strengthen the Treasury market. The Council's work through the HFWG and Open-end Fund Working Group, for example, is helping inform the IAWG's assessment of how funds' leverage and liquidity risk management practices affect the Treasury market.

Climate-related financial risk is another key priority for the Council. Since 2021 the Council has been leading and coordinating an interagency response to climate-related risks to the financial system. In October 2021, the Council published its *Report on Climate-Related Financial Risk*, which recommended the formation of two committees – a staff-level Climate-related Financial Risk Committee (CFRC), which has met regularly since February 2022, and an external advisory committee, the Climate-related Financial Risk Advisory Committee (CFRAC), which was established in October 2022. The CFRC has served as a key forum for interagency information sharing, coordination, and capacity building to help fill data gaps, improve the assessment of climate-related risks, and advance agencies' efforts to implement the recommendations identified in the Council's climate report.

The Council identified digital assets as a priority area in February 2022. In response to the directive in Executive Order 14067, Ensuring Responsible Development of Digital Assets, the Council published its *Report on Digital Asset Financial Stability Risks and Regulation* on October 3, 2022. The report details the Council's findings and recommendations, as discussed in Section 3.1.5. The Council's Digital Assets Working Group met regularly throughout 2022 and coordinated the drafting process.

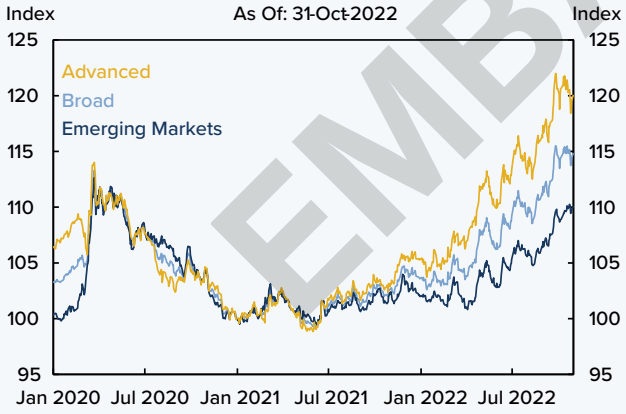
The Council has advanced efforts to assess and address financial stability risks in all four priority areas and also continues to focus on other vulnerabilities identified in this year's report. For more information on the Council's priorities and activities in 2022, please refer to Section 4.1.

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Box A: Stress in Global Markets

The global economy is facing headwinds to growth and grappling with higher inflation, posing heightened financial stability risk. Russia's war against Ukraine has complicated the global macroeconomic outlook, adding stresses to an already challenging economic environment coming out of the COVID-19 pandemic. Different paces of monetary tightening have contributed to currency movements, and the dollar has appreciated broadly against both advanced and emerging market currencies (**Figure A.1**). Russia's war against Ukraine has led to a severe energy crisis in Europe and other parts of the world that is detrimentally impacting economic activity. In China, the lockdowns associated with the zero COVID policy have contributed to slowing growth, and the country's property sector, a significant component of economic activity and historically a key driver of Chinese economic growth, is weakening. The International Monetary Fund (IMF) projects weak global growth in 2022 to persist into 2023.

A.1 Nominal Trade-Weighted U.S. Dollar Index

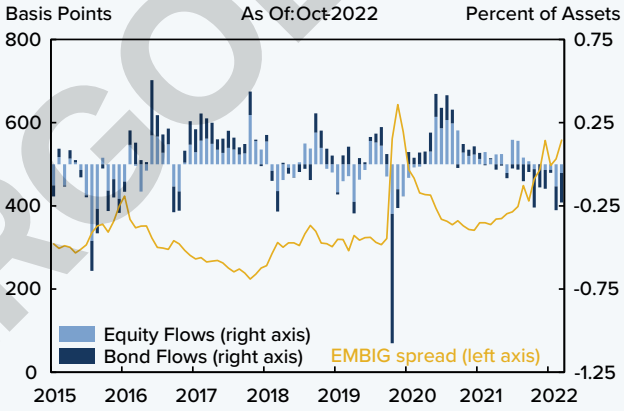


Source: Federal Reserve, Haver Analytics

Note: Indexed to 100 as of Dec. 31, 2020.

The various stresses in the global economy have led to capital outflows from EMEs in 2022 (**Figure A.2**). The impact of these external factors on EMEs has been tempered in part by their generally large stock of foreign exchange reserve buffers and EME preemptive monetary policy tightening. However, high inflation and continued monetary tightening in advanced economies may cause risk-adjusted yield differentials between EMEs and advanced economies to narrow. Further capital outflows and currency depreciations could curtail funding sources for EME governments and corporations and, in vulnerable EMEs with elevated debt levels, could result in debt-service difficulties in the face of higher interest rates.

A.2 Portfolio Flows to EMEs



Source: EPFR, Bloomberg, L.P.

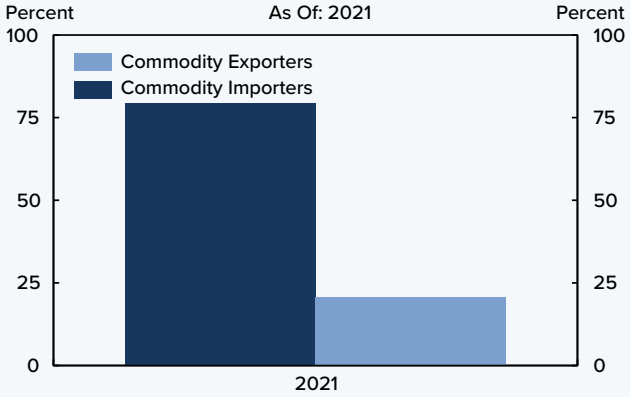
Note: Bars show monthly averages of weekly flow data, line shows monthly average of daily Spread data.

Rising commodity prices have helped mitigate the fragilities of EMEs that are commodity exporters. But this mitigation will reverse should commodity prices stabilize. In addition, commodity-importing countries constitute a far larger share of total EME GDP than commodity exporters (**Figure A.3**). Many of these countries are facing energy and food insecurity that can potentially lead to social unrest and political instability.

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Box A: Stress in Global Markets (continued)

A.3 Shares of Commodity Importers and Exporters



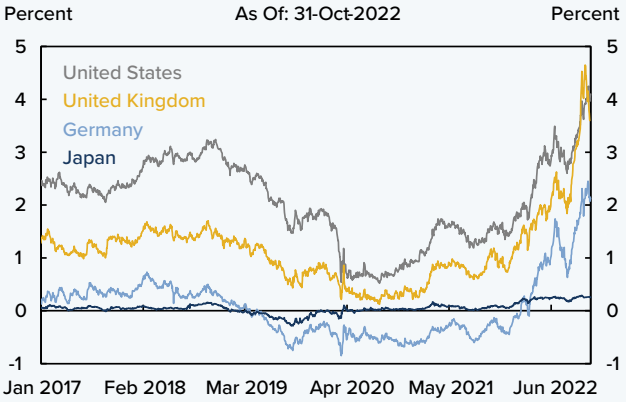
Source: UN Comtrade, Haver Analytics, FSOC calculations

High levels of debt in China in public, corporate, and household balance sheets could cause financial distress and be a catalyst for wider EME stress. China's economy is slowing significantly amid sporadic COVID-19 lockdowns and troubles in the real estate sector—a pillar of the Chinese economy, with real estate-based lending equivalent to 45% of China's GDP and mortgage-based household debt amounting to 35% of China's GDP.[1] Property developers are facing cash flow problems that hinder their ability to finish construction projects, contributing to a sharp deterioration in confidence in the real estate sector. The renminbi has depreciated against the dollar, reflecting both slowing growth in China and interest rate differentials. Capital outflows have persisted but remain orderly. The Chinese authorities have taken some steps to support the property sector, especially encouraging local governments to facilitate the completion of ongoing construction projects, which has been a source of social unrest. However, these steps have so far been more cautious than in the past, in part reflecting the difficult tradeoff of supporting growth and mitigating moral hazards. Difficulties in the real estate sector could cause strains across China's financial system, including at banks, nonbanks, corporate bond markets, and local government finances.

EME stresses are unlikely to threaten U.S. financial stability unless a broad EME financial crisis were to occur. Financial stresses in EMEs could impact the U.S. financial system through losses on investors' exposures to EME assets and other channels.

Decelerating growth and high inflation have also affected many advanced economies in 2022. These economies have experienced significant currency depreciation versus the dollar. Most advanced economies have flexible, fully floating exchange rates and accordingly have not undertaken currency intervention as EMEs have. In one notable exception, Japan intervened in currency markets in September to support the yen over concerns about depreciation. Yield differentials have widened between Japan and other advanced economies as Japan has notably continued an accommodative monetary policy and yield curve control (YCC) at a time when other major advanced economies have raised interest rates (**Figure A.4**). Ongoing depreciation pressure could create challenges to the YCC policies moving forward.

A.4 Advanced Economies 10-Year Sovereign Yields



Source: U.S. Treasury, Deutsche Bundesbank, Ministry of Finance Japan, Bank of England, Haver Analytics

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Advanced economy sovereigns are facing lesser strains than EMEs in terms of servicing debt, and while currency depreciation may contribute to inflation, the impact is likely modest. For advanced economies that export more to the United States than they import, currency depreciation against the dollar may provide some positive impetus to growth through the trade channel. Real factors, including the energy crisis in Europe, have been the predominant weight on growth and the associated decline in European assets and rise in corporate bond spreads over the past several months. Direct U.S. exposures to advanced economies are significant, suggesting potentially sizable spillovers to U.S. financial stability. However, financial sectors in these economies generally retain substantial buffers that support their resilience to shocks.

The challenges facing the global economy require careful calibration of macroeconomic policies. In September, the Bank of England (BOE) was forced to intervene in the UK sovereign bond market due to the sharp increase in interest rates after the UK announced a significantly expansionary government budget. This intervention was made necessary in part because levered UK pension funds were reportedly forced to sell sovereign bond holdings in order to meet margin requirements on their derivatives holdings. While this is not seen as a risk for U.S. pension funds due to differences in regulation and structure, it is one example of how higher interest rates and slower growth trajectories have contributed to financial stability challenges abroad, even in advanced economies.

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3 Vulnerabilities, Significant Market Developments, and Council Recommendations

3.1 Financial Risks

3.1.1 Commercial Real Estate

Commercial real estate (CRE) loans totaled almost $5.4 trillion as of Q2 2022,[2] and CRE represents a significant portion of the assets of many financial institutions. While CRE lending is a key function of the financial sector, the Council has identified certain risks related to CRE lending. In a period of stress, high concentrations of CRE loans can expose financial institutions to significant credit risk. For example, many depository failures during the 2008 financial crisis were related to CRE loans.[3]

Although the CRE market performed relatively well in 2022, it faces a more uncertain outlook given elevated inflation, rising interest rates, a slowing economy, and the potential for structural changes in behaviors due to the COVID-19 pandemic. High inflation and interest rates could lead to decreasing cash flows and property values in the CRE market, and these properties may be worth less than the lender assumed when the property was financed. If the value decline is sufficiently steep, especially compared with the property valuation at the time of financing, lender credit losses will likely occur. Slowing economic growth negatively affects demand for almost all types of CRE properties, and the COVID-19 pandemic's negative after-effects continue to linger, particularly for office properties in large cities.

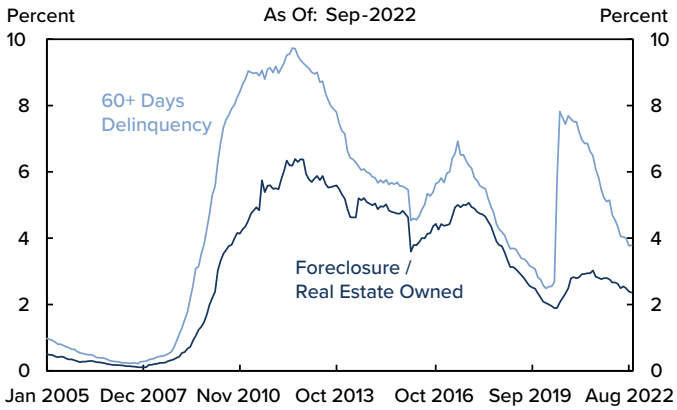
As losses from a CRE loan portfolio accumulate, eroding the lender's capital, they can spill over to the broader financial system through two mechanisms. First, asset sales of financially distressed individual properties can lower overall market valuations, affecting adjoining property values and leading to more distress and a broader downward CRE valuation spiral. Second, many CRE loans are owned by banks. Among them, small- and medium-sized banks have a higher proportion of their loan book or their balance sheet invested in CRE loans. Widespread CRE distress could pressure such banks and tighten credit availability and economic growth. In extreme cases, CRE credit losses can lead to outright bank failures, particularly for banks with high exposure to CRE loans.

CRE Loan Performance

Banks hold a significant market share of CRE loans at 50%, with the rest held by various financial institutions such as insurance companies, commercial mortgage-backed securities, and debt funds, and CRE is the largest loan category at almost one-half of U.S. banks.[4] The delinquency rate on CRE loans held by U.S. banks was modest at 0.74% in Q2 2022, near 2019 pre-pandemic lows.[5]

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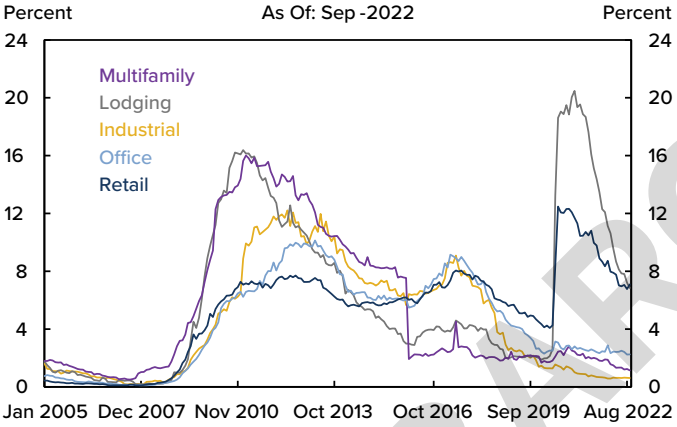
3.1.1.1 Conduit CMBS Delinquency and Foreclosure Rate



Source: JPMorgan, Trepp

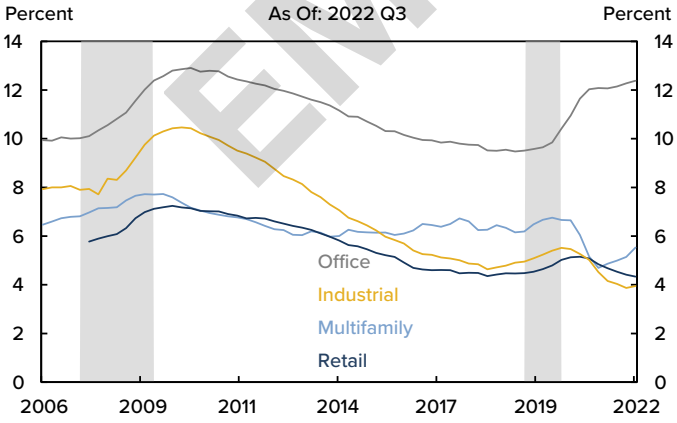
Note: 60+ Days Delinquent includes Foreclosure/Real Estate Owned.

3.1.1.2 Delinquency Rate by Property Type



Source: JPMorgan, Trepp

3.1.1.3 Vacancy Rate by Property Type



Source: CoStar, Haver Analytics

Note: Gray bars signify NBER recessions.

Delinquency rates on conduit commercial mortgage-backed securities (CMBS) increased substantially during the initial phase of the COVID-19 pandemic but improved in 2021 and 2022 (**Figure 3.1.1.1**). In September 2022, the overall commercial mortgage-backed securities conduit CMBS delinquency rate fell to 3.8% after reaching a high of 7.8% in July 2020. The delinquency rate in the hotel and lodging sector remained elevated at 6.8% but is well below the COVID-19 pandemic peak of 20.5% (**Figure 3.1.1.2**). In addition, the delinquency rate in office properties remained below the pre-pandemic level, improving to 2.3% in September 2022. However, structural changes in the demand for office space can lead to weaker credit quality for loans secured by office properties over the long term.

CRE Sectors

While the CRE market has largely recovered from stressed levels during the COVID-19 pandemic, significant uncertainties remain in certain CRE sectors. Industrial and multifamily property sectors performed well in 2022, but parts of the shopping mall sector are weak amid changing consumer preferences, including the continued expansion of online shopping.

The industrial property sector, mostly warehouse and distribution centers, experienced low vacancy rates amid strong demand for space in 2022 (**Figure 3.1.1.3**). However, demand related to warehouse and e-commerce distribution centers is showing signs of slowing.[6] Similarly, the vacancy rate in the multifamily sector was near a 20-year low in Q2 2022, but the pace of construction has been brisk, especially in rapidly growing regions.

The office property market may face the most uncertainty, with the prospect of weak future demand as return-to-office plans evolve and users decide how much space they need. At the onset of the COVID-19 pandemic, net absorption turned negative for the first time in a decade, as commercial office space that was vacated or supplied by new construction

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exceeded what was leased or absorbed by tenants. Net absorption of office space improved in 2022 but remained tepid. The drop in demand for office space has contributed to an increase in vacant space. Through Q2 2022, the U.S. office vacancy rate, at 12.3%, remained well above pre-pandemic levels. Further, office property sales prices and rent growth have lagged behind other property types. Low absorption, softening rents, and elevated vacancy rates suggest weak demand, but the effects of structural change in the office sector are still evolving. Office property demand may take time to stabilize as tenants navigate remote work decisions, adjust how much space they need, and make leasing decisions. In addition, a slow return to densely populated urban office centers could reduce the desirability of office properties and even nearby retail space. This may be especially true for older, less desirable office spaces with fewer modern amenities. Finally, softening economic conditions could lead to additional stress amid a structural shift in the office property sector.

Recommendations

Rising interest rates, uncertain economic conditions, continuing weakness in urban commercial real estate, and the possibility that some post-pandemic changes in demand for CRE will become permanent have heightened concerns about CRE. The Council recommends supervisors and financial institutions continue to monitor CRE exposures and concentrations, ensure the adequacy of credit loss allowances, assess CRE underwriting standards, and review contingency planning for a possible increase in delinquencies.

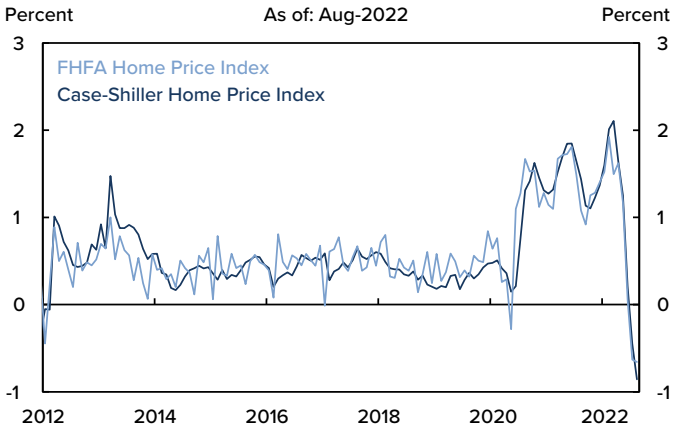
3.1.2 Residential Real Estate

Residential real estate is a significant part of the U.S. economy, comprising almost 15% of real GDP through residential fixed investments and consumption spending on housing services.[7] Recognizing the importance of residential real estate, the Council has identified downside risks to housing from rising mortgage rates, including pressure on home prices and increased delinquencies.

A sharp decrease in home prices could negatively affect homeowners' net wealth, weaken consumer confidence, and increase the likelihood or depth of a broader slowdown in the U.S. economy. At the same time, a weaker labor market could increase delinquency or foreclosure rates, putting additional negative pressure on home prices. Nonbank mortgage companies could also face acute liquidity strains in the event of widespread delinquencies (**see Section 3.3.3**). Nevertheless, a variety of factors should mitigate spillovers from a potential decline in home prices. First, mortgage underwriting standards remain high, with the median credit score of newly originated mortgages standing at 773 in Q2 2022, an increase from below 750 in the years before the 2008 financial crisis.[8] Second, there is little evidence to date that a surge in speculative activity drove recent house price increases. The rapid rise in house prices experienced since the onset of the pandemic was likely in part attributable to a shift in the demand for housing.[9] Finally, delinquency rates remain subdued, and the equity of current mortgage holders is strong. As of Q2 2022, 92.7% of all outstanding mortgages had 20% or more equity – an all-time high since 2000.[10]

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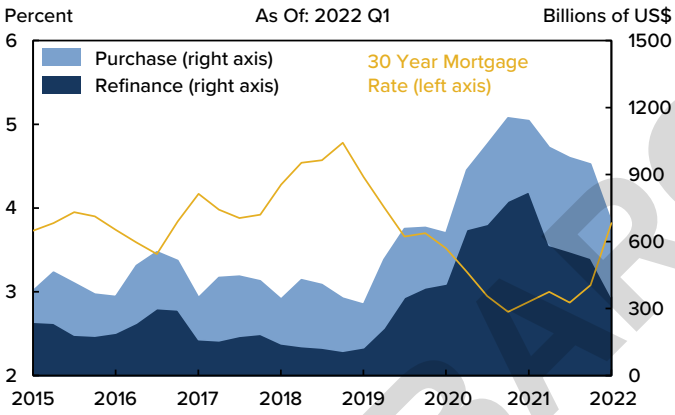
3.1.2.1 Monthly House Price Growth



Source: S&P CoreLogic Real Estate Data, FHFA, Haver Analytics

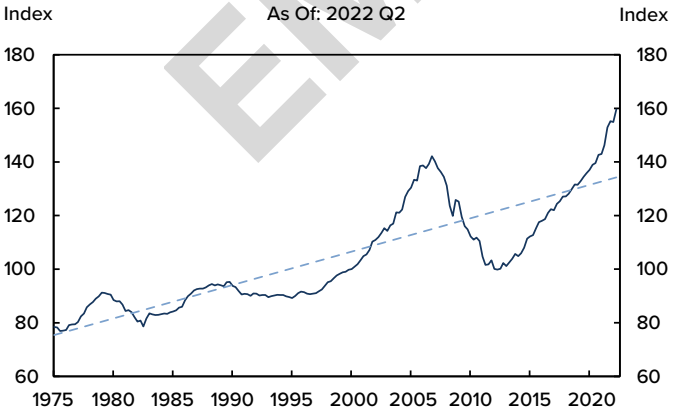
Note: SA. Month-over-month percentage change.

3.1.2.2 Residential Purchase and Refinance Levels



Source: NMDB®, Freddie Mac Primary Mortgage Survey

3.1.2.3 Real House Prices Relative to Long-Term Trend



Source: FHFA, BLS, FRED

Note: Not seasonally adjusted, real terms. Trend is estimated using data from 1975 Q3 through 2012 Q2 (trough-to-trough).

There is evidence of significant cooling of the U.S. housing market. By July 2022, both the Case-Shiller and FHFA indices reported a decline in home prices (**Figure 3.1.2.1**). At the same time, mortgage originations have moderated, and refinance activity has declined significantly (**Figure 3.1.2.2**). Based on the National Mortgage Database (NMDB®), mortgage refinancing has fallen to $351 billion in Q1 2022, a 57% drop from Q1 2021, and existing home sales fell to a seasonally adjusted annual rate of 4.7 million units in September 2022, down from the 6.5 million units in January.[11] This is the lowest pace of home sales since June 2020.

Much of this recent contraction can be attributed to the rapid increase in mortgage rates. Mortgage rates have more than doubled over the past year, with the 30-year fixed-rate mortgage (FRM) rate exceeding 7% in October, the highest level in 20 years. Despite this recent increase in mortgage rates, home prices remain elevated relative to their long-term trend (**Figure 3.1.2.3**). The rapid increase in mortgage rates and elevated home prices have worsened housing affordability problems (**see Box B**).

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Mortgage-backed securities (MBS) markets have experienced similar cooling. Agency residential mortgage-backed securities (RMBS) issuances fell to $401 billion in Q3 2022, a 52% decline relative to Q3 2021.[12] Additionally, spreads have widened materially, with the spread between the 30-year current coupon MBS and 10-year U.S. Treasury note hitting its highest level since 2008 (**Figure 3.1.2.4**). At the same time, liquidity in the agency MBS market deteriorated over the summer of 2022.[13]

3.1.2.4 30-Year MBS Spread



Source: Bloomberg, L.P.

Note: Spread to 10-Year Treasury.

Increased volatility in MBS markets could lead to further significant investment losses by certain market participants, put further pressure on mortgage rates, and lead to a sharper decline in home prices. Further losses for fixed-income investors carrying MBS securities at market value could lead to outflows and sales by asset managers facing liquidity strains. Additionally, a further widening in MBS spreads could lead to deleveraging by mortgage real estate investment trusts (mREITS), adding strains on MBS spreads and overall market liquidity.

Recommendations

With rising interest rates and a slowdown in economic growth creating the potential for a softening of the housing market, the Council recommends supervisors and financial institutions continue to monitor residential real estate exposures and ensure the adequacy of credit loss allowances. Federal and state agencies should enhance or establish information-sharing protocols to enable collaboration and communication in response to the increased risk in residential real estate and mortgages. The Council acknowledges the changing market environment and encourages member agencies to review existing loss mitigation options of their regulated entities, including assessing the affordability and sustainability of available home retention solutions, such as modifications, in a higher interest rate environment. The results of such a review should inform supervisory responses by member agencies.

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Box B: The Rapid Rise of Mortgage Rates

The mortgage interest rate is a key factor affecting housing market affordability. For a standard 30-year fixed-rate mortgage, the interest rate rose to over 7% in October 2022, up almost 400 basis points from the prior year (**Figure B.1**). This is the largest year-on-year increase observed in the last 40 years and the highest level since 2002.

B.1 Mortgage Rate (30-Year Fixed-Rate Average)



Source: Freddie Mac Primary Mortgage Market Survey, FRED

There are two possible ways that the "ability to pay" channel could create risks to financial stability. First, facing higher interest rates, payment-constrained potential borrowers may place lower bids on the market or exit the market, which could reduce housing asset values through the demand channel. Second, the resulting valuation changes may affect perceptions of the riskiness of the collateral on mortgages through changes in equity valuations and mark-to-market loan-to-value ratios for existing mortgages.

As interest rates rise, the maximum loan amount a borrower can afford under a fixed monthly payment falls when facing a binding debt service payment constraint. For example, a borrower who can afford a maximum $1,000 monthly mortgage payment faces a change in borrowing power from $237,000 to $167,000 as rates for a 30-year fixed-rate mortgage increase from 3% to 6%, a drop of $70,000 or 30%. Alternatively, if a borrower maintains a loan amount of $237,000, the monthly payment would increase by 42%, from $1,000 to $1,421. Accordingly, increasing interest rates may reduce house prices through demand channels.

While future mortgage interest rates are uncertain, current forward rates indicate the possibility that mortgage rates could remain elevated in the medium-term. Although the current expected monetary policy path is priced into current mortgage rates, deviations from expectations will likely cause changes to mortgage interest rates. In particular, changes to long-run inflation expectations and the Federal Reserve's MBS holdings may significantly impact mortgage rate volatility and direction, and a further significant increase in mortgage rates could increase the risk to financial stability.

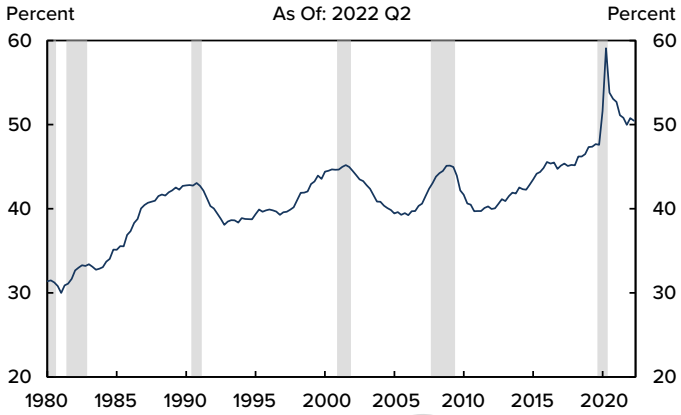
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3.1.3 Nonfinancial Corporate Credit

Well-functioning corporate credit markets facilitate efficient capital formation and allow investors to direct capital to fund economic growth.[14] However, financial stability risks arise when companies cannot service their obligations, and the financial sector cannot absorb losses from defaults and downgrades. For example, investment funds that hold corporate credit and have significant liquidity mismatches may experience large redemptions, which could disrupt market functioning. Additionally, financial stability risks may occur if market participants are unwilling or unable to provide intermediation during times of stress. Thus far, corporations and investors have managed to weather the recent increase in interest rates despite increased funding costs and significant investment losses. Nevertheless, if the sharp increase in interest rates leads to widespread debt servicing problems, credit markets could experience a further repricing of risk and disruptions to financial stability.

Nonfinancial corporate debt as a percent of GDP has decreased from its peak in early 2020 but remains elevated relative to pre-pandemic levels (**Figure 3.1.3.1**).[15] While many firms increased their leverage during the early COVID-19 pandemic period by drawing on their lines of credit in an abundance of caution, many companies reduced their leverage in the second half of 2020 to more normalized levels. Still, leverage remains elevated, especially within industries most impacted by the COVID-19 pandemic, including the airline, hospitality and leisure, and restaurant sectors. Some public companies have large cash buffers that can mitigate some of the risk created by elevated leverage levels, but higher leverage levels generally equate to a higher risk of default.

3.1.3.1 Nonfinancial Corporate Debt as Percent of GDP

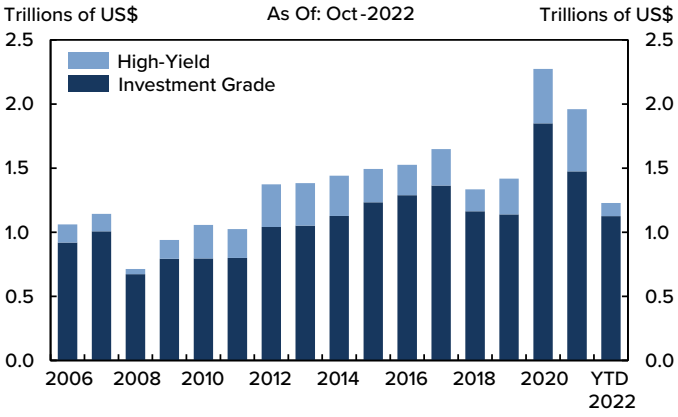


Source: Federal Reserve, Haver Analytics

Note: Gray bars signify NBER recessions.

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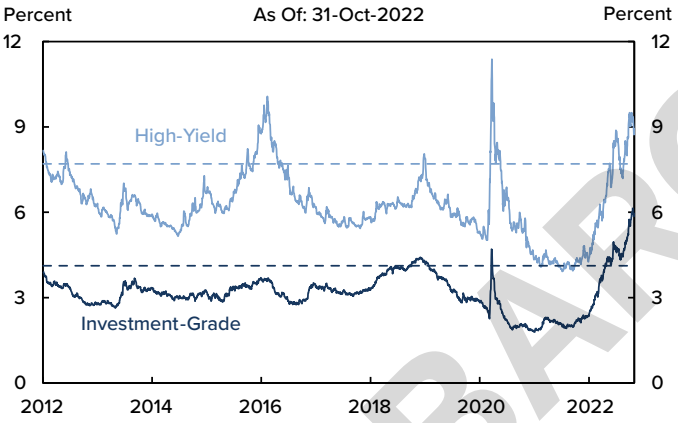
3.1.3.2 Gross Issuance of Corporate Bonds



Source: Refinitiv, SIFMA

Note: Includes all non-convertible corporate debt, MTNs, and Yankee bonds, but excludes all issues with maturities of one year or less and CDs. 2022 figures are through October.

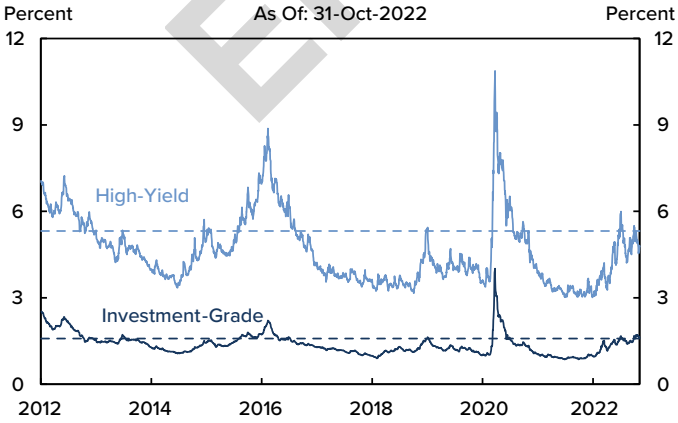
3.1.3.3 Corporate Bond Yields



Source: ICE Data Indices, FRED

Note: Dotted lines represent 20-year average.

3.1.3.4 Corporate Bond Spreads



Source: ICE Data Indices, FRED

Note: Dotted lines represent 20-year average.

Corporate Debt Markets

In 2020 and 2021, corporations took advantage of historically low-interest rates by issuing record amounts of corporate debt (**Figure 3.1.3.2**). Corporate bond yields have since risen markedly, and by mid-October, both investment grade and high-yield bond yields were well above their 20-year average (**Figure 3.1.3.3**). In light of the less favorable financing conditions, corporate bond issuances have fallen markedly; in Q3 2022, investment grade issuances fell by 17%, while high-yield issuances fell by 81% compared to Q3 2021. Nevertheless, the increase in interest rates has not led to material spillovers to corporate credit market functioning, and corporate credit spreads remain in line with their longer-term average (**Figure 3.1.3.4**). Additionally, many corporations have extended the maturity of their debt, which should mitigate near-term refinancing risks (**Figure 3.1.3.5**).

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Corporate debt investors also face risks in a rising rate environment. Over the last several years, investors have been willing to purchase longer-term debt in exchange for higher yields. However, the interest rate sensitivity of fixed-rate debt increases as the instrument's maturity lengthens, exposing investors to greater market value declines as rates rise. The recent increase in interest rates has led to significant investment losses, as indicated by the ICE BofA US Corporate Total Return Index, which was down 19.2% year-to-date as of October 31, 2022. Moreover, fixed-income investors, including open-end funds, could accumulate further losses if rates continue to increase (**see Section 3.2.2**).

Leveraged Loan Markets

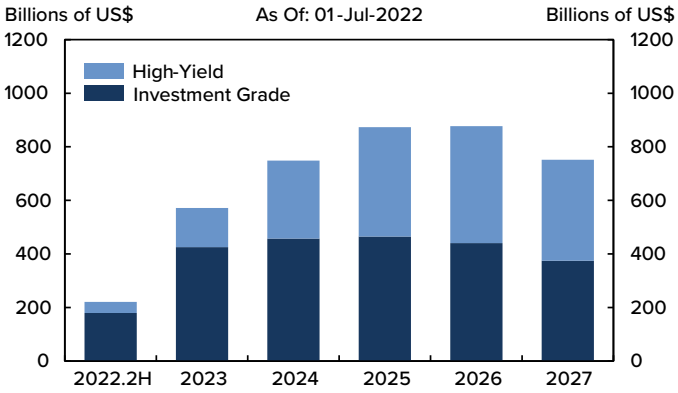
High-yield issuers that obtained financing through leveraged loans pay variable interest on their outstanding obligations. In the event of rising rates, these companies may struggle to make payments as their debt service burden increases, especially if they do not hedge their interest rate exposure. In addition, deteriorating macroeconomic conditions can further impact these companies' ability to service debt.

The leveraged lending market has experienced rapid growth since 2011, with U.S. institutional loans exceeding $1.4 trillion as of September 2022 (**Figure 3.1.3.6**). Covenant-lite loans, which have fewer investor protections, continue to represent most new loan issuances. The widespread use of covenant-lite loans could reduce the amount of technical defaults through less frequent covenant violations. However, when combined with weaker credit quality, weaker financial maintenance covenants in leveraged loans may lead to lower recovery rates in the event of a default (**see Section 3.3**). Thus far, leveraged loan default rates have remained below pre-pandemic levels.[16]

Recommendations

Rising interest rates, the continued effects of the COVID-19 pandemic, and the slowdown in economic growth have increased nonfinancial corporate credit

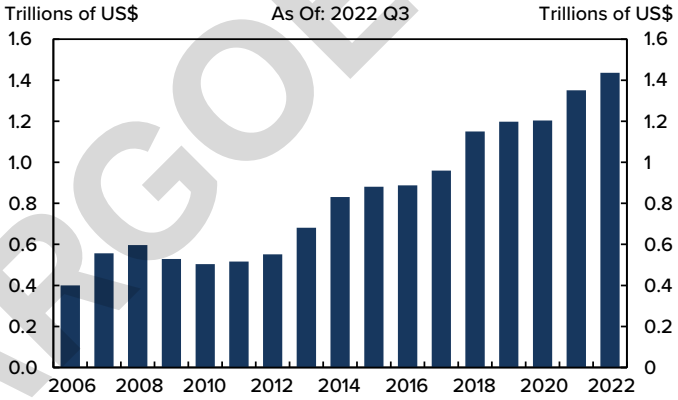
3.1.3.5 Maturity Profile of U.S. Nonfinancial Corporate Debt



Source: S&P Global Ratings Research

Note: Includes bonds, loans, and revolving credit facilities that are rated by S&P Global Ratings. Excludes debt maturing after 2027.

3.1.3.6 Institutional Leveraged Loans Outstanding



Source: S&P LCD

Note: Includes all loans including those not included in the LSTA/TRLPC mark-to-market service. Primarily institutional tranches.

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risk. If credit quality worsened significantly, a potential wave of defaults could lead to large redemptions at investment funds with significant liquidity mismatches, and in turn disrupt market functioning. The Council recommends that member agencies, in order to assess and reinforce the ability of the financial sector to manage severe simultaneous losses, continue to monitor levels of nonfinancial business leverage, trends in asset valuations, and potential implications for the entities they regulate. The Council encourages entities exposed to corporate credit risk to review their risk-rating methods in light of the uncertain economic environment and, if applicable, assess the adequacy of their allowance for credit losses.

3.1.4 Short-term Wholesale Funding Markets

Short-term wholesale funding markets provide essential financing for businesses, financial intermediaries, state and local governments, and the federal government. These markets are critical for implementing monetary policy and supporting financial market liquidity. They are also highly interconnected with systemically important financial institutions that borrow and lend in these markets. In addition, some key intermediaries in these markets perform significant liquidity and maturity transformation and are vulnerable to runs. These features contribute to fragilities in the short-term funding markets that can affect financial stability.

The Role of Money Market Funds as Short-term Lenders

U.S. domiciled money market funds (MMFs) are major lenders in the short-term funding markets. As described in (**Section 3.2.2**), MMFs contribute to funding market vulnerabilities by performing liquidity and maturity transformation. In both 2008 and 2020, prime and tax-exempt MMFs experienced heavy redemptions, contributing to dislocations in the short-term funding markets. These events led to extraordinary policy responses in 2008, when the Federal Reserve established liquidity facilities and the U.S. Treasury provided a temporary guarantee of MMFs, and in 2020 when the Federal Reserve again established facilities to stabilize short-term funding markets. In February 2022, the SEC published proposed amendments to MMF rules to address the vulnerabilities demonstrated at the onset of the COVID-19 pandemic.[17]

Other investment funds operating as lenders in the short-term funding markets include dollar-denominated non-U.S. domiciled (so-called "offshore") MMFs, bank-sponsored short-term investment funds (STIFs), local government investment pools, private liquidity funds, and ultrashort bond funds. Like MMFs, these intermediaries perform liquidity and maturity transformation, can contribute to fragilities in the short-term funding markets, and have experienced large outflows amid financial stress.

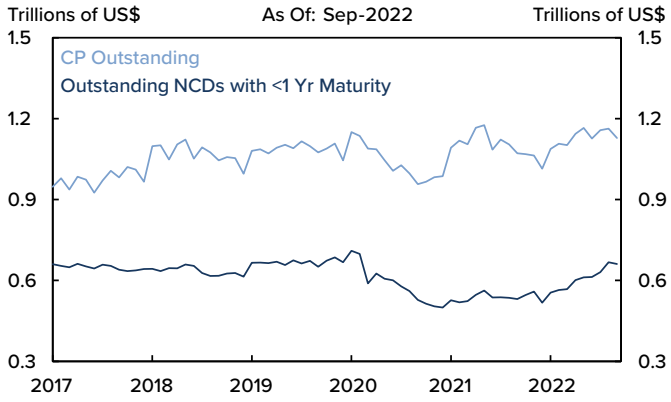
Many of these intermediaries, including government MMFs, prime and tax-exempt MMFs offered to retail investors, offshore MMFs, STIFs, and private liquidity funds, maintain stable net asset values (NAVs). These products may obtain a stable share price by using amortized cost accounting for calculating the NAV, arriving at a fixed share price of, for example, $1.00. Stable NAV funds are typically limited in the risk they can take, but when short-term interest rates rise sharply or portfolio assets lose value for other reasons, the market value of a fund's shares may fall below the typical stable NAV. The rising possibility of losses in a stable NAV fund may prompt investor concerns and redemptions that can cause a fund to sell assets to meet redemptions, potentially straining markets for short-term instruments.

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Unsecured Lending

Commercial paper (CP) is an important source of unsecured short-term funding used by both nonfinancial and financial firms. Negotiable certificates of deposit (NCDs) are a means for banks to obtain short-term unsecured funding in capital markets. CP and NCD markets have grown over the past year and reached $1.1 trillion and $700 billion in September 2022 (**Figure 3.1.4.1**).[18] There has also been a significant shift in the composition of the CP outstanding in recent years, as the amount issued by domestic nonfinancial firms has declined while the amount issued by foreign financial firms has increased (**Figure 3.1.4.2**). The CP investor base has also shifted over time, with MMFs' share declining but remaining significant and nonfinancial firms increasing their direct investment (**Figure 3.1.4.3**). While CP spreads have been somewhat volatile in 2022, they are not indicating crisis-level concerns regarding liquidity or credit (**Figure 3.1.4.4**).

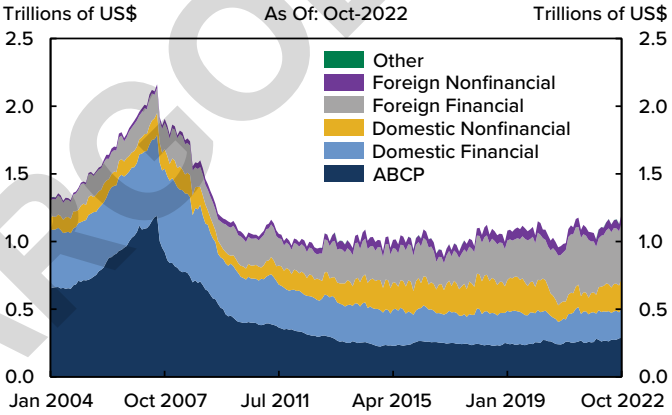
3.1.4.1 CP and NCDs Outstanding



Source: Federal Reserve, Haver Analytics, DTCC Solutions LLC

Note: Not seasonally adjusted. Domestic includes CP issued in the U.S. by entities with foreign parents.

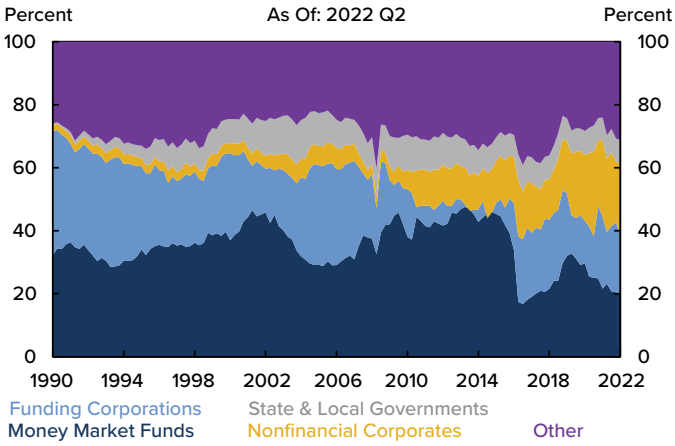
3.1.4.2 CP Outstanding by Issuer Type



Source: Federal Reserve, Haver Analytics

Note: Not seasonally adjusted. Domestic includes CP issued in the U.S. by entities with foreign parents.

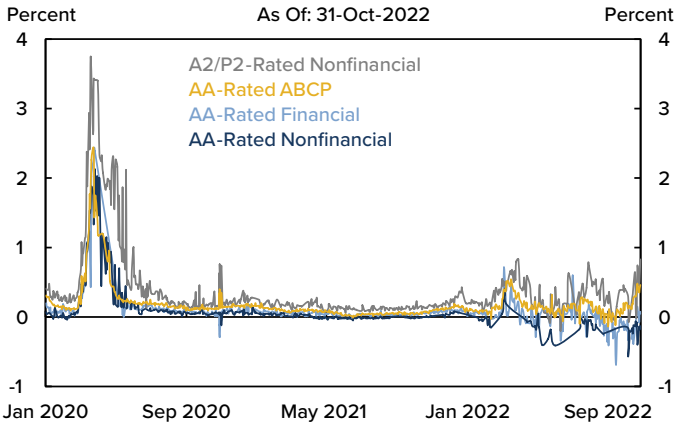
3.1.4.3 CP Investors



Source: Federal Reserve, Haver Analytics

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3.1.4.4 3-Month CP Interest Rate Spreads



Source: Federal Reserve, Refinitiv, Haver Analytics

Note: Spread to 3-Month Overnight Index Swap (OIS) rate.

As investors tend to buy and hold these short-term instruments to maturity, demand for secondary market liquidity is usually low, and dealers face little incentive to intermediate and support secondary markets. Hence, when demand for liquidity rises sharply, such as during the "dash for cash" in March 2020, these markets cannot accommodate large volumes of sales requests from investors, such as prime MMFs. At the same time, financial institutions that depend on these markets as a source of funding may be unable to obtain new funding as these short-term instruments mature. This creates a channel for financial instability between the institutions seeking funding and the institutional investors providing the funds, contributing to the fragility of the short-term funding markets. In March 2020, the Federal Reserve established a Commercial Paper Funding Facility to ensure that firms were able to roll over their CP based on the severe market disruption, illustrating the vulnerability that this market can create and the importance of ensuring that it is properly functioning during market stress.

Secured Lending

The repurchase agreement (repo) market is an important source of short-term wholesale funding, and repo markets play a critical role in Treasury market liquidity and monetary policy implementation. Repos are a form of secured lending in which an investor receives securities as collateral in exchange for cash, with an agreement to repurchase the securities at a later date at a specified price.[19] Large bank-affiliated dealers serve as the primary intermediaries in the repo market by borrowing from cash lenders, such as MMFs, and lending to entities that employ leverage, such as hedge funds.[20] Dealers also borrow in the repo market to finance their own securities holdings. In addition, large banks may rely on repo markets in times of stress to obtain quick access to cash rather than liquidate assets.

Over the past year, repo market rates increased along with the increase in Federal Reserve policy rates. However, the Secured Overnight Financing Rate (SOFR) and Tri-

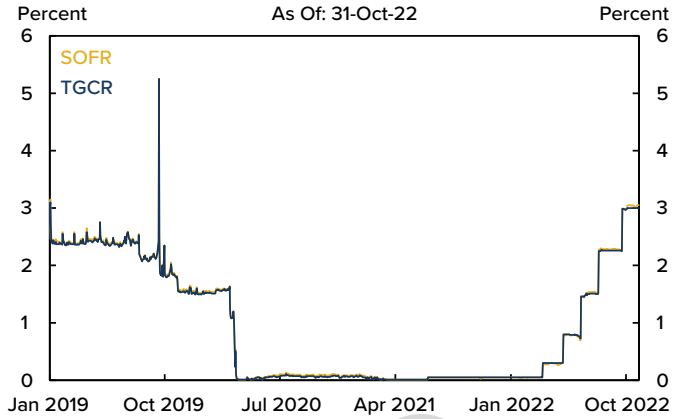
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Party General Collateral Rate (TGCR) have generally been slightly below the Overnight Reverse Repo Facility (ON RRP) rate, indicating ample cash available for lending (**Figure 3.1.4.5**). Repo borrowing totaled $6.1 trillion, of which non-Federal Reserve borrowing represented $3.8 trillion as of Q2 2022 (**Figure 3.1.4.6**).[21] The market consists of two main segments: tri-party repo, in which settlement occurs within the custodial accounts of a clearing bank, and bilateral repo, which typically refers to all activity not settled within the tri-party system. Bilateral repo consists of transactions cleared through the Fixed Income Clearing Corporation (FICC) and those that are not centrally cleared. Repo trading volumes in the tri-party and centrally cleared bilateral repo markets have been relatively stable over the past two years, as represented by the roughly $300 billion in daily volumes for the TGCR and $600 billion making up the remainder used for the Secured Overnight Financing Rate SOFR (**Figure 3.1.4.7**). Included in the SOFR volumes are FICC's sponsored repo service, which has been an important way for non-FICC members to access centrally cleared bilateral repo markets (**Figure 3.1.4.8**).

Less is known about the aggregate size of the non-centrally cleared bilateral repo market, which is the subject of a data collection pilot initiated by the OFR in 2022. For the pilot, nine participants voluntarily shared data on their non-centrally cleared bilateral repo agreement transactions with the OFR for three days in June 2022. The insights from this pilot collection will also help support ongoing research about overall market stability and vulnerabilities that may emerge. The OFR pilot collection is designed to prepare industry participants and the OFR for permanent data collection under a future final rule, which will capture data on an ongoing basis across market participants.

Repo markets may impact financial stability, given their size and the prominent role played by systemically important financial institutions and utilities. Many repo market participants are vulnerable to funding or

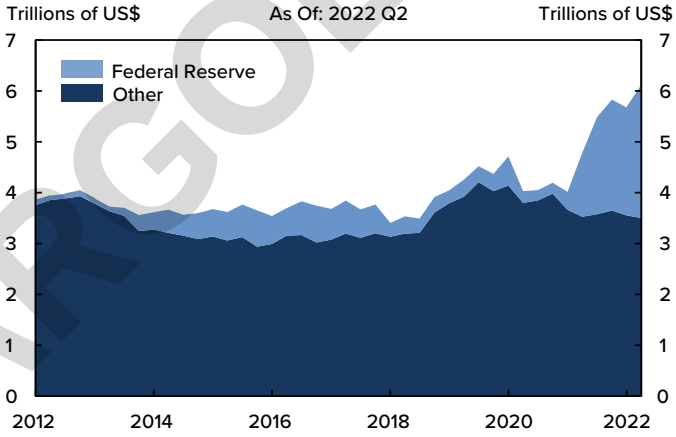
3.1.4.5 Repo Rates



Source: FRBNY

Note: TGCR = Tri-party General Collateral Rate; SOFR = Secured Overnight Financing Rate.

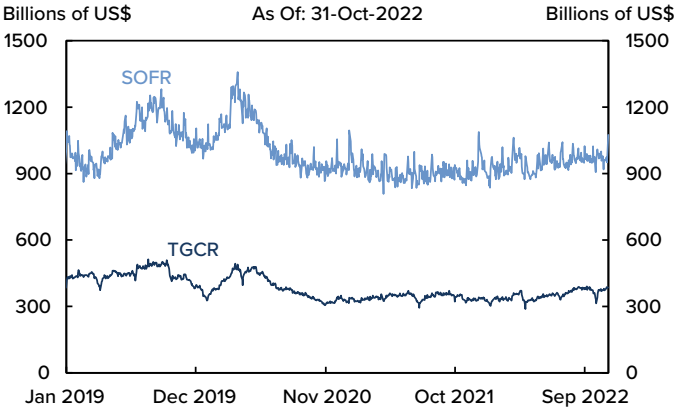
3.1.4.6 Repo Borrowing Outstanding



Source: Federal Reserve, Haver Analytics

Note: Federal Reserve repo borrowing primarily consists of ON-RRP facility.

3.1.4.7 Repo Volumes

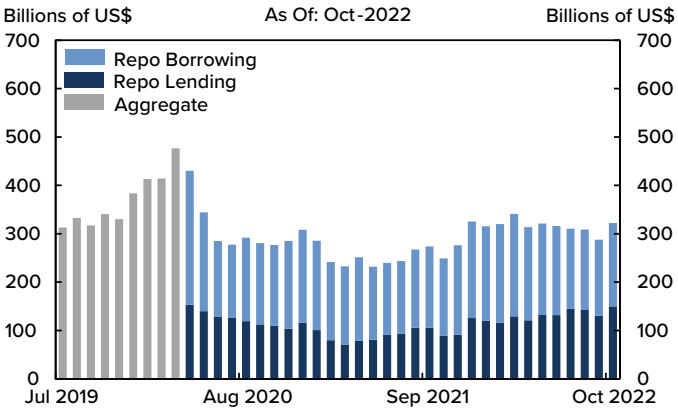


Source: FRBNY

Note: TGCR = Tri-Party General Collateral Rate; SOFR = Secured Overnight Financing Rate.

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3.1.4.8 Sponsored Repo Activity



Source: DTCC

Note: Average daily volume. Breakdown of repo lending and repo borrowing unavailable prior to April 2020.

liquidity shocks and may transmit stress to other repo market participants and broader short-term funding markets. For example, MMFs and open-end funds, which are net lenders in the repo market, may pull back from the market during periods of market stress to raise cash to meet redemptions. At the same time, leveraged investors, such as hedge funds and mortgage real estate investment trusts (mREITS), may face a sudden tightening in financing terms or be unable to roll over financing. As a result, leveraged investors may be forced to sell assets quickly, which can depress asset prices, lead to a further tightening in financing terms, and force further deleveraging. In addition, CCPs, which tend to reduce strains in repo markets and improve market functioning by reducing counterparty risk, could become a source of strain if multiple large clearing members defaulted on their obligations to the clearing house simultaneously. This could force the CCP to liquidate a large amount of collateral in a way that may be challenging for the underlying market.[22]

Repo markets, and in particular tri-party repo, have undergone significant structural changes since the 2008 financial crisis, making them safer.[23] These changes helped streamline some repo operations, and higher collateral quality has helped reduce exposure to counterparty risk. Nevertheless, recent episodes of stress in repo markets, particularly in September 2019, and to a lesser extent, in March 2020, highlighted how problems in the repo market could quickly transmit or exacerbate stress in the financial system.

In July 2021, the Federal Reserve established two repo facilities, one standing repo facility (SRF) for primary dealers and depository institutions and one for foreign and international monetary authorities (FIMA Repo Facility).[24] Initially, the SRF only included primary dealers, but the Federal Reserve has, over time, added certain depository institutions that can apply for access. Both of these facilities allow counterparties to obtain funds from the Federal Reserve by pledging securities,

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including U.S. Treasuries, agency debt, and agency mortgage-backed securities for the SRF but only U.S. Treasuries for the FIMA Repo Facility, thus supporting market functioning by serving as a backstop source of secured funding. These facilities support effective monetary policy implementation as their primary objective, limiting the potential for pressures in overnight interest rates.

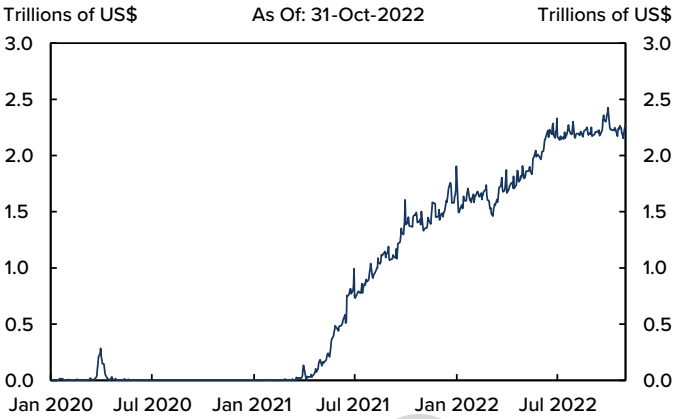
The Federal Reserve also operates the ON RRP. The ON RRP places a floor under overnight interest rates by providing an alternative investment opportunity for eligible counterparties when overnight repo rates fall below the rate offered at the ON RRP.[25] Over the past year, the ON RRP has seen usage expand to over $2 trillion amid low repo rates relative to other short-term rates and limited alternative investments for ON RRP participants (**Figure 3.1.4.9**). Nonetheless, private market rates and volumes in the overnight Treasury repo market have been relatively stable over the past year.

As we look ahead, the increase in the supply of U.S. Treasury securities to private sector investors may require higher levels of repo financing. Accordingly, ensuring a robust and smooth functioning repo market will be critical to maintaining liquidity in the market for Treasury securities and other financial markets more broadly.

Recommendations

In light of the ongoing market volatility and shifts in monetary policy, the Council recommends member agencies closely monitor short-term funding market conditions and take actions to mitigate vulnerabilities. The Council supports efforts by financial regulators to strengthen short-term funding markets and support orderly market functioning, including during periods of heightened market stress. Where lack of data prevents close monitoring, Council members should develop proposals to collect the necessary data, such as the efforts by the OFR to improve collection and transparency of non-centrally cleared bilateral repo markets data.

3.1.4.9 Overnight Reverse Repo Facility



Source: FRED, FRBNY

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3.1.5.1 Bitcoin Price



Source: Bloomberg, L.P.

3.1.5 Digital Assets

In February 2022, the Council identified digital assets as a priority area. In October, the Council released its *Report on Digital Asset Financial Stability Risks and Regulation* in response to Executive Order 14067, Ensuring Responsible Development of Digital Assets.[26] The report found that financial stability vulnerabilities fall into two categories with respect to digital assets. The first category arises from interconnections between the digital asset ecosystem and the traditional financial system. Such interconnections would broaden the effects of shocks that originate inside the digital asset ecosystem. The second category covers a set of vulnerabilities primarily confined to the digital asset ecosystem, including the potential for drops in asset prices, financial exposures via interconnections inside that ecosystem, operational vulnerabilities, funding mismatches, risk of runs, and the use of leverage. Each vulnerability within the digital asset ecosystem has the potential to operate independently, but they are likely to interact as they do in traditional financial markets.

The digital asset ecosystem has grown substantially in scale and scope in recent years. However, crypto-asset prices fell broadly over the past year, including major assets such as Bitcoin (**Figure 3.1.5.1**) and Ethereum, and prominent crypto platforms such as Blockfi, Voyager Digital, and Celsius Network experienced severe financial problems and subsequently filed for bankruptcy. In November, crypto-exchange FTX and some affiliated firms declared bankruptcy. The exchange could not meet withdrawal requests from customers, which followed reports that the exchange had loaned billions of dollars of customer funds to Alameda Research, an affiliated crypto trading firm, and that a significant amount of those funds were missing or lost.[27] In its bankruptcy filing, the new CEO of FTX identified many problems including a lack of trustworthy financial information, compromised systems integrity, faulty regulatory oversight abroad, and concentrated control of the business.[28]

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The problems at FTX precipitated price decreases in Bitcoin and other crypto-assets, but thus far have had a limited impact on the broader U.S. financial system.

The crypto downturn has negatively impacted many investors. Documentation from bankruptcy proceedings of recently failed crypto-asset platforms provides qualitative insight into individuals whose crypto-asset holdings faced substantial losses and, in some cases, lost their entire life savings.[29] For example, survey data suggest that 46% of crypto-asset owners reported their investments did worse than they expected, versus only 15% who said they did better than expected.[30] According to one survey, the percentage of Americans comfortable investing in crypto-assets reportedly dropped to about 21% in 2022 from 35% in 2021.[31] The steepest drop came among millennials: almost 30% of American investors between the ages of 26 and 51 are comfortable investing in crypto-assets, down 20 percentage points from the 50% who reported being comfortable in 2021. The decline in investor enthusiasm may be attributed to a number of market characteristics, including price volatility, fraud, and lack of compliance with disclosure and market integrity requirements among crypto-asset market participants.

Past surveys about crypto-asset ownership have focused on the percentage of surveyed people who hold any amount of crypto-assets, not on where most crypto-assets are concentrated. Industry metrics show a high concentration of crypto-asset ownership among the top 1% of asset holders. This is true for many governance tokens and stablecoins, and outstanding tokens held by the top 1% exceed 95% in several cases. While survey data from the Federal Reserve shows that 29% of crypto-asset investors make less than $50,000 per year, there are indications that the majority of crypto-assets are held by a few wealthy entities, colloquially known as "whales."[32]

Fraud can cause or exacerbate financial instability, and state securities regulators consistently identify crypto-assets as one of the most common subjects of enforcement actions.[33] The CFPB's Consumer Complaint Database reveals that fraud and scams are a significant problem in crypto-asset markets: 40% of the 8,300 crypto-asset complaints received between October 2018 – September 2022 were marked by consumers as a complaint about a "fraud or scam."[34] The crypto-asset fraud reports from the Federal Trade Commission's (FTC) Consumer Sentinel show similar trends: between January 1, 2021 – March 31, 2022, the FTC reported that over 46,000 people lost more than $1 billion worth of crypto-assets due to scams and fraud, with an overall median loss of approximately $2,600. Crypto-asset losses reported to the FTC in 2021 were nearly sixty times more than in 2018.[35] The SEC has received over 23,000 tips, complaints, and referrals since fiscal year 2019 involving crypto-asset activities. Common subjects of these reports to the SEC include initial "coin" or "token" offerings, crypto-asset wallet access issues, crypto-asset platform operational issues, pricing and manipulation, and high-yield investment schemes that purport to involve crypto-asset trading and mining.[36]

However, the turmoil in the crypto-assets ecosystem did not have notable effects on the traditional financial system. The current regulatory framework, and the limited overall scale of crypto-asset activities, have helped largely insulate traditional financial institutions from the acute instability seen in the crypto-asset ecosystem. While crypto-asset interconnections with the traditional financial system are relatively limited, they could increase rapidly. Participants in the crypto-asset ecosystem and the traditional financial system have explored or created a variety of interconnections. Notable sources of potential interconnections include stablecoin issuers' reserve assets held by traditional financial institutions. Crypto-asset trading platforms may also have the potential for greater interconnections by providing a wide variety of services, including leveraged trading and asset custody, to a range of retail investors and traditional financial institutions. Other connections between traditional finance and the crypto-asset ecosystem could arise through increased consumer access to crypto-assets, including through certain traditional money services businesses.

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Recommendations

Council members have continued to enforce existing rules and regulations applicable to crypto-asset activities over the past year, including actions related to unregistered offers and sales of crypto-asset securities, episodes of fraud and market manipulation, and false and misleading statements made directly or by implication, concerning the availability of federal deposit insurance for a given product. These are violations of the law, and have given customers the impression that they are protected by the government safety net when that protection does not exist. The Council's *Report on Digital Asset Financial Stability Risks and Regulation* recommends that members continue to enforce existing laws and, in doing so, consider a set of general principles described in the report, including the principle of same activity, same risk, and same regulatory outcome.

In addition, though the existing regulatory system covers large parts of the crypto-asset ecosystem, the report notes three gaps in the regulation of crypto-asset activities in the United States.

First, the spot markets for crypto-assets that are not securities are subject to limited direct federal regulation. As a result, those markets may not be subject to a regulatory framework designed to ensure orderly and transparent trading, prevent conflicts of interest and market manipulation, and protect investors and the financial system more broadly. To address this regulatory gap, the Council recommends that Congress pass legislation that provides for explicit rulemaking authority for federal financial regulators over the spot market for crypto-assets that are not securities. The Council recommends that this rulemaking authority should not interfere with or weaken market regulators' current jurisdictional remits. Legislation should provide for enforcement and examination authority to ensure compliance with these rules.

Second, crypto-asset market businesses do not have a consistent or comprehensive regulatory framework and can engage in regulatory arbitrage. Some crypto-asset businesses may have affiliates or subsidiaries operating under different regulatory frameworks, with no single regulator having visibility into the risks across the entire business. To address the risk of regulatory arbitrage, the Council recommends continued coordination, legislation addressing the risks posed by stablecoins, legislation relating to regulators' authorities to have visibility into and supervise the activities of all of the affiliates and subsidiaries of crypto-asset entities, and appropriate service provider regulation.

Third, a number of crypto-asset trading platforms have proposed offering retail customers direct access to markets by vertically integrating the services provided by intermediaries such as broker-dealers or futures commission merchants. Financial stability and investor protection risks may arise from retail investors' exposure to some practices often proposed by vertically integrated trading platforms, such as automatically and rapidly closing out customer positions. Therefore, the Council recommends that member agencies assess the impact of potential vertical integration by crypto-asset firms.

Finally, the Council recommends that Council members continue to build capacities related to data and the analysis, monitoring, supervision, and regulation of crypto-asset activities. The Council's report on digital assets describes these recommendations in greater detail.

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3.2 Financial Institutions

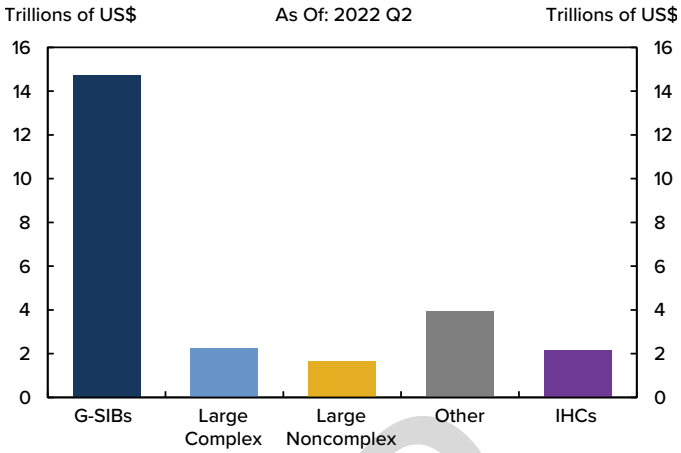
3.2.1 Large Bank Holding Companies

Large bank holding companies (BHCs)[37] comprise the majority of banking assets in the U.S., with global systematically important banks (G-SIBs) comprising the majority of U.S. banking assets (**Figure 3.2.1.1**). Large BHCs are critical to the U.S. financial system, performing essential banking functions such as providing credit to commercial and retail borrowers, helping firms raise capital and hedge risk, and providing asset management and custody services. These companies also fill a central role in facilitating retail and wholesale payments on a global scale and clearing large volumes of transactions in repo markets. The stability of these operations is critical to the global financial system. Due to their interconnectedness to global financial markets, large BHCs are also subject to material risks from counterparty exposures and emerging global climate-related risks that could have greater relevance to the broader financial ecosystem.

Bank Capital and Liquidity

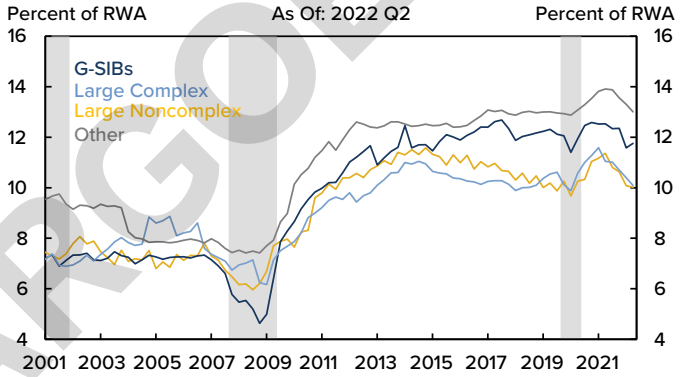
In the early stages of the COVID-19 pandemic, fiscal stimulus from the Coronavirus Aid, Relief, and Economic Security (CARES) Act and monetary stimulus measures from the Federal Reserve injected trillions of dollars into the U.S. economy. This resulted in significant deposit inflows, which helped to increase banks' capital and liquidity levels. These actions helped to avert severe economic stress and a wave of defaults that would have weakened these institutions considerably during the COVID-19 pandemic. The economic and policy initiatives undertaken during and after the 2008 financial crisis,[38] which set stronger capital and liquidity requirements for banks and gave existing supervisors greater authority to restrict leverage, also contributed to this outcome. Bank common equity tier 1 (CET1) capital ratios and return on average assets dropped in the months after the initial COVID-19 outbreak as banks added to credit loss reserves in anticipation of loan losses (**Figures 3.2.1.2** and **3.2.1.3**). As the stimulus

3.2.1.1 Total Assets by BHC Type/IHC



Source: FR Y-9C

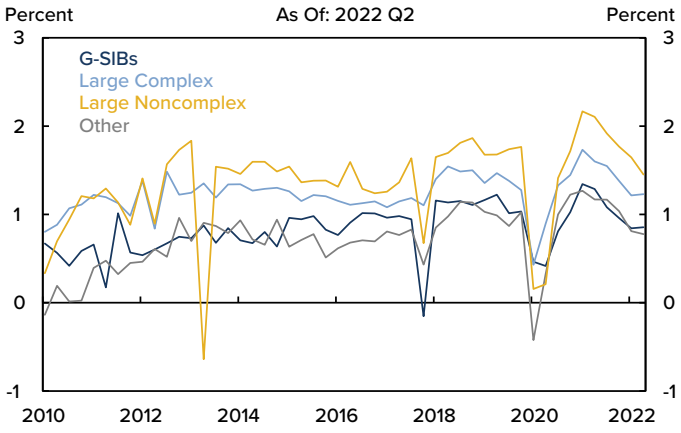
3.2.1.2 Common Equity Tier 1 Ratios



Source: FR Y-9C, Haver Analytics

Note: Tier 1 common capital is used as the numerator of the CET1 ratio prior to 2014:Q1 for G-SIBs and large complex BHCs, and prior to 2015:Q1 for large noncomplex and other BHCs. The denominator is risk-weighted assets (RWA). Shaded areas indicate NBER recessions.

3.2.1.3 Return on Assets

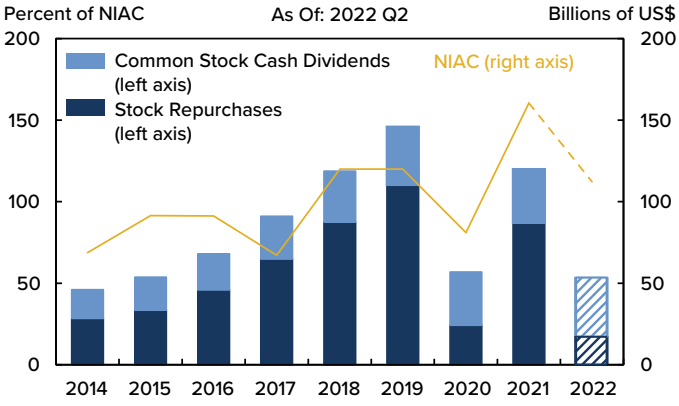


Source: FR Y-9C

Note: Quarterly, seasonally-adjusted annual rate. Return on assets is equal to net income divided by average assets.

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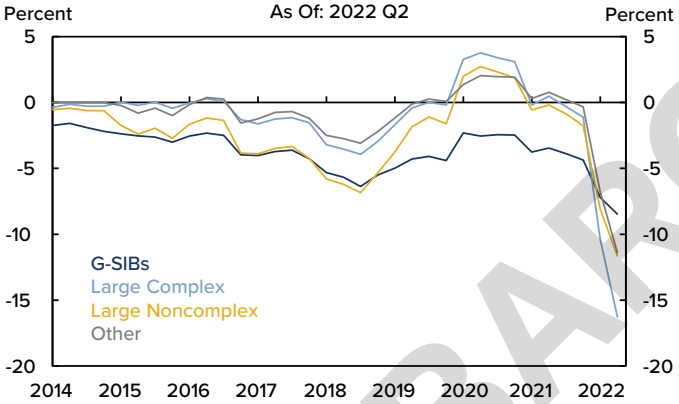
3.2.1.4 Payout Rates at U.S. G-SIBs



Source: FR Y-9C

Note: Payout rates are the ratios of stock repurchases plus cash dividends to net income available to common shareholders (NIAC). NIAC is net income minus preferred dividends. 2022 data represents YTD data through Q2.

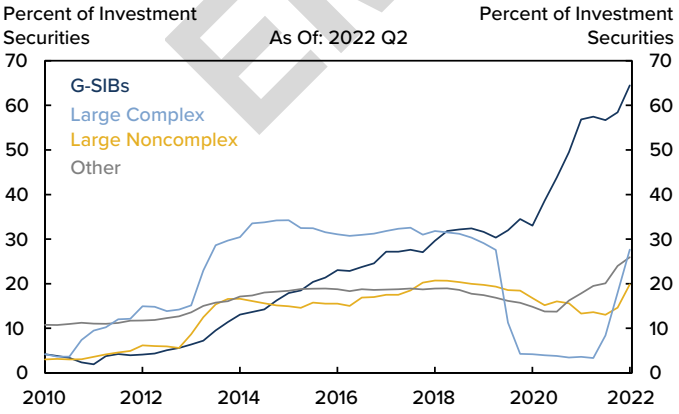
3.2.1.5 AOCI as a Percent of Equity



Source: FR Y-9C

Note: Accumulated other comprehensive income (AOCI).

3.2.1.6 Held-to-Maturity Securities



Source: Call Report

Note: Investment securities are held-to-maturity securities plus available-for-sale securities.

took effect and loans performed better than expected, banks released reserves, which helped improve their capital and profitability levels.

Large BHCs have sound capital and liquidity positions as several large BHCs had increased earnings retention rates and credit loss reserves to meet higher risk-based capital requirements and boost resilience. Following the 2022 Comprehensive Capital Analysis and Review (CCAR), several large U.S. banks, including G-SIBs, were required to hold higher stress capital buffers beginning in Q4 2022. In addition, some G-SIBs will also have to meet a higher G-SIB capital surcharge beginning in Q1 2023.

Bank profitability declined somewhat in 2022 as banks increased loan loss provisions amid higher uncertainty about the economic outlook. But banks report that rising interest rates will support their profitability going forward, as higher rates will lead to higher interest revenues on new loans and existing floating rate assets.

Since 2019, large BHCs retained more earnings to build capital levels as risks to capital grew and some BHCs were also subject to temporary restrictions on their capital distributions in 2020 and 2021 (**Figure 3.2.1.4**).

Tightening Financial Conditions

Financial conditions tightened in 2022 in response to rising inflation. Investment portfolios are at risk as rates rise, particularly portfolios where duration was extended over the last two years to offset net interest margin (NIM) compression (**see Box C**). The high proportion of securities classified as held-to-maturity (HTM) at G-SIBs has helped to offset unrealized losses in accumulated other comprehensive income (AOCI) related to their market-sensitive available-for-sale (AFS) securities portfolio (**Figures 3.2.1.5** and **3.2.1.6**).

Aggregate banks' survey responses from the July 2022 Senior Loan Officer Opinion Survey

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indicate an overall net tightening in lending standards and a net weakening in loan demand. In their outlook for the second half of 2022, banks reported expecting to tighten lending standards across all loan categories, which stands in stark contrast to the January 2022 survey when banks expected to further ease lending standards over 2022. The most cited reasons for expecting to tighten standards were an expected deterioration in borrowers' debt-servicing capacity due to inflation, an expected reduction in risk tolerance, and an expected decline in collateral values.

Nevertheless, bank lending remains robust, and in particular, lending to nonbank financial institutions (NBFIs) continued to increase notably. Credit quality measures show limited credit risk on these loans, but because NBFIs rely primarily on their bank credit lines to meet unexpected liquidity needs, loan commitments can experience sudden, correlated drawdowns. These drawdowns could generate liquidity pressures at large banks during times of financial stress.

The vulnerabilities of U.S. banks to the Russian war against Ukraine appear to be limited. Before the war, banks maintained relatively small footprints in Russia and Ukraine, and their outstanding loans to borrowers in those countries were small. Exposures of large banks to counterparties that are active in commodity markets increased markedly, but banks appear to have managed risks amid the extremely high volatility seen in these markets since the beginning of the war. However, several indirect channels could pose risks for U.S. banks, including heightened volatility in asset markets; disruptions in payment, clearing, and settlement systems due to sanctions; and interconnections with large European banks, which could be adversely affected through the impact of the conflict on the European economy.

Operational and Technological Risks

While rising interest rates may benefit net interest margins, inflation and a tight labor market are increasing operating costs. In addition, heightened competition for highly-skilled and high-paid workers is driving efficiency measures at the largest banks, where salaries and benefits constitute over 50% of non-interest expenses. Smaller banks face similar challenges. Coupled with the disruption caused by the COVID-19 pandemic and resulting changes in work and return-to-office dynamics, staffing management has grown more complex. Banks continue leveraging new technology and innovative products and services to meet evolving operational needs, customer demands, and expectations. Digitalizing the financial services industry presents myriad risks and points of disruption for traditional banks, which could impact long-term profitability if risks are not adequately managed.

Operational and technology risks are already elevated at many large BHCs. Introducing new products and processes can exacerbate challenges in addressing legacy issues. Banks operate in an increasingly complex environment due to the adoption of these new products, services, and delivery channels, as well as expanded relationships with fintech companies and other third parties. These activities may result in increased operational risks related to innovation or the failure to implement appropriate controls and risk management frameworks.

While banks are critically dependent on information technology to conduct business operations, threats to their information technology are increasing. The finance and insurance industries were subject to the most cyberattacks of any industry from 2015 to 2020.[39] The current geopolitical situation further heightens the importance of cyber threat monitoring and effective defensive capabilities. Banks' increasing reliance on third-party relationships, development, and adoption of innovative products, services, and technologies, and ongoing changes to banks' staffing and operating environment, may increase operational risk.

Recommendations

Large BHCs face a challenging environment that includes rising interest rates, increased concerns about the economic outlook and its potential impact on credit quality, and continued cyber security threats. The Council recommends banking supervisors continue to ensure that

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banks maintain adequate capital and liquidity, sound interest rate risk management practices, and well-developed operational resiliency plans. The Council encourages banks and supervisors to focus their monitoring efforts on the impact of interest rate risk on bank capital, including the impact of unrealized losses on their securities portfolios. The Council supports the continued use of stress testing to assess risks to banks, noting that banking agencies and financial institutions should ensure that their stress-testing methodologies adequately account for plausible tail risks, given the current economic environment. Models calibrated to recent data may not fully capture forward-looking risk. The Council recommends that banking agencies continue monitoring bank exposures to NBFIs, including assessing how banks manage their exposure to leverage or liquidity mismatch in the nonbank financial sector.

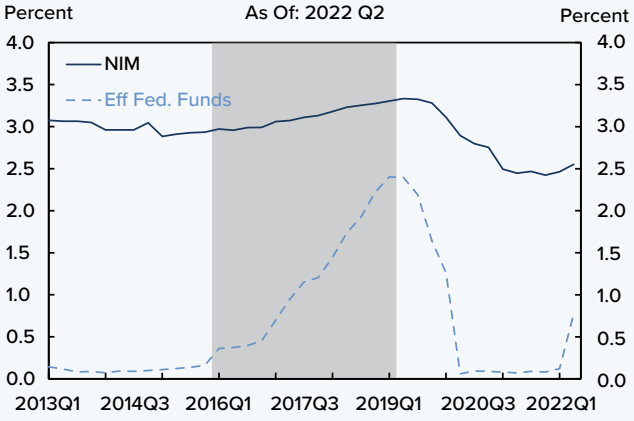
Box C: The Impact of Interest Rate Risk on Banks, Insurance Companies, and Pension Funds

Higher interest rates may affect the resilience of banks, insurance companies, and pension funds as the Federal Reserve tightens monetary policy to bring down above-target inflation.

Banks

Higher interest rates have various effects on bank profits and capital. On the one hand, banks may benefit from higher interest rates due to an increase in their NIM as higher rates are passed through more quickly to bank assets like floating-rate securities and loans than to bank liabilities like deposits and debt (**Figure C.1**).[40] However, a rapid increase in rates may decrease profitability for banks with larger shares of long duration holdings like longer-term fixed-income securities or mortgage loans. Further, higher rates cause mark-to-market losses on available-for-sale (AFS) fixed-income securities, reducing banks' tangible equity capital. For some of the largest banks, these losses also reduce their regulatory capital.

C.1 Bank NIM and Fed Funds Rates: 2013 - 2022



Source: Call Report, Federal Reserve

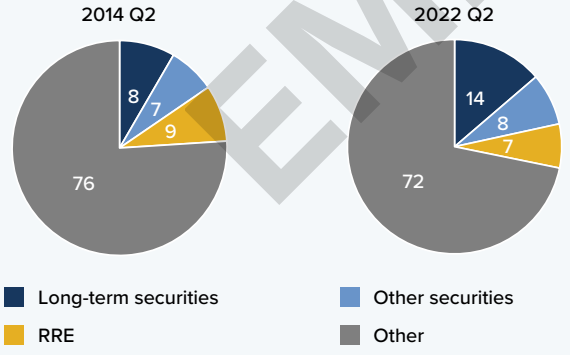
Under current accounting rules, declines in the market value of held-to-maturity (HTM) securities do not impact banks' tangible equity capital or regulatory capital, and many banks have shifted their securities portfolios from AFS to HTM with unrealized losses or gains being amortized over the life of the securities, resulting in an

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adjustment to yield. However, banks can face economic losses due to revaluation effects on HTM securities and other long-term fixed-rate assets, such as first and junior-lien residential real estate loans. Additionally, declines in the value of securities and fixed-rate assets can have material impacts on the equity market value of the firm.[41]

The largest U.S. banks have shifted their asset mix in recent years, creating more exposure to changes in long-term rates and securities losses. For example, long-term securities have increased as a percentage of banks' balance sheets from 8% in Q2 2014 to 14% in Q2 2022 (**Figure C.2**). In nominal terms, the value of long-term securities increased from about $1.2 trillion to about $3.0 trillion during this same period. However, banks have also reduced their dependence on short-term wholesale funding over the past several years, and they have experienced significant growth in stable deposits, which may have boosted NIMs and helped offset the impact of securities losses by delaying the pass-through of rates to depositors.[42]

C.2 Bank Asset Composition: 2014 and 2022



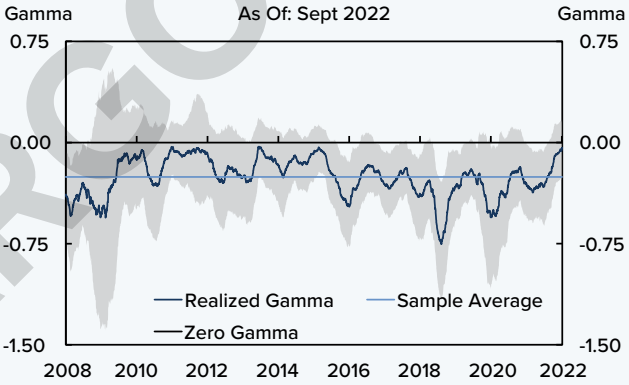
Source: FR Y-9C

Note: Long-term securities are defined as securities that mature or reprice in more than five years. RRE loans include first and junior lien mortgage loans.

Insurance Companies

Life insurers' liabilities generally have longer effective duration than life insurers' assets. As a result, gradually rising interest rates may have a positive effect on the profitability of life insurers. One way to estimate life insurer interest rate risk is to measure the sensitivity of insurers' stock returns to changes in long-term interest rates (**Figure C.3**). However, the most recent estimates show the sensitivity is not statistically significant.

C.3 Realized Interest Rate Risk Hedging by Life Insurers: 2008 - 2022



Source: Thomson Reuters Tick History

Note: Realized gamma is the daily coefficient from a regression of five-minute returns on a market capitalization-weighted index of life insurers on five-minute return on a 10Y Treasury Index controlling for five-minute returns on the S&P500 index. See Brunetti, Foley-Fisher and Verani (2022) "What Do High-Frequency Insurer Stock Prices Tell Us About Their Interest Rate Risk Management?", mimeo for more details. Confidence intervals are constructed by subsampling returns within each day. A gamma below zero indicates that insurance companies did not hedge the change in interest rates and would benefit from rising long-term interest rates.

One salient source of life insurer interest rate risk is that some liabilities can be redeemed earlier than expected. Insurance products, such as whole life and deferred fixed annuities, often can be "surrendered," meaning the savings can be withdrawn early, though sometimes subject to a penalty. Since these products often also have a guaranteed minimum return, the incentive

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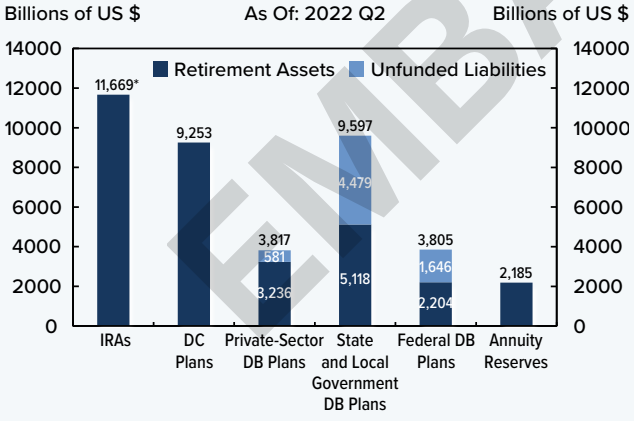
Box C: The Impact of Interest Rate Risk on Banks, Insurance Companies, and Pension Funds (continued)

for surrendering can depend on the level of interest rates and market volatility. A large, quick increase in interest rates can lead to an unexpected large wave of surrenders, which is referred to as disintermediation risk. Higher-than-expected surrender rates could force insurers to sell assets while rising interest rates are pushing down market prices, forcing insurers to realize losses to meet higher redemptions. Significant realized losses could prompt institutional investors to re-evaluate their funding to life insurers' nontraditional liabilities, potentially contributing to increased liquidity stresses.

Pension Funds

Defined benefit (DB) pension plans, which are offered through private, state and local, and federal employers, continue to play a major role in the U.S. retirement system, accounting for over $17 trillion in pension entitlements as of June 2022 (**Figure C.4**).

C.4 U.S. Total Retirement Entitlements



Source: ICI

Note: For definitions of categories, see Table 1 and 2 in the US Retirement Market, Second Quarter 2022 ICI statistical report. Components may not add to the total because of rounding.
* Data are estimated.

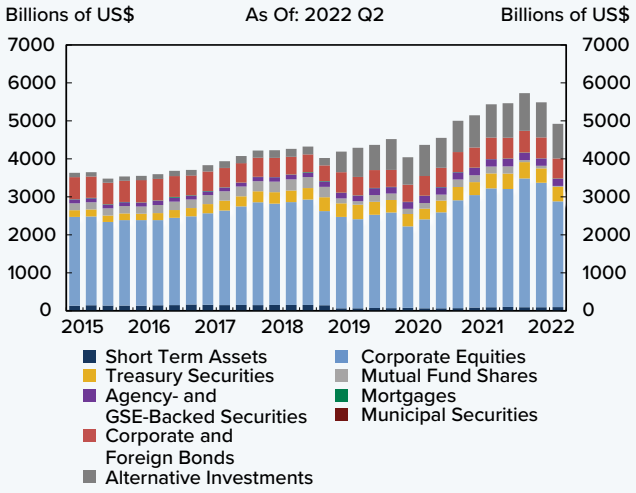
Defined benefit plans promise a regular retirement income that typically depends on age, tenure, and final salary. To meet these promises, plan sponsors set aside financial assets that are invested in various asset classes, such as fixed-income, equity, or alternative investments, which include hedge funds, private equity, real assets, and private credit. If plan assets are sufficient to cover the present value of future liabilities, the plan is said to be fully funded.

Interest rate changes affect the present value of pension assets and liabilities. A fully funded plan can fully match the duration of its liabilities to immunize itself against interest rate shocks. DB plans use strategies to manage interest rate risk, such as derivative instruments and liability-driven investments (LDI),[43] but can also be exposed to interest rate risk from derivatives. The overall interest rate risk for private, state, and local DB plans differs due to different rules and regulations.

Public pension funds discount obligations at the expected return of plan assets, following Government Accounting Standards Board accounting rules. The relatively high discount rates allowed lower contributions, which led to substantial underfunding. The underfunding, exacerbated by higher liabilities under the recent low-interest rate environment, in turn, incentivized sponsors to invest further in risky alternatives in a reach for yield (**Figure C.5**). Some pension fund boards allowed the use of leverage, repurchase agreements, and derivatives instruments to boost returns.[44] In the event that fast-changing interest rates sufficiently affect the value of collateral, these funds could need to sell assets such as Treasuries to cover these positions since the funds' cash holdings are usually limited.[45]

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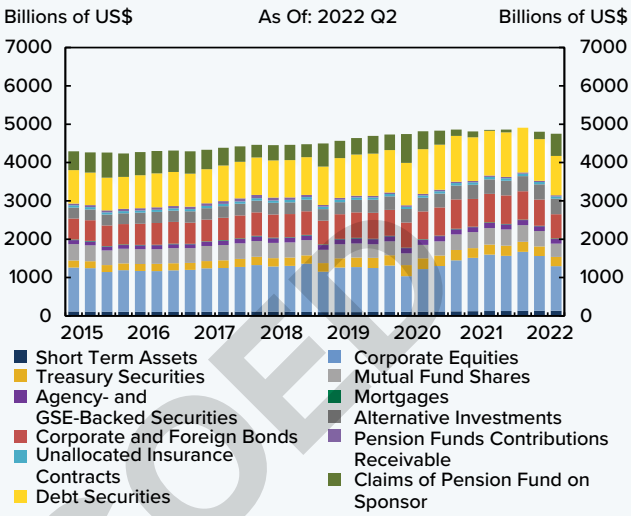
C.5 State and Local DB Total Assets by Z.1 Category



Source: Financial Accounts of the United States

Note: Alternative investments include hedge funds, private funds, and other unclassified assets as reported in the Census QSPP. Short term assets include checkable deposits and currency, time and savings deposits, money market fund shares, security repurchase agreements, and open market paper. Private equity is included in corporate equities.

C.6 Private DB Total Assets by Z.1 Category



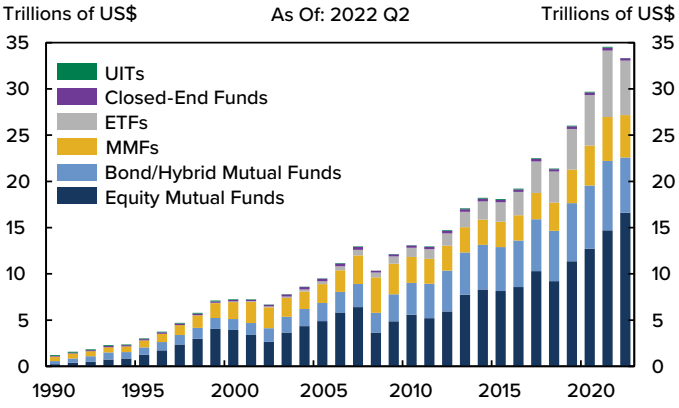
Source: Financial Accounts of the United States

Note: Alternative investments include hedge funds, private funds, and other unclassified assets as reported in the Census QSPP. Short term assets include checkable deposits and currency, time and savings deposits, money market fund shares, security repurchase agreements, and open market paper. Private equity is included in corporate equities.

Private DB plans discount pension benefit obligations using investment-grade corporate bond yields and adhere to stricter funding rules. As a result, they are more likely to use interest rate immunization strategies, though most funds still rely on long bond portfolios over LDI strategies.[46] Since the average duration of their liabilities is a little over 10 years, U.S. private pensions can achieve their target duration in the large and more liquid 10-year U.S. Treasury bond market and the corporate bond market (**Figure C.6**). Beyond their effect on funding levels, interest rate increases may accelerate the shift away from DB plan schemes. As pension buy-outs become more attractive, sponsors' incentives to engage in pension risk transfers (PRT)[47] to life insurance companies increase. Following a PRT, pension liabilities are irrevocably transferred to insurers, along with the associated interest rate risk.

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3.2.2.1 Investment Company Asset Growth



Source: ICI

Note: Excludes non '40 Act ETPs.

3.2.2 Investment Funds

Investment funds play a critical intermediary role in the U.S. financial system, promoting economic growth through efficient capital formation and providing vital funding to the U.S. economy. While recognizing these benefits, the Council has identified certain vulnerabilities related to investment funds, whose assets have increased significantly over the past decade (**Figure 3.2.2.1**). Hedge funds, open-end mutual funds, collective investment funds, and money market funds all play unique and critical roles in the financial system but also carry their own set of risks to financial stability.

Hedge Funds

Hedge funds have come to play a more prominent role in certain markets in recent years. The hedge fund industry has grown considerably over the last five years, with gross assets rising from approximately $6.4 trillion in Q4 2016 to approximately $9.8 trillion in Q4 2021.[48] Over the same period, qualifying hedge funds' presence in the critically important short-term funding markets and the U.S. Treasury market has increased markedly. Between Q4 2016 and Q4 2021, qualifying hedge fund exposures to U.S. Treasuries increased by 55%, while their repo and reverse repo exposures increased by 92%.[49]

From the perspective of systemic risk, there are three main channels through which hedge funds can create risks to financial stability: (1) by causing or contributing to market disruptions through large asset liquidations; (2) by transmitting risks to counterparties that are large, highly interconnected financial institutions; or (3) by reducing financial intermediation, which could, under certain conditions, potentially impair market functioning.

A common thread for each channel is hedge funds' use of leverage. During periods of market stress, leveraged funds can face internal or external pressure to liquidate their positions. An initial shock can create losses for a fund that lead to margin or collateral

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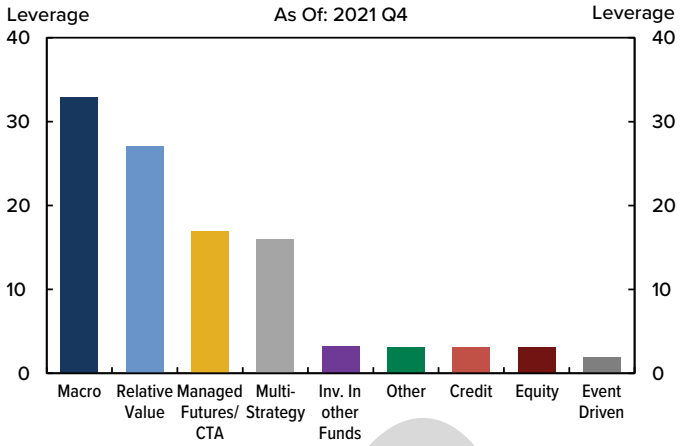
calls, which may lead the fund to liquidate its positions. This liquidation can, in turn, lead to adverse price changes in the assets the fund holds, leading to further margin calls, additional losses on existing positions, and tighter risk management.

Similarly, the counterparty or prime broker could reduce or cut off its funding exposure to the fund instead of demanding additional margin or collateral. If a counterparty becomes concerned about the riskiness of a fund, it may refuse to roll over the funding and force the fund to liquidate its positions.

Finally, the counterparty's exposure to a distressed fund can also act as a transmission channel through which the fund's losses inflict losses on the counterparty and broadly disrupts the financial system. This vulnerability is particularly salient if the counterparty fails to implement the appropriate practices to manage the risk of its exposure to the fund.

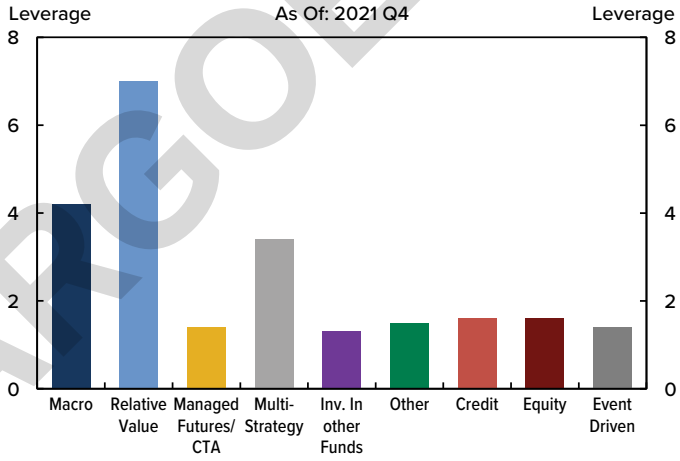
Hedge funds' use of leverage varies widely by the type of investment strategy the fund uses. At the aggregate level, the median gross notional exposure (GNE) to net asset value (NAV) ratio for qualifying hedge funds stood at 1.9x, while the median gross asset value (GAV) to NAV ratio stood at 1.4x as of Q4 2021. However, this aggregate statistic masks the significant heterogeneity in funds' use of leverage across different strategies. For example, relative value, global macro, and multi-strategy funds use much more leverage than other funds. As a result, those three fund strategies reported asset-weighted average GNE/NAV ratios of 27.1x, 32.9x, and 16.0x and GAV/NAV ratios of 7.0x, 4.2x, and 3.4x in Q4 2021 (**Figures 3.2.2.2** and **3.2.2.3**). Additionally, leverage appears to be concentrated among a small number of large hedge funds, with 25 funds accounting for 55% of hedge fund derivatives value and 49% of hedge fund borrowing (**Figure 3.2.2.4**).

3.2.2.2 GNE/NAV



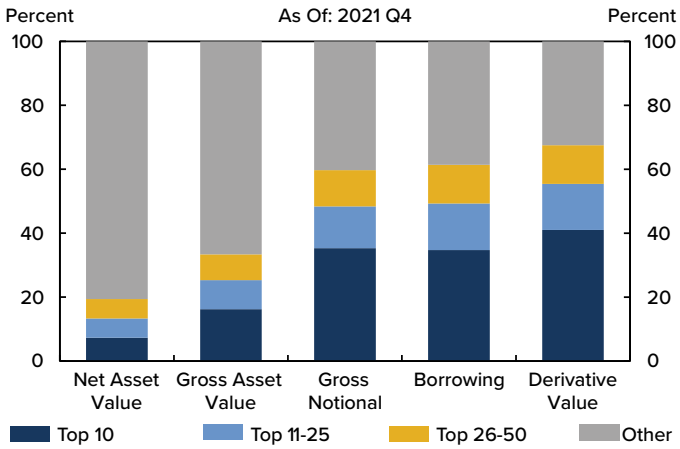
Source: SEC Form PF Statistics Report

3.2.2.3 GAV/NAV



Source: SEC Form PF Statistics Report

3.2.2.4 Hedge Fund Industry Concentration



Source: SEC Form PF Statistics Report

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The events of March 2020 and the more prominent role of leveraged funds in Treasury markets underscore the importance of assessing hedge funds' impact on market functioning during stress periods. At the same time, no single regulator has all the information necessary to evaluate the complete risk profiles of hedge funds. While the SEC's Form PF data and hedge fund exams provide some information, other information on hedge fund activities comes indirectly from insight gained through regulatory oversight of their counterparties.

To enhance regulators' abilities to assess hedge fund-related risks in systemically important markets, the Council re-established the Hedge Fund Working Group (HFWG) in 2021. In February 2022, the HFWG presented its analysis of hedge fund financial stability risks to the Council using activity in the Treasury markets during March 2020 and the failure of Archegos Capital Management, a family office employing levered strategies also used by hedge funds, as case studies. The HFWG found that hedge funds were among the three largest categories of sellers of Treasury securities in March 2020, along with foreign institutions and open-end mutual funds. Hedge funds materially contributed to the Treasury market disruption during this period but were not the sole cause. The HFWG also found that the failure of Archegos transmitted material stress to large, interconnected financial institutions.[50] Since then, the HFWG has developed an interagency risk monitoring framework based on quantitative and qualitative information to identify potential risks to financial stability posed by hedge fund activity and communicate those risks to the relevant regulators.

The HFWG also identified gaps in the availability of data related to hedge funds, and Council member agencies are taking steps to address these gaps. For example, the SEC and the CFTC proposed amendments to Form PF, the primary regulatory data source on the private fund industry. The SEC also proposed a new requirement that certain advisers to hedge funds report timely information about events that indicate significant distress at a fund. Moreover, the HFWG coordinates its work with the Interagency Working Group on Treasury Market Surveillance (IAWG) and is currently considering policy options to mitigate the risks it has identified.

Open-end Funds

Open-end funds can create risks to financial stability by engaging in liquidity and maturity transformation. They allow daily redemptions while potentially investing in less-liquid assets. These two features can amplify and transmit stress in the U.S. financial system. Investors may be incentivized to redeem ahead of others because the remaining investors in the fund bear the cost of meeting large-scale redemptions, creating a first-mover advantage. Funds' asset sales can lead to asset price declines, transmit stress to previously unaffected market participants, and ultimately create broader market disruptions.

In February 2022, the Council's Open-end Fund Working Group presented updated findings on potential financial stability risks associated with these funds, concluding that open-end funds were one of the significant contributors to the financial system disruptions experienced in March 2020. Unprecedented investor redemptions drove the large volume of asset liquidations for fixed-income open-end funds. As a result, U.S. open-end funds were among the largest recorded net sellers of U.S. Treasuries, U.S. municipal bonds, and possibly U.S. corporate debt during this period. The impact of these asset sales on U.S. fixed-income markets, together with sales by other investors, was magnified by challenging liquidity and stressed trading conditions. While open-end funds were not the sole or primary cause of market stress, the size of their asset liquidations indicates that they were one of the significant contributors to this stress.

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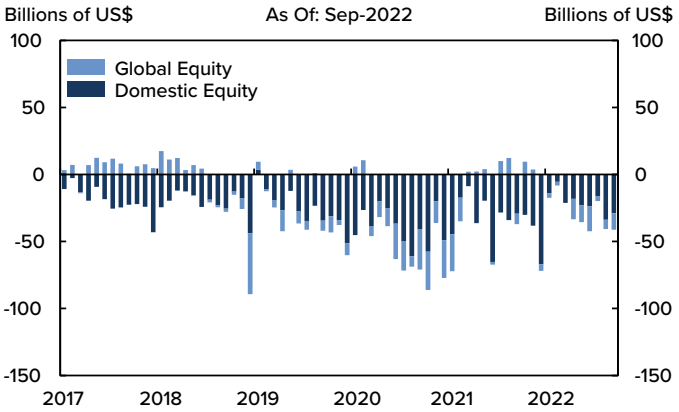
Open-end funds continue to pose risks to U.S. financial stability. While U.S. mutual funds have seen notable investor outflows this year, these funds remain important investors in the U.S. debt markets that were disrupted in March 2020. U.S. mutual funds have seen investor outflows of $718 billion year-to-date through September 2022, with equity fund outflows totaling $260 billion and bond-fund outflows totaling $395 billion **(Figures 3.2.2.5** and **3.2.2.6)**.[51] Rising interest rates create challenges for fixed-income funds, where the inverse relationship between bond prices and interest rates can lead to losses. In contrast to outflows from mutual funds, equity and bond exchange-traded funds (ETFs) took in a combined total of $414 billion during the same period.[52] Even after the outflows, U.S. mutual funds remain one of the top investors in U.S. Treasuries, municipal bonds, and corporate bonds.

In November 2022, the SEC voted to propose amendments to better prepare open-end funds for stressed conditions and mitigate the dilution of shareholders' interests.[53] The rule and form amendments would enhance how funds manage their liquidity risks, require mutual funds to implement liquidity management tools, and provide more timely and detailed reporting of fund information. Among other things, the proposal would require open-end funds to use a liquidity management tool called "swing pricing," which is a method to allocate costs stemming from inflows or outflows to the investors engaged in that activity rather than diluting other shareholders.

Collective Investment Funds

Collective investment funds (CIFs) include common trust funds for personal trusts and collective investment trusts (CITs) offered to tax-qualified retirement plans. Certain funds have grown relative to other investment options in retirement plans, especially for 401(k) and other participant-directed plans. CIFs can be daily valued and traded like shares of mutual funds, but at the same time, are perceived as lower cost and more flexible than investments in mutual

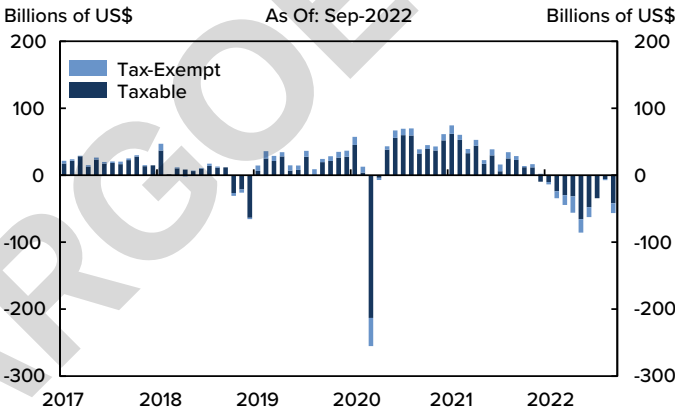
3.2.2.5 Monthly Equity Mutual Fund Flows



Source: ICI, Haver Analytics

Note: Net fund flows.

3.2.2.6 Monthly Bond Mutual Fund Flows

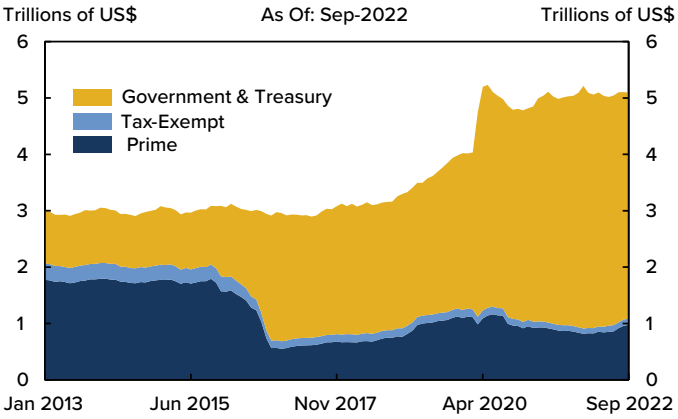


Source: ICI, Haver Analytics

Note: Net fund flows.

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3.2.2.7 MMFs Total Net Assets by Fund Type



Source: SEC Form N-MFP

funds. Although CIFs and mutual funds are both pooled investment vehicles managed collectively in accordance with a common investment strategy, they are subject to different regulatory regimes. For example, by statute, qualifying CIFs are subject to prudential oversight by banking regulators, are not required to be registered under federal securities laws, and must be administered by a bank acting as a fiduciary. Additionally, the vast majority of funds invested in CITs are retirement funds subject to the Employee Retirement Income Security Act (ERISA) and related regulations promulgated thereunder. Despite these requirements, additional regulation of open-end funds, such as the liquidity risk management proposal discussed above, may make mutual funds more costly compared to other CIFs, including CITs, and has the potential to encourage growth of CIFs.

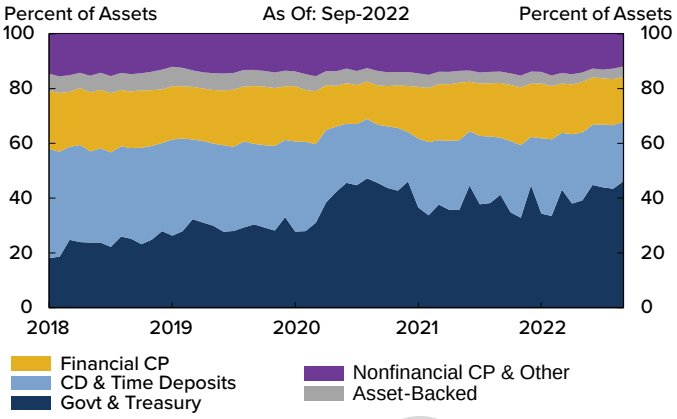
Money Market Funds

MMFs serve as intermediaries between investors seeking daily liquidity with limited principal volatility and entities with short-term funding needs. As of September 30, 2022, total U.S. MMF net assets were $5.1 trillion, up 1.3% from a year earlier (**Figure 3.2.2.7**). There are three main types of MMFs. First, government and Treasury MMFs, which had net assets of $4.0 trillion at the end of September 2022, invest in obligations of the U.S. government and federal agencies and repurchase agreements backed by government securities and account for 79% of U.S. MMF assets under management. Second, prime MMFs, which had net assets of around $980 billion at the end of September 2022, hold a variety of short-term taxable obligations issued by corporations, banks, and governments along with repurchase agreements and asset-backed commercial paper and account for 19% of U.S. MMF assets under management. Finally, tax-exempt MMFs, which primarily hold obligations of state and local governments, had net assets of about $110 billion at the end of September 2022 and account for approximately 2% of U.S. MMF assets under management.

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All MMFs engage in liquidity and maturity transformation. Prime and tax-exempt funds hold a variety of short-term obligations issued by financial and non-financial corporations, governments, municipalities, and asset-backed structures, as well as provide funding through repos (**Figure 3.2.2.8**). As discussed in **Section 3.1.4**, some of these instruments can become illiquid amid financial stress. MMFs provide liquidity to investors by offering redemptions on demand. In certain funds, this liquidity mismatch contributes during times of stress to an incentive for investors to be the first to redeem, which may lead to runs on MMFs and dislocations in short-term funding markets.

3.2.2.8 Prime MMF Exposures



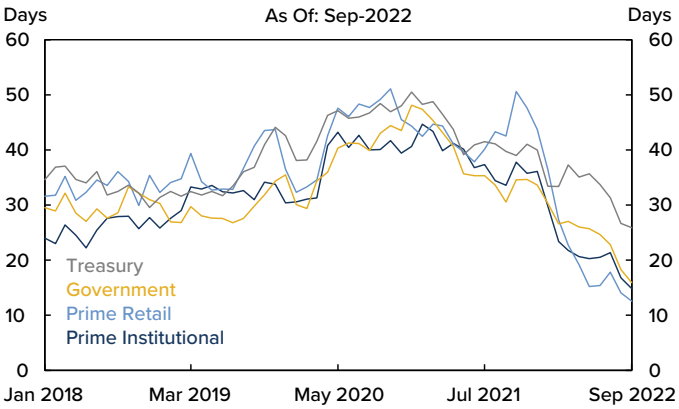
Source: SEC Form N-MFP

Large-scale outflows from prime MMFs during the early stages of the COVID-19 pandemic contributed to stress in short-term funding markets. These events underscored that prime MMFs continued to have structural vulnerabilities that can create or transmit stress to short-term funding markets. In contrast, government MMFs typically experience asset inflows during market stress as investors seek the most conservative and liquid investment option. To address the vulnerabilities in prime and tax-exempt MMFs, in February 2022, the SEC proposed amendments to certain rules to improve the resilience and transparency of MMFs.[54] A main goal of the proposal is to eliminate investors' incentive for preemptive redemptions from certain types of MMFs and to strengthen MMFs' liquidity buffers, to help ensure they are available to be used in times of stress. In addition, under the proposal, certain MMFs would be required to implement swing pricing policies and procedures to ensure that redeeming investors bear the liquidity costs of their redeeming decisions.

Prime MMFs have experienced significant growth over the past year. Much of this recent growth has been driven by retail prime funds, which have grown by $96 billion, or 45%, for the twelve-month period that ended September 30, 2022. Prime funds have become more attractive to retail

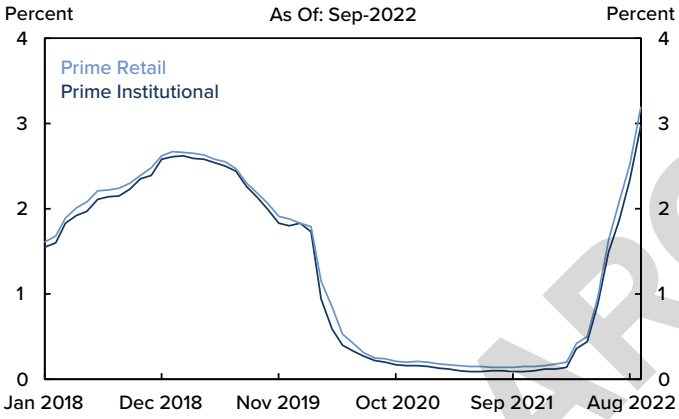
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3.2.2.9 MMF Weighted Average Maturity



Source: SEC Form N-MFP

3.2.2.10 Prime MMF Gross Yields



Source: SEC Form N-MFP

investors, given the recent increase in rates and poor performance of other asset classes. Institutional prime funds have experienced more modest growth, increasing by $10.1 billion, or 1.5%, over this same period.

MMFs have assumed a more defensive position in the current environment of expected interest rate increases. More specifically, MMFs have materially reduced the weighted average maturity of their portfolios by investing in shorter-duration securities (**Figure 3.2.2.9**). By investing in shorter-duration securities, funds have been able to reinvest cash in higher-yielding assets and offer higher returns to their investors. As a result, gross yields for prime retail funds have risen from 0.16% at year-end 2021 to 3.19% as of September 2022 (**Figure 3.2.2.10**).

The asset composition of MMFs has continued shifting towards repo holdings over the past year. MMFs' repo investments stood at $2.7 trillion in September 2022, or 54% of total assets, compared to 45% of MMFs' total assets in September 2021 and 22% in September 2020. MMFs' use of the Federal Reserve's overnight reverse repo facility (ON RRP) has continued trending upwards. As of September 30, 2022, MMFs' ON RRP investments totaled $2.2 trillion, or 44% of total assets, up from $1.4 trillion, or 29% of total assets, twelve months earlier.[55] In contrast, MMFs have continued reducing their investments in sponsored repos, which FICC centrally clears. MMFs' sponsored repo investments totaled $64 billion at the end of September 2022, down from the peak of $276 billion as of year-end 2019.

Recommendations

The Council supports the initiatives by the SEC and other agencies to address risks in hedge funds, including proposed data collection improvements for Form PF. The Council will continue to review the findings of the Hedge Fund Working Group as they are developed. The Council recommends that the SEC and other relevant regulators consider whether additional steps should be taken to address these vulnerabilities.

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The Council is encouraged by the SEC's continued engagement regarding potential reforms of open-end funds, including its recently proposed amendments regarding open-end fund liquidity risk management, swing pricing, and fund reporting, and looks forward to reforms that robustly address the financial stability risks from SEC-registered open-end funds. The Council should also consider whether congruent reforms are needed for open-end funds not subject to SEC regulation. For example, in light of inconsistent reporting across different regimes, regulators should consider whether additional data reporting is necessary to obtain appropriate information concerning these funds so that the Council can gain a better understanding of whether the regulatory differences between the regimes governing CIFs and mutual funds increase the risks of regulatory arbitrage.

In February 2022, the SEC proposed reforms for MMFs that would increase the minimum liquidity requirements for these funds, require some MMFs to adopt swing pricing, and remove provisions that tie an MMF's ability to impose liquidity fees and redemption gates under rule 2a-7 to a decline in the fund's liquidity below identified thresholds. The Council supports the SEC's efforts to improve the resilience and transparency of MMFs and strengthen short-term funding markets. The Council will continue to monitor initiatives relating to MMF reforms. These reforms will be considered in the broader context of regulatory efforts to strengthen short-term funding markets and support orderly market functioning.

The Council encourages pension regulators and the Financial Accounting Standards Board (FASB) to improve the quality, timeliness, and depth of pension financial statements and portfolio holdings disclosures.

Box D: The Protection Gap and Insurance

Insurance plays an important role in the U.S. financial system and economy, allowing individuals and firms to engage in economic activity while managing the financial risks associated with their activities.[56] Insurance also typically creates financial incentives through underwriting, pricing, and contract features that encourage insureds to manage and mitigate risk. However, not all risks are fully covered, creating a protection gap, which is the difference between insured losses and total economic losses from a particular event risk.[57] This gap is growing for some risks, such as those related to climate change or cyber incidents, and may expose more of the financial system and economy without full coverage for those risks.

Sectors of the economy that have historically relied on readily available insurance coverage, such as housing and lending activities, may be forced to internalize the liability and physical risk associated with these activities if the protection gap widens and no other alternatives for managing risk are available. One estimate of the protection gap for climate-related catastrophes concludes that 62% of potential economic losses are not insured in North America, compared with 78% in Europe, 86% in Latin America, and 91% in Asia.[58]

As a result of the increased likelihood and severity of losses and less insurance coverage, commercial insureds may have to spend more resources absorbing and mitigating business risks like cyber incidents, business interruption, or property damage, passing those costs on to their customers. For example, while cyber insurance coverage is available, recent ransomware attacks have caused a tightening of underwriting standards among insurers and lower coverage amounts. This underwriting tightening may provide incentives for insureds to strengthen their cybersecurity defenses and be more resilient to cyberattacks and may reduce the insurance sector's exposure, but it also leaves more of the

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Box D: The Protection Gap and Insurance (continued)

risk uninsured. For example, Lloyds of London estimates that the global cost for cyber incidents is roughly $400 billion, and the potential protection gap for a significant incident is as much as 90%.[59]

As climate-related disasters grow more frequent and severe, insurers may require that insureds retain more of this exposure through product features like named storm deductibles, caps on coverage, exclusions, and limitations for certain perils. In addition, insurers may exit certain regions or lines of business. For an individual insured, this may alter the price and location of a home purchase or create other unintended economic barriers.

Additional analysis is needed to measure gaps in insurance coverage, explain how the gaps could threaten financial stability, and assess whether there are alternatives to insurance that could effectively mitigate those financial stability risks.

3.2.3 Central Counterparties

Since the 2008 financial crisis, regulatory reforms have increased the use of central counterparties (CCPs) instead of bilateral contracts, making them key actors in the global financial system. Under central clearing, parties to a financial contract enter into two matched contracts with the CCP that offset one another, with the CCP ensuring the performance of open contracts. Central clearing protects against defaults among counterparties that could threaten financial stability but also concentrates the risk of default at the central counterparty. As a result, although CCPs provide significant benefits to market functioning and financial stability, they can also create potential risks to the financial system. The inability of a CCP to meet its obligations arising from the default of one or more clearing members or non-default losses could strain the surviving members of the CCP and, more broadly, the financial system. The stress on the financial system depends on several factors, including the size of the CCP and its interconnectedness with other financial institutions.

CCPs' risk management frameworks are structured to ensure they have sufficient resources to cover member defaults by mutualizing counterparty credit risk. A CCP reduces settlement risks by netting offsetting transactions between multiple counterparties and reduces financial risk by:

- requiring margin deposits;
- providing independent valuation of trades and collateral;
- monitoring the creditworthiness of the member firms; and
- providing a guarantee fund that can be used to cover losses that exceed a defaulting member's collateral on deposit.

A key part of a CCP's risk management framework is the collection of initial margin and default fund contributions to protect the clearinghouse in the event of a clearing member's default. CCPs typically adjust initial margin requirements in response to changes in market conditions. For instance, a CCP may increase initial margin requirements in response to high price volatility. Variation margin is another key component of

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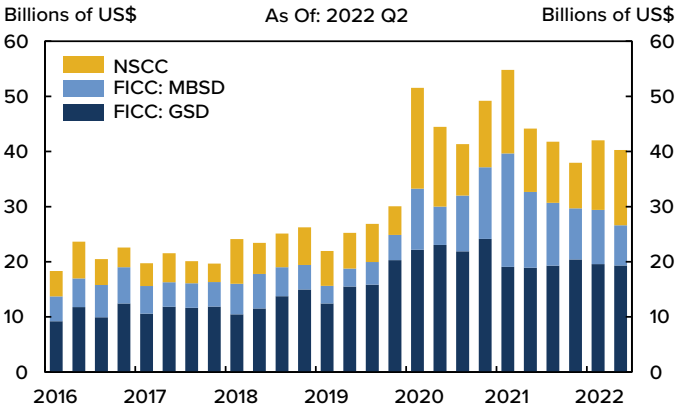
a CCP's risk management framework that offsets changes in current exposures resulting from changes in market prices. To determine the variation margin, which is typically collected and paid out in cash, positions are marked to market, and the profit or loss for each position is calculated. If the position has a loss, the member must pay a variation margin; if the position has a profit, the member receives a variation margin. To cover defaults greater than a defaulting member's resources, a CCP may set aside some of its capital and establish a mutualized guarantee/default fund. If a clearing member defaults, CCPs will use their default procedures, likely liquidating the defaulting member's cleared positions and collateral. In the event that a CCP realizes losses associated with the default of a clearing member that exceeds the defaulting firm's resources, the CCP may draw on its mutualized guarantee fund to cover those losses or impose special assessments on its clearing members.

U.S. CCPs

In the U.S., the Depository Trust & Clearing Corporation (DTCC) is the primary provider of clearing services for cash securities through its subsidiaries, the FICC and the National Securities Clearing Corporation (NSCC).[60] Required contributions to MBSD's and NSCC's clearing funds, which spiked at the onset of the COVID-19 pandemic, remained elevated through Q2 2022 relative to pre-pandemic levels. As of June 30, 2022, clearing fund requirements across the DTCC's three clearing services totaled $40.3 billion, down $3.8 billion from June 30, 2021 (**Figure 3.2.3.1**).

Most U.S. exchange-traded derivatives are cleared through the Chicago Mercantile Exchange (CME), the Intercontinental Exchange (ICE) Clear U.S., and the Options Clearing Corp (OC Corp). CME and ICE Clear U.S. provide clearing services for futures and options on futures, while OC Corp mainly provides clearing services for exchange-traded equity options. The initial margin posted against futures and options remains elevated relative to pre-pandemic levels, with

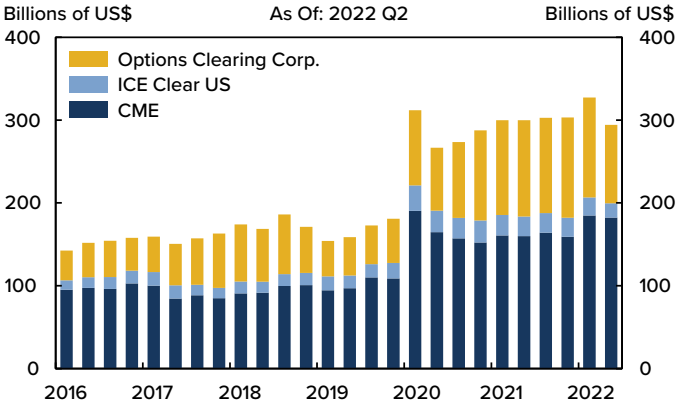
3.2.3.1 DTCC Clearing Fund Requirements



Source: PFMI Quantitative Disclosures, Clarus FT

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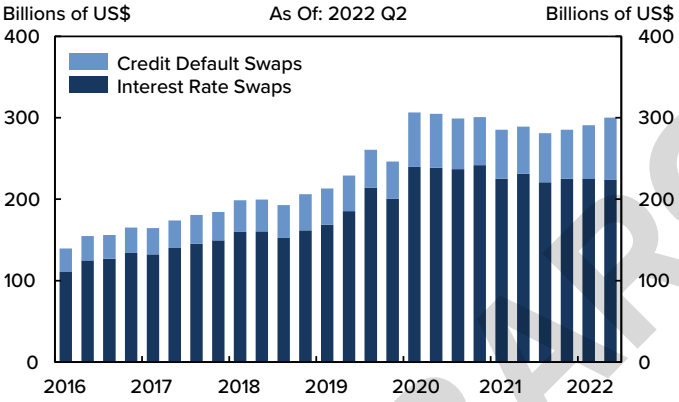
3.2.3.2 Initial Margin: U.S. Exchange Traded Derivatives



Source: PFMI Quantitative Disclosures, Clarus FT

Note: Initial margin required as reported in quantitative disclosures; includes house and client accounts.

3.2.3.3 Initial Margin: Centrally Cleared OTC Derivatives



Source: PFMI Quantitative Disclosures, Clarus FT

Note: Initial margin required as reported in quantitative disclosures; includes house and client accounts. Interest rate swaps margin includes LCH Ltd. and CME. CDS margin include CME, ICC, ICEU, and LCH SA). CME ceased clearing CDS in March 2018.

the margin at OC Corp, CME, and ICE Clear U.S. totaling $294.3 billion (**Figure 3.2.3.2**). Within the over-the-counter (OTC) derivative markets, most U.S. dollar interest rate swaps are cleared through LCH Ltd. or CME, while most credit default swaps (CDS) are cleared through ICE Clear Credit, ICE Clear Europe, or LCH SA. The required initial margin for interest rate swaps and credit default swaps totaled $300.2 billion as of June 30, 2022, up $11.1 billion from the prior year (**Figure 3.2.3.3**).

Commodity Market Volatility

As noted in **Box E**, commodity price volatility surged following Russia's war against Ukraine, forcing several commodity-focused CCPs to raise initial margins substantially. Despite the sudden increase in margins in February and March 2022, there was limited impact on the broader financial system. However, several lessons can be learned from this stress. High commodity prices and volatility can hamper commercial activity and key participants' willingness or ability to hedge price risk in derivatives markets or engage in market-making activity, which could impact commodities supplies to the market and the economy.

CCP Stress Test Results

Although increased margin demands may have put a temporary strain on the liquidity of some members, these events helped alleviate concerns about potential CCP defaults going forward. As a result, the banks' CCP probability of default estimates, as reflected in the Federal Reserve's CCAR, have decreased substantially from their levels in Q1 2020.

Additional evidence is derived from the March 10, 2022, release of stress tests performed on 7 of 13 CCPs considered systemically important in more than one jurisdiction (SI>1 CCPs). The seven SI>1 CCPs operate a total of 15 service lines, all of which were tested in coordination with their regulator. The analysis was based on default and non-default loss scenarios potentially extreme enough to require recovery and resolution tools. Although there are limitations to the analysis

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that mean the results of these stress tests should be interpreted cautiously, all the CCP service lines could absorb all of the losses.[61] About half of the 15 CCP service lines had to use recovery tools, but none needed resolution. For non-default losses, a cyber theft scenario was considered, and resolution authorities would have needed to trigger resolution for the majority of CCPs to generate sufficient resources to cover the loss. In another non-default scenario, the liquidity arrangements of one CCP were insufficient.

CCP Resolution

Although CCP failures are rare, they require sufficient resolution planning and preparedness to continue critical functions to maintain U.S. financial stability. Accordingly, the Council has designated five CCPs as financial market utilities (FMUs) that are systemically important because the failure of or a disruption to the functioning of the FMU could threaten financial stability. In addition, 13 CCPs from 10 jurisdictions were identified as SI>1 CCPs, including three U.S. CCPs. Regulators have taken steps for these SI>1 CCPs to enhance their preparedness, including setting up crisis management groups with cooperation agreements to support resolution planning and resolvability assessments. These CCPs have also prepared and submitted plans to their primary regulators outlining potential paths for recovery and orderly wind down. However, it is important to note these CCP orderly wind-down plans consider cessation of critical services. Furthermore, recovery and orderly wind-down plans may fail, which could create serious financial stability concerns for the United States in the absence of readily available substitutes.

Recommendations

The Council recommends that the CFTC, Federal Reserve, and SEC continue to coordinate the supervision of all CCPs designated by the Council as FMUs that are systemically important. Relevant agencies should continue to evaluate whether existing standards for CCPs are sufficiently robust to mitigate threats to financial stability from default and non-default losses. The agencies should pay particular attention to the tradeoff between counterparty and liquidity risks. Agencies that regulate clearing members should continue to assess those firms' liquidity risk management practices and capabilities. CCP supervisory agencies should continue to work with the FDIC to support CCP resolution planning.

Council member agencies should continue working with global counterparts and international standard-setting bodies to identify and address areas of concern. The Council encourages continued engagement with foreign regulators to address the potential for inconsistent regulatory requirements or supervision that pose risks to U.S. financial stability. The Council encourages cooperation in the oversight and regulation of SI>1 CCPs and consideration of appropriate resources for SI>1 CCP resolution.

The Council also encourages agencies to continue monitoring and assessing interconnections among CCPs, their clearing members, and other financial institutions. CCPs should ensure they can manage risks associated with sudden volatility and that participants are prepared to meet their liquidity needs to fund higher margin calls during periods of stress.

In addition, while margin requirements have increased significantly in the aftermath of Russia's war against Ukraine, agencies should continue analyzing and monitoring the impacts of regulatory risk management frameworks in cleared, uncleared, and related securities markets and their impact on systemically important intermediaries and clients.

Finally, the Council encourages regulators to continue advancing recovery and resolution planning for FMUs and SI>1 CCPs and to continue coordinating the design and execution of supervisory stress tests of these entities.

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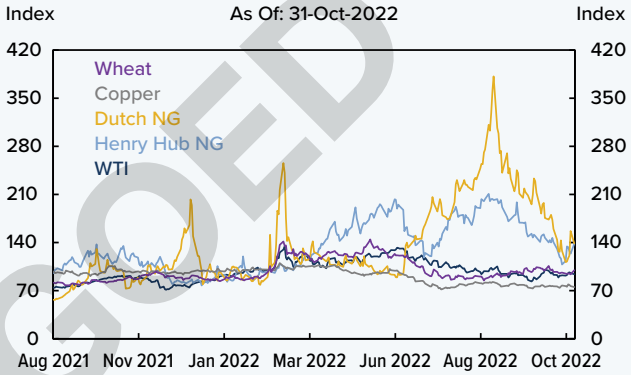
Box E: Recent Developments in Commodities Markets

Commodities and commodities derivatives markets have experienced several bouts of volatility over the last few years. As a result, commodity-focused CCPs have raised margin requirements significantly. Despite significant volatility, trading remained orderly on U.S. exchanges. However, disorderly trading in the London Metal Exchange's (LME) nickel contract led to the suspension of the nickel market in March. Although LME is not regulated by any U.S. entity, its decision to suspend trading raises broader questions about the role and design of trade suspensions.

Commodities prices, which generally fell at the onset of the COVID-19 pandemic, have since rebounded sharply. Aggressive monetary and fiscal stimulus accelerated a sharp rebound in aggregate demand. At the same time, supply for many commodities continued to be constrained by logistical bottlenecks, bad weather, and rising input costs. As a result, by the end of August 2021, almost all energy, metals, and agricultural markets exceeded pre-pandemic price levels, and many were trading at multi-year highs. For the most part, markets steadied through the fall of 2021, as the emergence of the Omicron variant, continued lockdowns in China, and more restrictive monetary policies tempered bullish expectations for commodities.

Just before and after the Russian war against Ukraine began on February 24, 2022, prices for markets with the potential for supply disruptions from the region, such as crude oil, natural gas, and wheat, rose sharply from already elevated levels (**Figure E.1**). European natural gas markets were especially affected since Europe imports a significant amount of natural gas from Russia. While European economies have since reduced their reliance on Russian gas, natural gas prices remain significantly elevated as Russia continues to interrupt supplies. At about the same time, monetary tightening by the Federal Reserve led to multi-year highs in the U.S. dollar. Many commodities, notably oil, are priced in U.S. dollars, and historically a stronger dollar puts downward pressure on commodities prices. Additionally, price pressure was tempered by continued lockdowns in China and increasingly tight worldwide financial conditions.

E.1 Relative Price of Selected Futures Contracts

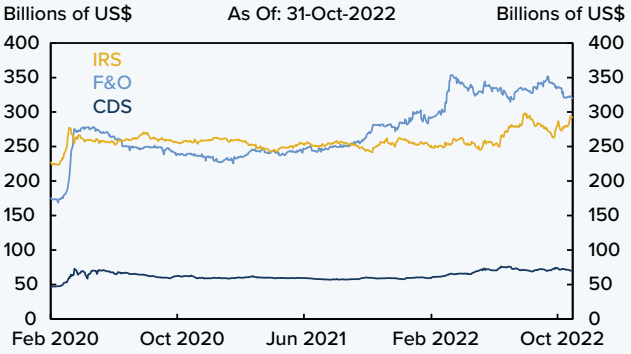


Source: CFTC

Derivatives Clearing

Elevated commodities market volatility has led to material increases in initial margin levels at CCPs (**Figure E.2**). Total collateral for futures and options contracts rose roughly $50 billion in February and March 2022, with further margin increases in interest rate derivatives as many central banks worldwide began successive rate increases.

E.2 Aggregate Initial Margin by Asset Class

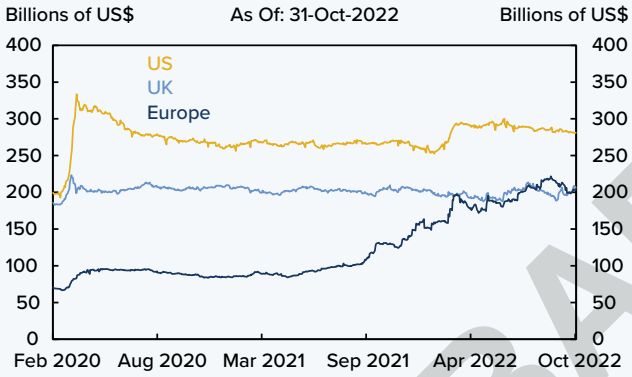


Source: CFTC

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The geographical distribution of margin increases highlighted the regional impact of the war in Ukraine, with increases highly concentrated in Europe-based clearinghouses (**Figure E.3**). By the fall of 2022, total collateral held by registered CCPs exceeded $700 billion, significantly higher than during the peak of the COVID-19 pandemic. During this period, variation margin payments, which represent the day-to-day changes in portfolio value, rose to approximately $50 billion per day, similar to those seen early in the COVID-19 pandemic.[62]

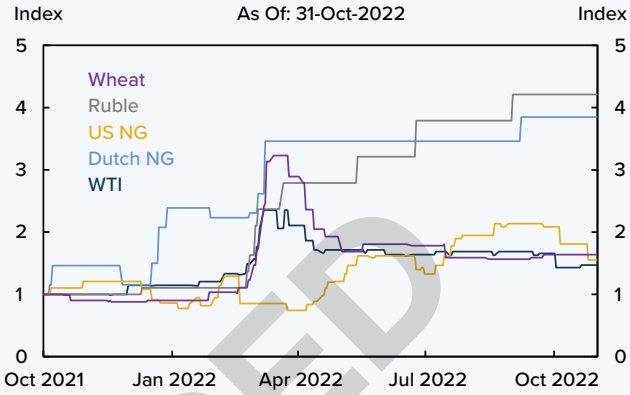
E.3 Aggregate Initial Margin by Region



Source: CFTC

The increase in initial margin levels was most pronounced for derivative products directly affected by recent events. Normalized margin levels are shown for futures products most impacted by Russia's war against Ukraine (**Figure E.4**). While some initial margin requirements for products were increased in advance of Russia's invasion, the pace of margin increases accelerated post invasion, with margin levels on certain contracts tripling over a few months. Margin requirements for most products have since fallen. However, margin levels for European gas futures remain elevated, which can be attributed to ongoing supply disruptions and continued volatility going into the winter heating season.

E.4 Normalized Margin of Futures Contracts



Source: CFTC

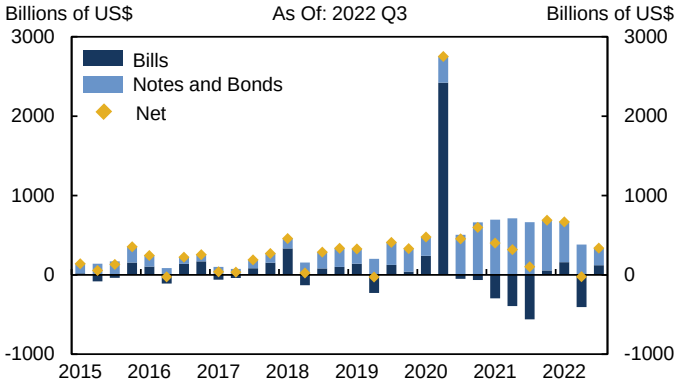
LME Nickel Market

On March 8, 2022, the LME suspended trading in the nickel market following unprecedented price increases in the 3-month nickel contract.[63] The LME also retroactively canceled all contracts executed on the morning of March 8, ceased publication of nickel prices, and deferred delivery of physically settled nickel contracts. LME's decision to suspend trading was partly due to concerns that the extreme volatility had created a systemic risk to the market.[64] More specifically, there were serious concerns about market participants' ability to meet margin calls, raising the significant risk of multiple defaults.

The suspension raises a broader question about the role and design of trade suspensions. Although such measures can help mitigate risks to financial stability by reducing liquidity stress, interruptions to trading and price discovery may carry significant costs, including loss of price transparency, which is important for valuation, settlement, and risk management. It also constrains participants' ability to enter into or close out positions and mitigate their exposures.

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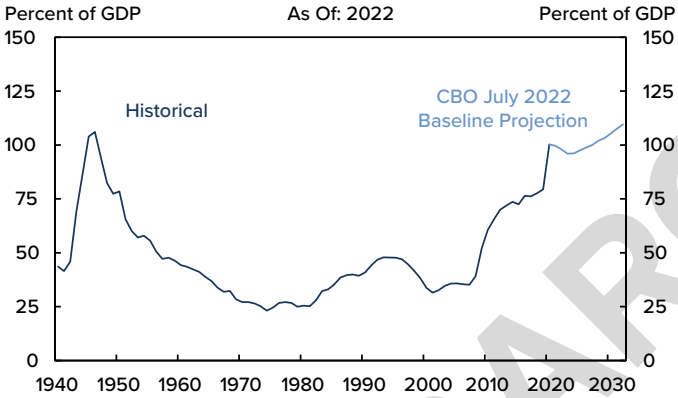
3.3.1.1 Net Issuance of Treasury Securities



Source: U.S. Department of the Treasury, Bureau of the Fiscal Service, SIFMA, Haver Analytics

Note: Includes marketable securities only.

3.3.1.2 Federal Debt Held by the Public



Source: CBO, Haver Analytics

Note: Data for fiscal years. Years after 2021 are projected.

3.3 Financial Market Structure

3.3.1 Treasury Markets

The Treasury market plays a critical role in financing the federal government, supporting the broader financial system, and implementing monetary policy. The market remains the deepest and most liquid market in the world and a central component of the financial system. However, recent episodes of challenging liquidity conditions in the secondary Treasury market, including in September 2019 and March 2020, highlight market vulnerabilities and illustrate the need to consider policies that enhance Treasury market resilience. The sheer size of the total Treasury market, at $24 trillion marketable outstanding and $670 billion of average daily trading volume over the past year as of September 2022, requires close monitoring and vigilance, as a breakdown in market functioning would have significant financial stability implications.

In FY 2022, the federal deficit declined to around $1.4 trillion, half of the $2.8 trillion deficit in FY 2021, based on a decline in fiscal spending related to the COVID-19 pandemic.[65] Treasury net marketable borrowing, however, increased from around $1.4 trillion in FY 2021 to $1.7 trillion in FY 2022, due primarily to the need to rebuild the cash balance after the prior debt limit episode (**Figure 3.3.1.1**). In July 2022, the Congressional Budget Office projected that public debt would remain relatively stable as a percent of GDP over the next few years at just below 100% before increasing again to 110% by 2032 (**Figure 3.3.1.2**). In the near term, net marketable borrowing was forecast to increase by around $1 trillion over the next two years, which will need to be absorbed by private sector investors. Adding to the supply of Treasury debt to the private sector are the maturities of the Federal Reserve holdings of Treasury securities, which contributed to the need to raise an additional $150 billion in privately-held net marketable borrowing in FY 2022.

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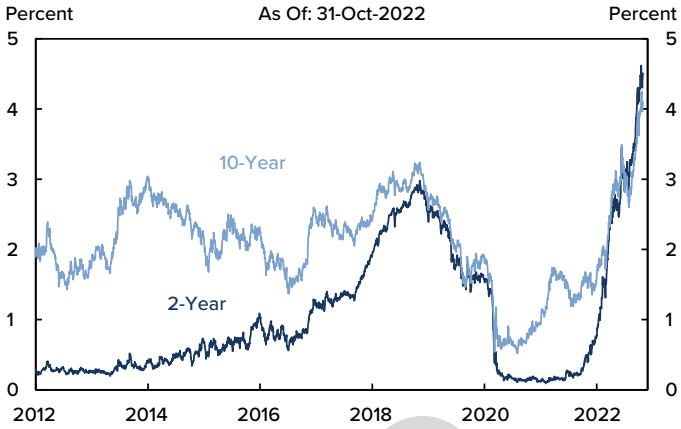
During 2022, nominal Treasury yields rose substantially as 2-year yields increased over 350 basis points to above 4.5% (**Figure 3.3.1.3**). The increase was primarily the result of the Federal Reserve increasing the target range for the federal funds rate. However, the Treasury curve also flattened significantly and inverted with 2-year yields rising above 10-year yields for the first time since 2019, a spread commonly viewed as one indicator of recession risk.

Economic and monetary policy uncertainty, combined with the disruptive impact of Russia's war against Ukraine, resulted in substantial Treasury yield volatility, leading to lower levels of trading liquidity across the global financial system (**Figure 3.3.1.4**). The lower Treasury market liquidity was particularly acute in the short- and intermediate-term tenors, which are more sensitive to the policy rate path (**Figure 3.3.1.5**). As a result, trading costs in the Treasury market have been somewhat higher as depth has declined, bid-ask spreads widened, and measures of price dispersion have increased. Nonetheless, while the cost of trading has increased, given the higher yield volatility, trading volumes have remained robust (**Figure 3.3.1.6**). Market participants continue to note that the Treasury market continues to function smoothly and that they can still execute trades effectively.

Treasury Market Resilience

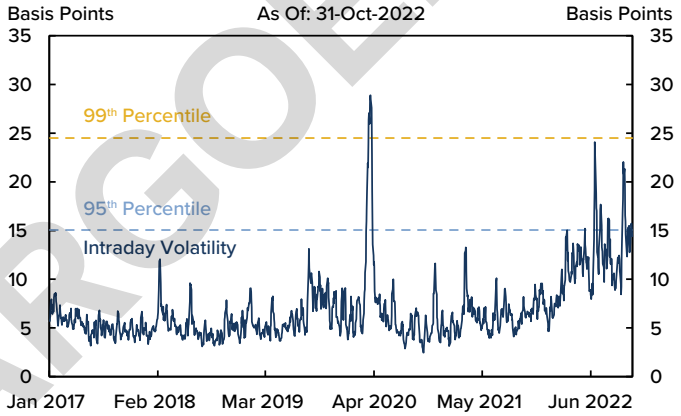
The Treasury market has shown resilience in the face of increased uncertainty and volatility in 2022. To ensure that the Treasury market continues to fulfill its vital purpose, it is important to seek continual improvements that strengthen the Treasury market to keep pace with the changing size of the market, technology, and trading patterns. Multiple agencies and organizations have regulatory and oversight responsibilities for the Treasury market. To ensure effective surveillance and coordinated policymaking, these groups collaborate through the Inter-Agency Working Group for Treasury Market Surveillance (IAWG), which consists of the Treasury, Federal Reserve, SEC, CFTC, and the Federal

3.3.1.3 U.S. Treasury Yields



Source: U.S. Department of the Treasury

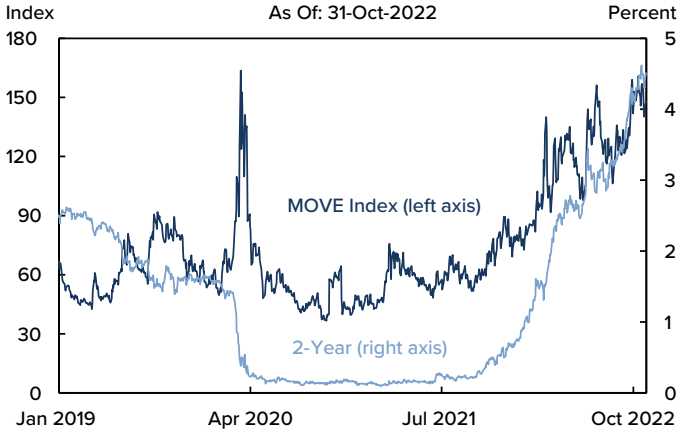
3.3.1.4 Intraday Volatility for 10-Year Treasury Yields



Source: Bloomberg, L.P.

Note: 5-day moving average. Intraday volatility calculated as daily high yield minus daily low yield on 10-year Treasury notes. Percentiles based on January 2005–October 2022. Dec. 5, 2018 is included in the data despite the market being closed.

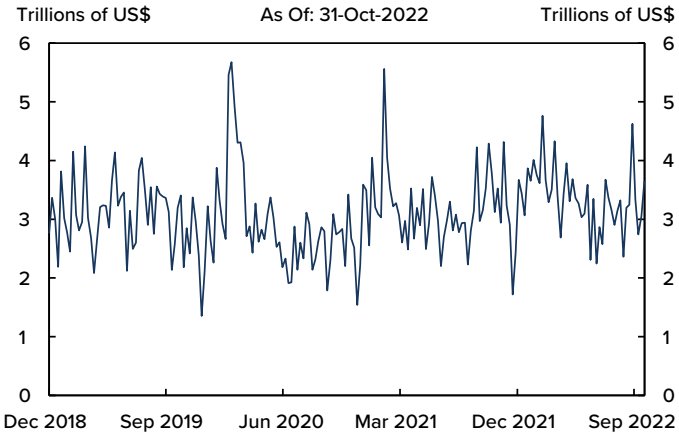
3.3.1.5 MOVE Index and 2-Year Treasury Yield



Source: FRED, Bloomberg, L.P.

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3.3.1.6 Total TRACE Treasury Weekly Trading Volumes



Source: FINRA

Reserve Bank of New York (FRBNY). On November 8, 2021, the IAWG published a Staff Progress Report, which identified specific principles and workstreams the joint staffs are pursuing to improve Treasury market resilience, including bolstering the resilience of market intermediation, improving data quality and availability, evaluating expanded central clearing, and enhancing trading venue transparency and oversight.[66]

Since the 2021 Staff Progress Report, significant additional progress has been achieved.[67] On November 10, 2022, the IAWG released another Staff Progress Report detailing the steps taken over the past year.[68] For example, in 2022, the SEC proposed three rules to (1) enhance oversight of and public disclosures by Treasury trading platforms, (2) require certain market participants that act as liquidity providers to register as dealers and comply with other laws and regulatory obligations, and (3) enhance risk management practices for central counterparties while expanding central clearing requirements for Treasury securities transactions.

The FRBNY released a working paper examining the considerations for expanded all-to-all trading in the Treasury market. The working paper, *All-to-All Trading in the U.S. Treasury Market*, discusses the benefits and challenges of a potential Treasury market structure where all participants can trade directly.[69] The Federal Reserve has also added depository institution counterparties to the standing repo facility, an important development for ensuring repo market functioning in stressed environments. The Federal Reserve has also required certain depository institutions to begin reporting Treasury transactions data in the Trade Reporting and Compliance Engine (TRACE).

In addition to the new bank reporting to TRACE, significant progress has also been made by Treasury and the OFR regarding additional data collection and transparency. For example, OFR conducted a pilot program designed to prepare industry participants

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and the OFR for a permanent data collection of non-centrally-cleared bilateral repo market transactions. Likewise, the Financial Industry Regulatory Authority (FINRA) made several announcements regarding enhancements to Treasury transaction data in TRACE, such as reducing the reporting timeframe, improving execution timestamps, and increasing the frequency of and the information included in aggregate public data releases. Treasury conducted a request for information (RFI) on additional transparency for secondary market transactions in the Treasury market. Based, in part, on feedback received in the RFI, Treasury proposed releasing transaction data for on-the-run nominal coupons, with end-of-day dissemination and with appropriate cap sizes.[70]

Although significant steps have been taken toward enhancing Treasury market resilience, additional work is ongoing. The rapid increase in interest rates this year will cause government financing costs to increase and will create losses for some investors. Technological changes in trading also continue to present new risks that need to be monitored and understood. The Council acknowledges the need to be flexible in order for public policy to evolve alongside the evolution of the Treasury market and expects significant further progress to be made to bolster market resilience.

Recommendations

The Council recommends that member agencies continue to review Treasury market structure issues that may contribute to liquidity challenges in Treasury markets in the context of the ongoing growth of Treasury debt outstanding and the evolution of technology and counterparties providing market liquidity. Policies should be considered for improving data quality and availability, bolstering the resilience of market intermediation, evaluating expanded central clearing, and enhancing trading venue transparency and oversight.

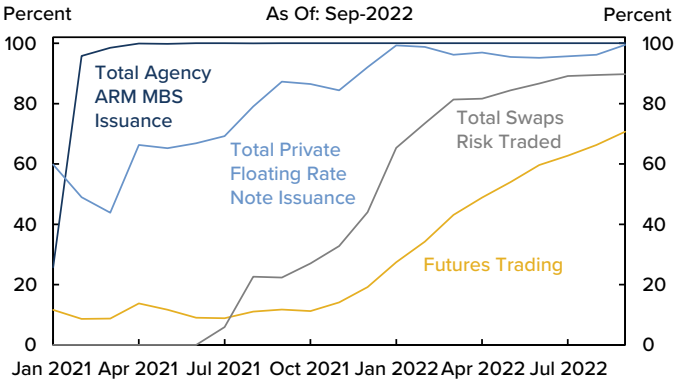
The Council also supports and encourages efforts by Treasury to continue to enhance collection and transparency in post-trade transactions in the cash market for Treasury securities.

3.3.2 Alternative Reference Rates

LIBOR is a key risk to financial stability, bank safety and soundness, and market integrity due to the decline in the underlying markets that LIBOR was meant to represent, the ability to manipulate LIBOR rates, and the vast scale of derivatives tied to LIBOR. The remaining U.S. dollar (USD) LIBOR rates are due to end as of June 30, 2023, marking the end of LIBOR.[71] The financial exposures to USD LIBOR rates are sizeable: the Alternative Reference Rates Committee (ARRC) has estimated that USD LIBOR was used in $223 trillion of financial contracts as of Q1 2021, and it is also used extensively in nonfinancial contracts.

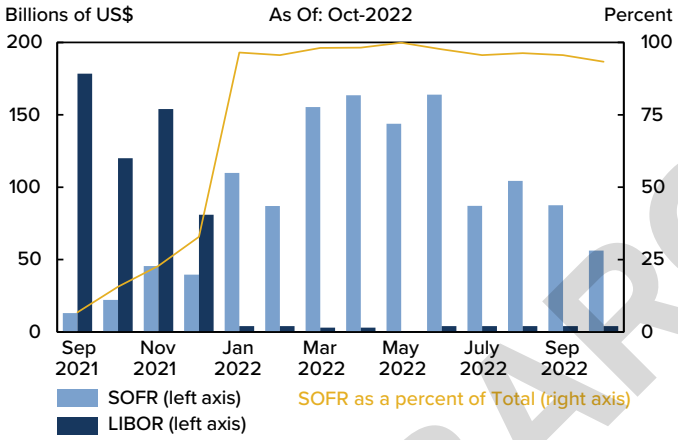
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3.3.2.1 Progress in Transition to SOFR



Source: Black Knight-eMBS, Bloomberg Finance L.P., and Clarus Financial Technology

3.3.2.2 Syndicated Lending



Source: LCD, an offering of PitchBook Data, and Refinitiv LLC

Note: Excludes loans without an identical base rate, foreign currency, and prime loans.

Council member agencies have worked with the ARRC to address the risks USD LIBOR poses. Following guidance issued by the Federal Reserve, FDIC, and OCC to stop most use of LIBOR, activity in Agency ARM MBS, private floating rate notes, swaps, and futures has shifted toward using the Secured Overnight Financing Rate (SOFR), the rate recommended by the ARRC as the replacement for USD LIBOR (**Figure 3.3.2.1**). SOFR is published by the FRBNY in conjunction with the OFR and reflects the cost of borrowing in the repo market collateralized by Treasury securities.[72] In derivatives markets, activity in SOFR-linked products has accelerated. For example, SOFR swaps now account for around 90% of daily volumes of interest rate risk traded in the outright linear swaps market, and average daily volumes in SOFR futures are growing to surpass that of Eurodollar futures. In cash markets, nearly all new transactions in agency ARM MBS and private floating rate notes have moved to SOFR (**Figure 3.3.2.2**).

Many lending products have adopted Term SOFR, which is derived from the activity in futures markets for SOFR.[73] The ARRC has recognized the use of Term SOFR for certain cash products, particularly business loans, but has recommended limiting the use of Term SOFR in derivatives and most other cash markets. If more cash products were to reference Term SOFR, it likely would cause an increase in Term SOFR derivatives, which could lead to a decline in the overnight SOFR derivatives markets. The ARRC's recommendations are intended to ensure the financial system's stability by avoiding use that is not in proportion to, or materially detracts from, the depth of transactions in the underlying SOFR derivatives market that are essential to the construction of the Term SOFR.

Credit-sensitive alternatives to SOFR, which are based on the same or similar markets to those that underlie LIBOR, have been relatively little used by market participants. The Council has continued to advise lenders, borrowers, and other market participants

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to consider SOFR-based rates and to conduct a comprehensive evaluation before adopting any alternative rate, warning that rates based on small transaction volumes, especially if much lower than the volume of instruments that reference a given rate, could introduce risks. While banks will not be criticized solely for choosing a different rate,[74] a number of Council members have emphasized concerns with such credit-sensitive rates being referenced in capital or derivatives markets.

While new contracts have primarily transitioned to using SOFR, existing or "legacy" LIBOR contracts still exist. More recent cash products referencing USD LIBOR have contractual fallback language, and most uncleared derivatives adhered to the International Swaps and Derivatives Association's Interbank Offered Rate (ISDA IBOR) protocol to fall back to SOFR when LIBOR ends, but many older LIBOR contracts do not. Federal legislation passed this year has addressed the risk posed by these contracts and will significantly reduce the risks associated with the end of LIBOR. Market participants must also ensure that they are operationally prepared for a large number of legacy LIBOR contracts due to transition over a short period next year. Accordingly, the ARRC has encouraged market participants to actively transition legacy contracts ahead of June 2023. The ARRC is also working with DTCC and key market participants to enhance DTCC's Legal Notice System (LENS) to ensure that rate changes in legacy LIBOR securities can be effectively communicated to investors.[75]

Recommendations

In light of the large volume of legacy USD LIBOR contracts outstanding, the Council advises firms to take advantage of any existing contractual terms or opportunities for renegotiation to transition their remaining legacy LIBOR contracts before June 30, 2023. The Council advises responsible parties to communicate any outstanding decisions regarding the rates that outstanding legacy LIBOR contracts will transition to and any conforming changes well in advance of June 2023. The Council also encourages securities issuers and trustees to use the enhanced LENS system to ensure they have effectively communicated rates and conforming changes where applicable.

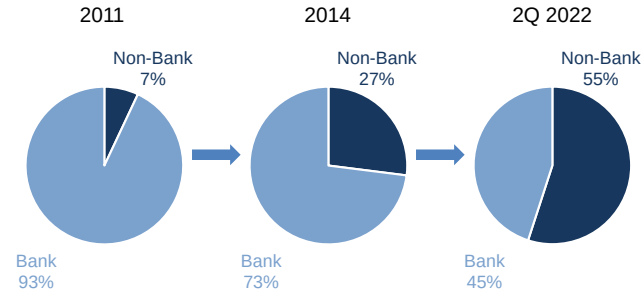
Council members have emphasized that derivatives and capital markets should continue moving to SOFR, a broad and robust measure of borrowing rates. While the Council recognizes the usefulness of Term SOFR in certain business lending transactions, it endorses the ARRC's recommendations to limit the use of Term SOFR in other markets and strongly encourages market participants to limit the usage of Term SOFR in derivatives and most other cash markets.

3.3.3 Provision of Financial Services by Nonbank Financial Institutions

Nonbank financial institutions are increasingly providing financial services traditionally provided by banks. The emergence of nonbank financial institutions in certain markets has fostered increased competition and innovation and has increased access to capital markets for households and corporations. However, the growth of nonbank financial institutions in certain marketplaces may introduce new risks to the broader financial system. Given the multifaceted nature of nonbank business activities, these risks present themselves differently across consumer products, business lending, and mortgage origination and servicing.

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3.3.3.1 Transition of Mortgage Servicing Assets from Banks to Nonbanks: 2011 – Q2 2022



Source: Inside Mortgage Finance; Federal Reserve, *Report to Congress on the Effect of Capital Rules on Mortgage Servicing Assets*, June 2016

3.3.3.2 Nonbank Mortgage Originators Number of Companies, Origination Volumes & Market Share: 2017 – 2021

	2017		2021		Change		
State Licenses	Companies Reporting	Market Share	Companies Reporting	Market Share	Organization Growth	Licensee Growth	Market Share
1	9,542	21%	10,889	10%	-1%	15%	-52%
2-25	2,595	26%	4,338	24%	89%	67%	-9%
26-50	163	23%	230	22%	102%	41%	-3%
50+	63	30%	73	44%	205%	16%	46%
Total	12,363		15,530		109%	26%	

Source: NMLS MCR, CSBS

Nonbank Mortgage Companies

In recent years, mortgage servicing activity has notably shifted out of the banking sector and into nonbank mortgage servicing companies. As of the second quarter of 2022, nonbank companies service 55% of U.S. mortgages compared to 6% in 2011 (**Figure 3.3.3.1**). Individual nonbank mortgage servicing companies have also grown: as of the second quarter of 2022, nonbank servicing volume at the largest 10 nonbank servicers averaged approximately $430 billion and, in aggregate, represented 34% of the residential mortgage market. These same figures for the largest 10 nonbank servicers at the end of 2014 were an average portfolio of $180 billion and a collective 18% total market share.[76]

The nonbank mortgage origination sector has also increased dramatically in recent years, marked by growth in the total number of companies, origination volumes, and the largest nonbank mortgage originators' market share. Since 2017, the total number of nonbank mortgage originators has increased by 26%,[77] driven primarily by adding over 1,700 smaller regional companies (**Figure 3.3.3.2**).[78] However, the largest source of loan origination growth has occurred at companies operating nationwide. Over the same period, nonbank mortgage originators operating nationwide saw their origination volume grow 205%, and their market share increased from 30% to 44% of all nonbank originations.[79] With mortgage originations declining from their 2021 highs, there is evidence of nonbank mortgage originators beginning to loosen underwriting standards and innovate on product offerings to maintain origination volume.

Though their business models vary, most nonbank mortgage companies rely on short-term wholesale funding, making them vulnerable to rollover risk.[80] In addition, many nonbank mortgage companies have limited capital and loss-absorbing capacity despite investing in difficult-to-value mortgage servicing rights. Mortgage servicers could face acute liquidity strains in the event of widespread delinquencies. In

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some cases, servicers have an obligation to make payments to the investor regardless of whether the borrower makes a mortgage payment and must repurchase the mortgage out of its MBS pool. During this period, the mortgage servicer must also continue making insurance payments, tax payments, and occasionally homeowners' association fees. During a crisis, widespread delinquencies could threaten the viability of nonbank mortgage servicers because there can be a substantial amount of time during which the nonbank mortgage servicers must forward these payments before the relevant mortgage guarantor reimburses them.

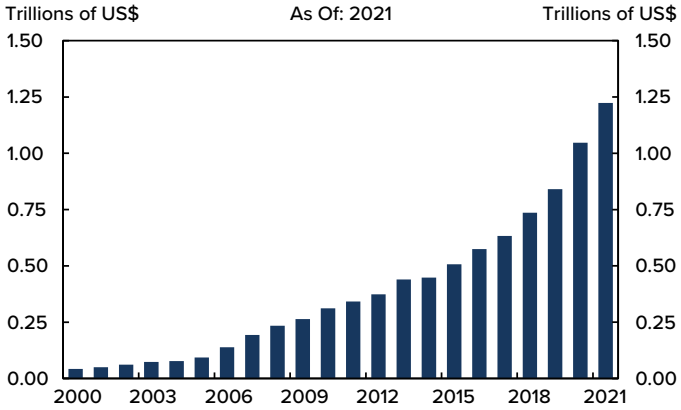
Looking forward, nonbank mortgage companies could come under significant pressure in the face of an economic downturn and an increasing interest rate environment. Rising interest rates will reduce mortgage origination volumes, adversely impacting earnings. Given their large market share, this has the potential to restrict financing in the housing market and interrupt mortgage servicing operations, especially for nonperforming loans, and might have secondary effects on these servicers' mortgage originations in the residential real estate market.

Nonbank Business Lending

Nonbank lenders play an increasingly significant role in providing credit to nonfinancial businesses. The growth in private debt has been partly fueled by the retreat of banks from certain lending activities. At the same time, yield-seeking institutional investors have been willing to assume higher credit and liquidity risks.

Private credit, defined as direct lending by nonbanks to nonfinancial businesses, makes up a growing segment of nonfinancial business lending. Estimates place the size of the global private credit market at over $1.2 trillion as of year-end 2021, up from roughly $600 billion five years earlier (**Figure 3.3.3.3**). Investors typically receive higher interest rates as compensation for the loans' lower liquidity and higher credit risk. Businesses have,

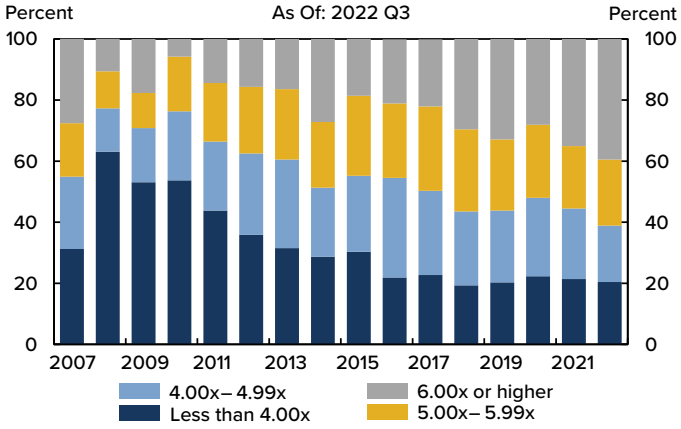
3.3.3.3 Global Private Debt AUM



Source: Preqin

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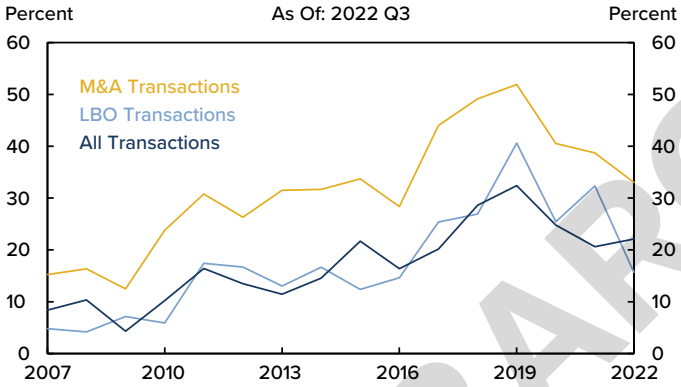
3.3.3.4 Distribution of Leveraged Loan Debt/EBITDA Ratios



Source: S&P LCD

Note: Includes issuers with EBITDA>$50M. Media and telecom loans excl. Prior to 2011, 2007-2021 data is annual; 2022 data is through Q3.

3.3.3.5 Leveraged Loan Transactions with EBITDA Adjustments



Source: S&P LCD

Note: Media and telecom loans excluded prior to 2011. Excludes existing tranches of add-ons, amendments & restatements with no new money, as well as DIPs, second liens and unsecured transactions. EBITDA adjusted for prospective cost savings or synergies.

at times, benefited from increased access, limited disclosure requirements, and faster execution in private credit markets.

The opacity of private credit markets makes it difficult for regulators to assess the buildup of risks in these markets. However, there are indications that interconnections between private credit markets and the broader financial system have increased. For example, some private equity firms, active in private credit markets, are acquiring life insurers or assuming life business through owned reinsurers to access and leverage long-term assets. This intersection may increase interconnectivity among nonbank lenders, insurers, and the broader financial sector while exposing a growing investor base to lending activities that may be subject to less regulatory scrutiny.

While the demand from nonbank investors has helped support capital formation, it may have also led to a deterioration of credit quality among syndicated loan issuers. Notably, the number of large corporate highly leveraged deals, measured by total debt to EBITDA of six times or higher, has trended higher (**Figure 3.3.3.4**). At the same time, firms have increased their reliance on optimistic revenue growth projections and cost savings synergies, as evidenced by the number of loan transactions with EBITDA adjustments (**Figure 3.3.3.5**). Finally, when combined with weaker credit quality, weaker financial maintenance covenants in leveraged loans may mean lower recovery rates.

The market's growth has been supported by increased demand for yield from institutional investors, mainly in the form of collateralized loan obligations (CLOs), which had a total of $910 billion outstanding in 2022.[81] The capital structure of CLOs has improved since the 2008 financial crisis, and the highest-rated CLO tranches are better positioned to absorb losses. However, underlying loans held in these portfolios are more vulnerable because borrowers generally have less subordinated debt outstanding that could be a cushion against potential losses. Additionally,

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CLOs are much more limited in their capacity to support the lowest-rated assets in the loan market, a group that will increase if downgrades increase.

Fintech & Consumer Products

Technological advances and the growth of fintech firms have the potential to increase efficiency, introduce new product offerings, and broaden access to financial services. Many new entrants in the nonbank financial services markets offer their products entirely or mostly online, reducing the need for and costs of a brick-and-mortar operation. The COVID-19 pandemic further accelerated the fintech industry's growth as customers shifted away from brick-and-mortar operations to digital channels. However, these firms may not be subject to the same type of financial services regulation with which incumbent financial service providers must comply, which could create financial stability risks.

Buy Now, Pay Later

Buy now, pay later (BNPL) refers to a wide array of retail financing, but the most ubiquitous and popular model is the four-payment, no-interest product, sometimes referred to as "pay-in-four" or "split pay." These short-term unsecured loans allow consumers to split purchases into four equal interest-free installments at the point of sale, with the first installment due at checkout.[82] BNPL's popularity has soared in recent years, with the volume of BNPL loans originating in the U.S. rising from $2 billion in 2019 to $24 billion in 2021.[83] For some consumers, the loan may offer cheaper and more readily available financing than a credit card but present the risk of taking on too much debt in small increments or incurring late fees. Additionally, BNPL underwriting standards are looser, and BNPL borrowers are more than twice as likely to have an overdraft compared to all adults.[84] Delinquencies in the sector are rising; 10.5% of borrowers were charged at least one late fee in 2021, up from 7.8% in 2020.[85]

Recommendations

The Council recommends that member agencies leverage existing authority to ensure that the same activity with the same risk, when conducted by different entities, has the same regulatory outcome. Where gaps in the legislative framework prevent implementing that principle, the Council encourages the agencies to develop proposals to address them.

The Council recommends that relevant federal and state regulators continue to coordinate closely to collect data, identify risks, and strengthen oversight of nonbank companies involved in the origination and servicing of residential mortgages. In June, the Council restarted regular meetings of its Nonbank Mortgage Servicing Task Force, which discusses and analyzes nonbank servicer risks and concerns. In addition, to promote confidence and improve safety and soundness for nonbanks, FHFA and Ginnie Mae finalized and released updated Enterprise seller/servicer and Ginnie Mae issuer requirements on August 17, 2022. Following the release of FHFA's and Ginnie Mae's updated requirements, state regulators reviewed the CSBS Model State Regulatory Prudential Standards for Nonbank Mortgage Servicers issued in July 2021 and determined their standards remain substantially aligned with FHFA's and Ginnie Mae's requirements.

The Council supports these recent actions and encourages regulators to take additional steps available to them within their authorities to address the potential risks of nonbank mortgage companies. Relevant regulators should ensure that the largest and most complex nonbank mortgage companies are prepared should delinquencies and foreclosures increase as interest rates rise. In addition, the Council recommends that relevant federal and state regulators continue to enhance or establish information-sharing protocols to enable collaboration and communication in responding to distress at a mortgage servicer.

The Council supports enhanced data collection on nonbank lending to nonfinancial businesses to provide additional insight into the potential risks associated with the increase in private credit.

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3.4 Operational and Technological Risk

3.4.1 Cybersecurity

The financial sector is vulnerable to malicious cyber incidents, including ransomware, other malware attacks, denial-of-service attacks, data breaches, and non-malicious cyber incidents. Such incidents, if not prevented or mitigated, can affect tens or even hundreds of millions of Americans and result in financial losses totaling billions of dollars due to disruption of operations, theft, and recovery costs.

Although the U.S. financial system has not experienced a destabilizing cybersecurity incident, such an incident could potentially threaten the stability of the U.S. financial system through at least three channels:

- First, the incident could disrupt key institutions with few or no substitutes, such as central banks, exchanges, sovereign and subsovereign creditors, including U.S. state and local governments, custodian banks, and payment clearing and settlement systems. It could also disrupt other providers of critical services such as fund administrators, pricing or other data providers, specialty software providers, or cloud service providers.

- Second, the incident could compromise the integrity of critical data and disrupt the stable functioning of financial institutions and the financial system. If data is corrupted on a sufficiently large scale, it could lead firms not to trust their internal information and information they are receiving from counterparties and thus disrupt system functionality. A significant data corruption event would pose further problems if a systemically important failing firm had to be resolved. Determining the accuracy of records or ascertaining the financial standing of various counterparties, depositors, and obligors may not be possible, which would impede the firm's resolution.

- Third, a cybersecurity incident that causes a loss of confidence at a key financial institution could cause customers or participants to question the safety or liquidity of their assets or transactions, leading to the significant withdrawal of assets or activity from the markets. Additionally, a cybersecurity incident involving the theft of sensitive data has privacy implications for consumers, which could lead to identity theft and fraud, resulting in a loss of confidence.

Foreign Conflicts

The financial sector is potentially vulnerable to foreign conflicts and the activities of nation-state actors – either directly or indirectly – due to its interconnectedness with global financial markets and reliance on international digital networks. Therefore, the U.S. financial system relies on the cyber resiliency of domestic institutions and its international partners to protect the U.S. economy.

The Russian war against Ukraine has been accompanied by an increase in the number of cyberattacks against the U.S. by pro-Russian groups.[86] The U.S. cyber defenses were bolstered by the Department of Homeland Security's (DHS) Cybersecurity and Infrastructure Security Agency's (CISA) "Shields Up" program and the ongoing effort of the G7 Cyber Expert Group (CEG), which is co-chaired by the U.S. Department of the Treasury's Office of Cybersecurity and Critical Infrastructure Protection (OCCIP). OCCIP is the mandated secretariat of the Financial and Banking Information Infrastructure Committee (FBIIC), and has hosted classified and unclassified briefings with its private sector Financial Services Sector Coordinating Council (FSSCC) counterparts on the elevated Russian threat. Additionally, OCCIP has produced a "Lessons Learned" series to discuss best practices. These programs helped public and private sector financial institutions adopt a heightened posture by focusing on key threats.

Thus far, there have been few successful cyberattacks against the U.S. financial system related to Russia's war against Ukraine, and they have proven to be negligible in both disruption and impact.[87] On October 25, 2022, Russian hacktivist Killnet conducted a distributed denial-of-service (DDoS) attack on the U.S. Treasury,

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consisting of low-level DDoS activity targeting Treasury's critical infrastructure nodes.[88] Similar DDoS activity was then observed a couple of days later across U.S. financial services firms. Despite the wide net of the attack, no operational disruption occurred due in part to the sector's coordination and speedy information-sharing policies.

International partners are also susceptible to cyberattacks. For example, on February 15, 2022, the web portal of Ukraine's defense ministry and the banking and terminal services at several large state-owned lenders were disrupted in the largest DDoS attacks to hit Ukraine to date.[89] Despite its scale, the disruption was brief and limited in scope. Although the Kremlin denied involvement, the U.S. government publicly attributed the incident to Russia.[90]

Russia is by no means the only foreign government seeking to disrupt the financial sector to achieve geopolitical goals. China is a prevalent malicious actor in this space, often using the financial sector as both a vehicle for gathering information and an attack vector. For example, in November 2021, Taiwan's financial sector was hit by a months-long cyber espionage campaign attributed to the Chinese state-sponsored group APT10.[91] Attackers ran malicious code on local systems and installed a remote access Trojan (RAT) that allowed them to maintain persistent remote access to the infected systems, monitor communications, and exfiltrate data.

Ransomware

Ransomware is a highly visible and costly threat to U.S. financial firms.[92] [93] Ransomware attacks continue to rise worldwide as ransomware as a service (RaaS)[94] lowers the technical bar.[95] RaaS has allowed more cyber criminals to deploy ransomware with lower costs, higher payouts, and wider profit margins.[96] The use of ransomware by nation-states and hacktivists continues to rise, though these hackers tend to have lower payouts and more ransomware-related data leaks.[97] The financial system remains a high-value target for cybercriminals, with 55% of financial services firms targeted in the last year,[98] and ransomware-related data leaks in financial services almost doubled.[99] As financial firms have sought to strengthen their security controls to mitigate the risk of an operational disruption from a ransomware event, many also have turned to cyber insurance as a tool to mitigate financial losses from ransomware attacks. A reported 83% of financial services organizations have at least some cyber insurance coverage against ransomware.[100]

Insider Threat

Cybersecurity researchers have noted the rise of malicious insiders in the last year. For example, one report predicted that up to "25 per cent of ransomware attacks in 2022 will be deployed by insiders, compared to less than 2 per cent in 2021."[101] The motive for such insiders appears to be either monetary—as cybergangs will pay high prices for insider access—or employee discontent.[102] Furthermore, even with the rise in attacks involving malicious insiders, social engineering attacks targeting non-malicious and accidental insiders remain a common attack vector that exploits users' lack of awareness and training to compromise systems. As a result, the financial sector has paid more attention to developing insider threat mitigation programs, often mirroring the core components of the National Institute of Standards and Technology (NIST) Cybersecurity Framework: Identify, Protect, Detect, Respond, and Recover.[103] As explained in SIFMA's Insider Threat Best Practices Guide, "every component in an insider threat mitigation program should have a distinctly human element. While external cybersecurity threats can often be prevented or detected primarily through technical tools, those technological tools are insufficient to avoid many insider threats. In many cases, the only signals of an impending insider attack are commonly exhibited human behaviors that foreshadow the attacker's intent."[104] Thus, protecting against insider threats requires a holistic approach that involves "technology, legal advice, policy development, physical security, risk awareness and training, and counterintelligence resources."[105]

Supply Chain

The past year has also highlighted the importance of reviewing the resiliency of the sector's supply chain. In December 2021, the widely used

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Apache Log4j logging library was found to have a vulnerability through which attackers could infiltrate a network using Log4j and insert their own Java code into the infected services.[106] Well into 2022, opportunistic cybercriminals and nation-state actors (e.g. Chinese and Iranian attack groups) used this vulnerability to steal data and money. As standards move towards requiring the disclosure of exploitation within days of discovery, it will become increasingly important to address cyber incidents in downstream products more quickly. The sector should remain vigilant, thoroughly vet its supply chain, and be ready to respond immediately to new threats.[107]

Box F: Cyber Risk Data Collection

Council member agencies made significant strides in 2022 in their efforts to collect better data for managing cyber risk.[108] The SEC, OCC, Federal Reserve, FDIC, and NCUA all proposed or finalized rules that will improve the cyber data available to the agencies and allow them to respond more quickly to cyber incidents.

In February, the SEC proposed a rule that would require investment advisers to report "significant" cyber incidents to the SEC on a confidential basis within 48 hours after determining an incident occurred.[109] Investment advisers would be required to report incidents that significantly disrupt the adviser's ability to maintain critical operations or lead to unauthorized access to adviser information where the compromised data could substantially harm the adviser or a client. The rule aims to help the SEC monitor cyber incidents at investment advisers and assess potential systemic risks stemming from cyber risk. The data would be collected using a new form, ADV-C, creating a structured data set that would be comparable across incidents and allow the SEC to improve its risk assessment and monitoring of cyber risk.

In March, the SEC proposed a rule requiring public companies to disclose material cybersecurity incidents within four business days after the registrant determines it has experienced a material incident.[110] According to the proposed rule, a cybersecurity incident is an unauthorized occurrence on a company's information systems that jeopardizes the information system's confidentiality, integrity, or availability. A cybersecurity incident is material if there is a substantial likelihood that a reasonable shareholder would consider it important to an investment or voting decision. Examples include accidental data exposure, data breaches, and unauthorized access to systems to steal or alter data.

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In April, a rule issued by the OCC, Federal Reserve, and FDIC became effective that requires banking organizations to notify their primary federal regulator of certain cyber incidents as soon as possible and no later than 36 hours after determining that an incident has occurred.[111] The rule defines a computer-security incident as an occurrence that results in actual harm to an information system or the information contained within it. Banks are generally required to provide notice of incidents that have materially disrupted or degraded—or are reasonably likely to materially disrupt or degrade—the viability of a banking organization's operations, its ability to deliver banking products and services, or the stability of the financial sector. Examples of cyber incidents that banks are required to report include large-scale distributed denial-of-service (DDoS) attacks that disrupt customer access for an extended period, cyberattacks that disable banking operations for an extended period, and ransomware attacks that encrypt a core banking system.

The NCUA issued a proposed rule in July that requires federally insured credit unions (FICU) to notify the agency within 72 hours after a reportable cyber incident has occurred. The definition of "reportable cyber incident" encompasses substantial cyber incidents such as the exposure of sensitive data, disruptions of vital member services, and serious impacts on operational systems and processes.[112]

The agencies' actions are important steps forward in their efforts to understand and manage financial stability risks from cyberattacks. If adopted, the SEC's proposed rule for investment advisors would create the first structured cyber data set collected by a member agency, providing opportunities for improved analytics and risk monitoring. However, additional information beyond what is collected through cyber incident notification rules may be useful for Council member agencies' efforts to monitor and assess cyber risk. For example, information about technology services provided to financial institutions, operational volumes supported, and the interconnectedness and interdependencies of those services could be useful in gauging system-wide cyber risk.

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Recommendations

Maintaining and improving the cybersecurity resilience of the financial sector requires continuous assessment of cyber vulnerabilities and close cooperation across firms and governments within the U.S. and internationally. Building on the work of the Financial and Banking Information Infrastructure Committee (FBIIC), Financial Services Sector Coordinating Council (FSSCC), and Financial Services Information Sharing and Analysis Center (FS-ISAC) to promote interagency information sharing related to cyber risk, the Council recommends undertaking additional work to understand and mitigate cyber-related financial stability risks.

The Council supports the ongoing partnerships between state and federal agencies and private firms, including FBIIC, the FSSCC, and FS-ISAC. Sharing timely and actionable cybersecurity information can reduce the risk of cybersecurity incidents and mitigate the impacts of those that do occur. The Council encourages FBIIC to continue working closely with Council member agencies, state agencies, DHS, law enforcement, and industry partners to conduct regular cybersecurity exercises recognizing interdependencies with other sectors, such as telecommunications and energy. The Council recommends that agencies carefully consider how to share information, including confidential supervisory information and classified information.

Financial institutions have rapidly adopted innovative technologies, including cloud computing and artificial intelligence (AI). The Council supports the domestic efforts of the FBIIC Technology Working Group, which examines how financial institutions are using emerging technologies that may introduce new cyber vulnerabilities into critical financial services infrastructure. The Council also supports the international effort by the G7 CEG Emerging Threats/Opportunities Workstream to address how new technologies, such as AI and quantum computing affect the global financial system.

3.4.2 Third-Party Service Providers

Financial institutions have steadily increased their reliance on service providers for a broad range of information technology services, from video conferencing and collaboration software to banking platforms that support internal operations and business lines. In certain cases, a financial institution's use of these third-party services supports critical functions or services at the financial institutions, such as core banking and general ledger. The Council has identified the financial sector's concentrated dependency on a limited number of service providers, such as cloud service providers, for critical information technology services as a potential risk to financial stability.

Cloud Services

According to a survey conducted in 2021 by the American Bankers Association (ABA), more than 90% of surveyed banks stated that they maintain at least some data, applications, or operations in the cloud.[113] However, of those surveyed, more than 80% indicated they were in the "adoption" or "early adoption" phase concerning cloud services, with only 5% of respondent banks describing their cloud use as mature.

According to a more recent survey, over two-thirds of the surveyed banks want at least 30% of their applications and data to be in the cloud in three years.[114] This would represent approximately triple the number of banks that had achieved this level of cloud adoption at the time of the survey.[115] Similarly, a 2021 consulting company survey of banks, including North American financial institutions, estimated an average of 8% of all banking workloads were cloud-based.[116] This same survey indicated 24% of respondent banks located in North America had partially migrated some core services to the cloud.[117]

Industry research often cites "misconfiguration" by cloud service users, such as financial institutions, as the most common cause of data breaches.[118] Common misconfigurations can impact overall operational resilience because misconfigurations could be exploited by malicious actors to negatively affect the confidentiality, integrity, or availability of the services used by some or all customers of the technology service provider. In particular, customers of cloud servicers are, in many cases,

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responsible for configuring various aspects of those services, depending on whether customers are using the software as a service (SaaS), platform as a service (PaaS), or infrastructure as a service (IaaS).[119] Financial institutions can misconfigure PaaS and SaaS applications through inappropriate user access, application deployment, and data backup settings; however, IaaS provides the opportunity for the misconfiguration of data center resources more foundationally.

Prosecutors stated that an individual behind a major incident in 2019 scanned for common misconfigurations among a leading cloud services provider's clients to identify potential victims.[120] Although the incident itself involved many complex factors in addition to the misconfiguration issue, the perpetrator of this incident identified 30 similar misconfigurations that she was able to exploit to steal data and illicitly install crypto-asset mining software, showing that exploitation of common misconfigurations can be easily replicated across a cloud service's customers. Each aspect of running applications in the IaaS environment requires bespoke decisions at the design, implementation, and monitoring stages. These bespoke designs also require experienced personnel in cybersecurity, financial institution business processes, and cloud architecture.

Leveraging technology service providers, especially cloud service providers, can give financial institutions flexibility and scalability in their IT environments. However, some IT skills associated with traditional financial services' IT environments are not easily transferrable to cloud environments. Similarly, skills associated with one provider or service do not necessarily translate across other providers. As a result, financial institutions may need to reskill or hire new talent as they use new technology service providers.

Many service providers adhere to a shared responsibility model for security and system configuration that requires clients to take on some responsibilities for managing applications, data, user access, and workloads. A client must be capable of identifying and understanding the line between the service provider's responsibilities and the client's to manage the risks of its particular cloud deployment. One major report concluded: "Shared responsibility masks the uneven maturity of organizations and technologies on the user side of that shared line, producing much more of a zigzag than a clean line of responsibility."[121] The challenge of managing shared responsibility resources may be particularly acute for small and medium-sized financial institutions that must compete for limited IT staffing resources, which could eventually leave the industry on an uneven footing in terms of resilience and security.

Errors or mistakes in software development, deployment, and maintenance relative to contracted underlying technology services can potentially cause service outages at the service providers. For example, an entire cloud service provider's region suffered an outage in December 2021 that disrupted several of the cloud service provider's services. The outage was caused by an unexpected internal system behavior that ultimately congested the network, leading to further cascading issues resulting in the outage.[122] The outage lasted several hours while the cloud service provider's engineers identified and resolved the problems and made upgrades to prevent the same type of issue from occurring again. Although the compromise of SolarWinds software used for managing and monitoring on-premises and hosted cloud infrastructures (December 2020) yielded no known operational resilience impact to cloud service customers, the incident revealed weaknesses in identity and access management and privileged access management that the threat actor used across numerous customers' cloud environments.[123, 124] Exploitations like this could enable other malicious activity that could potentially affect the operational resilience of the users of those services.

Recommendations

The Council supports the ongoing collaboration of member agencies to examine third-party service providers and the services they provide to the financial system. The agencies continue to enhance their supervisory programs for

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cyber-related controls in key areas such as core processing, payment services, and cloud computing.

The Council supports continued risk identification associated with service providers' roles in the financial sector and their potential impact on financial stability. The Council also recommends that federal banking regulators continue coordinating third-party service provider examinations, work collaboratively with states, and identify additional ways to support information sharing among state and federal regulators.

The authority to supervise third-party service providers varies across financial regulators. To further enhance third-party service provider information security and address other critical regulatory challenges, the Council recommends that Congress pass legislation that ensures that the FHFA, NCUA, and other relevant agencies have adequate examination and enforcement powers to oversee third-party service providers.

Box G: The Use of Artificial Intelligence (AI) in Financial Services

Artificial Intelligence (AI) is a set of technologies that have been around for decades. However, its use in financial services has increased in recent years thanks to more advanced algorithms, and data storage and processing power improvements.

There is no single accepted definition of AI, but it is often considered software that performs tasks previously done by humans. For example, a common type of AI is machine learning, which updates its responses based on additional data with little or no human intervention. There is significant variety in AI methodologies and uses, and there is not always a stark difference between AI and more traditional quantitative modeling.

AI offers significant benefits, such as reducing costs and improving efficiencies, identifying more complex relationships, and improving performance/accuracy. Financial institutions use AI for various tasks, ranging from fraud prevention and detection to customer service, document review, and retail credit underwriting. Some institutions use AI extensively, while others take a more limited approach. Even within a single institution, AI may be used to varying degrees in different areas.

The use of AI, though, introduces certain risks. Potential risks associated with AI include safety-and-soundness risks – such as cyber and model risks – and consumer compliance risks. In addition, specific requirements to prevent discrimination or bias that apply to tools, models, or processes used in consumer compliance also apply to AI.

Many AI approaches operate as "black boxes," which can create challenges in explaining how the technology produces its output. This lack of "explainability" can make it difficult to assess the systems' conceptual soundness, increasing uncertainty about their suitability and reliability.

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A particular concern related to AI explainability is the possibility that AI systems with explainability challenges could produce and possibly mask biased or inaccurate results. This could affect, for example, consumer protection issues such as fair lending. There are techniques to address explainability challenges, which have their own strengths and weaknesses.

Data play a very important role in AI because of the high volumes of data typically involved and because data often play a larger role in driving the specifications – that is, determining which variables are to be included and how they are included – than in traditional quantitative modeling. Data used for AI may come from a wider variety of sources and may be less structured (e.g., a collection of documents instead of a formal dataset). With AI, data may also have to be processed at higher frequencies. Thus, data controls are vital to sound AI, including data quality, suitability, and security/privacy. Another potential issue with AI approaches is that they can be "overfit," which means they may adhere too closely to the data on which they were trained and not apply as well (or "generalize") to new conditions.

In March 2021, the Federal Reserve, OCC, CFPB, FDIC, and NCUA issued an RFI on AI to help them understand its use by their supervised institutions and solicit views from a wide range of stakeholders. In the RFI, those agencies also noted some existing regulations and guidance that apply to the use of AI. The agencies received over 100 comment letters on the RFI—from bankers, consumer advocates, vendors, academics, and others—whose feedback has been very helpful to supervisors as they consider potential future policy steps for financial institutions' use of AI.

3.5 Climate-related Financial Risk

In October 2021, the Council identified climate change as an emerging and increasing threat to U.S. financial stability for the first time. Broadly speaking, climate-related financial risks are grouped into two categories: physical risks and transition risks.

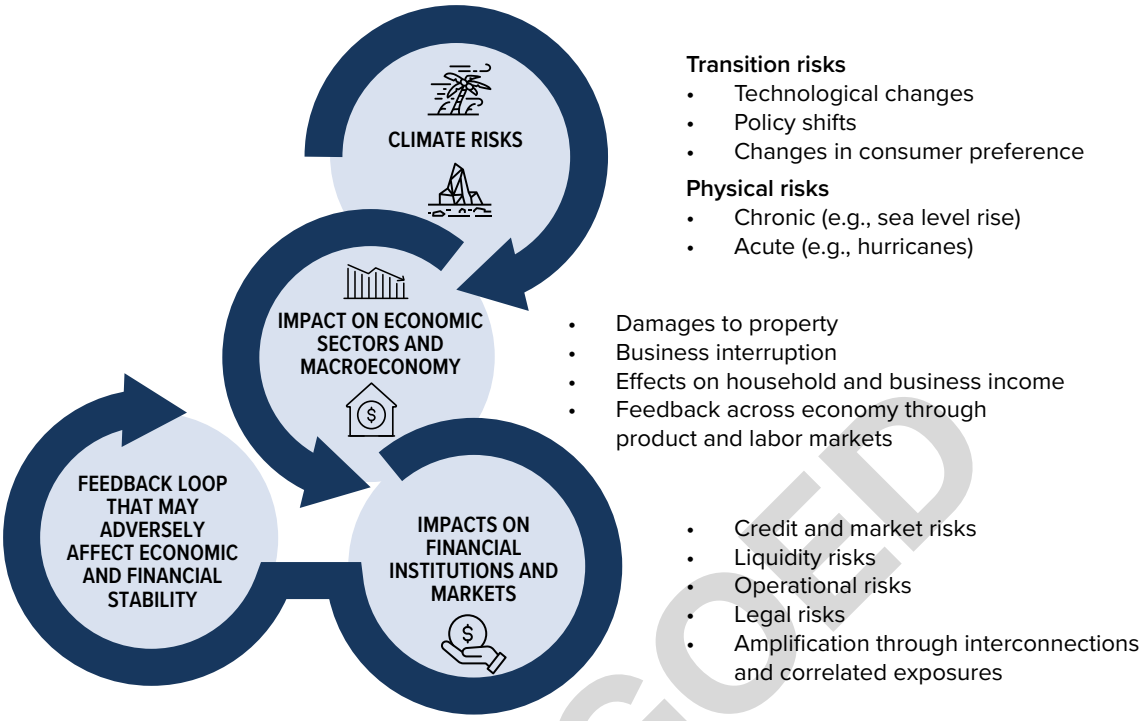
Physical risks generally refer to the harm to people and property that can arise from acute climate-related weather events like droughts, floods, wildfires, heatwaves, and hurricanes, or chronic changes over time, such as higher average temperatures, changes in precipitation patterns, sea level rise, persistent drought, degradation of arable land, or ocean acidification. Transition risks generally refer to stresses to certain institutions or sectors that may arise from the shift towards a lower greenhouse gas (GHG) or net-zero economy, including changes in policy, consumer and business sentiment, or technological advances. The impact of transition risks may result in added costs for some firms and communities even as they reduce the overall risk associated with physical risks. In addition, if the transition is delayed or disorderly, the impact on firms, market participants, individuals, and communities is more likely to be disruptive.

Climate-related financial risk can manifest in the form of traditional risks such as credit, market, liquidity, operational, or legal risks. However, member agencies are in the early stages of understanding the specific channels through which climate-related impacts can manifest as financial risks.

Climate-related financial risks could contribute to financial instability through numerous channels, including financial intermediaries experiencing significant losses, impairment of financial market functioning, or the sudden and disruptive repricing of assets. Physical and transition risks associated with climate change will likely affect households, communities, businesses, and governments by damaging property, impeding business activity, impacting income, and altering the value of assets and liabilities.[125] These effects may be transmitted and amplified further via interconnections in the economy and financial

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3.5.1 Transmission Channels Linking Climate Risks to Financial Stability



Source: FSOC

system. As a result, the financial sector may experience credit and market risks associated with loss of income, defaults, changes in the values of assets, inadequate liquidity, operational risks associated with disruptions to infrastructure or other channels, or legal risks. These outcomes may lead financial institutions and insurance providers to pull back from credit or insurance provisions, potentially amplifying the initial climate-related shock and threatening financial stability (**Figure 3.5.1**).

Given the breadth of transmission channels through which climate-related financial risk could materialize, work is underway to understand better and quantify the potential impacts on financial institutions and markets. The staff-level Climate-related Financial Risk Committee (CFRC) and Council member agencies are working to build capacity, address data gaps, and improve methodological approaches to risk monitoring (**see Section 4.1.1**).

Physical Risks

Real estate is emerging as an area of particular scrutiny because of its critical role in the economy and financial system, and the numerous transmission channels through which physical risk could affect it.

Climate-related events like wildfires and flooding may result in damage that can reduce the value of real estate. This may impact households[126] and owners of commercial real estate, increasing the probability of default and associated loss. As markets factor these risks into pricing, real estate exposed to physical risk could lose market value even without direct damage.[127] Because households of lower socio-economic status are often exposed to greater climate risk,[128] this could further exacerbate existing disparities in housing values, for example, in low- or moderate-income areas or majority-minority census tracts, thus eroding generational wealth. Additionally, it might also increase the costs associated with housing, for example, insurance premiums and the frequency and cost of repairs, thus further increasing the homeownership challenges for low-income communities.

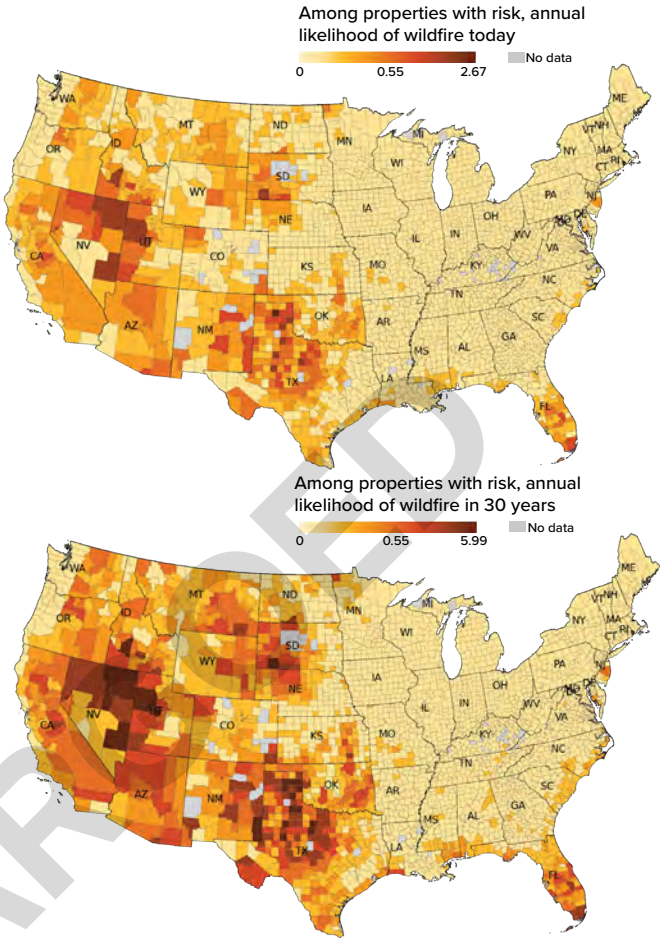
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Given the potential impacts on housing and mortgage markets, regions with a significant amount of real estate exposed to high levels of physical risk warrant close monitoring. For example, climate change has caused a doubling of forest fire areas in the western United States between 1984 and 2015.[129] Recent analysis suggests 71.8 million residential properties are already at risk of wildfire, and this number is expected to increase to 79.8 million by 2050, with a significant concentration of risks in some geographic areas (**Figure 3.5.2**).[130] For example, California, the most populous state, has the second-highest wildfire incidence.[131] As another example, flooding is also an increasing threat to U.S. real estate, with 23.5 million properties at risk, which, by some estimates, is expected to rise to approximately 26 million properties over the next 30 years.[132] Flood risk is also concentrated in some geographic areas, with properties along the Gulf and East Coasts likely to be most impacted by flooding (**Figure 3.5.3**).[133]

Role of Insurance

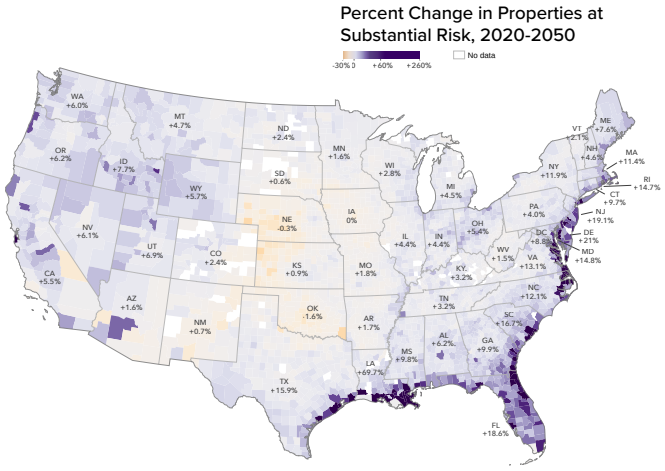
Insurers play an important role in the financial system in absorbing losses stemming from physical risks. However, the increasing incidence and severity of extreme weather could affect the solvency of insurers[134] and the cost and availability of coverage for homeowners and businesses. In response to rising insured losses, some insurers are raising rates, increasing policy exclusions, avoiding renewals in unprofitable markets, and implementing higher deductibles in areas with significant exposure to extreme weather.[135] These increases in premiums and changes in market coverage are affecting the affordability and availability of insurance coverage for consumers in affected areas.[136] [137] In some cases, government-run insurance programs may step in where private insurance coverage is insufficient, but these programs may also be forced to raise rates to remain solvent, affecting the availability and affordability of insurance.[138] From 2011 to 2021, nearly half of the economic damages from natural disasters in the United States were uninsured, resulting in a protection gap of 44%, or $435

3.5.2 Residential Properties at Risk of Wildfire – Percent Increase in Annual Likelihood by 2050



Source: First Street Foundation, *The 5th National Risk Assessment*, 2022

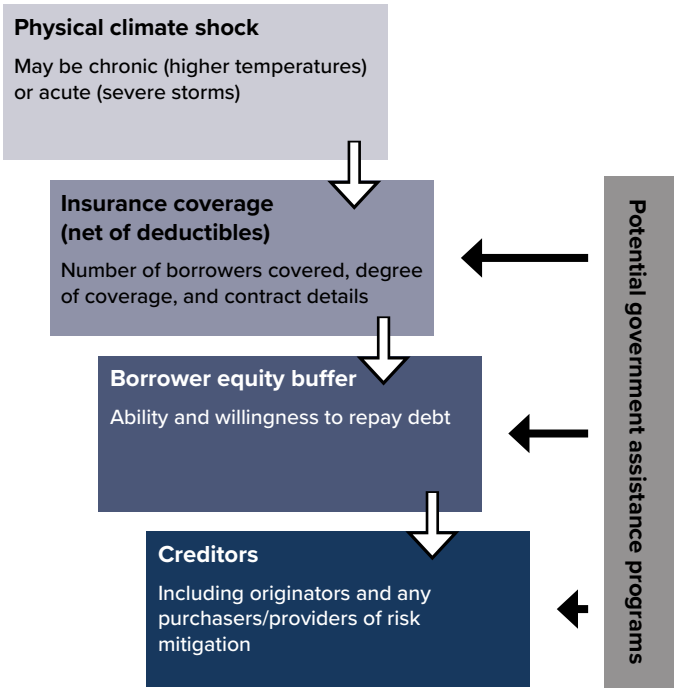
3.5.3 Projected Increase in Properties with Substantial Flood Risk



Source: First Street Foundation, *The First National Flood Risk Assessment*, 2020

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3.5.4 Flow-of-Risk 'Waterfall'



Source: FSOC

billion.[139] Ultimately, an increasing number of properties may become uninsurable due to the increasing severity and frequency of climate-related events and the associated changes in insurance policy structure, pricing, and availability.

These uninsured losses have the potential to spill over to other parts of the financial system and real economy. **Figure 3.5.4** depicts a flow-of-risk 'waterfall' to help visualize how the losses could flow through a stack of loss-absorption layers. In the event of an extreme climate-related disaster, insurance companies take the first loss net of deductibles if the specific peril is covered. Non-covered losses will adversely affect the impacted entities, likely including borrowers who differ in ability and willingness to absorb these remaining losses. Any resulting defaults will push losses into other parts of the financial system, including losses to originators, securities purchasers, and providers of risk mitigation products. Government programs may provide assistance to individuals, businesses, or others suffering losses at any given stage, potentially shifting losses to the government and ultimately to the taxpayer. Bottom-up exercises for specific regions, assets, and types of peril are needed to understand the potential financial impact of physical risks.

At the bottom of the flow-of-risk 'waterfall,' creditors may be exposed to uncovered losses. Given their central role in the financial system and real estate market, banks and government-sponsored enterprises (GSEs) exposures to uncovered losses are particularly worth monitoring. As the GSEs' mortgage-related portfolio has increased in the years following the 2008 financial crisis, their overall exposure to climate-related financial risk may also have increased. In light of increasing flood and fire risk and changing dynamics in insurance markets, additional attention should be placed on monitoring the overlap between such physical risks and mortgage debt. And ultimately, it will be necessary to understand how these physical risks translate into financial risks to assess the resulting U.S. financial stability risks fully.

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Transition Risks

In addition to the work underway to better understand physical risk and its implications for the financial system, Council members are making progress in identifying and developing a variety of methodologies to measure transition risks.

One approach to estimating financial institutions' exposures to transition risk relies on metrics such as GHG emissions. For example, facility-level emissions data could be matched against loan-level banking data to indicate large bank exposure to higher-emitting borrowers. However, emissions may be a noisy indicator of transition risk. For example, the impacts of policies to reduce emissions may vary significantly across sectors, policy designs, and degrees of abatement. Forward-looking approaches such as scenario analysis that take these factors into account are potentially more reliable but could be more complex and require analyzing how changes in climate variables may impact the type and amount of future economic activity.

Council members continue collaborating toward more granular, forward-looking methodologies to assess transition risk exposures.

Recommendations

The Council supports actions by member agencies to improve the availability of data for assessing climate-related financial risks such as the CFTC's RFI about the climate-related financial risk associated with derivatives markets,[140] FIO's proposed data collection from large writers of homeowners insurance on their underwriting metrics and related insurance policy information,[141] and the OFR's work of the Climate Data Hub.[142] The Council recommends state and federal agencies coordinate to identify, prioritize, and procure data necessary for monitoring climate-related financial risk.

The Council supports efforts to improve assessments and risk management of climate-related financial risks and vulnerabilities, including the Federal Reserve's pilot climate scenario analysis exercise and the principles on climate-related financial risk management at large banks proposed by the Federal Reserve, OCC, and FDIC. The Council recommends state and federal agencies continue to collect data on and study climate-related financial risks and how they might factor into appropriately tailored supervisory expectations of regulated entities' risk management practices.

Financial regulators should continue to promote consistent, comparable, and decision-useful disclosures that allow investors and financial institutions to consider climate-related financial risks in their investment and lending decisions. Examples include the SEC's proposed rules to enhance and standardize climate-related disclosures for investors and the National Association of Insurance Commissioners' (NAIC) updated Climate Risk Disclosure Survey.

The Council recommends enhanced coordination of data and risk assessment through the CFRC. The CFRC provides a forum for interagency information sharing, coordination, and capacity building. The newly established Climate-related Financial Risk Advisory Committee (CFRAC) will leverage expertise outside of the government to understand climate-related financial risk.

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4 Council Activities and Regulatory Developments

4.1 Council Activities

4.1.1 Risk Monitoring and Regulatory Coordination

The Dodd-Frank Act charges the Council with the responsibility to identify risks to U.S. financial stability, promote market discipline, and respond to emerging threats to the stability of the U.S. financial system. The Council also has a duty to facilitate information sharing and coordination among member agencies and other federal and state agencies regarding financial services policy and other developments.

The Council regularly examines significant market developments and structural issues within the financial system. This risk monitoring process is facilitated by the Council's Systemic Risk Committee (SRC), whose participants are primarily member agency staff in supervisory, monitoring, examination, and policy roles. The SRC serves as a forum for member agency staff to identify and analyze potential risks that may extend beyond any agency's jurisdiction.

Climate-related Financial Risk

The Council recognizes the critical importance of continuing to assess climate-related financial risks to the financial system and promote the resilience of the financial system to those risks. In October 2021, the Council published a Report on Climate-Related Financial Risk, which recommended the formation of two committees – a staff-level CFRC and an external advisory committee, the CFRAC.

The CFRC began meeting regularly in February 2022 and serves as an active forum for interagency information sharing, coordination, and capacity building. Given the known gaps in climate-related financial data, the continuing evolution in methodologies to assess risk, and the challenges of translating climate data into potential financial impacts, the CFRC plays an important role in enabling interagency staff to learn from one another on emerging best practices. Targeted working groups are focused on addressing data gaps and identifying priority data needs for member agencies, including working closely with the OFR's Climate Data Hub, advancing collective understanding of scenario analysis, and investigating metrics for risk assessment.

The CFRAC, established by the Council in October 2022, will help the Council receive information and analysis on climate-related financial risks from a broad array of stakeholders. The CFRAC's initial members include stakeholders from a wide range of backgrounds, including the financial services industry, non-governmental research institutions, climate-related data and analytics providers, non-profit organizations, and academia. Committee members with expertise in climate data and analysis will support the Council and its member agencies in their efforts to translate climate-related risks into economic and financial impacts.

Nonbank Financial Intermediation

The Council continues to evaluate the vulnerabilities posed by three types of nonbank financial institutions (NBFIs): open-end mutual funds, hedge funds, and MMFs. At the February 4, 2022, Council meeting, staff from member agencies updated the Council on their progress in analyzing and addressing the vulnerabilities associated with these three types of NBFIs through working groups and member agency rulemaking. At that meeting, the Council also issued a public statement supporting ongoing member agency work on NBFIs.

Since the February 2022 meeting, the Council's Hedge Fund Working Group has deepened its engagement with the IAWG, addressed certain data gaps, and developed a risk monitoring system to assess hedge fund-related risks to the U.S. financial stability. The working group presented its first risk assessment based on a pilot version of the monitoring system to the Council at

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the July 28, 2022, Council meeting and a second assessment based on the completed system at the November 4, 2022, meeting.

In addition, in June 2022, the Council restarted meetings of its Nonbank Mortgage Servicing Task Force, a staff-level working group including staff from member agencies and additional government agencies, such as the Department of Housing and Urban Development. The Nonbank Mortgage Servicing Task Force will facilitate interagency coordination and additional market monitoring of the risks posed to U.S. financial stability by nonbank mortgage servicers.

Digital Assets

As part of its responsibility to identify emerging risks to U.S. financial stability, the Council has monitored and discussed developments in the digital assets ecosystem as that ecosystem has developed. In February 2022, the Council identified digital assets as a priority area. In October 2022, the Council published a *Report on Digital Asset Financial Stability Risks and Regulation* in response to Executive Order 14067, Ensuring Responsible Development of Digital Assets, which called on the Council to produce a report outlining the specific financial stability risks and regulatory gaps posed by various types of digital assets and provide recommendations to address such risks. The report details the Council's findings and recommendations (see Section 3.1.5). The Council's Digital Assets Working Group met regularly and coordinated throughout the drafting process.

4.1.2 Determinations Regarding Nonbank Financial Companies

One of the Council's statutory authorities is to subject a nonbank financial company to supervision by the Federal Reserve and enhanced prudential standards if the company's material financial distress—or nature, scope, size, scale, concentration, interconnectedness, or mix of its activities—could pose a threat to U.S. financial stability. The Dodd-Frank Act sets forth the standard for the Council's determinations regarding nonbank financial companies and requires the Council to consider ten specific considerations and any other risk-related factors that the Council deems appropriate when evaluating those companies.

As of the date of this report, no nonbank financial companies are subject to a final determination by the Council under Section 113 of the Dodd-Frank Act or are under review in Stage 1 or Stage 2 of the Council's designation process.

4.1.3 Operations of the Council

The Dodd-Frank Act requires the Council to convene no less than quarterly. The Council held eight meetings in 2022, including at least one each quarter. The meetings bring Council members together to discuss and analyze market developments, potential threats to financial stability, and financial regulatory issues. Although the Council's work frequently involves confidential supervisory and sensitive information, the Council is committed to conducting its business as openly and transparently as practicable. Consistent with the Council's transparency policy, the Council opens its meetings to the public whenever possible. The Council held a public session at four of its meetings in 2022. Approximately every two weeks, the Council's Deputies Committee, composed of senior representatives of Council members, convenes to discuss the Council's agenda and to coordinate and oversee the work of the Council's six other staff-level committees. The other staff-level committees are the CFRC; the Data Committee; the Financial Market Utilities and Payment, Clearing, and Settlement Activities Committee; the Nonbank Financial Companies Designations Committee; the Regulation and Resolution Committee; and the Systemic Risk Committee. As noted in **Section 4.1.1**, the Council also established its first advisory committee, the CFRAC, in 2022. The Council adopted its FY 2023 budget in September 2022.

4.2 Safety and Soundness

4.2.1 Enhanced Capital and Prudential Standards and Supervision

On November 23, 2021, the Federal Reserve, OCC, and FDIC issued a final rule that requires a banking organization to notify its primary Federal regulator of any "computer-security incident"

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that rises to the level of a "notification incident," as soon as possible and no later than 36 hours after the banking organization determines that a notification incident has occurred. The final rule also requires a bank service provider to notify each affected banking organization customer as soon as possible when the bank service provider determines that it has experienced a computer-security incident that has caused, or is reasonably likely to cause, a material service disruption or degradation for four or more hours. The final rule defines a "notification incident" to include a computer-security incident that has materially disrupted or degraded, or is reasonably likely to materially disrupt or degrade, the viability of a banking organization's operations, its ability to deliver banking products and services, or the stability of the financial sector.

On December 10, 2021, the Federal Reserve issued a letter to remind supervised firms of safe and sound practices for counterparty credit risk management in light of the Archegos Capital Management default. The letter noted that in light of the Archegos default and the context of firms' relationships with investment funds, the Federal Reserve is issuing guidance to remind firms of the supervisory expectations in Interagency Supervisory Guidance on Counterparty Credit Risk Management and to make firms and industry participants aware of practices that may be inconsistent with safe and sound banking practices.

On December 23, 2021, the NCUA issued a final rule providing a simplified measure of capital adequacy for federally insured, natural-person credit unions (credit unions) classified as complex (those with total assets greater than $500 million). Under the final rule, a complex credit union that maintains a minimum net worth ratio and that meets other qualifying criteria is eligible to opt into the complex credit union leverage ratio (CCULR) framework if it has a minimum net worth ratio of nine percent. A complex credit union that opts into the CCULR framework need not calculate a risk-based capital ratio under the NCUA Board's October 29, 2015, risk-based capital final rule, as amended on October 18, 2018. A qualifying complex credit union that opts into the CCULR framework and maintains the minimum net worth ratio is considered well-capitalized. The final rule also made several amendments to update the NCUA's October 29, 2015, risk-based capital final rule, including addressing asset securitizations issued by credit unions, clarifying the treatment of off-balance sheet exposures, deducting certain mortgage servicing assets from a complex credit union's risk-based capital numerator, revising the treatment of goodwill, and amending other asset risk weights.

On March 31, 2022, the FDIC issued a request for comment (RFC) regarding the application of the laws, practices, rules, regulations, guidance, and statements of policy that apply to merger transactions involving one or more insured depository institutions, including the merger between an insured depository institution and a noninsured institution. The FDIC sought comments regarding the effectiveness of the existing framework in meeting the requirements of Section 18(c) of the Federal Deposit Insurance Act (known as the Bank Merger Act).

On July 28, 2022, the Federal Reserve issued a proposed rule to implement the Adjustable Interest Rate (LIBOR) Act. The proposed rule would establish benchmark replacements for contracts governed by United States law that reference certain tenors of USD LIBOR (the overnight and 1-, 3-, 6-, and 12-month tenors) and that do not have terms that provide for the use of a clearly defined and practicable replacement benchmark rate following the first London banking day after June 30, 2023. The proposed rule also would provide additional definitions and clarifications consistent with the Adjustable Interest Rate (LIBOR) Act.

4.2.2 Dodd-Frank Act Stress Tests

On June 23, 2022, the Federal Reserve released the results of its annual bank stress test, which showed that banks continue to have strong capital levels, allowing them to continue lending to households and businesses during a severe recession. A total of 34 banks were required to participate in the 2022 stress test. All banks tested remained above their minimum capital requirements, despite total projected losses of $612 billion. Under stress, the aggregate common

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equity tier 1 capital ratio is projected to decline by 2.7 percentage points to a minimum of 9.7%, which is still more than double the minimum requirement.

4.2.3 Resolution Planning and Orderly Liquidation

Under the Dodd-Frank Act, the U.S. Bankruptcy Code is the statutory first option for resolution in the event of the failure of a financial company. Section 165(d) of the Dodd-Frank Act requires nonbank financial companies designated by the Council for supervision by the Federal Reserve and certain BHCs—including certain foreign banking organizations (FBOs) with U.S. operations—to periodically submit plans to the Council, Federal Reserve, and FDIC for their rapid and orderly resolution under the U.S. bankruptcy code in the event of material financial distress or failure. The Federal Reserve and FDIC review each plan and may jointly determine that a plan is not credible or would not facilitate an orderly resolution of the company under the U.S. bankruptcy code. Since the resolution planning requirements took effect in 2012, U.S. G-SIBs and certain other firms have improved their resolution strategies and governance, refined their estimates of liquidity and capital needs in resolution, and simplified their legal structures. These changes have made these firms more resilient and resolvable.

In December 2021, the Federal Reserve and FDIC received targeted resolution plan submissions from 16 covered companies in categories II and III of the agencies' large bank regulatory framework. On July 1, 2022, the Federal Reserve and FDIC received resolution plan submissions from 55 foreign banking organizations in category IV of the agencies' large bank regulatory framework, consisting of 50 reduced resolution plans and five full resolution plans. On September 29, 2022, the Federal Reserve and FDIC provided feedback to Truist Financial Corporation regarding its initial resolution plan submitted on September 29, 2021. At that time, the Federal Reserve and FDIC also announced that they anticipate issuing guidance in 2023, which would be made available for public comment, to assist the triennial full filers that are not already the subject of resolution planning guidance.

Furthermore, in 2022, the Federal Reserve and FDIC hosted Crisis Management Group (CMG) meetings for U.S. G-SIBs to discuss home and host resolvability assessments for the firms to facilitate cross-border resolution planning.

4.2.4 Insurance

FIO assists the Secretary of the Treasury in administering the Terrorism Risk Insurance Program, created under the Terrorism Risk Insurance Act of 2002, as amended. In June 2022, Treasury published a *Report on the Effectiveness of the Terrorism Risk Insurance Program (TRIP)*. In the report, Treasury concluded that TRIP has remained effective in making terrorism risk insurance available and affordable in the insurance marketplace and that the market for terrorism risk insurance has been relatively stable, with few observable changes over time in the relevant benchmarks.

During 2022, all 50 states, the District of Columbia, and the U.S. territories completed the adoption of the NAIC's Credit for Reinsurance Model law and regulation, creating nationally streamlined reinsurance supervision. The NAIC adopted the 2022 Group Capital Calculation template and Instructions and an updated Liquidity Stress Testing Framework. The NAIC also updated its Financial Condition Examiners Handbook, utilized in all NAIC Accredited jurisdictions, with additional guidance related to cybersecurity and ransomware attacks impacting insurers.

The NAIC made efforts to address the prolonged low-interest rate environment and the subsequent search for investment yield in the insurance sector. The NAIC adopted Actuarial Guidelines 53, which requires asset adequacy testing of complex assets supporting certain policyholder liabilities for life insurers. Similarly, the NAIC increased transparency and reporting requirements related to residual investment tranches. The NAIC also increased the authority of state regulators through the Purposes and Procedures Manual of the NAIC Investment Analysis Office, related to insurers' assets that would not be eligible for reporting as a bond.

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As private markets have expanded over the last decade, alternative asset management firms have reshaped their business models and increased involvement in the life insurance sector. Some alternative asset managers have increased their access to books of annuities and life insurance through acquisitions of insurers, while others have used reinsurance to contractually assume assets and liabilities associated with insurance businesses. In light of the ongoing and expanding presence of private equity-owned insurers in the life insurance space, the NAIC adopted a list of 13 considerations pertaining to the ability of state insurance regulators to adequately monitor and assess the risks of these new entrants. The NAIC also adopted new reporting requirements in the investment schedules for investment transactions with related parties. In addition to capturing direct loans in related parties, it will also capture information involving securitizations (or other similar investments) where the related party is a sponsor/originator, along with whether the underlying investment is in a related party.

The NAIC also updated the Own Risk Solvency Assessment guidance manual to incorporate elements of the International Association of Insurance Supervisors' Common Framework for the Supervision of Internationally Active Insurance Groups. Finally, the NAIC added new reporting requirements to gather additional data on the insurance industry's use of cryptocurrencies, though such directly held digital assets are not considered admitted assets for capital purposes.

4.3 Financial Infrastructure, Markets, and Oversight

4.3.1 Climate-Related Financial Risks

On August 31, 2021, following the May 20, 2021, Executive Order on Climate-Related Financial Risk, FIO issued a RFI to solicit public input on FIO's future work relating to the insurance sector and climate-related financial risks. The request also sought input on how FIO's data collection and dissemination authorities can best be used by FIO in support of these priorities, as well as to monitor and assess the insurance sector and climate-related financial risks.

On December 16, 2021, the OCC issued draft principles designed to support the identification and management of climate-related financial risks by banks with more than $100 billion in total consolidated assets. Consistent with the Council's Report on Climate-Related Financial Risk, the OCC identified the effects of climate change and the transition to a low-carbon economy as presenting emerging risks to banks and the financial system. The draft principles provide a high-level framework for the safe and sound management of exposures to climate-related financial risks, consistent with the existing risk management framework described in existing OCC rules and guidance.

In April 2022, the NAIC Executive Committee adopted a revised climate risk disclosure survey consistent with the international Task Force on Climate-Related Financial Disclosures framework. The survey is currently administered jointly by 15 states and the District of Columbia to all licensed insurers that write at least $100 million in direct premiums annually within those markets and applies group-wide (i.e., the disclosure captures information across the footprint of the group, not just the legal entities in these jurisdictions), capturing approximately 80% of the total U.S. market. Initial filings under the new survey are due in November 2022. In 2022, the NAIC also adopted changes to the Property Casualty Risk-Based Capital Formula to include projected modeled wildfire losses in the information reported to regulators and are developing a proposed capital charge for severe convective storms. The NAIC also established a Catastrophe Model Center of Excellence to provide model documentation, education, and training and conduct applied research using catastrophe models to address regulatory climate risk and resilience priorities.

On March 30, 2022, the FDIC issued an RFC on draft principles that would provide a high-level framework for the safe and sound management of exposure to climate-related financial risks. Although all financial institutions, regardless of size, may have material exposures to climate-related financial risks, these draft principles are intended for the largest financial institutions, those with over $100 billion in total consolidated

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assets. The draft principles are substantively similar to those issued by the OCC in December 2021 and are intended to support efforts by large financial institutions to focus on key aspects of climate-related financial risk management.

On April 11, 2022, the SEC proposed rule changes that would require registrants to provide certain climate-related information in their registration statements and annual reports. The proposed rules would provide investors with more consistent, comparable, and decision-useful climate-related information by requiring a registrant to provide disclosures on the oversight and governance undertaken by its board and management, risk management, and strategy with respect to climate-related risks; the registrant's climate-related targets or goals, if any; certain disclosure related to greenhouse gas emissions; and the current impact of climate-related events and transition activities on the registrant's consolidated financial statements and related expenditures.

On September 29, 2022, the Federal Reserve announced that six of the nation's largest banks would participate in a pilot climate scenario analysis exercise designed to enhance the ability of supervisors and firms to measure and manage climate-related financial risks. The pilot exercise will be launched in early 2023 and is expected to conclude around the end of the year. The Federal Reserve anticipates publishing insights gained from the pilot at an aggregate level, reflecting what has been learned about climate risk management practices and how insights from scenario analysis will help identify potential risks and promote risk management practices. No firm-specific information will be released. There will be no capital or supervisory implications from the pilot.

On October 18, 2022, FIO issued an RFC on a proposed collection of data from property and casualty insurers regarding current and historical underwriting data on homeowners' insurance to assess the potential for major disruptions of private insurance coverage in regions of the country that are particularly vulnerable to the impacts of climate change. This work builds on FIO's 2021 climate RFI and will be part of sequential and capacity-building efforts. FIO's initial steps are intended to consolidate foundational knowledge that can be used in future years to develop more comprehensive approaches to address climate-related financial risks.

On December 2, 2022, the Federal Reserve invited comments on proposed principles providing a high-level framework for the safe and sound management of exposures to climate-related financial risks for large banking organizations, those with more than $100 billion in total assets. They are substantially similar to proposals issued by the OCC and FDIC. The Federal Reserve intends to work with those agencies to promote consistency in the supervision of large banks through final interagency guidance.

4.3.2 Digital Assets, Payment Systems, and Technological Innovation

On November 18, 2021, the OCC issued an interpretive letter regarding the authority of a bank to engage in certain cryptocurrency activities. The interpretive letter clarified that the activities addressed in prior OCC interpretive letters (i.e., OCC Interpretive Letters 1170, 1172, and 1174) are legally permissible for a bank to engage in, provided the bank can demonstrate, to the satisfaction of its supervisory office, that it has controls in place to conduct the activity in a safe and sound manner. The letter further stated that a bank should notify its supervisory office, in writing, of its intention to engage in any of the activities addressed in the interpretive letters. The bank should not engage in the activities until it receives written notification of the supervisory office's non-objection. In deciding whether to grant supervisory non-objection, the supervisory office will evaluate the adequacy of the bank's risk management systems, controls, and risk measurement systems to enable the bank to engage in the proposed activities safely and soundly.

In December 2021, the NCUA issued a letter to federally insured credit unions (FICUs) to provide clarity about the already existing authority of FICUs to establish relationships with third-party providers that offer digital asset services to the FICUs' members (including services provided

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by third parties to allow FICU members to buy, sell, and hold uninsured digital assets with the third-party provider outside of the FICU), provided certain conditions are met. The letter stated that FICUs must comply with applicable laws and should follow safe-and-sound business practices in the provision of digital asset services through third-party arrangements. FICUs should fully evaluate the risks involved with digital asset activities, including legal risks, reputation risks, and economic risks. The letter stated that in light of the rapidly changing technological environment and the variety of digital asset products and services available, FICUs should actively monitor that they, and the third-party service providers they facilitate member relationships with, remain in ongoing compliance with all laws. FICUs should ensure that effective risk measurement, monitoring, and control practices are in place to successfully manage such third-party arrangements once established.

On March 31, 2022, the SEC issued Staff Accounting Bulletin No. 121, which expresses the views of the staff regarding the accounting for obligations to safeguard crypto-assets an entity holds for platform users. The bulletin is applicable to, among other entities, those that file reports pursuant to Sections 13(a) or 15(d) of the Exchange Act and entities that have submitted or filed a registration statement under the Securities Act or the Exchange Act that is not yet effective.

On April 7, 2022, the FDIC issued a financial institution letter to address the engagement by FDIC-supervised institutions in crypto-related activities. The letter stated that crypto-related activities may pose significant safety and soundness risks and financial stability and consumer protection concerns. Moreover, these risks and concerns are evolving as crypto-related activities are not yet fully understood. The FDIC noted that there is little consistency in the definitions associated with many crypto-assets and crypto-related activities, which makes it difficult to categorically identify these assets and activities. Further, the structure and scope of these activities are rapidly changing and expanding. As a result, of the dynamic nature of crypto-related activities, it is difficult for institutions, as well as the FDIC, to adequately assess the safety and soundness, financial stability, and consumer protection implications without considering each crypto-related activity on an individual basis. Therefore, the FDIC requested all FDIC-supervised institutions that are considering engaging in crypto-related activities to notify the FDIC of their intent and to provide all necessary information that would allow the FDIC to engage with the institution regarding related risks. The letter advised that any FDIC-supervised institution that is already engaged in crypto-related activities should promptly notify the FDIC and encouraged institutions notifying the FDIC to also notify their state regulator.

On July 29, 2022, the FDIC issued a Fact Sheet for the public and an Advisory to FDIC-insured institutions regarding FDIC deposit insurance and dealings with crypto companies to address certain misrepresentations about FDIC deposit insurance related to crypto-assets. The Fact Sheet stated that some crypto companies have represented to their customers that their products are eligible for FDIC deposit insurance coverage, which may lead customers to believe, mistakenly, that their money or investments are safe. The FDIC noted in the Advisory that inaccurate representations about deposit insurance by non-banks, including crypto companies, may confuse nonbank customers and cause them to mistakenly believe they are protected against any type of loss.

On August 16, 2022, the Federal Reserve issued a supervisory letter to supervised firms providing additional information for banking organizations engaging or seeking to engage in crypto-asset-related activities. The letter outlined the steps Federal Reserve-supervised banks should take before engaging in crypto-asset-related activities, such as assessing whether such activities are legally permissible and determining whether any regulatory filings are required. Additionally, the letter stated that Federal Reserve-supervised banking organizations should notify the Federal Reserve before engaging in crypto-asset-related activities. The letter also emphasized that Federal Reserve-supervised banking organizations should have adequate systems and controls in place to conduct crypto-asset-related activities in a safe and sound manner prior to commencing such activities.

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On August 19, 2022, the Federal Reserve approved final guidelines for Federal Reserve Banks to utilize in evaluating requests for access to Federal Reserve Bank master accounts and services. The final guidelines followed a supplemental notice and proposed guidelines that were issued on March 8, 2022.

4.3.3 Derivatives, Swap Data Repositories, Regulated Trading Platforms, Central Counterparties, and Financial Market Utilities

On May 11, 2022, the SEC issued a proposed set of rules (Regulation SE) and forms under the Exchange Act that would create a regime for the registration and regulation of security-based swap execution facilities (SBSEFs) and address other issues relating to security-based swap (SBS) execution generally. One of the rules proposed as part of Regulation SE would implement a part of the Dodd-Frank Act that is intended to mitigate conflicts of interest at SBSEFs and national securities exchanges that trade SBS. Other rules proposed as part of Regulation SE would address the cross-border application of the Exchange Act's trading venue registration requirements and the trade execution requirement for SBS. In addition, the SEC proposed to amend an existing rule to exempt, from the Exchange Act definition of "exchange," certain registered clearing agencies as well as registered SBSEFs that provide a marketplace only for SBS. The SEC also proposed a new rule that, while affirming that an SBSEF would be a broker under the Exchange Act, would exempt a registered SBSEF from certain broker requirements. Finally, the SEC proposed certain new rules and amendments to its Rules of Practice to allow persons who are aggrieved by certain actions by an SBSEF to apply for review by the SEC. The SEC also withdrew all previously proposed rules regarding these subjects.

On August 24, 2022, the CFTC issued a final rule modifying its existing interest rate swap clearing requirement regulations under applicable provisions of the Commodity Exchange Act (CEA) due to the global transition from reliance on certain interbank offered rates (IBORs) (e.g., LIBOR) that have been, or will be, discontinued as benchmark reference rates to alternative reference rates, which are predominantly overnight, nearly risk-free reference rates (RFRs). The amendments updated the set of interest rate swaps that are required to be submitted for clearing pursuant to the CEA and the CFTC's regulations to a derivatives clearing organization (DCO) that is registered under the CEA or to a DCO that has been exempted from registration under the CEA, to reflect the market shift away from swaps that reference IBORs to swaps that reference RFRs.

On October 5, 2022, the Federal Reserve issued a proposed rule to amend the requirements relating to operational risk management in the Federal Reserve's Regulation HH, which applies to certain financial market utilities that have been designated as systemically important (designated FMUs) by the Council under Title VIII of the Dodd-Frank Act. The proposal would update, refine, and add specificity to the operational risk management requirements in Regulation HH to reflect changes in the operational risk, technology, and regulatory landscapes in which designated FMUs to operate since the Federal Reserve last updated the risk management requirements in 2014. The proposal would also adopt specific incident-notification requirements.

4.3.4 Securities and Asset Management

On February 8, 2022, the SEC issued a proposed rule to amend certain rules that govern money market funds under the Investment Company Act of 1940. The proposed amendments are designed to improve the resilience and transparency of money market funds. The proposal would remove the liquidity fee and redemption gate provisions in the existing rule, which would eliminate an incentive for preemptive redemptions from certain money market funds and could encourage funds to more effectively use their existing liquidity buffers in times of stress. The proposal would also require institutional prime and institutional tax-exempt money market funds to implement swing pricing policies and procedures to require redeeming investors to bear the liquidity costs of their decisions to redeem. The SEC also proposed to increase the daily liquid asset and weekly liquid asset minimum liquidity requirements to 25% and 50%, respectively, to provide a more substantial buffer in the event of rapid redemptions. The proposal would amend certain reporting requirements on Forms

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N-MFP and N-CR to improve the availability of information about money market funds, as well as make certain conforming changes to Form N-1A to reflect the proposed changes to the regulatory framework for these funds. In addition, the SEC proposed rule amendments to address how money market funds with stable net asset values should handle a negative interest rate environment. Finally, the SEC proposed rule amendments to specify how funds must calculate weighted average maturity and weighted average life.

On February 17, 2022, the SEC issued a proposed rule to amend Form PF, the confidential reporting form for certain SEC-registered investment advisers to private funds, to require current reporting upon the occurrence of key events. The proposed amendments also would decrease the reporting threshold for large private equity advisers and require these advisers to provide additional information to the SEC about the private equity funds they advise. Finally, the SEC proposed to amend requirements concerning how large liquidity advisers report information about the liquidity of funds they advise. The proposed amendments are designed to enhance the Council's ability to monitor systemic risk and bolster the SEC's regulatory oversight of private fund advisers and investor protection efforts.

On February 24, 2022, the SEC issued a proposed rule to shorten the standard settlement cycle for most broker-dealer transactions from two business days after the trade date (T+2) to one business day after the trade date (T+1). To facilitate a T+1 standard settlement cycle, the SEC also proposed new requirements for processing institutional trades by broker-dealers, investment advisers, and certain clearing agencies. These requirements are designed to protect investors, reduce risk, and increase operational efficiency. The SEC proposed to require compliance with a T+1 standard settlement cycle, if adopted, by March 31, 2024.

On September 1, 2022, the SEC and CFTC issued a proposed rule to amend Form PF, the confidential reporting form for certain SEC-registered investment advisers to private funds, including those that also are registered with the CFTC as a commodity pool operator or commodity trading adviser. As with the February 17, 2022, proposed rule, the amendments are designed to enhance the Council's ability to monitor systemic risk and bolster the SEC's regulatory oversight of private fund advisers and investor protection efforts. In connection with the amendments to Form PF, the SEC proposes to amend a rule under the Investment Advisers Act of 1940 to revise instructions for requesting a temporary hardship exemption.

Treasury Market Structure

On March 18, 2022, the SEC issued a proposed rule to amend Rule 3b-16 under the Exchange Act, which defines certain terms used in the statutory definition of "exchange" under Section 3(a)(1) of the Exchange Act to include systems that offer the use of non-firm trading interest and communication protocols to bring together buyers and sellers of securities. In addition, the SEC re-proposed amendments to its regulations under the Exchange Act, which were initially proposed in September 2020, to enable alternative trading systems (ATSs) to take into consideration systems that may fall within the definition of "exchange" because of the amendments proposed in 2022. The SEC re-proposed, with certain revisions, amendments to its regulations for ATSs that trade government securities as defined under Section 3(a)(42) of the Exchange Act or repurchase and reverse repurchase agreements on government securities. The SEC also proposed to amend Form ATS-N for NMS Stock ATSs, which would require existing NMS Stock ATSs to amend their existing disclosures. In addition, the SEC proposed to amend the fair access rule for ATSs. The SEC also proposed to require electronic filing of and to modernize Form ATS-R and Form ATS, which would require existing Form ATS filers to amend their existing disclosures. Further, the SEC re-proposed amendments to its regulations regarding systems compliance and integrity to apply to ATSs that meet certain volume thresholds in U.S. Treasury Securities or in a debt security issued or guaranteed by a U.S. executive agency or government-sponsored enterprise.

On April 18, 2022, the SEC issued a proposed rule to further define the phrase "as a part of a regular business" as used in the statutory definitions

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of "dealer" and "government securities dealer" under Sections 3(a)(5) and 3(a)(44), respectively, of the Exchange Act. The proposed rules would define three qualitative standards designed to more specifically identify activities of certain market participants who assume dealer-like roles, specifically, persons whose trading activity in the market "has the effect of providing liquidity" to other market participants. In addition, proposed Rule 3a44-2, which would apply only to government securities dealers, would include a quantitative standard. This quantitative standard would establish a bright-line test, under which a person engaging in certain specified levels of activity would be deemed to be buying and selling government securities "as a part of a regular business," regardless of whether it meets any of the qualitative standards. A person whose activity meets the quantitative or any of the qualitative standards would be a dealer and so subject to the Exchange Act registration requirements, regardless of whether the liquidity provision is a chosen consequence of its activities.

On October 25, 2022, the SEC issued a proposed rule to amend the standards applicable to covered clearing agencies for U.S. Treasury securities to require that such covered clearing agencies have written policies and procedures reasonably designed to require that every direct participant of the covered clearing agency submit for clearance and settlement all eligible secondary market transactions in U.S. Treasury securities to which it is a counterparty. In addition, the SEC proposed additional amendments to the Covered Clearing Agency Standards with respect to risk management. These requirements are designed to protect investors, reduce risk, and increase operational efficiency. Finally, the SEC proposed to amend the broker-dealer customer protection rule to permit margin required and on deposit with covered clearing agencies for U.S. Treasury securities to be included as a debit in the reserve formulas for accounts of customers and proprietary accounts of broker-dealers, subject to certain conditions.

4.3.5 Accounting Standards

On March 28, 2022, the Financial Accounting Standards Board (FASB) issued ASU 2022-01, "Derivatives and Hedging (ASC Topic 815): Fair Value Hedging – Portfolio Layer Method." ASU 2022-01 establishes the portfolio-layer method, which expands an entity's ability to achieve fair value hedge accounting for hedges of financial assets in a closed portfolio.

On March 31, 2022, the FASB issued Accounting Standards Update (ASU) 2022-02, "Financial Instruments – Credit Losses (Topic 326): Troubled Debt Restructurings and Vintage Disclosures." ASU 2022-02 eliminates the accounting guidance for troubled debt restructurings by creditors that have adopted Accounting Standards Codification (ASC) Topic 326 and enhances disclosures for certain loan refinancings and restructurings when a borrower is experiencing financial difficulty.

4.3.6 Bank Secrecy Act/Anti-Money Laundering Regulatory Reform

On March 16, 2022, the OCC issued a final rule amending its suspicious activity report (SAR) regulations to harmonize its legal authority to issue exemptions from its SAR regulations with Financial Crimes Enforcement Network's (FinCEN) preexisting authority. The rule establishes processes for the OCC to facilitate changes related to SAR regulations required by the Anti-Money Laundering Act of 2020 and grant relief to banks that develop innovative solutions intended to meet Bank Secrecy Act requirements more efficiently and effectively.

On September 30, 2022, FinCEN issued a final rule requiring certain entities to file with FinCEN reports that identify two categories of individuals: the beneficial owners of the entity and individuals who have filed an application with specified governmental authorities to create the entity or register it to do business. These regulations implement Section 6403 of the Corporate Transparency Act, enacted as part of the National Defense Authorization Act for Fiscal Year 2021, and describe who must file a report, what information must be provided, and when a report is due. These requirements are intended to help prevent and combat money laundering, terrorist financing, corruption, tax fraud, and other illicit activity while minimizing the burden on entities doing business in the United States.

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4.4 Mortgages and Consumer Protection

4.4.1 Mortgages and Housing Finance

On December 8, 2021, the CFPB issued a final rule amending Regulation Z, which implements the Truth in Lending Act, generally to address the anticipated sunset of LIBOR, which is expected to be discontinued for most U.S. dollar (USD) tenors in June 2023. Some creditors currently use USD LIBOR as an index for calculating rates for open-end and closed-end products. The CFPB amended the open-end and closed-end provisions to provide examples of replacement indices for LIBOR indices that meet certain Regulation Z standards. The CFPB also amended Regulation Z to permit creditors for home equity lines of credit (HELOCs) and card issuers for credit card accounts to transition existing accounts that use a LIBOR index to a replacement index on or after April 1, 2022, if certain conditions are met. This final rule also addressed change-in-terms notice provisions for HELOCs and credit card accounts and how they apply to accounts transitioning away from using a LIBOR index. Lastly, the CFPB amended Regulation Z to address how the rate reevaluation provisions applicable to credit card accounts apply to the transition from using a LIBOR index to a replacement index.

On March 16, 2022, FHFA issued a final rule amending the Enterprise Regulatory Capital Framework (ERCF) by refining the prescribed leverage buffer amount and credit risk transfer securitization framework for Fannie Mae and Freddie Mac. The final rule also made technical corrections to various provisions of the ERCF that was published on December 17, 2020.

On August 17, 2022, FHFA and Ginnie Mae finalized and released updated Enterprise seller/servicer and Ginnie Mae issuer requirements. The Enterprise seller/servicer requirements were updated to promote confidence and improve safety and soundness for nonbanks by enhancing the definitions of capital and liquidity; more accurately capturing liquidity needs by differentiating by remittance type; reducing procyclicality in the liquidity requirements by (1) eliminating the Non-Performing Loan liquidity add-on that existed in the previous requirements and (2) requiring a liquidity buffer that can be drawn on during times of stress; and incorporating lessons learned from the COVID-19 pandemic, including establishing requirements to address origination pipeline risk, as the previous requirements focused primarily on mortgage servicing.

On August 31, 2022, FHFA announced it would conduct a comprehensive review of the Federal Home Loan Bank (FHLBank) System beginning in the fall of 2022. As part of the review process, FHFA hosted two public listening sessions and a series of regional roundtable discussions to consider and evaluate the mission, membership eligibility requirements, and operational efficiencies of the FHLBanks. FHFA heard from stakeholders on the FHLBanks' role or potential role in addressing housing finance, community and economic development, affordability, and other related issues.

4.4.2 Consumer Protection

On May 17, 2022, the CFPB issued a circular that addresses prohibited practices on claims about FDIC insurance. The circular noted that firms may violate federal law if they misuse the name or logo of the FDIC or make false or misleading representations about deposit insurance. The issue has taken on renewed importance with the emergence of financial technologies – such as crypto-assets, including stablecoins – and the risks posed to consumers if they are lured to these or other financial products or services through misrepresentations or false advertising.

On June 2, 2022, the FDIC issued a final rule to implement section 18(a)(4) of the Federal Deposit Insurance Act. Section 18(a)(4) prohibits any person from misusing the name or logo of the FDIC or from engaging in false advertising or making knowing misrepresentations about deposit insurance. The FDIC has observed an increasing number of instances where financial services providers or other entities or individuals have misused the FDIC's name or logo or have made false or misleading representations about deposit insurance. The final rule establishes the process by which the FDIC will identify and

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investigate conduct that may violate section 18(a)(4), the standards under which such conduct will be evaluated, and the procedures which the FDIC will follow when formally and informally enforcing the provisions of section 18(a)(4).

On August 11, 2022, the CFPB issued a circular confirming that financial companies may violate federal consumer financial protection law when they fail to safeguard consumer data. The circular provides guidance to consumer protection enforcers, including examples of when firms can be held liable for lax data security protocols. The CFPB noted that it is increasing its focus on the potential misuse and abuse of personal financial data. As part of this effort, the circular explains how and when firms may be violating the Consumer Financial Protection Act with respect to data security. Specifically, financial companies are at risk of violating the Act if they fail to have adequate measures to protect against data security incidents. The circular also provides examples of widely implemented data security practices. While the circular does not suggest that particular security practices are specifically required under the Act, it notes some examples where the failure to implement certain data security measures might increase the risk that a firm's conduct triggers liability under the Act.

4.5 Data Scope, Quality, and Accessibility

4.5.1 Data Scope

Global adoption of the Legal Entity Identifier (LEI), which enables the unique and transparent identification of legal entities participating in financial transactions, continues to grow. In the United States, the LEI is used in regulatory reporting mandated by the Federal Reserve, CFPB, SEC, CFTC, and OFR, among others.

Once OTC derivative transaction data are brought together across jurisdictions, the LEI, unique transaction identifier (UTI), unique product identifier (UPI), and the harmonized critical data elements (CDE) fields can improve the ability to monitor financial stability through analysis of counterparty exposure and risk positioning at various levels of aggregation.

In October 2020, the Financial Stability Board (FSB) transferred the role of international governance body for the UTI, UPI, and CDE to the Regulatory Oversight Committee (ROC). The ROC is a group of more than 70 regulatory authorities worldwide that oversee the Global LEI Foundation (GLEIF). In December 2021, the responsibility for providing secretariat services to the ROC was transferred from the FSB to the OFR, with support from the People's Bank of China. ROC secretariat staff play an important role in the day-to-day mechanics of regulatory governance of the LEI, UPI, UTI, and CDE.

4.5.2 Data Quality

Improving the quality of LEI data is important to building market confidence in the value of the LEI. Therefore, considerable attention is directed to this challenge by the Council members that are represented on the ROC, including the Federal Reserve, OCC, CFPB, SEC, FDIC, CFTC, and OFR. A focus of Council members is the work on "Level 2" LEI data. This is data submitted by legal entities acquiring an LEI regarding their "direct accounting consolidating parent" and their "ultimate accounting consolidating parent." This past year, the ROC has continued to focus on improving the quality of Level 2 LEI data, among other elements of LEI reference data. Level 2 LEI data provides the direct counterparties to a transaction and the affiliated entities and can improve the ability to perform a risk assessment of the transaction counterparties

Additionally, this past year, the ROC continued to work closely with the GLEIF as the GLEIF continues to develop its LEI digital strategy. Toward this purpose, Council members contributed to the ROC's analysis of a new work item proposal under Technical Committee 68 of the International Organization for Standardization (ISO) to develop Part 3 of the LEI standard (ISO 17442). This proposal, which was put forth by the GLEIF, pertains to what the GLEIF refers to as "verifiable LEIs" (vLEIs). vLEIs provide automated remote verification of legal entities owning LEIs –– that is, they cryptographically prove that an LEI is owned by the organization signing with or presenting the credential.

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5 Select Council Member Agency Publications on Financial and Regulatory Developments

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6 Abbreviations

ABA	American Bankers Association
ABCP	Asset-Backed Commercial Paper
AFS	Available For Sale
AI	Artificial Intelligence
AOCI	Accumulated Other Comprehensive Income
ARM	Adjustable-Rate Mortgage
ARM MBS	Adjustable-Rate Mortgage Mortgage-Backed Security
ARRC	Alternative Reference Rates Committee
ATS	Alternative Trading System
BHC	Bank Holding Company
BNPL	Buy Now, Pay Later
BOE	Bank of England
CARES Act	Coronavirus Aid, Relief, and Economic Security Act
CBDC	Central Bank Digital Currency
CCAR	Comprehensive Capital Analysis and Review
CCP	Central Counterparty
CCULR	Complex Credit Union Leverage Ratio
CD	Certificate of Deposit
CDE	Critical Data Element
CDS	Credit Default Swap
CEA	Commodity Exchange Act
CEG	Cyber Expert Group
CET1	Common Equity Tier 1 Capital
CFPB	Consumer Financial Protection Bureau
CFRC	Climate-related Financial Risk Committee
CFRAC	Climate-related Financial Risk Advisory Committee
CFTC	Commodity Futures Trading Commission
CIF	Collective Investment Funds
CISA	Cybersecurity and Infrastructure Security Agency
CIT	Collective Investment Trusts
CLO	Collateralized Loan Obligation
CMBS	Commercial Mortgage-Backed Security
CME	Chicago Mercantile Exchange Inc.
CMG	Crisis Management Group
Council	Financial Stability Oversight Council
CP	Commercial Paper
CPMI	Committee on Payments and Market Infrastructures
CRE	Commercial Real Estate
CSBS	Conference of State Bank Supervisors
DB	Defined Benefit
DCO	Derivatives Clearing Organization
DDoS	Distributed Denial of Service
DHS	Department of Homeland Security
Dodd-Frank Act	Dodd-Frank Wall Street Reform and Consumer Protection Act
DSB	Derivatives Service Bureau
DTCC	Depository Trust & Clearing Corporation
EBITDA	Earnings Before Interest, Taxes, Depreciation, and Amortization
EME	Emerging Market Economy
ERCF	Enterprise Regulatory Capital Framework
ERISA	Employee Retirement Income Security Act
ETF	Exchange-Traded Fund

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Exchange Act	Securities Exchange Act of 1934
Fannie Mae	Federal National Mortgage Association
FASB	Financial Accounting Standards Board
FBIIC	Financial and Banking Information Infrastructure Committee
FBO	Foreign Banking Organization
FDIC	Federal Deposit Insurance Corporation
Federal Reserve	Board of Governors of the Federal Reserve System
FHFA	Federal Housing Finance Agency
FHLBank	Federal Home Loan Bank
FICC	Fixed Income Clearing Corporation
FICU	Federally Insured Credit Union
FIMA	Foreign and International Monetary Authority
FinCEN	Financial Crimes Enforcement Network
FINRA	Financial Industry Regulatory Authority
FIO	Federal Insurance Office
FMU	Financial Market Utility
FOMC	Federal Open Market Committee
FRBNY	Federal Reserve Bank of New York
Freddie Mac	Federal Home Loan Mortgage Corporation
FRM	Fixed-Rate Mortgage
FSB	Financial Stability Board
FS-ISAC	Financial Services Information Sharing and Analysis Center
FSOC	Financial Stability Oversight Council
FSSCC	Financial Services Sector Coordinating Council
FX	Foreign Exchange
GAV	Gross Asset Value
GCF	General Collateral Financing
GDP	Gross Domestic Product
GHG	Greenhouse Gas
Ginnie Mae	Government National Mortgage Association
GLEIF	Global LEI Foundation
GNE	Gross Notional Exposure
GSD	Government Securities Division
GSE	Government-Sponsored Enterprise
G-SIB	Global Systemically Important Bank
HELOC	Home Equity Line of Credit
HFWG	Hedge Fund Working Group
HTM	Held-to-maturity
IaaS	Infrastructure as a Service
IAWG	Inter-Agency Working Group for Treasury Market Surveillance
IBORs	Interbank Offered Rates
IHC	Intermediate Holding Company
IMF	International Monetary Fund
IOSCO	International Organization of Securities Commissions
ISDA	International Swaps and Derivatives Association
ISDA IBOR	International Swaps and Derivatives Association's Interbank Offered Rate
ISO	Organization for Standardization
LDI	Liability-driven Investments
LEI	Legal Entity Identifier
LENS	Legal Notice System
LIBOR	London Interbank Offered Rate
LME	London Metal Exchange
MBS	Mortgage-Backed Security
MBSD	Mortgage-Backed Securities Division
MMF	Money Market Mutual Fund
MOVE	Merrill Lynch Option Volatility Estimate
mREIT	Mortgage REITs
MSR	Mortgage Servicing Right
NAIC	National Association of Insurance Commissioners

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NAV	Net Asset Value
NBFI	Nonbank Financial Institution
NCDs	Negotiable Certificates of Deposit
NCUA	National Credit Union Administration
NIM	Net Interest Margin
NIST	National Institute of Standards and Technology
NMDB	National Mortgage Database
NMS	National Market System
NSCC	National Securities Clearing Corporation
OCC	Office of the Comptroller of the Currency
OC Corp	Options Clearing Corporation
OCCIP	Office of Cybersecurity and Critical Infrastructure Protection
OFR	Office of Financial Research
ON RRP	Overnight Reverse Repurchase Agreement Facility
OTC	Over-the-Counter
PaaS	Platform as a Service
P&C	Property and Casualty
PRT	Pension Risk Transfer
RaaS	Ransomware as a Service
REIT	Real Estate Investment Trust
Repo	Repurchase Agreement
RFI	Request for Information
RFRs	Risk-Free Reference Rates
RMBS	Residential Mortgage-Backed Security
ROC	Regulatory Oversight Committee
RWAs	Risk-Weighted Assets
S&P	Standard & Poor's
SaaS	Software as a Service
SBS	Security-Based Swap
SBSEF	Security-Based Swap Execution Facility
SD	Swap Dealer
SDR	Swap Data Repository
SEC	Securities and Exchange Commission
SI>1 CCPs	CCPs Considered Systemically Important in More than One Jurisdiction
SIFMA	Securities Industry and Financial Markets Association
SOFR	Secured Overnight Financing Rate
SRC	Systemic Risk Committee
SRF	Standing Repo Facility
STIFs	Short-term Investment Funds
TRACE	Trade Reporting and Compliance Engine
TR	Trade Repository
Treasury	U.S. Department of the Treasury
TRIP	Terrorism Risk Insurance Program
UK	United Kingdom
UPI	Unique Product Identifier
USD	U.S. dollar
UTI	Unique Transaction Identifier
VIX	Chicago Board Options Exchange Market Volatility Index
vLEI	Verifiable LEIs
YCC	Yield Curve Control

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7 Glossary

Accumulated Other Comprehensive Income (AOCI)

Accumulated Other Comprehensive Income typically includes unrealized gains and losses in available for sale securities; actuarial gains and losses in defined benefit plans; gains and losses on derivatives held as cash flow hedges; and gains and losses resulting from translating the financial statements of foreign subsidiaries.

Affiliate

In general, a company is an affiliate of another company if: (1) either company consolidates the other on financial statements prepared in accordance with U.S. Generally Accepted Accounting Principles, the International Financial Reporting Standards, or other similar standards; (2) both companies are consolidated with a third company on financial statements prepared in accordance with such principles or standards; (3) for a company that is not subject to such principles or standards, consolidation as described above would have occurred if such principles or standards had applied; or (4) a primary regulator determines that either company provides significant support to, or is materially subject to the risks or losses of, the other company.

Asset-Backed Commercial Paper (ABCP)

Short-term debt which has a fixed maturity of up to 270 days and is backed by some financial asset, such as trade receivables, consumer debt receivables, securities, or auto and equipment loans or leases.

Bilateral Repo

A repo between two institutions in which negotiations are conducted directly between the participants or through a broker, and in which the participants must agree on the specific securities to be used as collateral. The bilateral repo market includes both non-cleared trades and trades cleared through Fixed Income Clearing Corporation's delivery versus payment repo service.

Central Counterparty (CCP)

An entity that interposes itself between counterparties to contracts traded in one or more financial markets, becoming the buyer to every seller and the seller to every buyer, thereby ensuring the performance of open contracts.

Clearing Bank

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

Collateral

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

Collateralized Loan Obligation (CLO)

A securitization vehicle backed predominantly by commercial loans.

Commercial Paper (CP)

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

Common Equity Tier 1 Capital (CET1)

A regulatory capital measure which includes capital with the highest loss-absorbing capacity, such as common stock and retained earnings.

Common Equity Tier 1 Capital Ratio

A ratio which divides common equity tier 1 capital by total risk-weighted assets. The ratio applies to all banking organizations subject to the Revised Capital Rule.

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Comprehensive Capital Analysis and Review (CCAR)

An annual exercise by the Federal Reserve to ensure that institutions have robust, forward-looking capital planning processes that account for their unique risks and sufficient capital to continue operations throughout times of economic and financial stress.

Credit Default Swap (CDS)

A financial contract in which one party agrees to make a payment to the other party in the event of a specified credit event, in exchange for one or more fixed payments.

Defined Benefit (DB) Plan

A retirement plan in which the cost to the employer is based on a predetermined formula to calculate the amount of a participant's future benefit. In defined benefit plans, the investment risk is borne by the plan sponsor.

Digital Asset

Digital asset refers to two categories of products: "central bank digital currencies" (CBDCs) and crypto-assets. Crypto-assets are private-sector digital assets that depend primarily on cryptography and distributed ledger or similar technology.

Duration

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

Emerging Market Economy (EME)

Although there is no single definition, emerging market economies are generally classified according to their state of economic development, liquidity, and market accessibility. This report has grouped economies based on the classifications used by significant data sources such as the MSCI and Standard & Poor's, which include, for example, Brazil, China, India, and Russia.

Federal Funds Rate

The interest rate at which depository institutions borrow overnight from lenders in the federal funds market. The FOMC sets a target range for the level of the overnight federal funds rate. The FRBNY then uses open market operations to influence the rate so that it trades within the target range.

Financial and Banking Information Infrastructure Committee (FBIIC)

The FBIIC consists of 18 member organizations from across the financial regulatory community, both federal and state. It was chartered under the President's Working Group on Financial Markets following September 11, 2001 to improve coordination and communication among financial regulators, enhance the resilience of the financial sector, and promote public-private partnership.

Financial Market Utility (FMU)

An entity, as defined in the Dodd-Frank Act, that, subject to certain exclusions, "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."

Fiscal Year

Any 12-month accounting period. The fiscal year for the federal government begins on October 1 and ends on September 30 of the following year; it is named after the calendar year in which it ends.

Futures Contract

An agreement to purchase or sell a commodity for delivery in the future: (1) at a price that is determined at the initiation of the contract; (2) that obligates each party to the contract to fulfill the contract at the specified price; (3) that is used to assume or shift price risk; and (4) that may be satisfied by delivery or offset.

Government-Sponsored Enterprise (GSE)

A corporate entity with a federal charter authorized by law, but which is a privately owned financial institution. Examples include the Federal National Mortgage Association (Fannie Mae) and the Federal Home Loan Mortgage Corporation (Freddie Mac).

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Gross Domestic Product (GDP)

The broadest measure of aggregate economic activity, measuring the total value of all final goods and services produced within a country's borders during a specific period.

Gross Notional Exposure (GNE)

The sum of the absolute values of long and short notional amounts. The "notional" amount of a derivative contract is the amount used to calculate payments due on that contract, just as the face amount of a bond is used to calculate coupon payments.

Initial Margin

Collateral that is collected to cover potential changes in the value of each participant's position (that is, potential future exposure) over the appropriate closeout period in the event the participant defaults.

Interest Rate Swap

A derivative contract in which two parties swap interest rate cash flows on a periodic basis, referencing a specified notional amount for a fixed term. Typically, one party will pay a predetermined fixed rate while the other party will pay a short-term variable reference rate which resets at specified intervals.

Intermediate Holding Company (IHC)

A company established or designated by a foreign banking organization (FBO) under the Federal Reserve Board's Regulation YY. Regulation YY requires that an FBO with U.S. non-branch assets of $50 billion or more must hold its entire ownership interest in its U.S. subsidiaries, with certain exclusions, through a U.S. IHC.

Legal Entity Identifier (LEI)

A 20-character alpha-numeric code that connects to key reference information which enables clear and unique identification of legal entities participating in global financial markets. The LEI system is designed to facilitate many financial stability objectives, including improved risk management in firms; better assessment of microprudential and macroprudential risks; expedition of orderly resolution; containment of market abuse and financial fraud; and provision of higher-quality and more accurate financial data.

Leveraged Loan

While numerous definitions of leveraged lending exist throughout the financial services industry, generally a leveraged loan is understood to be a type of loan that is extended to companies that already have considerable amounts of debt and/or have a non-investment grade credit rating or are unrated and/or whose post-financing leverage significantly exceeds industry norms or historical levels.

LIBOR

A rate based on submissions from a panel of banks. LIBOR is intended to reflect the rate at which large, globally-active banks can borrow on an unsecured basis in wholesale markets.

Loan-to-Value Ratio

The ratio of a loan amount to the value of the asset that the loan funds is typically expressed as a percentage. This is a key metric when considering a mortgage's collateralization level.

Margin

In the context of clearing activity, collateral that is collected to protect against current or potential future exposures resulting from market price changes or in the event of a counterparty default.

Money Market Mutual Fund (MMF)

A type of mutual fund which invests in short-term, high-quality, liquid securities such as government bills, CDs, CP, or repos.

Mortgage-Backed Security (MBS)

An asset-backed security backed by a pool of mortgages. Investors in the security receive payments derived from the interest and principal payments on the underlying mortgages.

Mortgage Servicing Company

A company that acts as an agent for mortgage holders by collecting and distributing mortgage cash flows. Mortgage servicers also manage

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defaults, modifications, settlements, foreclosure proceedings, and various notifications to borrowers and investors.

Mortgage Servicing Right (MSR)

The right to service a mortgage loan or a portfolio of mortgage loans.

Municipal Bond

A bond issued by states, cities, counties, local governmental agencies, or certain nongovernment issuers to finance certain general or project-related activities.

Net Asset Value (NAV)

An investment company's total assets minus its total liabilities.

Net Interest Margin (NIM)

Net interest income as a percent of interest-earning assets.

Open Market Operations

The purchase and sale of securities in the open market by a central bank to implement monetary policy.

Operational Resilience

The ability of an entity's personnel, systems, telecommunications networks, activities, or processes to resist, absorb, and recover from or adapt to an incident that may cause harm, destruction, or loss of ability to perform mission-related functions.

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. The most basic examples are an equity call option, which provides the right but not the obligation to buy a block of shares at a fixed price for a fixed period, and an equity put option, which similarly grants the right to sell a block of shares.

Over-the-Counter (OTC)

A method of trading which does not involve a registered exchange. An OTC trade could occur on purely a bilateral basis or could involve some degree of intermediation by a platform that is not required to register as an exchange. An OTC trade could, depending on the market and other circumstances, be centrally cleared or bilaterally cleared. The degree of standardization or customization of documentation of an OTC trade will depend on the whether it is cleared and whether it is traded on a non-exchange platform (and, if so, the type of platform).

Primary Dealer

A financial institution that is a trading counterparty of the FRBNY. Primary dealers are expected to participate in open market operations conducted by the Federal Reserve and to bid on a pro-rata basis in all Treasury auctions at reasonably competitive prices.

Public Debt

All debt issued by Treasury and the Federal Financing Bank, including both debt held by the public and debt held in intergovernmental accounts, such as the Social Security Trust Funds. Not included is debt issued by government agencies other than Treasury.

Qualifying Hedge Fund

A hedge fund advised by a Large Hedge Fund Adviser that has a net asset value (individually or in combination with any feeder funds, parallel funds, and/or dependent parallel managed accounts) of at least $500 million as of the last day of any month in the fiscal quarter immediately preceding the adviser's most recently completed fiscal quarter. Large Hedge Fund Advisers are advisers that have at least $1.5 billion in hedge fund assets under management.

Real Estate Investment Trust (REIT)

An operating company which manages income-producing real estate or real estate-related assets. Certain REITs also operate real estate properties in which they invest. To qualify as a REIT, a company must have three-fourths of its assets and gross income connected to real estate investment and must distribute at least 90 percent of its taxable income to shareholders annually in the form of dividends.

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Repurchase Agreement (Repo)

The sale of a security combined with an agreement to repurchase the security, or a similar security, on a specified future date at a prearranged price. A repo is a secured lending arrangement.

Risk-Weighted Assets (RWAs)

A risk-based concept used as the denominator of risk-based capital ratios (common equity tier 1, tier 1, and total). The total RWAs for an institution are a weighted total asset value calculated from assigned risk categories or modeled analysis. Broadly, total RWAs are determined by calculating RWAs for market risk and operational risk, as applicable, and adding the sum of RWAs for on-balance sheet, off-balance sheet, counterparty, and other credit risks.

Rollover Risk

The risk that as an institution's debt nears maturity, the institution may not be able to refinance the existing debt or may have to refinance at less favorable terms.

Secured Overnight Financing Rate (SOFR)

A broad measure of the cost of borrowing cash overnight collateralized by Treasury securities. The rate is calculated as a volume-weighted median of transaction-level tri-party repo data as well as GCF repo transaction data and data on bilateral Treasury repo transactions.

Securities Lending/Borrowing

The temporary transfer of securities from one party to another for a specified fee and term, in exchange for collateral in the form of cash or securities.

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.

Short-term Wholesale Funding

Short-term funding instruments not covered by deposit insurance which are typically issued to institutional investors. Examples include large checkable and time deposits, brokered CDs, CP, Federal Home Loan Bank borrowings, and repos.

Stablecoins

Digital assets that purport to maintain a stable value relative to a national currency or other reference asset or assets.

Swap

An exchange of cash flows with defined terms and over a fixed period, agreed upon by two parties. A swap contract may reference underlying financial products across various asset classes including interest rates, credit, equities, commodities, and FX.

Swap Data Repository (SDR)

A person that collects and maintains information or records with respect to transactions or positions in, or the terms and conditions of, swaps entered into by third parties for the purpose of providing a centralized recordkeeping facility for swaps. In certain jurisdictions, SDRs are referred to as trade repositories. The Committee on Payments and Settlement Systems and IOSCO describe a trade repository as "an entity that maintains a centralized electronic record (database) of transaction data."

Swap Dealer (SD)

Section 1a(49) of the Commodity Exchange Act defines the term "swap dealer" (SD) to include any person who: (1) holds itself out as a dealer in swaps; (2) makes a market in swaps; (3) regularly enters into swaps with counterparties as an ordinary course of business for its own account; or (4) engages in any activity causing the person to be commonly known in the trade as a dealer or market maker in swaps.

Syndicated Loan

A loan to a commercial borrower in which financing provided by a group of lenders. The loan package may have a revolving portion, a term portion, or both.

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Tri-Party Repo

A repo in which a clearing bank acts as third-party agent to provide collateral management services and to facilitate the exchange of cash against collateral between the two counterparties.

Underwriting Standards

Terms, conditions, and criteria used to determine the extension of credit in the form of a loan or bond.

Variation Margin

Funds that are collected and paid out to reflect current exposures resulting from actual changes in market prices.

VIX (Chicago Board Options Exchange Market Volatility Index)

A standard measure of market expectations of short-term volatility based on S&P equity index option prices.

Yield Curve

A graphical representation of the relationship between bond yields and their respective maturities.

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44 Limited data disclosures make it difficult to quantify the size or the use of these contracts. According to recent reports, some of the largest funds such as California Public Employees' Retirement System (CALPERS) and Teacher Retirement System of Texas, now allow limited borrowing against assets to meet their expected rate of return targets Rabouin, Dion, and Heather Gillers. 2022. "Pension Funds Plunge Into Riskier Bets—Just as Markets Are Struggling." Wall Street Journal, June 26, 2022. https://www.wsj.com/articles/pension-funds-plunge-into-riskier-betsjust-as-markets-are-struggling-11656274270.

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46 Industry reports state that the overall size of the LDI market in the U.S is between $1.2 - $1.9 trillion dollars (for all clients). According to preliminary data from eVestment, about half of these products are bought by corporate sponsors and involved long bond portfolios.

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