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August 2020

TECHNICAL NOTE—RISK ANALYSIS AND STRESS TESTING THE FINANCIAL SECTOR

This Technical Note on Risk Analysis and Stress Testing the Financial Sector for the United States FSAP was prepared by a staff team of the International Monetary Fund as background documentation for the periodic consultation with the member country. It is based on the information available at the time it was completed in July 17, 2020.

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July 17, 2020

TECHNICAL NOTE

RISK ANALYSIS AND STRESS TESTING THE FINANCIAL SECTOR

Prepared By
Monetary and Capital Markets Department

This Technical Note was prepared in the context of an IMF Financial Sector Assessment Program (FSAP) mission in the United States held during February–March 2020 led by Ms. Michaela Erbenová. It has been factually updated to incorporate COVID-19-related events in March and April 2020. It contains technical analysis and detailed information underpinning the FSAP's findings and recommendations. Further information on the FSAP program can be found at http://www.imf.org/external/np/fsap/fssa.aspx

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Glossary

ABS	Asset-Backed Security
AE	Asset Encumbrance
AFS	Available-for-Sale
AR	Auto Regressive term
BBB	BBB Rating class
BHCs	Bank Holding Companies
BIS	Bank of International Settlement
BNY Mellon	Bank of New York Mellon
BPs	Basis Points
CAR	Capital Adequacy Ratio
CB	Central Bank
CBC	Counterbalancing Capacity
CBOE	Chicago Board Options Exchange
CCB	Capital Conservation Buffer
CCP	Central Clearing Counterparty
CET1	Core Equity Tier 1
CLASS	Capital and Loss Assessment under Stress Scenarios
CLO	Collateralized Loan Obligations
CMO	Collateralized Mortgage Obligation
CoVaR	Conditional Value at Risk
CRD IV	Capital Requirements Directive IV
CRR	Capital Requirements Regulation
CUSIP	Committee on Uniform Securities Identification Procedures
C&I	Commercial and Industrial
DFAST/CCAR	Dodd-Frank Act Stress Tests/Comprehensive Capital Analysis and Review
DSGE	Dynamic Stochastic General Equilibrium
EaD	Exposure at Default
EA	Exposure Amount
ECB	European Central Bank
EDFs	Expected Default Frequencies
EM	Emerging Market
ES	Expected Shortfall
ETFs	Exchange Traded Funds
FCI	Financial Conditions Index
Fed	Federal Reserve System
FFIEC	Federal Financial Institutions Examination Council
FI	Financial Institution
FINRA	Financial Industry Regulatory Authority
FRB	Board of Governors of the Federal Reserve System

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FR-Y	Federal Reserve report form
FSAP	Financial Sector Assessment Program
GAAP	Generally Accepted Accounting Principles
GaR	Growth at Risk
GAS	Global Assumptions
GDP	Gross Domestic Product
GFC	Global Financial Crisis
GFM	Global Macrofinancial Model
GSE	Government-Sponsored Enterprise
G-SIB	Global Systemically Important Bank
G-SIFI	Global Systemically Important Financial Institution
GVD	Generalized Forecast-Error Variance Decomposition
HTM	Held-to-Maturity
HY	High-Yield
HQLA	High-Quality Liquid Assets
ICI	Investment Company Institute
ICPF	Insurance Companies and Pension Funds
IHC	Intermediate Holding Company
IMF	International Monetary Fund
IRB	Internal Rating-Based Approach
IT	Information Technology
LCR	Liquidity Coverage Ratio
LEI	Legal Entity Identifier
LGD	Loss-Given Default
LMTs	Liquidity Management Tools
MASS	Macrofinancial System Simulator
MBS	Mortgage-Backed Securities
MF	Mutual Fund
MMF	Money Market Fund
NAIC	National Association of Insurance Commissioners
NAV	Net Asset Value
NPL	Nonperforming Loan
N-PORT	Portfolio Investments Report
Non-GSIB	Non-Global Systemically Important Banks
OFR	Office of Financial Research
OTC	Over-the-Counter
PD	Probability of Default
PI	Price Impact Measure
PiT	Point in Time
PPML	Pseudo-Maximum Likelihood
PPNR	Pre-Provision Net Revenue
P&C	Property & Casualty
RBC	Risk-Based Capital

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RCR	Redemption Coverage Ratio
RWAs	Risk-Weighted Assets
SEC	Securities and Exchange Commission
SFTs	Securities financing transactions
SNL	S&P Global Market Intelligence (formally known as SNL)
SSM	Single Supervisory Mechanism
ST	Stress Test
STA	Standardized Approach [to capital requirements]
SVAR	Structural VAR
TBA	To-Be-Announced securities
TD	Top-Down
TRACE	Trade Reporting and Compliance Engine
TTC	Through-the-Cycle
U.S.	United States
UST	United States Department of the Treasury
U.K.	United Kingdom
VA	Variable Annuities
VAR	Vector Auto-Regression
VIX	CBOE Volatility Index
WEO	World Economic Outlook

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EXECUTIVE SUMMARY[1]

The U.S. financial system is very large, well-diversified, and home to numerous financial institutions which are significant at a global scale. Eight Global Systemically Important Banks (G-SIBs) are incorporated in the U.S., as well as several other large financial institutions, such as asset managers, insurers, and money market funds. Assets of the financial system amounted to about US$100 trillion at end-2019 and accounted for 500 percent of GDP. While the eight G-SIBs dominate the U.S. banking landscape, banking system assets represent only about 22 percent of total financial system assets. The systemic risk assessment (including stress testing) of this FSAP reflect the highly diversified nature of the U.S. financial system and focuses on banks, mutual and money market funds, insurance companies as well as cross-institutional and cross-sectoral linkages and exposures.

The U.S. financial landscape has experienced significant transformation since the global financial crisis as financial intermediation and concomitant risks increasingly shift to non-bank financial institutions. Banking regulation and supervision have been overhauled and large banks have strengthened their capital and liquidity buffers. The financial sector has seen significant deleveraging, with the sector's indebtedness falling from 125 percent of GDP at the height of the Global Financial Crisis (GFC) to about 77 percent currently. This process was accompanied by the growing role played by the non-bank financial intermediaries. These institutions are supplying a significant proportion of credit to the economy as well as providing liquidity transformation. Many of these intermediaries provide funding to households and nonfinancial corporates. Funding provided by the non-banks is growing faster than funding provided by depositary institutions. At the same time, non-bank intermediaries often depend on banks for liquidity and short-term funding.

The FSAP was conducted and this note was largely written prior to the pandemic onset and did not assess the impact of the shock and effectiveness of policy measures to mitigate that impact. Reflecting post-mission developments, baseline economic growth projections have been significantly revised downward in the April 2020 WEO and subsequently in the June 2020 WEO Update. The U.S. authorities implemented urgent measures to address health concerns, to safeguard economic and financial stability and to prevent adverse macrofinancial feedback loops. Nevertheless, the FSAP's risk analysis remains broadly relevant. The data cut-off point for this note was Q3 2019, except for the interconnectedness and liquidity analysis performed in March 2020 and the banking sector solvency stress test that relies on Q1 2020 data and June 2020 economic forecasts.

For the past few years, corporate leverage was on the rise, especially among a growing number of highly leveraged firms, while household indebtedness has fallen substantially. Total business sector debt stood at about US$16 trillion (75 percent of GDP) at the end of 2019, with

[1] The work on the technical note was carried out between October 2019 and March 10, 2020, ahead of significant market disruptions caused by the spread of a new public health risk (COVID-19). The work was overseen by Peter Breuer and the authors are Carlos Caceres, Mindaugas Leika, Fabian Lipinsky, Dulani Seneviratne, Eva Yu (all IMF), and Antoine Bouveret, and Timo Broszeit (external consultants).

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corporate sector debt (comprising corporate bond debt and bank loans) accounting for about two thirds. Easy financial conditions and the search for yield have been accompanied by a rapid increase in 'leveraged finance' to about 7 percent of total business sector debt—issuance of syndicated loans or non-investment grade bonds by highly-leveraged companies and related structured products, such as Collateralized Loan Obligations (CLOs). This segment has seen a rise in issuance with less covenant protections, and the solid performance of leveraged loans in recent years—characterized by low default rates—is being challenged by developments following the COVID-19 outbreak. Many nonfinancial firms remain vulnerable to changes in the availability and cost of funding and will likely face pressures from falling revenues due to the dual COVID-19 outbreak and oil price shock, most notably the energy sector. In contrast, households entered the crisis on a stronger footing. Total household debt declined from close to 100 percent of GDP at the onset of the crisis to about 75 percent currently. The reduction in indebtedness—and mortgage debt in particular—has been widespread across all income groups, with a large portion of new mortgage loans accruing to relatively high quality borrowers. Nevertheless, rising unemployment and faltering income will put pressure on households debt servicing capacity, particularly those working in hardest hit sectors (leisure, hospitality, transportation services), many of which tend to be relatively low-wage earners.

Risks could be spread through sizeable domestic exposures among banks and non-bank financial institutions, though links with foreign economies are relatively small. Intra-financial system interconnectedness analysis reveals that banks provide significant short-term funding to non-bank financial institutions, households and corporates. Unused credit lines and other funding commitments provided by banks constitute about 15 percent of intra-financial system exposures. At the same time, the U.S. banking system's average capital impairment due to their exposure to foreign banking systems could be as low as 2 percent of regulatory capital. The U.S. banking system, however, has substantial interconnections with global financial markets including foreign banks.

Outward spillover risk is mitigated by large banks' solid capital and liquidity buffers, which help to withstand severe economic and funding distress. Banks entered the COVID-19 outbreak well prepared: with substantial capital and liquidity buffers and ability to expand balance sheets to support the real sector. The systemwide Common Equity Tier 1 capital ratio (CET1) before the COVID-19 crisis was 12 percent on average and liquidity (LCR) ratios above 100 percent. Adding to this, banks are subject to a less procyclical (compared to the Internal Ratings Based approach) standardized approach to capital adequacy requirement calculation. In the baseline scenario, which follows the June 2020 WEO update, capitalization levels decline, but all G-SIBs stand above the regulatory minima. In the medium to long term (3 to 5 years), declines in interest rates and intensified pressure from the non-bank financial sector, especially Fintech firms, could lead to a compression of interest margins and loss in revenue from fees and commissions. To capture uncertainty related to the time profile and other specifics of the COVID-19 shock, the FSAP simulated multiple adverse sensitivity scenarios in conjunction with the baseline scenario. In the baseline scenario, industry-wide CET1 ratios decline by 390 basis points on average, reaching their lowest point after 2 years of stress. Smaller, non-G-SIB banks experience the largest impact. If the recovery is as fast as projected in the baseline scenario, the impact on CET1 ratios by the end of the 5-year horizon would be 50 basis points. The declines in the systemwide CET1 ratio in the outer

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years are mostly driven by a decline in net interest income due to compressed margins. In the adverse sensitivity scenario, which assumes an additional month of containment measures, median capitalization at the lowest point of the horizon is 7.6 percent, which is lower than the CET1 ratio under the baseline by 190 basis points. In the case of a more severe recession, such as a second wave of infection and subsequent contagion measures, the impact on the systemwide CET1 ratio at its lowest point would be 450 basis points compared to the baseline and 630 basis points compared to the median CET1 ratio at Q1 2020. Nevertheless, all G-SIBs would maintain CET1 ratios above the minimum regulatory requirements.

Interconnectedness analysis indicates that G-SIBs' exposure to each other's solvency and liquidity stress can be contained, but vulnerabilities in Non-Global Systemically Important Banks (Non-GSIBs) tend to increase. Illiquidity or default of a G-SIBs would affect other banks via counterparty losses, liquidity shocks and asset fire-sales. A joint IMF-FRB analysis indicates that these effects are relatively small within the group of 6 G-SIBs. However, vulnerabilities in smaller banks could increase as they ramp-up risk taking and reduce liquidity buffers in the context of recent regulatory relief. The stress test results indicate that in times of market shocks these banks may struggle to provide liquidity to customers.

Corporate sector stress could have a considerable impact on the non-bank financial sector and a moderate impact on banks. A large proportion of corporate sector debt resides outside of the banking sector,[2] including in insurance companies, mutual funds, pension funds, and foreign investors. Over half of leveraged loans outstanding are owned by CLOs, which are in turn held by a wide range of investors, with banks mainly holding the AAA-rated tranches. Stress in the corporate sector would result in significant losses in the non-bank financial sector, especially holders of equity tranches, resulting in some funding redemption pressures for open-ended funds, albeit fire-sales channel would be contained by the contractual structure of CLOs funds. Even in such a scenario, marked-to-market losses would be contained, with the impact on banks being moderate by virtue of their limited direct exposure.

Mutual funds stress tests conducted by IMF staff indicate that most funds would be able to withstand severe redemption shocks, but high yield and loan mutual funds would face significant shortfalls. More than 90 percent of funds (measured by assets under management) would have enough highly liquid assets to meet investors' redemption. However, funds exposed to high yield and leveraged loans would need to sell less liquid securities in their portfolio, (assuming that they do not use any liquidity risk management tools), potentially giving rise to fire sale dynamics. Funds with large exposures to derivatives could face liquidity demands related to variation margins depending on market conditions. Sensitivity analysis shows that potential variation margin calls could be higher than their liquid assets, increasing the potential risk of forced sales.

While the insurance sector appears resilient to a severe market shock, its profitability is vulnerable in a scenario of continued low interest rates and rising corporate defaults. The

[2] Banks' exposure to the corporate sector is largely through commercial and industrial (C&I) loans.

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stress test covered more than 70 percent of the life and non-life market by assets and included smaller, regionally concentrated non-life firms. A materialization of the adverse scenario would have a substantial balance sheet impact, especially in the life sector, stemming from impairments on shares, non-investment grade debt, and other investment assets. While current buffers as well as the valuation and solvency regime would prevent major disruptions, persistently low interest rates are expected to further erode profitability of life insurers. In turn, a large interest rate hike, triggering a mass lapse and large cash outflows from the life sector, would affect insurers very heterogeneously: some insurers would need to liquidate only small amounts of Treasury bonds, but a few would have to liquidate larger amounts of assets, including potentially less liquid corporate bonds.

Climate related risks would have a relatively contained impact on the financial system in the near term, but some companies and segments, like insurers, municipal bond market would be affected more. A very severe hurricane (expected to occur every 250 years) would have a major impact on companies and households in affected regions, but large and diversified non-life insurers would have enough capital to pay out compensations. Several smaller and more regionally concentrated insurers would face capital shortfalls. Overall impact estimates fall under a wide range considering increased probabilities of extreme weather events and potential damages. Further impact may come from insurers leaving affected regions, a deterioration of income of affected municipalities and a negative impact on municipal bond market.

While the U.S. financial system's resilience is strengthened by diversified sources of credit to the economy, the potential system-wide impact of valuation losses of corporate debt securities and leveraged loans is not easily quantifiable and may be non-negligible. The migration of activities from well-regulated, public and transparent financial institutions, such as banks, towards more opaque, private and unsupervised entities creates challenges for the identification and assessment of systemic risks. Public data is scarce on exposures of regulated financial institutions as well as the ultimate risk holders of leveraged loans and associated securitization vehicles. Greater transparency about those exposures would strengthen market discipline and allow for constant assessment of systemic risk. Results of a system-wide interconnectedness stress test confirm that some corporate bond mutual funds and insurers may have considerable direct losses in the scenario of distress in corporate debt markets. Banks, however, would experience smaller losses because of their limited exposure to the sector, except for potentially higher credit line drawdowns by corporates and non-bank financial institutions.

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INTRODUCTION

A. Objective

1. The objective of the risk analysis component of the FSAP is to identify macrofinancial vulnerabilities. The analysis identifies and quantifies risks which could potentially lead to severe disruptions in the provision of financial services in the U.S., including international spillovers via U.S. financial companies' exposures abroad.

2. The approach to the systemic risk assessment reflects the high degree of complexity and cross-sectoral interconnectedness of the U.S. financial sector.[3] The FSAP team analyzed links among banks, insurers and asset management industry, as well as characteristics of financial companies' exposures, and different business models, such as global diversification. Holdings of similar securities, exposures to specific asset classes (such as collateralized loan obligations, asset backed securities) were considered in designing the stress test methodology as well as the scenarios.

3. A comprehensive set of risk analyses and stress tests was conducted to assess the resilience of the U.S. financial system and shed light on linkages and potential risks and vulnerabilities. The assessment is based on multiple individual stress tests, which simulate the financial health of banks, mutual funds, and insurers under severe yet plausible (counterfactual) adverse scenarios and various sensitivity tests. The stress tests are largely independent but linked via scenarios where possible.[4] Scenarios include global and regional financial market stress (shocks to term and risk premiums and resulting asset price corrections) and a major slowdown of economic activity. This risk analysis relies on models and approaches designed by the FSAP team for solvency (banks, insurance companies), liquidity (banks, mutual, money market funds) and solvency-liquidity feedback analysis (fire-sales of assets across the financial sector). The approach is thus different form the ones employed by the U.S. regulatory agencies.

4. This note provides a comprehensive overview of all qualitative and quantitative work done by the U.S. FSAP Systemic Risk team. The note is structured as follows: The first section describes key structural features of the U.S. financial system, including interlinkages within domestic sectors and foreign jurisdictions. The second section analyzes key risks and vulnerabilities. Scenarios provide qualitative assessment of risks and quantification of shocks. The following sections discuss the impact of potential shocks on nonfinancial corporates, banks, insurers, mutual and money market funds. The note concludes with a systemic risk overview and an analysis of interconnectedness across various parts of financial system. The appendices provide further technical and analytical details of some of the approaches and models developed.

[3] We only refer to consolidated banking groups at the level of bank holding companies referred as banks in this note.

[4] Rapid developments during the COVID-19 crisis prevented updating all individual stress tests with the new scenarios.

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B. Stress Testing Work Done by the Authorities

5. The Federal Reserve supervisory stress tests project the impact of the macroeconomic scenarios on banks' capital position and income using granular models and confidential supervisory data. By contrast, the FSAP stress test are broader and focus on system-wide risks. For banks, the FSAP stress test is a top-down exercise mostly relying on public and non-confidential data as well as scenarios generated by in-house models developed by the FSAP team.[5] Relative to the Federal Reserve's regulatory stress test (CCAR/DFAST), while both the FSAP and the Federal Reserve scenarios broadly share a consistent narrative of risks, they differ in terms of the granularity of data inputs, the calibration of the various shocks and models used. Hence, the Federal Reserve and IMF top-down stress test bank solvency stress testing results are not directly comparable. Stress Testing Matrix (Appendix I) provides further details about FSAP Stress Testing models and assumptions.

6. Mutual funds are not subject to stress testing requirements (with the exception of Money Market Funds) by their managers or by the SEC. Recently, the SEC has proposed that funds using derivatives would be required to perform stress tests.

7. While U.S. authorities perform and are developing a variety of stress tests and analyses, they do not regularly conduct macrofinancial stress tests for the insurance sector. As part of the solvency regime, companies are required to calculate the impact of various natural disasters, and to conduct various sensitivity analyses for their interest rate risks (liability adequacy test). The NAIC is currently developing a liquidity stress test which is expected to be applicable to certain large insurance companies at end-2021. A few state supervisors, e.g., California, have conducted climate-related stress tests, also looking into the transitional risk of carbon-intense investments. Furthermore, the NAIC conducts market-wide exposure studies for various asset classes, e.g., CLOs, on an ad-hoc basis.

C. Risk Analysis and Stress Testing under the U.S. FSAP Program

8. The risk analysis covers multiple types of financial institutions and places strong emphasis on domestic and foreign exposures-based interconnectedness. Risk analysis conducted a battery of stress tests of banks (34 largest institutions), insurance companies (53 large groups and 17 medium-sized and smaller regional insurers), mutual funds (about 2,000 largest players) and selected money market funds (208). The selection is based on the size of banks (assets more than USD 100 billion)[6] and insurers (the insurance stress test aimed at a coverage of at least 70 percent of the life and the non-life sectors, comparable to most recent FSAPs also with the aim of having representative sample across different types of insurers).[7] Mutual fund stress tests included

[5] Following common practice in FSAPs, the baseline scenario follows the projections published in the IMF's *June 2020 World Economic Outlook (WEO) Update*.
[6] 33 banks with assets above USD 100 billion and one bank with assets close to 100 billion.
[7] The inclusion of smaller property & casualty insurers was motivated by concerns about regionally concentrated companies and their exposure to natural disasters.

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all fixed income and mixed mutual funds covered by Morningstar. Interconnectedness and systemic risk analysis links stand-alone stress tests. Common exposures and simulated asset fire-sales provide system-wide stressed loss estimates. The exercise gauges the level of resilience of the financial system against simulated severe yet plausible macro and financial shocks.

9. Like in other FSAPs in large advanced economies, the IMF scenario design is based on multiple approaches and severity benchmarks. The FSAP team used WEO baseline projections, which included assumptions about duration and severity of COVID-19 crisis, inference about severity from 2019 DFAST/CCAR scenarios, and the 2008–2009 Global Financial Crisis (GFC).

10. Analytical approaches in FSAP risk analysis are divided into multiple blocks (Figure 1). The risk analysis covers solvency of banks and insurers, limited (because of data availability) liquidity analysis of banks and mutual and money market funds. Sectoral risk assessment, scenario design and interconnectedness provide an envelope for linking various risks together. Systemic risk analysis relies on a set of models developed by FSAP team.

11. This technical note reflects discussions, presentations and consultations with the authorities, private sector and data sources available to the team. Some analyses (banking sector interconnectedness) were undertaken in close collaboration with the FRB staff to preserve confidentiality of the underlying input data based on supervisory reports. The analysis is nevertheless the IMF's work product and does not reflect the views of the U.S. regulators.

12. The FSAP team used various public and commercial data sources to perform the analysis and cooperated with the FRB on banking sector interconnectedness and liquidity analysis. Full-fledged market and liquidity risk analysis of banks and mutual funds typically requires access to supervisory data. The U.S. regulatory agencies require supervised and regulated institutions to publish large amounts of data which otherwise are considered confidential in many other jurisdictions. This enabled the FSAP team to perform analysis of banks, mutual and money market funds using public data. The results need to be interpreted with caution, however, as the FSAP team was unable to conduct a granular stress test of trading books which considers issues such as portfolio hedges and short positions, and also incorporates potential changes in banks' balance sheets. Insurance stress testing was based on confidential supervisory data. Liquidity stress test of banks are based on public 30-day Liquidity Coverage Ratio (LCR) disclosure templates and omits other time horizons, namely 1 day, 5 days, or 3 months typically employed in other systemic jurisdictions.[8] Structural liquidity risk analysis did not elaborate on Asset Encumbrance because such data were not available.

[8] Except for liquidity risks for six G-SIBs for which the test was performed by the FRB using supervisory data.

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Figure 1. United States: FSAP Systemic Risk Assessment Framework

Source: IMF staff.

FINANCIAL SYSTEM: RISKS AND VULNERABILITIES

A. Financial System Structure and Performance

The U.S. Financial System: An Overview

13. The U.S. financial sector is one of the largest and most complex financial systems in the world (Figure 2). The size of the financial system surpassed US$100 trillion in 2019 and amounts to about five times the U.S. nominal GDP. The U.S. banking sector is one of the largest in the world, although private depository corporations account for about 20 percent of the financial system reflecting the deep and liquid capital markets. Pension funds, MMFs and mutual funds, and insurance industries are also sizable. The mutual funds sector, which encountered a sharp decline in its balance sheet size during the GFC, has now surpassed its pre-crisis peak reaching 16 percent of the financial sector share as of 2019 (Appendix Figures VII.1–3).

14. The U.S. financial system is well diversified: it allocates savings, investments and provides capital through a vast number of financial institutions and instruments. Diversification creates resilience against sudden stop of credit flow via one type of institution (e.g., banks). Capital is allocated via deep and liquid capital markets with equity market capitalization above US$50 trillion (as of 2019) and sizable debt securities markets in addition to loans and deposits. Financial instruments also include personal investment products such as pension entitlements, with assets about US$30 trillion. Mortgages—home, multi-family residential, commercial, and farm mortgages—also remain sizable at about US$15 trillion as of 2019.

15. The systemic importance of the U.S. financial system remains high in the global financial landscape, in part owing to the safe heaven assets and the strength of the U.S. dollar. The demand for safe heaven assets from global investors remained high against the backdrop of external vulnerabilities. For instance, the average daily trading volume of U.S. Treasury

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securities grew by 10 percent year-over-year in 2019, reaching nearly US$600 billion per day on average. Overall, the portfolio investment position of foreign residents on the U.S. amounted to above US$20 trillion in 2019, while U.S. residents' portfolio investment position in the rest of the world was over US$12 trillion. Owing to the reserve currency status of the U.S. dollar in the global trade and financial landscape, financial institutions including foreign-owned entities carry-out lending in U.S. dollars and participate in U.S. dollar funding markets as well as rely on foreign exchange swaps vis-à-vis the U.S. dollar. The share of dollar-denominated cross-border claims amounted to about 50 percent of global banks' total cross-border claims in 2019. Foreign-owned banks maintain dollar-denominated cross-border claims over US$12 trillion, amounting to about 10 percent of their cross-border claims on average (October 2019 GFSR Chapter 5).

Figure 2. United States: Financial Sector

Size of the Financial Sector
(As of end-2018)

Sources: FRB, Flow of Funds; Haver Analytics.

Size of the Banking Sector
(As of end-2018)

Sources: FRB, Flow of Funds; Haver Analytics.

Financial Instruments in the U.S.
(In trillions of U.S. dollars; as of 2019Q3)

Source: FRB, Flow of Funds.

Financial Sector Asset Growth and the Share Held by the Rest of the World
(In percent)

Sources: FRB, Flow of Funds; Haver Analytics.

Banking Sector

16. The U.S. banking system has grown in size, even as banks consolidated over time. The system has undergone numerous mergers and acquisitions in addition to a few bank failures,

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bringing down the number of banks operating in the system to less than 5,000 from over 10,000 that existed at the end of the last millennium. The U.S. banking system is now dominated by 34 large bank/intermediate holding companies (BHCs/IHCs)[9] with consolidated assets over US$100 billion each, accounting for nearly 80 percent of U.S. banking system assets. The banking system is home to eight globally systemically important banks (G-SIBs), that hold more than 50 percent of banking system assets. The list of 34 banks also includes 12 large intermediate holding companies (IHC) (i.e., foreign-owned). Four IHCs among these are classified as *large and complex* when combined with their branch operations and are supervised under the Federal Reserve's Large Institution Supervision Coordinating Committee (LISCC) along with the eight G-SIBs. The rest of the holding companies among the 34 are domestically owned large entities, termed "Non-Global Systemically Important Banks" (Non-GSIBs) for the purposes of this note.

17. Assets of the largest BHCs in the stress testing sample have increased by 23 percent since the 2015 U.S. FSAP. While the total contribution of the banking sector towards credit provision to corporate and household sectors is falling in relative terms, the largest contributing factor for the growth in their assets (10 percent) is net loans and leases. Net loans and leases are also the largest component of banks' balance sheets (40 percent of total assets). Growth in trading assets and remaining non-tradeable securities portfolios was more modest. Highly liquid federal funds assets and reverse repos, account nearly 12 percent of total assets. The search for yield contributed for the decline in the share of cash and balances with the central banks, which accounted for 12 percent of the balance sheet during the previous FSAP, but now accounts for only 8 percent.[10]

18. Loans outstanding have increased steadily by 26 percent since the last FSAP, owing to the robust growth in commercial and industrial (C&I) and commercial real estate (CRE) categories. Real estate loans remain the largest component in banks' loan book at 35 percent of total loans, contributing 5 percent towards the total loan growth. The second largest loan component, C&I, accounts for 24 percent of total loans, contributing 8 percent to the overall loan growth. While the underwriting standards for loans in this category has slightly tightened in 2019, growth in some C&I loan subcategories such as leverage loans experienced decline in covenants. Credit card-related loans, which have the highest loss rate, account for 11 percent of the total loan

[9] These 34 institutions broadly align with, but do not exactly match, the set of domestic bank holding companies and intermediate holding companies listed in the October 2019 FRB-OCC-FDIC final rule on tailoring: https://www.federalreserve.gov/aboutthefed/boardmeetings/files/tailoring-rule-visual-20191010.pdf. See also Appendix V, Table V.1., for a listing of the 34 banks included in this FSAP's stress testing analysis.

[10] See Appendix Figures IV.4–IV.7 for banking sector performance.

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portfolio. Automobile loans and other consumer loan categories account for 10 percent of the loan portfolio.

19. Banks' funding to a large extent remains domestic and the share of stable funding increased. Liabilities of the largest banks increased, mostly due to the growth in domestic deposits which account for 52 percent of the total liabilities. Growth in deposits have allowed to keep unsecured wholesale funding growth (captured through other borrowed funds) contained. Other borrowed funds still account for 15 percent of total assets. Federal funds and repos also account for nearly 9 percent of the total liabilities and have contributed nearly 3 percent to the growth in total liabilities.

20. Banks maintained robust levels of capital, with the CET1 ratio doubling compared to pre-GFC levels and reaching 12 percent at the aggregate level as of 2019Q3. The increase in CET1 is mostly attributed to the steady growth in retained earnings, amidst higher risk weighted asset levels banks are required to maintain. Significant disparities in CET1 ratios, however, exist among banks, where most IHCs record significantly higher CET1 ratios compared to domestic banks in the sample. The leverage ratio (i.e., Tier1 capital-to-assets) also increased significantly since the pre-crisis levels, reaching about 8.7 percent as of 2019:Q3.

21. Off-balance sheet exposures relative to the size of the balance sheet have declined by a factor of about three since 2009 mainly due to lower derivatives positions, but credit line commitments remained stable as of 2019 (Appendix VII). Total gross off-balance sheet activities accounted for about 110 percent of total assets in 2019. Both, credit derivatives purchased and sold have significantly declined since the crisis from over 100 percent to low double-digit levels.[11] Unused credit line commitments relative to balance sheet size remain above 40 percent and are the largest off-balance sheet exposure category (see Appendix VII Figure 4)[12]. Increase in credit line utilization by corporates and households is expected during economic downturns, hence banks need to have adequate liquid assets to be able to meet those financing commitments without imposing liquidity shocks to the real sector. For instance, based on 8-k filings, credit line utilization between March-mid April 2020 had surpassed $200 billion.

22. Asset quality of the bank holding companies has improved significantly since the GFC, while underwriting standards for most loan categories show a slight tightening in 2019. Non-

[11] The decline was to a large extent driven by migration of derivatives to Central Clearing Counterparties (CCP), which allowed banks to net exposure against CCP.

[12] Rest of the off-balance sheet exposures include credit derivatives purchased (16 percent at of 2019:Q3), credit derivatives sold (14 percent), spot foreign exchange contracts (12 percent), securities lent (9 percent), securities borrowed (7 percent), and letters of credit and guarantees (4 percent).

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performing loans (NPLs) of the 35 largest BHCs have substantially declined reaching the lowest levels seen. The NPLs-to-gross loan ratio for delinquencies longer than 90 days fell below 1 percent in 2019. Past due loans of 30 to 89 days also depict similar trends. Moreover, BHCs maintain ample reserves against NPLs, with the reserve-coverage-ratio (i.e., allowances for reserves over the stock of NPLs) steadily increasing in recent years. NPL ratios by loan category reveal relatively higher NPL ratios related to residential real estate loans, albeit the asset quality of this category has significantly improved since the crisis. On the contrary, NPLs on consumer loans show a slight uptick in recent years, calling for continued vigilance in maintaining asset quality.

23. Large banks continue to maintain sound profitability levels, including when compared internationally, owing to favorable macroeconomic conditions. Banks have maintained robust levels of interest income amidst the low interest rate environment and have maintained healthy levels of non-interest income. While non-interest expenses have risen since the crisis, provisions have declined since then. A major contributing factor for the latter is the significantly lower levels of net charge-off levels incurred by the largest banks. Moreover, a sharp rise in profitability was recorded starting 2018 due to the reduction in the corporate tax rate in late 2017, by increasing the return on equity (ROE) of these large banks by about 4 percentage points on average. However, significant dispersion in profitability across banks exists, with foreign banks on average recording lower profitability ratios. Overall, sound profitability conditions have enabled the U.S. banks to maintain regulatory capital levels that are twice as high as the pre-GFC levels.

Mutual and Money Market Funds Sector

24. Fixed income and mixed funds play a significant role in credit intermediation and liquidity transformation. Funds invest in a range of asset classes, including corporate bonds and leveraged loans, thereby providing financing to the real economy. Mutual funds hold more than 15 percent of all U.S. corporate bonds outstanding and about 10 percent of leveraged loans. At the same time, mutual funds play a key role in liquidity transformation by offering daily liquidity to investors.

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25. Some mutual funds can be exposed to a liquidity mismatch. While the liquidity of funds' holdings vary, all mutual funds offer daily redemptions to investors. Funds that are significantly invested in potentially less liquid securities, have not effectively managed their liquidity risk and are faced with significant investor redemption demands could be forced to sell assets to meet redemptions. If significant in the aggregate, these sales could contribute to declines in asset prices. For funds using derivatives, liquidity demands can also arise from mark-to-market losses on derivatives exposures, resulting in variation margins. In that context, mutual funds are subject to regulatory requirements related to liquidity risk as well as limits on the use of leverage. Requirements include the need by funds to establish a written liquidity risk management program reasonably designed to assess, manage, and periodically review the fund's liquidity risk, including under reasonably foreseeable stressed conditions, and generally, to maintain a minimum amount of highly liquid assets; and to limit purchases of illiquid assets to 15 percent of the fund's net assets.

26. While most funds make limited use of leverage, some funds have large exposures through the use of derivatives. Under current rules, mutual funds are only allowed to borrow from banks up to 50 percent of their net asset value, resulting in a maximum balance sheet leverage of 1.5x. However, mutual funds can use derivatives for hedging and also to get exposures to underlying markets, which can result in an increase in synthetic leverage (due to the use of derivatives). According to the SEC (2019), about 60 percent of mutual funds do not use derivatives and 20 percent of mutual funds have adjusted notional amounts above 10 percent of NAV. However, some funds rely heavily on the use of derivatives, which could allow the build-up of a high level of synthetic leverage. The SEC reports that about 14 percent of mutual funds have gross exposures above 50 percent of their NAV. Based on commercial data on fixed income and FX derivatives only, some mutual funds report gross leverage more than four times the NAV (Figure 3).

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Figure 3. United States: Mutual Funds' Leverage and Insurers' Asset Allocation

Some funds have large exposures through the use of derivatives

Gross Exposures in Percent of NAV of Selected Funds

Note: Gross leverage(sum of long and short exposures) of selected funds. Data indude only fforeign exchange and fixed income derivatives.
Sources: Morningstar, IMF staff.

42 percent of life insurance sector assets are held in segregated accounts; in the general account, corporate bonds dominate.

Asset Allocation

Bond maturities are longest in life insurance, as can be expected, with 38 percent of bonds having a maturity of 10 years or more.

Bonds: Maturities

More than 90 percent of corporate bonds in each sector have an investment grade rating (NAIC 1 and 2).

Corporate Bonds: Rating Breakdown

Notes: Stress test sample only. Sovereign bonds include sub-sovereigns and government-sponsored entities.
Source: IMF staff calculations based on NAIC data.

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Insurance Sector

27. The U.S. life and health insurance sector is exposed to significant interest rate risks, and has furthermore expanded into less liquid assets. U.S. life insurers actively underwrite long-term annuity products with liability durations exceeding asset durations. The risk-based capital framework includes (mostly factor-based) capital charges associated with asset-liability mismatches. Still, the recent less restrictive stance of the U.S. monetary policy could have a negative impact on life and health insurers with large duration gaps. If long-term interest rates stay low for long, the accounting and solvency positions of life and health insurers would deteriorate gradually but significantly over time.

28. Market risks in life insurance are to a large extent shifted to policyholders in segregated accounts and are rather diversified in the general account (Figure 3, panels 2–4). Segregated accounts represent 42 percent of the life sector's balance sheet. The remainder (general account) comprises corporate and sovereign bonds with 30 percent and 9 percent, respectively. Equity investments play a minor role in the general account, while corporate bonds are the dominant asset class. Most insurers' investments are still liquid, but life insurers are taking on more liquidity risks by allocating 8 percent of total assets to mortgages and being important buyers of CLOs. The asset allocation of the non-life sector appears to be more biased towards equity exposures, however this is mainly driven by very few large outliers. Health insurance is mostly a cash-flow business, so investments are typically very liquid and less risky.

The Interconnectedness Landscape

29. The resilience of the financial system depends on the financial health of individual institutions and the interplay of vulnerabilities through direct and indirect exposures within and between segments of the financial system. These exposures can result in amplification or, mitigation of shock transmission. Understanding contagion risks and channels is thus key to the assessment of systemic risk. In addition to the direct interconnectedness between the financial sector agents such as banks, insurance, pension funds, money market and mutual funds, sectors are indirectly interconnected through exposures to common asset classes, such as corporate bonds, equities, agency and treasury securities markets. The exposures to the common asset classes amplify the risk transmission when vulnerabilities arise in one financial subsector through significant marked-to-market losses.

30. The U.S. financial sector is highly connected with the real economy, where credit provisioning remains well diversified. Relatively large share of financial assets of the domestic financial sector is held by household and corporate sectors, while the largest asset share is held within the financial sector (Figure 4, panel 1). The largest proportion of the financial assets of households is also held by the financial sector followed by the corporate sector. In fact, households' financial assets issued by the financial sector is the largest linkage between any two sectors (see Figure 4 heatmap). Moreover, within the financial sector, non-banks also have large exposures to households. For instance, about two-thirds of the residential real estate loans are held by the non-bank entities (Figure 4, panel 3). Among the 25 largest mortgage originators and servicers, non-

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banks currently originate 51 percent of mortgages and service 47 percent (FSOC annual report, 2019). The non-bank financial sector also plays a pivotal role in corporate sector financing, thus maintaining larger exposure levels vis-à-vis the domestic corporate sector (Figure 4, panel 3).

Figure 4. United States: Macrofinancial Linkages

Heatmap: Cross-Sectoral Exposures

		Liabilities					
		Households and Nonprofit Organizations	Nonfinancial Business	Federal Government	State and Local Governments	Domestic Financial Sectors	Rest of the World
Assets	Households and Nonprofit Organizations						
	Nonfinancial Business						
	Federal Government						
	State and Local Governments						
	Domestic Financial Sectors						
	Rest of the World						

Illustration of Cross-Sectoral Exposures

(In trillions of US dollars)

		Banks	Non-bank Financial Sector
Households	Mortgages	3.2	7.6
	Consumer Credit	2.2	0.6
Businesses	Bonds	0.7	5.9
	Other Loans	2.1	2.8
	CRE and Other Mortgages	2.4	2.1

Sources: FRB, Flow of funds.

Note: Data as of 2018:Q4 except for panel 3 with the illustration (as of 2019:Q3). Panel 1: Node size in reflects the intra-sectoral flow of funds. Edge color in the network map denotes the assets of the sector with the same colored node vis-à-vis the other sector (i.e., liabilities of the other sector). Edge width illustrates the relative size of the linkages between two sectors. Panel 2: Colors in the heatmap are based on the size of the linkages, where red denotes largest linkages and darker shades of green denoting smallest linkages.

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31. Financial subsectors are interconnected through their cross-exposures to numerous financial instruments (Figures 5, 6). The insurance sector held nearly 26 percent of corporate bond, while mutual funds held nearly 17 percent of corporate bonds (Figure 6) as of year-end 2018. In addition, mutual funds and pension funds had over 60 percent and 20 percent of assets invested in equities respectively. Agencies and U.S. Treasury securities combined consist of half of the assets of money market funds balance sheet. From a direct intra-sectoral exposure standpoint, insurance sector has exposure to mutual funds, while mutual funds have exposure to banks through providing short-term funding. Such cross-exposures may amplify the transmission of spillovers through asset fire sales.

Figure 5. United States: Intra-Financial Sector Linkages

Sources: FRB, Flow of funds.
Note: Data as of 2018:Q4. Node size reflects the intra-sectoral flow of funds. Edge color denotes the assets of the sector with the same colored node vis-à-vis the other sector (i.e., liabilities of the other sector). Edge width illustrates the relative size of the linkages between two sectors.

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Figure 6. United States: Intra-Financial Sector Linkages through Common Exposures

Sources: FRB, Flow of funds.
Note: Data as of 2018:Q4. Outer nodes represent sectors, while inner nodes represent asset classes in which the sectoral assets are invested in. The size of the outer nodes reflects the balance sheet size of each sector. Edge color denotes the assets of the sector with the same colored node invested in the respective asset classes. In panel 1, the edge width is proportional to each sector's exposure vis-à-vis the asset class relative to sectoral balance sheet size; in panel 2, the edge width is proportional to each sector's investment in the asset class relative to total investment of the particular asset class.

U.S. Banks Links to Domestic Financial Institutions

32. While the role of banks in providing long-term credit to corporates and households has diminished over time, banks still maintain a key role in distributing liquidity in the U.S. financial system. They offer payment services and liquidity support, other credit lines, hedging services to other banks, non-bank financial institutions. These on and off-balance sheet exposures could propagate shocks during stress times.

33. As expected, the G-SIBs are the key players in domestic financial system. Banks' domestic interconnectedness indicators reveal strong intra-financial system exposures, reflecting the distribution of capital and liquidity within the system. From a systemic standpoint, G-SIBs maintain the largest assets and liabilities positions against the financial system (Figure 7, panel 1). Some of these banks provide specialized custodial, secured lending, settlement services, thus relate to virtually every other financial institution in the system.

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34. Banks have sizable amounts of over-the-counter (OTC) derivatives and unused credit lines that are extended within the domestic financial system. Composition of assets and liabilities reveal significant linkages within the domestic financial system through deposits and OTC derivatives positions (Figure 7, panel 2). About one-half of the liabilities position comes from non-

Figure 7. United States: Banks' Domestic Intra-Financial System Interconnectedness

Banks' Exposures vis-à-vis the Domestic Financial System
(In billions of U.S. dollars)

Composition of Intra-financial System Assets and Liabilities of 35 BHCs

Unused Portion of Committed Lines and Standby LCs Extended to Other Financial Institutions
(In percent of bank's exposure)

Banks' Total Unused Position of Credit Lines vis-a-vis the Financial System
(In billions of U.S. dollars)

Source: FRB, FR Y-15, and IMF staff calculations.
Note: Data as of 2019Q3. The size of the bubbles in panel 1 is based on the total exposure; total exposure includes on-balance sheet exposures, derivatives and repo-style transactions exposures, and other off-balance sheet exposures. Bank names are anonymized.

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bank deposits, while OTC derivatives suggest large positions are held against non-banks.[13] Banks also have sizable amounts of unused credit lines in the network. On aggregate, about 15 percent of the total intra-financial exposures consists of unused credit lines. It is also evident that some banks have unused credit line commitments that are sizable even when measured against their total exposures (Figure 7, panel 3). While banks maintain such sizable unused credit line commitments vis-à-vis the financial system, the amount of unused credit lines obtained from the financial system is only about one-tenth of the amount extended. This suggests that the extended credit lines are mostly against the non-bank financial sector (Figure 7, panel 4). A rapid draw-down in such off-balance sheet commitments during stress episodes increase the potential for contagion.

Cross-Border Interconnectedness of the U.S. Banking Sector[14]

35. Nearly a quarter of the U.S. banking system's consolidated claims are held against foreign borrowers. Consolidated claims based on residency of the ultimate borrowers show some pockets of concentrated exposures. Claims against borrowers in the United Kingdom and Japan stand out with each accounting for about 3 percent of total assets or 35 percent of Tier1 capital of the U.S. banking system, while claims on Germany, France, and Canada are also above 1 percent of the U.S. banks' assets[15] (Figure 8, panel 1). Foreign claims of the eight U.S. G-SIBs depict similar trends at aggregate level, with the United Kingdom and Japan accounting for about 4 percent of assets or nearly 50 percent of Tier1 capital of the eight G-SIBs as of 2019:Q3; claims on borrowers in Germany, France, and Canada also account for 1–3 percent of the eight G-SIBs' assets. From a sectoral standpoint, U.S. banks' claims vis-à-vis foreign non-bank financial sectors is the highest cross-border sectoral exposure category. Exposure to foreign non-bank financial sectors is at 8 percent of the U.S. banks' assets. Exposure to foreign banking systems amount to 4 percent of the U.S. banks' assets at aggregate level (Figure 8, panel 2). Among the exposures on foreign banking systems, the U.K. and Japanese banking systems are the largest counterparty banking systems.[16]

[13] Imbalance in derivatives net positive and net negative positions shows the portion of OTC derivatives position held outside the entities in the sample.

[14] Data used in this descriptive analysis does not allow us to distinguish between secured and unsecured exposures as well as understand what type of collateral is used for secured exposures. Therefore, the analysis is based on very conservative assumptions that all of the exposures are unsecured.

[15] The U.S. banks have sizable claims vis-à-vis the Cayman Islands as well; however, this analysis does not focus on exposures vis-à-vis the Cayman Islands given its status as an offshore center for many other counterparty economies.

[16] While the presence of concentrated exposures per se may not give rise to contagion risks, the nature of the exposures would determine the potential vulnerabilities. For instance, contagion risks could arise if the repayment capacities of borrowers of unsecured claims (or those that are pledged with low-quality collateral) are severely hindered in stress episodes.

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36. U.S. banks are also interconnected with the rest of the world through cross-border off-balance sheet exposures. Derivatives make up the largest share of cross-border off-balance sheet exposures, though unused commitments vis-à-vis foreign borrowers are also sizable. The latter, amounting to 5 percent of the U.S. banking system assets, may particularly increase the potential for vulnerabilities if borrowers rapidly draw down on unused credit lines during tight financial conditions. From a counterparty point of view, the largest off-balance sheet exposures are vis-à-vis the borrowers in the U.K., France, Germany, and Japan with exposures amounting to 5, 4, 3, and 2 percent of the U.S. banking system assets, respectively.

37. Bank-level exposures identify several entities with large cross-exposures (i.e., presence of large cross-border claims and domestic intra-financial system liabilities). In particular, some G-SIBs have large liabilities to the domestic financial system, while also maintaining large cross-border claims (Figure 8, panel 3). To a lesser intensity, some non-G-SIBs including intermediate holding companies (IHCs) also have relatively sizable cross-exposures (Figure 8, panel 4). These tendencies may warrant continued vigilance given the potential for cross-border spillovers to propagate into the domestic financial system through these entities' liabilities vis-a-vis the domestic financial system (e.g., due to deleveraging and asset fire sales). Bank-level exposures further reveal that banks' exposure vis-à-vis foreign banking systems are mostly concentrated in banking systems in the U.K., Japan, Germany, and Canada (Figure 8, panel 5). Moreover, a large proportion of IHC' claims are concentrated in their parent banking systems.

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Figure 8. United States: Banks' Claims Based of the Ultimate Risk of the Borrowers

Cross-Border Claims of U.S. Banks
(In percent of U.S. banks' assets; ultimate borrower risk basis)

Source: Data as of 2019Q3. FFIEC E. 16 Country Exposure Lending Survey and Country Exposure Information Report.

Cross-Border Claims of U.S. Banks on Foreign Borrower Sectors
(In percent of U.S. banks' total assets; ultimate borrower risk basis)

Source: Data as of 2019Q3. FFIEC E. 16 Country Exposure Lending Survey and Country Exposure Information Report.

Cross-Border Claims on Ultimate Risk Basis vs. Liabilities against Domestic Intra-Financial System: 2019Q3

Source: FRB report FR Y15
Note: Data as of 2019Q3. Bubble size = total exposure of the entity.

Cross-Border Claims of Non-GSIBs vs. Liabilities against Domestic Intra-Financial System: 2019Q3

Source: FRB report FR Y15
Note: Data as of 2019Q3. Bubble size = total exposure of the entity.

Banks' Cross-Border Claims vis-à-vis Foreign Banking Systems on Ultimate Risk Basis

Source: FFIEC 009a.
Note: Data as of 2019Q3. Edge width = proportion of BHC's claims vis-à-vis the foreign banking systems.

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38. Cross-border funding exposures at banking system-level reveal several important counterparties from the funding-side. Among the U.S. banking system's consolidated liabilities to the top 10 counterparty banking systems, funding coming from the Japanese banking system is notably larger than the rest of the counterparties, followed by Canada (see purple arrows in Figure 9, panel 1). Further analyses using unconsolidated nationality-based exposures[17] reveal large liabilities to the U.K. banking system, and to the German banking system to a lesser extent (see purple arrows in Figure 9, panel 2). These could be particularly relevant to these banking systems' deposits held for FX transactions (e.g., U.S. dollar funding activities) and settlement purposes.

Figure 9. United States: Banks' Claims

U.S. Banking Systems' Largest Cross-Border Claims and Liabilities vis-à-vis Foreign Banking Systems on Consolidated Basis

U.S. Banking Systems' Largest Cross-Border Claims and Liabilities vis-à-vis Foreign Banking Systems on Unconsolidated Basis

Sources: BIS consolidated claims on ultimate risk basis (panel 1); BIS unconsolidated claims and liabilities on nationality basis (panel 2).
Note: Data as of 2019Q2. Edge width = proportion of claims vis-à-vis the recipient banking system. Edge color = direction of claims; green arrows are the claims of the U.S. banking system on top 10 foreign banking systems, while purple edges are the claims of foreign banking system on the U.S. banking system (i.e., funding coming into the U.S. banking system).

[17] Consolidated balance sheet data however may understate spillovers in the presence of heavy financial intermediation such as in the case of financial centers. To circumvent this, unconsolidated level balance sheet exposures are also explored using BIS locational nationality and residency basis datasets.

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B. Resilience and Vulnerabilities of Borrowers

Household Sector Indebtedness and Resilience

39. Households have continued to reduce their overall indebtedness over the past decade, driven by a large fall in housing-related leverage. Residential mortgage debt has decreased substantially since the Global Financial Crisis (GFC) across all income groups, mortgage loan performance has been robust (with low delinquency rates, particularly for newly originated mortgages), and debt servicing costs have been falling and maturities extended as households refinanced their mortgages benefiting from low interest rates (Figure 10). That said, the mortgage market is large, with outstanding mortgages exceeding US$10 trillion (roughly 50 percent of GDP, or two-thirds of total household debt), and a deterioration in credit quality could adversely impact financial stability.

40. Certain segments of consumer credit are rising rapidly. Although still relatively small, student loans and some segments of consumer credit debt (auto loans) are on the rise—albeit a large part of that growth accrues to households with prime credit scores. Given that most student loans are issued under government programs, the risks to the financial institutions remain limited. That said, delinquencies on student loans remain high, underscoring pre-existing debt repayment pressures among certain households, most notably younger cohorts. The relatively small share of subprime debt in overall consumer debt is a relatively positive development. However, rising vulnerabilities in these sub-segments of household credit would still call for close monitoring, to ensure that these do not reach systemic proportions.

41. Vulnerabilities in specific segments combined with adverse effects from the COVID-19 outbreak could put pressure on household debt-servicing capacity. Notwithstanding the abovementioned vulnerabilities, households entered the current crisis with lower indebtedness levels than at the onset of the global financial crisis. House price deviations from fundamentals were significantly smaller too, as evidenced by lower house price-to-income and house price-to-rent ratios. However, the COVID-19 outbreak and related-containment measures are expected to have a significant impact on employment and income. In particular, if economic strains owing to long-lasting hysteresis effects and behavioral changes related to social-distancing norms leads to subdued demand, with significant output and employment losses in hard-hit sectors (e.g., entertainment, hospitality, transportation services)—which tend to have relatively low wages—could severely impact households ability to service their debt, particularly at the lower end of the income distribution.[18]

[18] High-end service sectors, such as financial, legal, IT, and other professional & business services have experienced relatively small losses following the COVID-19 outbreak, in terms of both output and employment.

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Figure 10. United States: Household Borrowing

Household and NFPO debt
(In percent of GDP)

Mortgage Debt Across Income Groups
(In percent of gross income)

Outstanding Household Debt
(In billions of U.S. dollars)

Recent Growth in Household Debt
(In percent change)

Household Debt Service Ratio
(In percent of disposable income)

Consumer Credit Debt Ratio
(In percent of disposable income)

Sources: FRBNY Consumer Credit Panel/Equifax; Haver Analytics; Bureau of Economic Analysis; PSID; and IMF staff estimates.
Notes: NFPO = Not-For-Profit Organizations.

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42. The government continues to play a central role in the U.S. housing market. The Government-Sponsored Enterprises (GSEs)—most notably, Freddie Mac and Fannie Mae—currently own or guarantee about half of all mortgages. In the early 1980s, the GSEs owned or guaranteed about 8 percent of outstanding single-family mortgage debt. That share grew to 25 percent by the end of that decade and to 44 percent in the early 2000s, close to where it currently stands. Likewise, the share of outstanding multifamily debt owned or guaranteed by the GSEs grew from 25 percent at the onset of the global financial crisis to about 40 percent currently. Moreover, the GSEs—together with Ginnie Mae—dominate the MBS market, with outstanding MBS guaranteed by these entities of more than US$8 trillion, representing about 85 percent of that market.[19] Moreover, the market for MBS guaranteed by these entities is one of the most liquid fixed income markets worldwide, with average daily trade volumes exceeding US$200 billion. Given the size of the market, any reform to the housing finance market, could have significant financial depth and stability implications.

43. Non-bank lenders are important players in the mortgage loan market. The share of mortgages originated by non-depository mortgage companies has increased in recent years. Non-bank mortgage lenders' business model has also become more complex, with their range of activities including origination, loan servicing, as well as securitization of MBS. Their operations rely heavily on short-term credit lines for mortgage origination, which are subject to liquidity risks in periods of stress. In addition to the risks posed by their capital structure—with limited buffers to absorb adverse shocks—loan defaults pose additional liquidity risks, as servicers are usually required to comply with tax and insurance payments related to delinquent borrowers and, at times, make mortgage payments to MBS investors ("servicing advances") even when a borrower does not make a payment. Given their growing share of the market and complex interlinkages with the broader financial system, non-bank mortgage lenders could be a source of risk (see Box 2 of the 2020 FSAP FSSA).

[19] The GSEs and Ginnie Mae guarantee the timely principal and interest payment of these MBS, and benefit from an implicit—explicit in the case of Ginnie Mae—government guarantee.

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Corporate Sector Indebtedness and Resilience

44. Nonfinancial corporate sector debt in the U.S. is at a historic peak. Debt of nonfinancial corporates (NFCs) in the United States—at 47 percent of GDP—has surpassed the 2009 peak of 44 percent (Figure 11). Total debt of the business sector, i.e., including noncorporate firms, mirrored the same pattern, rising from 65 percent of GDP in 2012 to almost 75 percent of GDP. Its current level is comparable to household and financial sector leverage. The largest share (about two-thirds) of nonfinancial corporate debt is in the form of corporate bonds and commercial paper, amounting to about US$6.5 trillion. The remaining is comprised of bank loans (C&I loans) and leveraged loans, among others. In addition, the amount of outstanding commercial real estate (CRE) loans exceeds US$2 trillion, but has been growing in line with the economy in recent times.

45. The recent deterioration in corporate earnings caused the debt-to-earnings and the interest coverage ratios to creep up. The ratio of corporate debt to earnings before interest and taxes (EBIT) improved in the years following the GFC but has recently shot up to about six (Figure 11). Similarly, the interest coverage ratio—ratio of EBIT to net interest expense—has weakened. In 2013–14, EBIT covered nearly seven times annual interest expense. That ratio stands at around five today, comparable to levels seen during the global financial crisis.

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Figure 11. United States: Business Sector Borrowing

Business Sector debt
(In percent of GDP)

Outstanding Business Sector Debt
(In billions of U.S. dollars)

Recent Growth in Business Sector Debt
(In percent change)

Debt Servicing Capacity Measures
(In ratios)

Leveraged-loan Issuance by Debt-to-EBITDA
(In percent)

Share of Covenant-Lite Loans
(In percent of new issuances)

Sources: FRB; Haver Analytics; PSID; and IMF staff estimates.
Notes: CRE = Commercial Real Estate; EBIT[DA] = Earnings Before Interest and Tax [Depreciation and Amortization].

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C. Leveraged Finance: Leveraged Loans and CLOs

46. The recent flurry of borrowing by highly-leveraged corporates—the so-called "leveraged loans"—has emerged as a potential vulnerability. Both the historically high corporate borrowing and the concentrated increase in debt among the riskiest firms were highlighted as important vulnerabilities in the Federal Reserve's November 2019 Financial Stability Report and the IMF's recent Global Financial Stability Reports. The low interest rate environment has created an opportunity for highly leveraged corporates to obtain funding as investors accept greater risks in search of higher returns. The United States, which accounts for over 80 percent of global issuances, saw peak annual issuance of leveraged loans in 2017 at US$650 billion. Issuance volume has since come down, with US$491 billion issued in 2019. Institutional loans, i.e., those made by non-bank institutional investors, make up the bulk of primary market issuances. Corporates typically use leveraged loans for mergers and acquisitions (M&A), refinancing, leveraged buyouts, and recapitalization. The sectors that account for the highest shares of leveraged loan issuances are computers & electronics, followed by healthcare and services & leasing.

47. While leveraged loans remain a small share of corporate borrowing, its nature and rapid growth have drawn comparisons with the subprime mortgage market. Outstanding leveraged loans, currently estimated at US$1.1 trillion (about 5 percent of GDP), constitute a small share of the US$15.8 trillion total debt owed by the nonfinancial business sector (in mid-2019). But, fueled by easy financial conditions and the search for yield, the market has been growing at an average annual growth rate of nearly 15 percent since dipping to US$497 billion in 2010. Some measures of leveraged loan (e.g., that published by the Bank of England) which also include smaller, less liquid loans extended by non-banks as well as loans held by banks put the estimated size of the leveraged loan market at US$2.2 trillion.

48. A steady erosion of credit quality and investor protection was becoming apparent in the leveraged loan market. The underlying vulnerability in this market is likely even greater than suggested by reportedly highly debt-to-EBITDA ratios. In recent years, companies increasingly used "add-backs," which can include ill-defined items such as cost savings or synergies, to artificially boost their EBITDA and therefore lower their leverage ratio. Additionally, the borrower-friendly environment allowed for more leveraged loans to be issued without the traditional investor protections such as financial maintenance requirements that ensure the debt service capabilities of the borrower. These so-called 'covenant-lite' loans have accounted for more than half of new leveraged loan issuances in the U.S. market for the past four years (Figure 11). The concomitant deterioration in credit quality and investor protection would leave leveraged loan investors heavily exposed to a downturn in the corporate sector.

49. Related structured products such as Collateralized Loan Obligations (CLOs) have also fueled the leveraged loan growth. CLOs are special-purpose vehicles set up to invest in pools of leveraged loans. The pools are divided into tranches and sold to CLO investors. Of the US$1.1 trillion in outstanding leveraged loans, CLOs held roughly US$617 billion at end-2018. CLO investors are wide ranging and include, among others, U.S. and foreign banks, insurance companies, mutual funds, and pension funds. While data gaps impede a complete view of this market, estimates show

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that CLO holdings are concentrated among insurance companies, mutual funds, and banks. At end-2018, insurance companies held 28 percent of the market, mutual funds 15.5 percent, and banks 15 percent.[20]

50. Banks have a complex interconnection with the overall leveraged loan market. Banks are both directly and indirectly exposed to the leveraged loan market. Their direct exposure comes from the portion of the leveraged loans they originate and retain on their balance sheets as well as the revolving credit lines extended to leveraged corporates. Several channels indirectly connect banks to this market. Among these are loans in the form of "warehouse credit lines" to CLO arrangers to purchase leveraged loans.[21] Banks additionally invest in CLOs—albeit largely in higher credit AAA tranches. Lower-rated CLO tranches are mainly held by asset managers, insurers, hedge funds, and structured credit funds, as well as foreign entities, some of whom may have credit lines with banks.

51. A key concern is that the markets for leveraged loans and the associated CLOs, which have grown since the GFC, will experience significant stress during the ongoing macroeconomic downturn. While regulatory and underwriting standards for securitized products like CLOs have been strengthened since the crisis, the markets and their interlinkages are complex. There is uncertainty about how resilient the products will be under prolonged stress. Moreover, CLOs which are held by a wide range of investors could prove to be an important channel for spillovers.

52. The interplay between corporate vulnerabilities and the financial system is complex and can act through direct and indirect channels. Banks' direct exposure to corporate sector remains limited. Exposure to the leveraged loan market is mainly in the form of holdings of AAA-rate CLO tranches, and holdings of corporate bonds and commercial paper are relatively low following the global financial crisis and subsequent regulatory changes (e.g. Dodd-Frank Act). However, banks have important off-balance sheet commitments—mainly credit lines—provided to corporate clients estimated at around US$760 billion by the FSB, and facilities granted to CLO issuers for a smaller amount (around US$28 billion by end-2018 for U.S. banks). Funding liquidity stress, such as that observed at the onset of the COVID-19 outbreak, can trigger large uses of these credit lines by the corporate sector, potentially creating liquidity challenges for banks with lower liquidity buffers. These liquidity challenges could be further amplified by delays in repayment of warehouse facilities to CLO issuers. In addition, corporate stress can translate into added pressures to nonbank investors—for instance, loan funds and other funds facing potentially large redemptions (see mutual funds liquidity stress tests section). Waves of credit ratings downgrades for leveraged loans could also lead to stress for CLO tranches, through direct downgrades or by resulting failures of overcollateralization tests by CLO managers. Such stress could lead to asset sales by investors, and to a lesser extent by CLO managers as they seek to replace downgraded loans with higher quality

[20] Liu and Schmidt-Eisenlohr, 2019, "Who Owns U.S. CLO Securities?" FEDS Notes. Washington: Board of Governors of the Federal Reserve System, July 19, 2019, https://www.federalreserve.gov/econres/notes/feds-notes/who-owns-us-clo-securities-20190719.htm.

[21] International Monetary Fund, "Global Financial Stability Report," April 2019, https://www.imf.org/en/Publications/GFSR/Issues/2019/03/27/Global-Financial-Stability-Report-April-2019.

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assets. Depending on the severity of a potential stress episode, and if large parts of the corporate sector are under stress, this could trigger contagion losses acting through indirect channels—such as through asset liquidations by exposed financial institutions, resulting in mark-to-market losses—which could affect other segments of the financial system, including banks. These mechanisms are analyzed in more detail in the "systemic risk, interconnectedness, and contagion analysis" section of this technical note.

53. Overall, the ongoing crisis will put significant stress and amplify existing vulnerabilities on an already leveraged corporate sector. The rise in leverage in the risky credit markets—including leveraged loans, high yield and private debt—combined with a weakening in underwriting standards could see segments of the U.S. nonfinancial corporate sector underperform under stress. Owing to the combined COVID-19 outbreak and oil price shock, corporates faced the combined effects of recent financial market volatility, tightening in financing conditions and, for many, a collapse in sales. Corporate short-term liquidity needs are large, but most of these are concentrated in investment-grade companies whose debt markets are supported by the recently introduced Fed liquidity facilities—including the so-called "fallen angels", which have recently lost their investment grade status. However, with the potential of a protracted economic slowdown and behavioral changes induced by evolving social-distancing norms, the long-term sustainability of certain business models could be challenged. Solvency risks could materialize, leading to large credit risk losses. Sectors such as energy, entertainment and leisure services, retail, and durable-goods manufacturers appear to be among the most vulnerable.

STRESS TESTING SCENARIOS

A. Scope

54. The sensitivity test-based scenarios developed by the FSAP team incorporated risks related to the corporate sector and followed Risk Assessment Matrix (RAM) (Appendix VI). The RAM takes into account existing vulnerabilities as well as salient risks, stemming in particular from the COVID-19 outbreak. In the years up to the current crisis, households experienced a significant deleveraging—mainly driven by a reduction in mortgage indebtedness—while nonfinancial corporates have seen their leverage levels reach record highs and a significant deterioration in the underwriting standard in a few sub-segments of this sector (notably, the leveraged loan market). The COVID-19 crisis represents a real-life stress event, materializing through adverse shocks to both macroeconomic and financial conditions. In this context, the scenario design aims at quantifying the potential shocks and their impact on adequacy of the capital and liquidity levels of financial institutions, examining some of the existing vulnerabilities among corporates, and assessing how potential risks and vulnerabilities would transmit among different sectors and institutions (i.e., contagion) in certain stress environments.

55. The FSAP team used one baseline and three separate sensitivity scenarios to conduct its stress testing. The design process of the scenarios was different to regular IMF FSAP stress testing exercises. Shocks to GDP were derived using a simple accounting-based framework which measured

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sectoral output losses subject to duration of containment measures, as well as intensity of recovery after re-opening of economic activity. Employment losses and the unemployment rate path are proportionately linked to the severity of each scenario in terms of GDP losses. Short-term interest rates are underpinned by the assumption that the policy rate remains at the effective zero lower bound (ZLB) throughout the projection horizon in all scenarios. Longer-dated Treasury bill rates are derived from short-term interest rates and a term premium component which varies according to the scenario severity. Other macro-financial variables remained similar to those observed during the Global Financial Crisis. Sensitivity scenarios include, in addition to a baseline scenario—based on the *June 2020 WEO Update* projections—which embeds the expected macroeconomic consequences from the COVID-19 outbreak, three additional scenarios as sensitivity analysis. The FSAP stress test scenarios cover a five-year ahead horizon over the period 2020–25. This complements the Federal Reserve's severely adverse CCAR/DFAST scenario, which has a three-year horizon.[22]

56. The scenarios were applied consistently to test the resilience across all types of financial institutions included in this note. These scenarios were used for the banking sector and corporate sector stress tests and inform the stress tests of other financial institution affected by market developments following the COVID-19 outbreak. The additional sensitivity scenarios, with appropriate modifications to reflect immediacy of realization of some market shocks, were used to stress test insurance companies, and mutual and money market funds.

B. Scenario Narrative and Calibration

57. The following scenarios have been used for the stress tests (Figure 12):[23]

- The FSAP baseline scenario follows the *June 2020 WEO Update* projections. It entails a sharp contraction (mainly in 2020Q2) owing to containment measures in response to the COVID-19 outbreak, and subdued activity and reduced demand in sectors affected by social-distancing norms. This is then followed by a tepid economic recovery as the economy starts to open again, but private sector balance sheet deterioration—with the unemployment rate peaking at 13½ percent in 2020Q2—combined with long-lasting behavioral changes, keeping GDP below its pre-crisis (i.e., 2019Q4) level through end-2022. Asset prices face a commensurate short-term fall, and then recover back to their previous levels within two-year horizon.

- Three alternative sensitivity scenarios are also considered, which assume different length of containment and de facto mobility measures:

  Sensitivity Scenario 1: relative to the baseline, this scenario assumes that the reduced *de facto* mobility observed during the containment period lasts for the entire second quarter of 2020. Output losses during this period are assumed to be 25 percent (non-annualized) relative to pre-

[22] Most of the analysis in the FSAP was completed before DFAST/CCAR 2020 scenarios were published.

[23] See Appendix VIII for a numerical representation of the stress scenarios.

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COVID levels. In other words, the level of economic output in 2020Q2 is equivalent to 75 percent of the pre-shock output level. This is then followed by a slower economic recovery relative to the baseline, hysteresis losses are assumed to be commensurately larger.[24] The fall in financial asset prices is proportionately adjusted to the severity of the output losses embedded in the scenario.

Sensitivity Scenario 2: this scenario follows the same logic as the above scenario, but the containment measures and reduced mobility are assumed to last for another quarter. In other words, output levels in both 2020Q2 and 2020Q3 are only 75 percent of the pre-crisis level. This would lead to larger employment, income, and business losses, thus also translating into larger and longer-lasting economic 'scarring' relative to the previous two scenarios.

Sensitivity Scenario 3: initially, this scenario follows the same patter as Sensitivity Scenario 1, but it also assumes another wave of increased infections followed by a new containment period in the first quarter of 2021. This leads to a "W-shape" in the level of output, triggering more economic and balance sheet losses for longer. Consequently, economic activity recovers even slower in this scenario in subsequent years. Compared to historical patterns observed in previous economic crises as well as the latest CCAR/DFAST scenario,[25] the economic losses in these FSAP scenarios are unprecedented, reflecting the unprecedented nature of the ongoing global pandemic. For instance, the sharp real GDP contraction in 2020Q2 in the June 2020 WEO Update is equivalent to 12 times the historical standard deviation of the quarterly growth series recorded since the end of WWII. This same number is equivalent to 17 standard deviations in the case of the adverse scenarios. In terms of financial variables, the FSAP stress test scenarios follow closely the behavior of these embedded in the CCAR scenario but adjusted proportionately to the severity of the output losses in the FSAP scenarios. This includes large shocks to corporate risk premia, stock market prices, and real estate prices (which tend to exhibit a more delayed response).

[24] Medium-term GDP growth rates are broadly similar across scenarios, but depending on the severity of the initial shock (intensity and duration of the reduced mobility period), output levels would thus differ across scenarios.

[25] This refers to the supervisory scenarios that were disclosed in February 2020 at the outset of the DFAST exercise, and not to the additional scenarios that the Federal Reserve disclosed subsequently in June 2020 as part of DFAST 2020 sensitivity analysis.

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Figure 12. United States: Stress Test Scenarios

Delayed recovery leads to subdued activity ....

Real GDP Levels
(Index: 2019Q4=100)

... and more persistent unemployment

Unemployment Rate
(In percent)

House prices fall...

House Price Index
(Index; 2019Q4=100)

...following a contracting in the stock market

Stock Market Index
(Index; 2019Q4=100)

Risk premiums go up, especially for lower rated corporates....

BBB Corporate Spread
(In percent)

...despite policy rates expected to remain low for longer

Slope of the Yield Curve
(In percentage points; 10-year minus 3-month yield)

Sources: FRB, CCAR scenarios; Haver Analytics; IMF staff estimates.
Note: the baseline scenario is based on the *June 2020 WEO Update* projections.

C. Risks Related to High-impact Events and their Transmission Channels

58. The FSAP considered the impact of extreme weather events and exposures of insurers to carbon-intense assets. The frequency of extreme weather events increased in recent decades, thus raising the probability of severe damage to businesses, households, and municipalities located

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in selected geographical areas, with direct implications for the insurance sector. Idiosyncratic risk includes weather-related catastrophes such as hurricanes and flooding (see Section 7 on Insurance Stress Testing). Structural risk factors include a shift in technology (such as focus on green energy and decline in carbon-intense production, transportation, etc.). These factors are beyond assessment of the FSAP because there is little probability that structural shocks which could lead to rapid adoption of new technologies would happen within the FSAP time frame. At the same time, weather-related severe events will make an impact on financial condition of private corporates public utilities and municipalities in the affected areas. Figure 13, while not being US specific, provides a general description of climate risk transmission channels with two specific highlighted ones described in this technical note.

Figure 13. United States: Climate-Related Risks

Institutions	Risks	Institutions most affected	Response
Banks	Credit losses due to expsoure to corporates, commercial and residential mortgage portfolios in affected areas. See Figure 18 for a sectoral distribution of loans	Smaller, less diversified regional banks operating in high impact areas	Reduce exposure: diversify away or ration credit to corporates, households, municipalities
Insurance companies	Increase in reinsurance premiums, underestimation of severity/frequency of climate related events	Selected non-life insurance companies (See Chapter Insurance Siolvency Stress Tests)	Increase insurance premiums and/or leave the affected areas altogether
Investment funds	Market risk related to investments in stocks and bonds of corporates	Funds with high expsoure to affected corporate sectors, municipalities	Reduce exposure: diversify away or ration credit to corporates, households, municipalities
Corporates	Cash flow decline: carbon taxes, fall in demand, increase in liabilities and cost of insurance, damage to equipment and infrastructure	Sectors affected: energy (oil and gas), public utilities in affected areas, telecommunication, mining, real estate (in affected areas), transport, agriculture	Bankruptcies, restructuring
Municipalities	Decline in population (loss of tax revenue), increase in costs related to infrastructure/damage repairs	Municipalities located in high impact areas, particularly:	Bankruptcies, debt restructuring, increases in taxes

Source: IMF staff.

CORPORATE SECTOR STRESS TESTS

59. Stress tests were conducted to assess the resilience of the U.S. corporate sector, with a focus on 'leveraged firms.' Leveraged firms are active borrowers in the U.S. leverage loan and high yield corporate bond markets. Stress tests are used to assess solvency and liquidity risks of a sample of about 2,000 nonfinancial corporations with total assets amounting to US$19 trillion (87 percent of GDP) and aggregate indebtedness of US$9 trillion. Balance sheet and profit-and-loss data come from Capital IQ.[26]

[26] The list of companies that are active in the U.S. corporate bond and commercial paper market was extracted from Bloomberg, whereas the list of firms that borrow in the leveraged loan market was extracted from S&P Leveraged Commentary Data (LCD).

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60. Stress tests consist of projecting the firms' net income and debt servicing capacity under different macroeconomic scenarios. The projected net income flows as well as debt amortization and rollover patterns are gauged against the firms' initial level of capital and liquidity buffers. For instance, when the cumulated net losses of a firm exceed the reported amount of capital, then the firm falls into negative equity—and is considered to be in "distress."[27] Similarly, to gauge the liquidity (or refinancing) needs of the corporates in our sample, we compare the amount of cash and cash equivalent held at the beginning of the stress period relative to the potential liquidity needs from amortizations and maturing debt as well as any other potential net cash inflows (such as retained earnings, investment spending, etc.).

61. Firms profit and loss items are linked to macroeconomic variables through regression analysis. In the stress tests, gross revenues are modeled as a function of real GDP growth, and for certain industries (such as food and energy and utilities), these also depend on oil price developments. Another important parameter is the degree to which companies are able to adjust their non-interest expenditures to changes in revenues. Intuitively, firms that can cut costs substantially during downturns (i.e., falling revenues) will be more successful at absorbing a macroeconomic shock relative to those with more rigid cost structures. Finally, interest expenditures are modeled based on the existing debt profile, accounting for the share of debt that can be re-priced (e.g., variable rate loans) at any given period and applying the corresponding interest rate from the stress test scenarios (see Caceres et al. (2020a) for details).

62. Corporate sector stress tests suggest that potential losses could be significant. Stress tests were conducted on approximately 2,000 companies that are active in the corporate bond and leveraged loan markets. Results suggest that leveraged firms—defined in the stress tests as those firms with a debt-to-EBITDA ratio higher than 5—are likely to experience relatively large solvency and funding pressures, representing roughly three quarters of all firms with negative equity under the *baseline* projections (Figure 14).[28] In such a situation, and despite the relatively small size of the leveraged loan market, these firms would account for a large share of the potential losses (over 80 percent of the US$400 billion in potential debt-related losses). In a more severe scenario (c.f. FSAP *Sensitivity Scenario 3*—which assumes a second wave of infections in early 2021), losses stemming from corporate debt holdings could reach US$675 billion (US$465 billion related to leveraged firms). Although these losses are sizeable, banks have limited direct exposure to these products, and would suffer more limited losses.[29] However, indirect exposures and market dislocations combined with liquidity shortages could play an amplifying role in a situation of stress

[27] In practice, firms with negative equity could continue operating if the market continues to provide funds to satisfy their cash needs. Conversely, firms with positive equity could default on their debt obligations, for instance, if they run out of cash or for other reasons. Nevertheless, in a stress testing setting, it would be difficult to model the motives and behavior of firms driving their decision to default on their debt obligations, and such approach would inherently need to rely on a set of arbitrary assumptions.

[28] These numbers do not correspond exactly to the potential losses for equity and debt holders. In case of default or liquidation, investors and lenders would still recover part of their investments. However, these numbers can be seen as equity and debt exposures "at the moment of stress".

[29] Banks hold slightly less than 20 percent of outstanding corporate bonds and loans, representing roughly one-tenth of their own assets.

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Figure 14. United States: Corporate Stress Test Results

Number of New Firms with Negative Equity in the "Baseline Scenario"
(number; percent of total)

Number of New Firms with Negative Equity in "Sensitivity Scenario (3)"
(number; percent of total)

Equity and Outstanding Debt of Firms with Negative Equity in the "Baseline scenario"
(In billions of U.S. dollars)

Equity and Outstanding Debt of Firms with Negative Equity in "Sensitivity Scenario (3)"
(In billions of U.S. dollars)

Equity Position of Firms in Negative Equity in the "Baseline Scenario"
(In billions of U.S. dollars)

Equity Position of Firms in Negative Equity in "Sensitivity Scenario (3)"
(In billions of U.S. dollars)

Sources: Capital IQ; Caceres et al. (2020a); and IMF staff estimates.
Notes: 'Leveraged' denotes firms with a debt-to-EBITDA ratio higher than 5.

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BANKING SECTOR STRESS TESTS

A. Solvency

Scope

63. The key emphasis in quantifying risks to banks was placed on banks' ability to sustain losses due to a sharp deterioration of macroeconomic environment and increase in corporate default rates, at the same time distinguishing between different types of banks in terms of size, systemic importance and business models. This chapter analyzes how the baseline and adverse scenarios described in the previous section affect the solvency of banks. Elevated corporate sector vulnerabilities translate into large C&I loan losses, corporate defaults lead to higher unemployment. In turn, losses on loans to households rise, and pre-provision income and expenses (PPNR) falls because of lower income from trading, loan origination and associated fees. The FSAP team used various satellite models to translate these macro shocks into credit risk and market losses associated with all domestic and foreign exposures (aggregated). Analysis on derivative positions were not performed due to the lack of suitable data, and accordingly the associated risks were not fully assessed. Counterparty credit losses, as reported in DFAST/CCAR public disclosure, was added to the PPNR of relevant institutions.

64. Both top-down (TD) solvency and liquidity stress test were performed. The stress tests cover the 34 largest U.S. bank holding companies (BHCs), which account for about 86 percent of BHC assets, and 75 percent of total banking system assets (Appendix X). The TD stress test builds on the Capital and Loss Assessment under Stress Scenarios (CLASS) model developed by the Federal Reserve staff[30] and uses FRB and publicly available data (such as reported in FRB reporting templates FR-Y 9C, FR-Y 15). Given the importance of corporate credit losses in assessing risks, an additional robustness check was performed to compare stress testing results under accounting (write-offs) and market implied PDs (EDFs) models. Also, a set of additional sensitivity analysis was performed to account for challenges to banks' profitability given low interest rate environment, high shareholders' payout ratios, Fintech related competition and credit growth assumptions. A reference date for the banking data used in the stress test was Q1 2020.

Solvency Stress Testing Methodology

65. Bank balance sheet and income statement components are projected for bank holding companies (BHCs) using multiple panel regression models. The framework for this top-down stress testing exercise is based on a modified version of the CLASS model. Quarterly data from 1991 to 2020:Q1 from FR Y-9C report on consolidated financial statements for BHCs are used to gauge historical relationships between bank balance sheet and income statement variables and macrofinancial conditions. The elasticities obtained from these historical relationships are then used

[30] The Capital and Loss Assessment under Stress Scenarios. See Federal Reserve Bank of New York Staff Reports No. 663. July 2015.

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in a model that forecasts income statement and balance sheet ratios (Appendix X). Based on the forecasted ratios through the stress testing horizon (i.e., 2025:Q1), net income, balance sheet, and capital ratios are calculated (see the schematic in Appendix X)

66. Overall, unemployment, house prices, corporate credit spreads and interest rates remain the most significant driving factors of losses. FSAP team satellite models reveal, that in line with FRB scenarios, a key set of macrofinancial variables in the CLASS model specifications explain the largest part of variation in accounting-based losses (charge-offs, recoveries) and pre-provision net revenue (PPNR). As expected, unemployment, housing prices impact losses on loans to households, while GDP, corporate spreads and interest rates losses on C&I loans. Overall, without adjustments explained in paragraphs below, loss rates (except for credit card loans (see Figure 18) would be slightly lower compared to the ones observed during the GFC; mainly due to lower interest rates and risk premiums than the ones prevailing at the onset of the crisis in 2008–09. The U.S. banks derive relatively small share of income from abroad (except for some trading banks), thus their ability to diversify away from the U.S. domestic recession is rather limited.

67. Rapid developments due to the COVID-19 outbreak highlighted the need to make adjustments to the model to reflect the unprecedented increase in unemployment and deep shocks to quarterly GDP. Satellite models calibrated using historical data before the COVID-19 crisis underestimated risks in certain exposure classes and overestimated the potential impact of other PPNR components. Namely, losses to corporate loans, commercial real estate loans may be higher due to specificity of this crisis which affected small businesses, travel, hotels, office rent and retail trade sectors disproportionately. At the same time the model overestimated potential expenses unrelated to credit risk, i.e., it is expected that banks would be able to minimize costly restructurings, face lower fines etc. which were prevalent after the GFC. Banks may also retain income by lowering capital and other expenditure, minimize shareholder payouts. To account for these factors, we used CLASS model adjustments outlined below.

68. Three types of adjustments to CLASS loan loss satellite models were explored: (i) based on market data[31]; (ii) a separate corporate risk stress test and COVID-19 market intelligence-based adjustments; (iii) adjustments for salaries growth as well as growth of non-interest expenses (excluding wages).

69. A market data-based alternative to accounting based (write -offs) loan loss specifications was performed to check robustness and compare results of corporate credit risk. The PD proxy for exposures to tradeable securities were extracted from bond yields using a Merton-based approach.[32] The FSAP team used data from public returns (FR- 9 Y) on the breakdown of financial assets to back out banks' exposures to various types of securities. It extracted estimates of probabilities of default (PD) from the spreads projected in the scenario using a reduced-form

[31] This test was performed before COVID-19 shock with cut-off date for the data as of end of 2019.

[32] An increase in sovereign issuer risk is reflected in higher loan loss impairment charges on HTM and AFS portfolios.

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structural model.[33] Using the credit spreads for counterparty representing sector *i* linked to the scenario $S^i_{t,T}$, time to maturity (*T-t*), and assuming *LGD*=45 percent, the implied risk-neutral *PD* is backed-out as:

$$PD^i_{t,T} = \frac{1 - exp^{-S^i_{t,T} \cdot (T-t))}}{LGD^i_t}$$

70. Banks exposures to different sectors of the commercial and industrial loans was linked with estimates of market data-based PDs for these sectors. The banking system is exposed to various sectors of industry, with manufacturing and construction receiving most of the loans (Figure 18 below). A set of regressions was constructed to obtain stressed market data implied PDs. Overall, the results yielded shocks to PDs like the ones observed during the GFC (Figure 18). Flow of loan loss provisions was obtained by multiplying stressed PDs, LGDs, and bank-by-bank exposures.

71. Overall, the use of market-based commercial and industrial (C&I) loss estimates led to an additional decline in the system-wide CET1 ratio by 50 basis points. The impact was small given that models capture developments observed during several past crises, namely the dot-com bubble (2000–2001) and the GFC (2008–2010) (Figure 15). Based on that, the FSAP team did not use market data-based PDs, but utilized the second approach, i.e., made use of separate corporate risk stress test and COVID-19 market intelligence-based adjustments.

72. Historic data on C&I loan losses may not reflect structural risk related to rapid growth of leveraged loans with few or even without covenants. Instead of using the CLASS C&I loss satellite model, the FSAP team used the output from the corporate ST exercise to guide losses in the C&I exposure class. Team developed a multiplier approach, i.e., calculated a relative increase of C&I compared to the base quarter (Q1 2020). The multiplier then was applied for each bank C&I loan portfolio to derive the flow of provisions. The potential losses from the C&I loan category increase compared to the recent historic peak (reached during the GFC) : (i) in the baseline scenario, the loss rate reaches 11.2 percent and is 4 times higher; (ii) adverse sensitivity 1 scenario - losses reach 14.9 percent and are 5 times higher; (iii) adverse sensitivity 2 scenario: maximum losses reach 18.1 percent (6 times higher); (iv) In adverse sensitivity scenario 3: maximum losses reach 15 percent (5 times higher).[34]

73. The FSAP used market data to guide estimates of potential losses from commercial real estate (CRE) portfolios. The unprecedented nature of the crisis does not allow to fully rely on historic data about banks' losses from commercial real estate loans. These loan portfolios were hit

[33] This approach assumes that the difference between a risk-free security and a risky security is the put option on the value of the assets which includes the loss induced by the stressed PD and LGD of the bond.

[34] Scenario 2 is more severe than Scenario 3 in terms of GDP losses in 2020 (it entails two quarters of reduced mobility, compared to only one quarter in Scenario 3); however Scenario 3 is more severe in 2021 (the second wave of infection triggers a quarter of reduced mobility in Q1 2021, which does not affect 2020). Accordingly, corporate sector expected losses are higher in Scenario 2 in 2020 (distress rate of 13 percent compared to 11.1 percent in Scenario 3), but corporate losses are higher in Scenario 3 in 2021 (4.8 percent compared to 1.3percent in Scenario 2). Cumulatively (over 2020-25), Scenario 3 entails larger losses than Scenario 2.

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hard by the containment measures with expected losses far exceeding observed loss rates during previous cyclical downturns. CRE loan losses follow a path projected by market sources, with estimates that the impact will lead up to a 3-fold increase in losses exceeding those observed in 2008–9.[35]

74. Non-interest expense data shows high historic volatility (Figure 15), hence adds to the overall uncertainty of stress test estimations. A significant degree of uncertainty related to the ST results is driven by the largest components of non-interest related expenses: wages and all residual items, such as operating losses, mergers and acquisitions, restructuring costs, fines banks paid after the GFC. Many of these items are discretionary, thus their dependency on macro data are weak (except for wage growth). Applying a large increase in unemployment and a shock to quarterly GDP lead to an overestimation of shocks to these items in the ST. To overcome this issue, the FSAP team adjusted the model: It introduced upper bounds which are lower than historic average growth rates (reference period 2015–2019), i.e., assumed that annual wage growth would not exceed 1 percent and the residual non-interest expenses would not exceed 2.6 percent in all scenarios. Based on these caps, the estimated expenses omit some potential large discretionary expense items due to litigation, operational risk events etc. These items however are not determined by the scenarios, i.e., behavior of macro variables.

Figure 15. United States: Loss Estimation

[35] See Moody's report: "Coronavirus (COVID-19): Credit Risk Impact on Commercial Real Estate Loan Portfolios"). https://www.moodysanalytics.com/-/media/article/2020/covid19-credit-risk-impact-cre.pdf

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Figure 15. United States: Loss Estimation (concluded)

Market based corporate loss rates: simulations reveal an increase similar to the GFC

Manufacturing PD

Communications and IT PD

Retail Trade PD

Services PD

Market based loss metrics leads to an additional 50 basis points of CET1 impact.

Non-interest incme and expenses exhibit high volatility in the past five years

Historical Average Annual Growth

(Four-quarter moving average; in percent)

Source: IMF staff estimates.

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Hurdle Rates

75. The definition of eligible capital and hurdle rates considers Basel III and the U.S. regulatory minima on CET1 ratios (4.5 percent), the Capital Conservation Buffer (CCB) and include additional requirements for Global Systemically Important Financial Institutions (G-SIBs) and leverage ratio. The capital definition includes CET1, Tier 1, and total CAR. The hurdle rate consists of a 4.5 percent CET1 requirement. The fully loaded level of capital conservation (CCB) buffer applicable in 2019 (2.5 percent) and the bank-specific G-SIB surcharge buffer is allowed to be depleted in the adverse scenario. The Tier 1 leverage ratio is based on the U.S. implementation of the Basel principles, namely 4 percent for all banks in the sample, except for the G-SIBs with more than US$700 billion of assets, for which 6 percent minima applies.

Results

Baseline

76. The banking system entered COVID-19 crisis with solid capital buffers, though future capital depletion is subject to multiple sources of uncertainty, including duration and intensity of COVID-19 containment measures. Solid capital buffers allowed banks to provide credit to the economy, namely extend credit lines to cash trapped corporates and households. Were the October 2019 WEO baseline macroeconomic scenario to materialize, banks would maintain high capital buffers and profitability. In contrast, the current June 2020 WEO Update—informed by the initial set of macroeconomic indicators since the pandemic crisis started unfolding—assumes sudden and a sharp decline in economic activity more severe than real and financial sector crisis in the past, which focused on a gradual increase in unemployment and decline in economic growth. The uncertainty around duration of the crisis and impact of various regulatory, monetary and fiscal measures required simulation of additional adverse scenarios and making of *ad hoc* assumptions listed below. Namely, the stress testing exercise thus incorporated multiple sources of uncertainty related to the recent outbreak and possible reaction of banks: sensitivity to duration of containment type of scenarios in addition to the COVID-19 baseline, assumptions about payouts to shareholders, dynamics of non-interest expenses, and credit portfolio growth. The stress tests exercise however was not able to fully estimate and incorporate impact of various fiscal measures, such as payments from the fiscal stimulus package and measures, like e.g., temporary postponement of loan repayments on condition of banks' borrowers.

77. Capital depletion rates are high in the *baseline (Figure 16)*, as expected given the unfolding sudden and sharp economic contraction yet remain manageable. The impact of COVID-19 is significant, and plays out mainly via two channels: i) immediate increase in credit losses, especially exposures to credit cards (losses of up to 3 percent of risk-weighted assets (RWAs)); C&I loans (losses of up to 1.8 percent of RWAs) ii) growth of RWAs due to a utilization of credit and funding lines, which lead to an additional depletion of CET1 of up to 1 p.p.[36] Banks are

[36] Assuming a system-wide expected utilization of 20 percent (see Figure 12) and a credit conversion factor of 50 percent.

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expected to generate a cumulative loss of 4 percent of total assets over the five-year scenario horizon. This compares to the 1.9 percent cumulative losses in the October 2019 WEO baseline. Net interest income offsets majority of losses, albeit declining margins due to policy rates being close to zero are lowering PPNR. Policy rates have a small additional positive effect on funding costs but a significant negative one on loan interest rates. Cumulative five-year gross interest income goes down from 15.5 to 12.2 percent of total assets (when compared to the October 2019 WEO baseline). This leads to a 360 b.p. annual capital uplift from net interest income compared to 420 b.p. one before the COVID outbreak. If shareholder payouts remain at an average level of 40 percent of net income, up to 4 banks (none of them G-SIBs) would need additional capital to meet the minimum 4.5 CET1 requirement within the three-year horizon.[37] Recapitalization amounts would be small (0.4 percent of GDP). No G-SIB would fall below minimum requirement also within the five-year horizon. Only one additional non-GSIB bank would fall below minimum, leading to the total number of five banks, requiring additional capital. Recapitalization needs would be around 0.8 percent of GDP. If shareholder payouts are zero for the stress test horizon, only four non-GSIBs would need additional capital with the recapitalization needs falling to 0.6 percent of GDP over the five-year horizon.

Figure 16. United States: Solvency Stress Testing Results—IMF Baseline Scenario1/

Banks started with strong capital position to support further growth of balance sheets, but declining interest margins coupled with high credit losses would lead to four non-GSIBs falling below minimum requirements…

… as do trading banks which have low exposure to consumer loans.

G-SIBs have enough buffers to continue expanding loans yet the shareholder payouts at the current rates would reduce buffers going forward….

Foreign banks fare relatively well, though some with significant retail exposures face a challenge…

[37] For the purposes of comparing different business models of the banks, in the charts G-SIB group of banks includes 4 universal banks designated as G-SIB and excludes other 4 G-SIBs which fall under the trading banks category due to the underlying business model. In the text however, we refer to all G-SIBs to emphasize that no G-SIBs as defined by supervisors, require additional capital.

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Figure 16. United States: Solvency Stress Testing Results—IMF Baseline Scenario (concluded)

...as do Non-GSIBs' which started with lower levels of capital and profitability and have less diversified credit portfolios.

Non interest expenses may be further optimized: cost optimization, lower shareholder payouts would help in preserving capital base.

Sources: IMF staff estimates.
1/ The box plots illustrate the interquartile range through the orange rectangular shaped objects, while the wiskers denote upper and lower bounds (latter is set to zero). The Baseline scenario assumes that shareholder payouts continue at an average of 40 percent.

78. Most of the banks would be able to maintain leverage ratios above the minimum requirement (Figure 17). Some trading banks designated as G-SIBs would face a challenge in maintaining a 6 percent leverage ratio without the reducing the dividend payout ratio or asset growth. [38] Notwithstanding, the recent actions by the US supervisors to grant a temporary relief by excluding some assets from the calculation of the supplementary leverage ratio (which is at 3 percent in addition to the minimum) allowed G-SIBs to remain within the regulatory limits. Foreign and some non-GSIBs, which are not subject to the supplementary leveraged ratio rule, would need additional capital to remain within the minimum Tier 1 leverage ratio of 4 percent.

[38] The analysis did not take into account the temporary rule which excludes U.S. Treasury securities and deposits at Federal Reserve Banks from the calculation of the supplementary leverage ratio. See https://www.federalreserve.gov/newsevents/pressreleases/bcreg20200401a.htm.

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Figure 17. United States: Solvency Stress Testing Results: Leverage Ratios under the Baseline Scenario

G-SIBs face little change to their leverage ratios, given the temporary regulatory relief…

Some Trading banks are more affected by the crisis and need higher capital buffers to maintain 6 percent leverage ratio

Tier1 Leverage in Baseline Scenario - GSIBs

Tier1 Leverage in Baseline Scenario- Trading Banks

Foreign owned banks cannot maintain historic growth of balance sheet and continue to payout the same amount of retained earnings to parent companies. …

….Non-GSIBS may need to retain more profit as well.

Tier1 Leverage in Baseline Scenario- Foreign

Tier1 Leverage in Baseline Scenario- Non-GSIBs

Sources: IMF staff estimates.

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79. The potential impact of competition from Fintech companies is relatively small system-wide, and highest for smaller non-GSIBs banks (Figure 18). The growing competition for deposits, fee revenues, and payment services from fintech companies will pose risks to banks' business models in the medium term, unless banks increase their spending on IT and other innovative technologies. Non-GSIBs are most vulnerable given that their market share in local deposits markets may decline as online channels would erode their natural advantage of physical presence in serving local communities. Moreover, smaller banks do not have the resources large banks deploy to upgrade and adapt their information technology (IT) systems to online distribution channels. As a result, non-GSIBs compared to G-SIBs may need to invest relatively more into IT systems. Industry estimates reveal that banks spend on IT about 15 percent of their total expenses on average, with an average spending growth rate increase of up to 4 percent annually. [39] Without such investments and upgrade in the infrastructure, smaller banks may lose up to 14.5 percent of potential revenue from payment processing.[40] In the sensitivity analysis we assumed that banks either increase investments into IT or risk losing potential revenue. Applying IT spending and revenue loss projections from industry surveys and rating company reports in the pre-COVID-19 period, sensitivity test leads to an average 10-basis point decline in CET1 ratio. An increase in IT expenses leads to a larger impact on CET1 than the loss of payment revenue in the sample of banks. The result is not surprising given a simplifying assumption that banks would maintain their share in payments market and that fees and commissions revenues would grow at an average historic rate. The uncertainty is driven by multiple factors, including a potential redistribution within the market resulting from increases in IT. Banks with better systems would gain the market share in payment revenues at the expense of other banks. Moreover, the analysis was conducted before COVID-19, and the impact of COVID-19 on digitalization of retail banking and pressures for cost cutting via closure of physical branches may accelerate further.[41]

[39] See S&P Global ratings (2019). The Future Of Banking: The Growth Of Technology And Its Impact On The U.S. Banking Sector.

[40]See: Accenture (2019). Accenture Global Payments Pulse Survey 2019. Two ways to win in payments. Accenture, 2020.

[41] The sensitivity analysis was performed using Q3 2019 data.

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Figure 18 United States: Sensitivity Analysis—Impact of Fintech

Decline in the CET1 Ratio Under Fintech Impact Simulation
(In basis points of RWAs)

Decline in the CET1 Ratio Under Fintech Impact Simulation
(In basis points of RWAs)

System-Wide CET1 Ratio at the End of the Simulation Horizon (Q1 2025)

Source: FRB, FR-Y9C; S&P Market Intelligence; S&P Ratings Direct; Accenture research; IMF staff.

Adverse Sensitivity Scenarios

80. Assuming a more prolonged economic disruption leads to a further depletion of banks' capital buffers, yet no G-SIB falls below the minimum required CET1 level within the three years (Figure 19). Due to an unprecedented uncertainty about duration of the crisis, including potential second waves of infection, the three adverse scenarios focused on impact of credit losses on banks' capital position due to an extension of containment measures. Overall, C&I loans as well as consumer loans (credit cards) constitute the bulk of credit risk related losses. As expected, banks with the highest exposures to these types of loans are affected more. Figure 20 provides decomposition of evolution of the key PPNR items. Focusing on the three-year period, up to 6 banks (all of them are non-GSIBs) would need additional capital in the adverse sensitivity scenario 1. The overall capital shortfall against the 4.5 percent CET1 minimum is small and amounts to about 0.5 percent of GDP. Only one additional bank (non-GSIB) would need to be recapitalized if the stress test horizon is expanded to the five-year horizon. The scenario reveals that systemically important banks have high enough capital buffers to withstand the simulated shocks.

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Figure 19. United States: Solvency Stress Testing Results—Sensitivity Scenario 1

Most of the banks would stay above 4.5 percent CET1 minimum within the first year of the scenario…

CET1 Ratio in Sensitivity Scenario 1

G-SIBS show greatest resilience due to the diversified nature of their business models and high initial capital buffers…

CET1-Ratio in Sensitivity Scenario 1- GSIBs

…while banks focused on market trading are hit less because of higher relative exposure to market and counterparty risks which are not assumed to materialize due to monetary and market support measures

CET1 Ratio in Sensitivity Scenario 1 - Trading Banks

Some foreign banks would need additional capital buffers, especially those exposed to consumer lending segment….

CET1 Ratio in Sensitivity Scenario 1 - Foreign

…as would Non-GSIBs, especially those with lower initial capital bufers and higher expsoure to consumer and C&I loans

CET1 Ratio in Sensitivity Scenario 1- Non-GSIBs

Overall, credit cards, C&I loans are the largest contributors to credit risk.

Sources: IMF staff estimates. 1/ The box plots illustrate the interquartile range through the orange rectangular shaped objects, while the wiskers denote upper and lower bounds (latter is set to zero).

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Figure 20. United States: Solvency Stress Testing Results: Adverse Sensitivity Scenario 1

A detailed decomposition of evolution of P&L items in the Adverse scenario reveals that profitability of banks remains high even during the severe downturn, and most of the decline in CET1 is due to non-interest expenses, such as salaries.

Sources: IMF staff estimates.

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81. Sensitivity analysis using different assumptions about duration of the current crisis and a hypothetical second infection wave indicates a range of impact on banks' capital positions. An additional quarter of lockdown reduces system wide CET1 ratio on average by an additional 90 b.p (Q2 2022); up to 8 banks (non-GSIBs) would need additional capital, but the overall capital shortfall against the 4.5 percent CET1 minimum is similar to Adverse Scenario 1 and amounts to about 0.6 percent of GDP. In case of a second wave of infections and subsequent reactivation of full containment measures, the CET1 declines compared to the baseline by additional 450 b.p. in the third year. Overall, prolonged containment (beyond Q2 2020) and the second wave of infection would lead to 10 non-GSIB banks failing to meet minimum CET1 within the first three years of the crisis. The capital shortfall against the 4.5 percent CET1 minimum amounts to about 0.8 percent of GDP. The recapitalization needs would be on average 0.1 p.p. lower in the scenarios which assume that shareholder payouts are zero during the simulated crisis period.

82. Banks with a high share of retail funding, diversified asset portfolios, and high initial CET1 capital buffers are more resilient. G-SIBs with diversified business lines fare well, with trading banks[42] experiencing limited impact on their balance sheets, mainly due to prompt actions from the FRB (setting up of various lending facilities to stabilize market liquidity[43]). Non-G-SIBs[44] and some foreign owned banks with considerable exposure to C&I loans, lower capital buffers, and large shareholder payout ratios are relatively more vulnerable to shocks. Non-G-SIBs are primarily exposed to losses from unsecured lending to households (e.g., credit cards), secured loans (e.g., residential mortgages), and commercial and industrial (C&I) loans, as well as commercial real estate lending. Some smaller non-GSIBs have high exposure to consumer lending, such as credit cards. Moreover, banks differ in terms of exposures to various sub-segments of consumer credit, with some banks having targeted lower income households which were particularly strongly hit by the crisis.

83. Leverage under the stress scenarios evolves in line with projected capitalization levels. As in the case of the baseline scenario, some of the G-SIBs would need additional capital to maintain their required minimum leverage ratios of 6 percent (without taking into account the temporary relief rule, which effectively reduced the CET1 requirements by up to 2 percentage points on

[42] Trading banks is the group of banks in the sample which have high share of trading related income and trading assets. This sample includes *inter alia* 4 G-Sibs.

[43] Liquidity stress tests were conducted prior to COVID-19 crisis, thus do not take into analysis FRB actions to support the economy. See Federal Reserve announces extensive new measures to support the economy; March 23, 2020 https://www.federalreserve.gov/newsevents/pressreleases/monetary20200323b.htm.

[44] This group includes large banks with consolidated total assets above US$100 billion, excluding U.S. G-SIBs and Intermediate Holding Companies.

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average), albeit within the first two years of the stress horizon only. While foreign and non-GSIB banks are not subject to supplementary leverage rule and have lower Tier 1 leverage requirement they show less resilience due to a rapid decline in CET 1 capital base. The measure of their leverage (defined as total capital over total assets) falls below their required minimum of 4 percent (Figure 21).

Figure 21. United States: Solvency Stress Testing Results—Leverage Ratio under the Adverse Sensitivity Scenario 1/

Without regulatory relief, some G-SIBs would need additional capital or reduce balance sheet to maintain minimum leverage ratios in the sensitivity scenario within the first two years....

...as is the case for trading banks.

Sources: IMF staff estimates.

1/ The box plots illustrate the interquartile range through the orange rectangular shaped objects, while the wiskers denote upper and lower bounds (latter is set to zero).

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Additional Sensitivity Tests

84. To gauge sensitivity of results to behavioral assumptions, the stress test considered two options for dividend payouts. The main set of simulations involved the assumption that banks would continue dividend payouts at long term historic average levels (i.e., at approximately 40 percent of net earnings, excluding share buybacks) and will reduce relative expenses while balance sheets will grow at the rate of up to 4 percent per year reflecting lower demand for credit compared to average growth rates of 7.5 percent. An alternative set of simulations assumed that banks would reduce shareholder payouts to zero. Based on these assumptions and the four scenarios, 8 simulations were performed in total.

85. Given the uncertainty of duration of the crisis and firmness of the post-crisis recovery, reduction in shareholder payouts would help to preserve capital in the *Baseline and Adverse scenarios*, while allowing banks to continue extending credit (Figure 22). Even under the adverse scenarios most of the banks earn enough interest income to offset credit risk related losses, yet other non-interest expenses drive the overall impact on capitalization. U.S. banks have a track record of reducing operational expenses quickly by closing branches and reducing workforce and staff compensation. Nevertheless, to ensure preparedness for the longer duration of the crisis and further growth of the loan portfolio even in the adverse scenario, higher share of earnings would need to be retained or a temporary moratorium on shareholder payouts instituted. By keeping shareholder payouts at zero for the duration of the crisis, banks would save an average of 60 b.p. of CET1 by the Q2 2022. This would also help banks to maintain staffing ensuring robust business continuity.

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Figure 22. United States: Solvency Stress Testing Results—Results Under Multiple Adverse Scenarios and Assumptions About Dividend Payouts

Dividend payout rateacross all banks in the sample...

Dividend Payout Ratio: Post-GFC

...and were steadily increasing in the past years.

Dividend Payout Ratio: 2019:Q3

(In percent)

Overall, shareholder payout ratios (including share buy-backs) exceeeded net income in some banks.

Shareholder Payout Ratio for G-SIBs: 2014-19

(In percent)

Systemwide CET1 ratio would remain above the 4.5 percent CET1 minimum within the stress test horizon...

CET1 Ratio — With Dividend Payouts

(In percent of risk weighted assets)

...and temporary lower or zero shareholder payouts would help to conserve additional capital which may be needed to remain above the minimum requirements in case of an extended duration of the current pandemics.

CET1 Ratio — Without Dividend Payouts

(In percent of risk weighted assets)

System-wide leverage ratio also improves, however marginally, as banks which face significant decline in CET1 ratios still struggle to remain above the minimum requirement.

Tier1 Leverage in Baseline Scenario Without Dividend Payouts

Source: IMF calculations.

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Conclusions

86. The banking system has solid capital buffers, and thus system-wide capital shortfall in the baseline and adverse sensitivity scenarios is relatively small. While six smaller Non-GSIBs would fall below the CET1 ratio of 4.5 percent, recapitalization needs would be manageable from 0.52 in case of adverse sensitivity scenario 1 to 0.81 percent of GDP (10 banks, all of them non-GSIBs, below CET1 minima) in the most severe case of the double recession due to a second wave of COVID-19. In recent years' banks increased dividend payout ratios to shareholders, share buybacks and in some cases (especially Non-GSIBs) reduced their CET1 (see Figure 25). This leads to procyclicality of capital planning if additional severe shocks are to materialize, especially given the uncertainty related to the swift recovery from the negative impact the virus outbreak had on the economy. Additional sensitivity tests were conducted to estimate the impact of different assumptions regarding the impact of dividend payout ratio impact on the evolution of CET1/leverage ratios. The potential capital shortfall in terms of GDP under the scenarios would be higher up to 0.2 percentage points higher if banks maintain average dividend payout ratios of 40 percent to the shareholders.

87. The stress tests results are subject to numerous uncertainties, however they also demonstrate that the banking system has flexibility to cut expenses and ability to generate income to adjust to the COVID-19 crisis without unnecessarily reducing exposure to the real sector, Banks are primarily exposed to risks related to losses from unsecured lending to households (credit cards) as well as secured loans: residential and commercial real estate. C&I loan losses would be high under a distress in corporate sector scenario, which assumes increase in default correlations of highly leveraged companies. Nevertheless, even under the adverse scenario most of the banks earn enough interest income to off-set credit risk related losses. As in the case of the baseline scenario, the U.S. banking system benefits from labor market flexibility: the largest expense item—administrative costs—may be adjusted further downwards by reducing staff number, salaries, and bonuses.

88. The stress test results also confirm that leverage requirements become more binding during stress scenarios, Simulation results indicated, that some of the banks, including G-SIBs would face challenges to maintain leverage ratios above minimum requirements. Absent the recent changes to the supplementary leverage ratio calculation, affected banks would need to either increase their capital base by retaining higher share of profit, raising additional equity or shrinking their balance sheets, for example, by reducing exposures to counterparties, holdings of securities etc.[45] All of these actions by banks would introduce several system-wide effects, such as asset fire sales, shocks to funding liquidity and thus further amplify liquidity shocks in the markets.

[45] The analysis did not take into account the temporary rule announced in April which excludes U.S. Treasury securities and deposits at Federal Reserve Banks from the calculation of the supplementary leverage ratio and will be in effect until March 31, 2021. See https://www.federalreserve.gov/newsevents/pressreleases/bcreg20200401a.htm.

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B. Banking Sector Liquidity Risk Analysis and Stress Tests

89. The aim of the liquidity risk analysis and stress testing is to evaluate to what extent U.S. banks would be able to sustain severe funding shocks and at the same time continue to provide liquidity to the customers. As emphasized in the previous chapters of this note, banks play an important role in providing short-term funding and liquidity to various non-bank financial institutions as well as corporates and households. For example, existing commitments to the leveraged loan borrowers account for US$760 billion in credit facilities (drawn and undrawn revolvers).[46] The capacity to extend those credit lines to customers depends on banks' ability to obtain liquidity in the market, cope with the stressed liquidity outflows without breaching regulatory requirements.

90. To assess liquidity risks, a comprehensive analysis of large banks' structural liquidity ratios is complemented with a variety of liquidity stress tests. The structural analysis considers the Basel III liquidity coverage ratio (LCR) and funding concentration. While the former measures short-term liquidity risks, the latter ratios gauge more structural longer-term refinancing and funding risks. Cash flow-based liquidity stress tests were conducted using public (LCR disclosure) and, for the six G-SIBs - supervisory (FRB) data. This approach employs multiple scenarios of increasing severity covering a 30-day horizon with varying assumptions regarding liquidity buffers and shocks to cash inflows and outflows.

Funding Structure and Concentration

91. Banks rely on cash, central bank reserves and U.S. Treasury securities to meet expected and stressed outflows, but Non-GSIBs hold smallest relative amount of highly liquid assets. The quality of HQLA is very high (see Figure 23), as nearly three-quarters of it consists of highly liquid assets (such as Treasury securities) which tend to perform a role of safe heaven during market distress events. At the same time, HQLA assets represent just a fraction of all potential sources of liquidity in a stressed environment. All unencumbered assets can be used to obtain liquidity in a market or (subject to collateral eligibility) a central bank. While data on asset encumbrance is not available, the FSAP team used balance sheet FR Y9 data for structural liquidity assessment. Overall, in the current low yield environment, banks tend to hold bonds with longer maturities which implies lower liquidity and higher haircuts for sales and/or repo transactions. The share of HQLA is highest in market trading banks, which reflects their market making activities and higher reliance on wholesale funding. Smaller domestic banks have lower regulatory liquidity requirements, hence target lower liquidity ratios overall.

[46] See "Vulnerabilities associated with leveraged loans and collateralized loan obligations," Financial Stability Board, December 19, 2019.

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Figure 23. United States: Funding Structure and Liquid Assets

Much of the HQLA is comprised of Treasury securities, cash and CB reserves.

Sources: IMF staff estimates

Most of the securities banks hold are long-term, hence subject to higher haircuts for secured funding transactions.

Foreign banks and Non-GSIBS have lowest relative HQLA buffers.

Domestic deposits establish the largest funding source for banks.

Sources: IMF staff estimates

...Non-GSIBs have high share of stable, deposit-based funding, while trading banks and foreign banks rely on other types of funding.

Foreign banks to a large extent rely on secured lending inflows, thus vulnerable to disruption in secured funding market.

Sources: IMF staff estimates. Yellow dots represent sample median values while bars—quartiles.

92. Funding structure shows reliance on domestic deposits. Most of the domestic banks (G-SIBs and Non-GSIBs) rely on stable deposit-based funding sources, while some market trading banks as well as the majority of foreign-owned banks often depend on repo markets. COVID-19

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crisis and massive market liquidity support provided by the Fed led to a significant (US$1 trillion) increase in bank deposits by households and corporates (as of Q1 2020). In case of repo market distress and/or funding shocks, these banks would face large challenges to maintain adequate liquidity. Due to stable funding sources and low reliance on secured and unsecured interbank borrowing, Non-GSIBs have the lowest share of highly liquid assets in their assets.

Structural Liquidity Risks[47]

93. All banks have LCR ratios above 100 percent (Figure 24). All banks in the sample meet 100 percent LCR requirements, albeit some of them only due to a 70 percent outflow multiplier applied by smaller banks (mostly Non-GSIBS). G-SIBS tend to have marginally lower LCR, due to the two factors: (i) the maturity mismatch add-on and (ii) higher assumed outflows due to absence of 70 percent outflow multiplier. To mitigate intraday mismatch risk when calculating LCR, supervisors require large systemically important banks to include maturity mismatch add-on in calculating LCR. The add-on reflects the largest potential gap within the 30-day period. This add-on is applied to selected banks (17 out of 33 in our sample) and requires them to keep additional liquid assets equivalent to 1 percent of total liabilities on average. Non-GSIBs have considerable structural liquidity risks: i) they have large contractual funding gaps, some of them have largest in the sample off-balance sheet committed facilities coupled with lowest expected utilization rates (Figure 24). Moreover, as highlighted in FRB (2017) publications,[48] commercial banks use Federal Home Loan Banks (FHLBs) as short-term wholesale funding providers, partially to benefit from LCR requirements (a maximum 25 percent run-off rate for FHLB advances in 30 days). FHLBs receive some of their funding form Money Market Funds (MMFs), hence any funding distress related to the MMF funding withdrawal could lead to a reduction of funding FHLBs provide to commercial banks. Withdrawal of funding from banks may be a source of risk. The IMF analysis conducted by FRB using supervisory data revealed that potential liquidity squeeze due to withdrawal of funding from FHLBs from the six largest G-SIBs is insignificant.[49] An additional set of scenarios was used to test the impact of a closure of repo markets for other than HQLA1 type of collateral (discussion and results in the Liquidity Stress Testing section).

[47] Structural liquidity analysis as well as liquidity stress test focus on idiosyncratic (i.e. bank specific) risks and ignore system-wide distribution of liquidity as well as evidence that liquidity may dry up for some banks and at the same time other banks may experience large inflows.

[48] See https://www.federalreserve.gov/econres/notes/feds-notes/the-increased-role-of-the-federal-home-loan-bank-system-in-funding-markets-part-3-20171018.htm (accessed on 01/31/2020).

[49] At the same time, the importance of FHLBs on the rest of the banks in the sample was not tested due to the lack of access to supervisory data.

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Figure 24. United States: Structural Liquidity Ratios

The median LCR ratio increased since 2018 and all banks have buffers above 100 percent…

…with foreign banks maintaining highest average ratios

* 8 banks (G-SIBs), ** 17 banks, *** 33 banks.

Overall, liquidity risk expsoure is high, with the 30 day funding gap close to 40 percent of total assets…

*Non-GSIBs have the highest unsecured funding gap, but the source of the gap is stable retail deposits which are typically insured and sticky**

* Calculated as Deposits+Unsecured funding outflows – Inflows over total liabilities

Excluding off-balance sheet commitments, 30 day contractual funding gap is on average of 50 percent of TA

*Maturity mismatch add-on is on average an additional 1 percent of total liabilities**

*only some banks in the sample are subject to add-on requirements.

Sources: IMF staff estimates. Yellow dots represent median values while bars – quartiles. Red line – 100 percent minimum requirement (LCR).

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94. The gap between contractual inflows and outflows at the 30-day horizon excluding retail and operational deposits is high, and mostly driven by off-balance sheet financing facilities. The contractual funding gap[50] represents the most severe liquidity risk scenario for a bank. As evidenced during crisis times, affected banks experience outflows approaching contractual maturity. On-balance sheet net cash and securities flows (including retail, sight and operational deposits) over 30-day period constitute on average around half of banks' balance sheet. Off balance sheet credit and liquidity facilities constitute another 25 percent of Total Assets (TA). Most of these commitments are credit lines to corporations and households (credit cards), loans to other financial institutions, including mutual, investment, hedge funds. Banks do have leeway to estimate expected utilization of such lines for LCR purposes.

95. Evidence suggests that in the past banks with a low utilization rate of credit and liquidity facilities may underestimate liquidity risks (higher outflows than expected) during stress scenarios.[51] As evidenced during the GFC**,** and during the COVID-19 stress period**,** more financial and nonfinancial counterparties utilize revolving credit facilities (due to inability to obtain term loans, refinance existing debt, receive trade credit, etc.), credit card accounts, etc. as loans of last resort before declaring insolvency or illiquidity. In a business as usual scenario, banks may underestimate potential outflows due to the need to grant such facilities in stressed market conditions. For example, many of these loans may be committed, but have multiple covenants or be uncommitted with a bank having an option to unilaterally cancel the line. While it would be perfectly rational for a bank to cancel the lines, macro consequences of such a collective behavior would lead to further increase in corporate default rates. As evident from the LCR disclosure data, some of the Non-GSIBS have a high share of credit and liquidity facilities coupled with low expected utilization rate (Figure 25).

Figure 25. United States: Credit and Liquidity Facilities and their Utilization

Most of the banks expect that only about a quarter of amounts of credit and liquidity facilities will be utilized…

….with Non-GSIBS having the lowest modeled ratios.

Sources: IMF staff estimates. Yellow dots represent median values while bars—quartiles.

[50] Measured as all contractual inflows minus contractual outflows.

[51] See for example research by Reich and Falato (2019) which documents that during stress times firms are more likely to draw banks' credit lines and the FSB report "Vulnerabilities associated with leveraged loans and collateralized loan obligations," Financial Stability Board, December 19, 2019" which highlights LCR limitations by not distinguishing higher credit utilization rates by lower rated corporates.

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Liquidity Stress Testing Methodology and Scenarios

96. Liquidity stress tests incorporated various assumptions on how banks and their clients would behave under stressed market conditions. To deal with parameter uncertainty, the cash flow tests were conducted over a wide range of scenarios featuring different degrees of severity. Public LCR cash flows disclosure templates were used to calculate system-wide average inflow/outflow parameters as well as haircuts on HQLA.

97. Haircuts on liquid assets holdings of banks are based on an empirical attempt to quantify asset fire-sales during different market liquidity regimes. Multiple types of securities (Treasury, Corporates, Mortgage-Backed, U.S. Agencies, etc.) are included into Counterbalancing Capacity (CBC) of banks. The stress test applied non-linear estimation techniques, such as Markov regime switching models, to calibrate haircuts on CBC securities. It was assumed that during distress in the markets, these securities will be sold under asset fire sales prices, i.e., with significant haircuts (see Appendix XVII). Haircuts were determined based on collective amount of assets sold (as opposed to linear haircuts and individual amounts). The estimations reveal, that asset prices (haircuts on them) tend to behave non-linearly with haircuts being much higher during market turmoil. Increase in market volatility tends to be a good predictor of illiquidity, thus higher haircuts on assets sold.

98. Secured cash inflows and off-balance sheet commitments represented the key risk drivers in the 30-day tests (Figure 26). Liquidity stress test scenarios assumed wholesale funding shock, high utilization of credit lines and asset fire-sales. In line with key risks stemming from corporate sector, it was assumed that banks would need to provide liquidity to cash strapped companies. This scenario assumed a gradual increase in utilization ratios of credit and liquidity facilities. Another scenario assumed withdrawal of wholesale funding, including a partial closure of repo markets. The most important caveat is that stand-alone liquidity stress tests are not meant to simulate redistribution of liquidity within the banking system, i.e., situations when withdrawal from one bank or group of banks leads to an increase in inflows in another one(s) or when credit line utilization leads to redistribution of deposits within the same bank.

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Figure 26. United States: Cash Flows Over 30-Day Period

Secured funding inflows (asset swaps, reverse-repo) dominate in the 30-day cash flow window....

... while repos and off-balance sheet commitments are the largest items on the outflow side,

Source: IMF staff estimates based on public LCR data.

Liquidity Stress Test Results

99. A gradual increase in utilization of credit and liquidity facilities scenario leads to a significant shortage of liquidity in several individual banks, but the system-wide impact is contained (Figure 27). It is expected that in times of stress nonfinancial corporates, households would increase utilization of available credit and liquidity facilities from banks. Liquidity stress tests reveal, that many banks (including G-SIBs) would need additional liquidity to provide funding to distressed corporates and other institutions in times of wholesale funding stress or adverse conditions in the market, if drawdowns exceed 30 percent.[52] Depending on the share of committed and uncommitted credit lines, assumed credit conversion factors, additional depletion of CET1 ratios due to the increase in RWAs would be from 20 (minimum of 5 percent drawdown) to 250 basis points were banks to allow full drawdown of the lines. Failure to grant credit lines would lead to various non-linear feedback effects within the financial sector and further defaults of distressed (cash trapped) corporates. While the FRB actions at the outset of the COVID-19 outbreak helped to shore up liquidity, it is therefore important to ensure that banks have high enough liquidity buffers and predictable access to central bank liquidity facilities.

[52] The test assumed that banks' inflows/outflows follow LCR rates, except for higher (standardized for all banks) outflow (utilization) rates applied for credit and liquidity facilities. Full amount of HQLA without haircut is used to cover the gap. The test does not distinguish between committed/uncommitted lines.

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Figure 27. United States: Liquidity Stress Testing Results

System-wide liquidity needs are small in case of increase in drawdowns on revolvers of up to 30 percent of utilization rates with some Non-GSIBS driving the overall impact due to assumptions about low expected drawdowns

Sources: IMF staff estimates using public LCR and FR 9Y disclosure data.

100. Additional cash flow-based stress test was conducted by the FRB using IMF scenarios and models to assess funding and market liquidity risks in the network of U.S. G-SIBs (see Appendix XVII for technical details[53]). The test focused on two key scenarios: (i) the LCR-based shock scenario, which used LCR stress parameters but assumed more severe outflow rates on contingent liquidity items, such as credit and liquidity facilities, derivatives, loss of rehypothecation rights; (ii) the LCR-based shock scenario coupled with the assumption of a partial closure of repo markets (i.e., repos with MBS, agency, and corporate securities not possible) and outflow rates on selected cash flow items the same as in scenario i).

101. G-SIBs have enough liquidity to withstand severe LCR-like liquidity shock coupled with additional contingent liquidity and committed line outflows over 1-, 5-, and 30-day horizon. Compared to the results of the analysis above conducted for 35 banks using public LCR data (where a number of Non-GSIBs were illiquid), the G-SIBs do not have a gap after HQLA sales and do not need to repo assets. The liquidity gap and impact on CET1 are thus zero across all scenarios and maturity horizons. There is also no further transmission of funding risk in the network due to counterparty exposures among the G-SIBs.

102. Closure of the repo market for non-treasury securities would lead to a small and short-lived cash flow gap in several banks, but the system-wide impact from asset fire sales is small.[54] Unless daily asset trading volume exceeds five times the historic average, an immediate

[53] The analysis was performed by the FRB staff using IMF scenarios and models and does not reflect the views of the U.S. regulators. Further details are in Caceres, C., M. Leika, D. Seneviratne and E. Yu "Keeping It Real": Enhanced Network Analysis in IMF FSAPs." IMF Working paper (2020c), forthcoming.

[54] The test was performed before the COVID-19 and did not consider that ability to repo or sell US sovereign securities may be limited. Moreover, that test did not considered increase in RWAs because of utilization of credit lines.

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closure of the non-Treasury repo markets affects banks during the one-day to five-day horizons (Figure 28). The worst observed cash flow gap (before a bank needs to repo treasury securities) would be from 0.09 percent of total assets (one day) to 0.27 percent (one week). This gap is fully covered by other inflows on the 30-day horizon (i.e., no shortage of liquidity is observed). If affected banks liquidate assets in stressed markets, this would lead to an insignificant 9 basis points decline of CET1 on average (because the assets liquidated are treasury securities). No bank would become technically illiquid and there would be no additional losses due to interconnectedness among G-SIBs. It is worth noting, that in case of a complete closure of repo markets (i.e., including Treasury securities), affected banks would face higher asset liquidation needs. Albeit probability of such a scenario is very low. Withdrawal of funding from FHLBs itself would not lead to a cashflow gap.

103. Closure of repo market may lead to illiquidity of a G-SIB when this severe shock is combined with an increased utilization of credit and liquidity facilities by other financial institutions or corporates. The stress test found one G-SIB illiquid, albeit under an assumption of very high outflow rates from the credit and liquidity facilities (40 percent and above) and only under a 30-day test horizon. Overall, the impact of asset fire sale, including repricing of remaining assets on affected G-SIBs balance sheets, is small with a similar decline in CET1 capital by 9 basis points as in the previous case, and funding gap of only 7 basis points of total assets in the worst-case scenario (Figure 31). The liquidity impact depends on changes in market depth: the largest impact on daily liquidity of banks comes from assumptions about changes in average daily trading volumes of HQLA securities.

104. Overall, "liquidity pipeline" risk in the financial system is high as banks maintain their central role in providing liquidity to other financial and nonfinancial customers which do not have access to central bank facilities.[55] Analysis in the next chapter shows how the sample of banks is linked to the rest of the banking and financial system. This analysis and liquidity stress tests reveal that banks' role in liquidity provisions to the financial system is critical: failure to grant credit lines would lead to various non-linear feedback effects within the financial sector and further defaults of corporates. It is therefore important to ensure that banks have high enough liquidity buffers, predictable access to central bank liquidity facilities.

[55] See for example, Sooji Kim, Matthew C. Plosser, and João A.C. Santos "Macroprudential Policy and the Revolving Door of Risk: Lessons from Leveraged Lending Guidance," FRB NY Staff Reports May 2017 Number 815. The report estimated that nonbank financial institutions (NBFIs) increased borrowing from banks by 125 percent in 2016–2017. The loans were used to extend NBFIs' investments into leveraged loans.

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Figure 28. United States: Liquidity and Asset Fire Sales Scenario for U.S. G-SIBs

Impact of the closure of the repo market is small, and on its own will not lead to illiquidity of banks (one-week horizon is shown), especially if they can sell multiple amounts of liquid securities (5 times average daily trading volume in the figure below means that the gap becomes zero).

Minimum Gap Ratio after Liquidation
(In percent of total assets; horizon = 1 week; liquidation strategy for funding shocks = slicing; stress regime = stress ; repo threshold = 1 times estimated threshold)

Under the 30-day scenario, all G-SIBs would retain positive cash flow gap if outflow shock on credit facilities would remain below 40 percent.

Minimum Gap Ratio after Liquidation
(In percent of total assets; horizon = 30-days; liquidation strategy for funding shocks = slicing; stress regime = stress ; repo threshold = 1 times estimated threshold)

CET1 capital impairment solely due to liquidation losses is about 4.5 basis points

Minimum CET1 Impact: Liquidation Loss Only
(Liquidation strategy for funding shocks = slicing; stress regime = stress ; repo threshold = 1 times estimated threshold)

...while marked-to-market losses are also around the same level, thus yielding a combined CET1 impact of 9 basis points

Minimum CET1 Impact: Liquidation Procedure Only
(Liquidation strategy for funding shocks = slicing; stress regime = stress ; repo threshold = 1 times estimated threshold)

Sources: IMF calculations performed by the FRB based on FRB supervisory data.

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C. Banking Sector Interconnectedness

Domestic Interbank Network Stress Testing

105. Modelling domestic bank interconnectedness reveals that direct (funding and credit) contagion among G-SIBs is small and failure of one G-SIB would not lead to direct default of another one. The joint interconnectedness modelling exercise performed by the FSAP team in collaboration with the FRB staff assessed the propagation of such idiosyncratic and systemic shocks through the network of U.S. G-SIBs, linking solvency and liquidity risks (Figure 29). The analysis considered unsecured, secured (repos/reverse repos, swaps, etc.) and contingent (derivatives, CDS contracts) exposures among six largest G-SIBs. While the closure of non-Treasury repo markets coupled with severe scenario parameters would lead to one G-SIB becoming illiquid over 30-day horizon, the impact of asset fire sale on remaining banks in the network is limited to a decline in CET1 by 25 basis points, depending on banks' asset liquidation strategies and daily trading volume constraints (Figure 30).[56]

Figure 29. United States: Enhanced Interconnectedness Analysis—Solvency and Liquidity Risk Linkages

Source: IMF staff.
Note: The analysis is based on two stages. First stage—funding liquidity risk based on cash flow data, second stage—network contagion model. The first stage simulates conditions under which a bank would be illiquid or insolvent under severe yet plausible funding shocks; in the second stage a bank which fails the first stage (illiquid because of revaluation of its assets using fire-sale prices) does not meet its contractual obligations to the other banks in the network. Entity h in this illustration refer to any entity outside of bank i and j.

[56] The test used two strategies: waterfall when banks liquidate most liquid assets first and slicing when banks liquidate proportional amount of each type of security.

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Figure 30. United States: Liquidity and Asset Sales Scenario Propagation in the U.S. G-SIBs Network

The impact of asset sales on CET1 would be 9 basis points for affected banks if they use proportional liquidation approach to sales (slicing)…

…the network contagion and fire-sales impact would be higher if banks were to adopt waterfall liquidation strategy (i.e., liquidate most liquid assets first), albeit no one bank would be insolvent and final impact would be 25 basis points of CET1 loss.

Sources: IMF calculations performed by the FRB based on FRB supervisory data.

Cross-Border Bank Network Analysis[57]

106. Potential cross-border contagion risks are assessed using exposure-based network analyses. The analyses aim at quantifying the capital impairment incurred by the U.S. banking system or BHCs due to an idiosyncratic shock originated in a counterparty banking system or transmitted via a counterparty banking system (i.e., the cascade effect). Two shock transmission channels are explored. First, spillovers are assumed to be transmitted through a credit shock in which—due to a hypothetical default of a counterparty banking system—the U.S. banking system/BHC does not recover a fraction of its claims on the system in distress. Second, spillovers are amplified due to a funding shock assuming that the hypothetical default of a counterparty banking system would lead to liquidity pressures owing to foregone funding and asset fire sales. These analyses are performed using the network contagion model and methodology developed by Espinosa-Vega and Sole (2010).[58] The cross-border bank network analysis consists of two separate

[57] Data used in the analysis does not allow us to distinguish between secured and unsecured exposures as well as understand what type of collateral is used for secured exposures. Therefore, the analysis is based on very conservative assumptions that all of the exposures are unsecured. It is worth noting however that, based on supervisory data, 2019 France FSAP stress testing technical note reveals that majority of U.S. dollar funding exposures of the French banking system are secured exposures. Based on BIS cross-border exposures, nearly 50 percent of all reporting countries exposures is denominated in U.S. dollars.

[58] Due to the lack of granularity in the available cross-border exposures data, cross-border network analysis does not use the enhanced interconnectedness model developed during this FSAP in collaboration with the FRB staff for the domestic interconnectedness analysis.

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analyses: the first set of simulations assesses network contagion at banking system-level; the second set of simulations assesses network contagion at U.S. BHC vis-à-vis foreign banking system level (see Figure 31).

Figure 31. United States: Schematic Representation of the Network Contagion Analyses

Source: IMF staff.

Contagion Analysis 1: Network Contagion at Banking System Level

107. Network analysis in this section quantifies the potential spillovers[59] between the U.S. banking system and large counterparty banking systems through several types of exposures.[60] First, spillovers emanating from exposures unrelated to intra-group positions are assessed, thus quantifying the spillovers between U.S.-owned banks and foreign-owned banks. Nevertheless, the presence of branches and subsidiaries (the latter to a lesser extent in many cases based on the regulatory landscape) may alter the spillover transmission between banking systems; For example, sizable exposures may exist due to large credit lines provided by parent entities. The role of financial centers, large banks, and foreign banking operations in intermediation of cross-border flows of funds—for instance related to FX transactions including U.S. dollar funding activities—may also amplify potential spillovers particularly in deleveraging episodes. The second and third exposure types aim at capturing additional spillovers due to such activities, while the

[59] The term "spillovers" in this section refer to the capital impairment incurred by an entity or a system due to distress in another banking system.

[60] The analysis is based on BIS consolidated and locational statistics (both residency and nationality basis) and uses the 10 largest counterparty banking systems for which bilateral consolidated and locational interbank exposures are available.

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distinction between the two exposure types rely on how the banking system is defined (i.e., banking systems including foreign operations vs. banking systems based on the domicile).[61]

108. The following scenario and assumptions are used in the simulation on shock transmission through credit (solvency) and funding (liquidity) channels:

- The scenario considers the effect of a severe credit shock combined with a funding shock under the assumptions below;
- Assumptions: 100 percent of the interbank lending provided to the banking system in distress is not recovered (i.e., loss-given-default parameter is 1.0).[62] Assets are liquidated to meet the funding gap at a 50 percent discount during an asset fire sale. It is also assumed that banking systems will be able to roll-over 65 percent of the lost funding through other means such as raising equity (therefore, the share of lost funding that is not recovered is 0.35).

109. The analysis suggests inward spillovers into the U.S. banking system from other large counterparty banking systems is limited on average. The sources of potential vulnerabilities—due to direct exposure as well as through the cascade effect of other foreign banking systems with exposure to the U.S. banking system—are concentrated in few large foreign banking systems such as the United Kingdom and Japan (Figure 32). At a much lower intensity, potential vulnerabilities may also arise from the banking systems in Canada, Germany, and France.[63] The results also suggest that the quantification of vulnerabilities may benefit from capturing different types of exposures such as those that are previously discussed, as the intensity of spillovers may vary based on the nature of stress episodes. Potential vulnerabilities could in fact diverge depending on the type of exposure assessed. Specifically, potential inward spillovers into the U.S. banking system ranges between 2–8 percent of initial regulatory capital of the U.S. banking system depending on the type of exposure. This capital impairment is transmitted mostly via the credit channel (i.e., due to direct and second-round credit exposures). However, incorporating funding shocks in the simulations increase the systemic importance of some banking systems from a liquidity point of view, thus increasing inward spillovers into the U.S. banking system by one-third.

110. The U.S. banking system has the potential to be a source of significant contagion to large banking counterparts. In particular, the potential contagion risks transmitted through a

[61] Specifically, in the second exposure type, the residency-based exposures are reorganized to include exposures of branches and subsidiaries domiciled outside the parent country along with the parent country exposures. The third type is based on residency-based exposures, where foreign branches and subsidiaries are included under the host banking system.

[62] A loss-given-default rate of 100 percent is used with the assumption that these exposures are unsecured exposures and due to the difficulty of recovering assets at the time of banking system failure. Data used in this analysis does not allow us to distinguish between secured and unsecured exposures as well as understand what type of collateral is used for secured exposures. Therefore, the analysis is based on very conservative assumptions that all of the exposures are unsecured.

[63] These five banking systems are the largest potential spillover transmitters into the U.S. banking system based on all three exposure types assessed.

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credit shock result in an impairment of about 10 percent of the initial regulatory capital of recipient foreign banking systems on average (Figure 33). Additional amplification of potential contagion through the funding channel also amounts to about one tenth of the capital impairment from the credit shock. However, the contagion effect could also vary depending on the type of exposure that would transmit spillovers. For instance, the average impairment stemming from contagion risk to foreign-owned banks could increase from 10 percent of capital to 40 percent of initial capital when contagion risks to host banking systems is considered.

111. Contagion risks are concentrated in several banking systems and concentrations vary depending on the type of exposures (Figure 32). Canadian-owned, Japanese-owned, and French-owned banks (latter to a lesser intensity) at aggregate level have the highest potential contagion risks due to a hypothetical systemic shock to U.S.-owned banks. This alludes particularly to heavy financial intermediation activities between foreign-owned banks and globally active U.S. banks including dollar funding activities carried out via large U.S.-owned banks. On the other hand, when foreign banking systems including branch and subsidiary operations are considered, the U.K. banking system has the highest potential for contagion. This is not only due to the United Kingdom's direct exposure to the U.S. banking system, but also due to the cascading effect owing to U.K.'s exposures to other foreign banking systems that are large counterparties of the U.S. banking system. The role of the U.K. banking system as a financial center in intermediation of cross-border flows is in part behind these large contagion effects.[64] The host banking systems in Canada, the United Kingdom, and Japan (France and Germany to a lesser extent) have large potential for contagion, also emphasizing the ability of contagion to cascade in the presence of branch and subsidiary operations.

112. Potential contagion from the U.S. banking system would still be significant under a less severe scenario. Given the uncertainty surrounding the loss-given-default parameter used, as it may vary depending on the nature of exposures—unsecured or secured—and the collateral pledged, a sensitivity analysis is performed. For robustness, the scenario assumes a 50 percent loss-given-default rate.[65] Results reveal that even under this scenario, foreign banking systems would lose a sizable share of their capital due to contagion from the U.S. banking system by about 5 percent to 15 percent of their initial regulatory capital (Figure 34). Compared to the severe scenario presented earlier, this is about a one-half reduction in losses. Similar to the previous simulation results, contagion is specifically larger in the U.K., Japan, and Canada. Potential capital impairment of the U.S. banking system is also about one-half lower in this scenario (ranges from 1–3 percent of initial capital of the U.S. banking system).

[64] Belgium also has large potential contagion risks, owing to financial intermediation such as cross-border dollar funding activities conducted through Belgium banks' foreign operations. Spillover analysis performed at host country-level reveal that the presence of foreign operations increases the potential for contagion to the host banking system.

[65] Banking systems is assumed to roll-over 90 percent of lost funding (share not recovered = .1) under this scenario, while assets are liquidated at a 10 percent haircut.

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Figure 32. United States: Cross-Border Inward and Outward Spillovers by Type of Exposure

(Purple edges = inward spillovers to the U.S. banking system; green edges = outward spillovers)

Exposure Type 1: Spillovers between U.S.-owned and Foreign-owned Banking Systems

Banking system defined at parent country level (without intra-group operations): against counterparty banking systems on ultimate counterparty/ guarantor residency

Exposure Type 2 & 3: Spillovers between U.S. and Foreign Banking Systems (with Intra-group Operations)

Exposure type 2: banking system defined at parent country level: against counterparty banking systems based on counterparty residency

Exposures type 3: banking system defined at host country level: against counterparty banking systems based on counterparty residency

Sources: BIS, IMF FSI, IMF staff.
Edge width = proportion of contagion vis-à-vis the recipient banking system. Edge color = direction of contagion; green edges are the potential contagion emanating from the U.S. banking system into top 10 foreign banking systems (i.e., outward spillovers), while purple edges are the potential vulnerabilities (i.e. inward spillovers) from foreign banking systems into the U.S. banking system.

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Figure 33. United States: Average Spillover between the U.S. Banking System and Foreign Banking Systems

(In percent of initial capital of the spillover recipient)

Sources: BIS, IMF FSI, IMF staff.

Figure 34. United States: Sensitivity Analysis using a Less Severe Scenario: Average Spillover between the U.S. Banking System and Foreign Banking Systems

(In percent of initial capital of the spillover recipient)

Sources: BIS, IMF FSI, IMF staff.

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Contagion Analysis 2: Network Contagion between U.S. Banks and Foreign Banking System

113. A separate simulation is performed in order to assess the spillovers at individual BHC-level using publicly available data on cross-border claims against foreign banking systems.[66] In the absence of liabilities-side data and bilateral bank-to-bank exposures, the analysis is performed under several major caveats. First, this analysis only captures the first-round effects direct exposures; in the absence of exposure against other banks in the network, the analysis does not capture the cascading effect due to other large counterparty banks' exposure to large foreign financial systems. Second, the simulations are limited to a credit shock scenario given the liability-side cross-border exposures are not available. This scenario assumes 25 percent of the credit provided to the foreign banking systems is not recovered[67].

114. Results reveal some concentrated inward spillovers due to a hypothetical distress in foreign banking systems transmitted through a credit shock, though spillovers are modest on average (Figure 35). Domestic G-SIBs have particularly larger direct inward spillovers emanating from the Japanese banking system. While the analysis is unable to capture the cascading effect given the data limitations, U.S. banks with limited inward spillovers may also experience larger spillovers if their counterparty exposure vis-à-vis the G-SIBs are sizable. On average, potential capital impairment incurred solely due to direct exposures by a G-SIB is about 1.2 percent of their initial regulatory capital. Other domestically owned BHCs in the sample on average have potential capital impairment of less than 1 percent of their initial capital, when the cascading nature of spillovers are not considered. Intermediate holding companies (IHCs) on average are susceptible to potential inward spillovers due to direct exposures at about 1 percent of initial capital. These potential spillovers could amplify in the presence of large counterparty exposures vis-à-vis the other banks in the network. However, significant concentrations exist among the IHCs against potential spillovers emanating from their parent banking systems.

[66] Data for this section comes from FFIEC 009a report.

[67] The assumption of LGD at 25 percent as oppose to a more stringent assumption at a higher LGD is used given the partial availability of the exposure data (i.e. exposure of a bank vis-à-vis a banking system, as oppose to bank-to-bank exposures).

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Figure 35. United States: Bank-Level Inward Spillovers from Foreign Financial Systems

Sources: FRB FFIEC 009a , IMF FSI, IMF staff
Note: Edge (arrow) width represents the size of inward spillovers into the bank, proportionate to spillovers of other banks. Edge color corresponds to the group of the spillover recipient. The inner circle represents foreign financial systems.

LIQUIDITY STRESS TESTING FOR U.S. MUTUAL FUNDS

A. Objective and Scope

115. This stress testing exercise examines liquidity risk for U.S. mutual funds. The objectives are to assess whether mutual funds are able to withstand severe but plausible redemption shocks, identify which types of funds are potentially more vulnerable to liquidity risk and estimate and the extent to which funds can transmit shocks to the financial system.[68]

116. The emphasis is on fixed income mutual funds, since they invest in a range of fixed income assets with varying degrees of liquidity. Based on commercial data, the sample includes 2,743 funds for a net asset value of about US$6.4 trillion as of end-2019, covering the entire mutual

[68] For the remainder of the document "funds" refer to mutual funds unless specified otherwise.

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fund universe tracked by the Investment Company Institute (see Appendix XI for details). The sample is subdivided into nine categories reflecting the type of fixed income instruments mutual funds invest in. The categories are IG and HY corporates, loan funds, global bond funds, EM funds, government bond funds, municipal bond funds, mixed funds and multi-strategy funds (Table 1).

D. Methodology

117. The stress tests are based on three pillars: calibration of the redemption shock, composition of asset sales and the price impact of sales. The analysis compares for each fund the level of redemptions with the level of highly liquid assets at the disposal of the manager. Then, following the shock, it is assumed that the manager will sell some of the assets in the portfolio according to a liquidation strategy. When assets are sold, sales are assumed to have a negative price impact on the market, the extent to which depends on the amounts of sales and on the absorption capacity of the market (see Appendix XII for details about the methodology).

Calibration of Redemption Shocks

118. One set of redemption shocks are calibrated based on historical data. For each fund, historical data are used to calibrate the redemption shocks based on the most extreme outflows observed in the past by funds in the same category. Within each of the nine fund categories, funds face the same redemption shock ('homogeneity assumption'), which is calibrated based on the average of the worst 3 percent net flows observed by funds in a given category.[69] The resulting levels of redemptions range from 7 percent of the net asset value for municipal bond funds to more than 15 percent for HY and EM bond funds, which tend to experience more volatile flows (Table 1). The redemption shock is also calibrated at fund-level ('heterogeneity assumption'), where each single fund faces an idiosyncratic shock based on its own historical net flows. The levels of shocks are in line with previous FSAPs (see IMF (2015, 2016, 2017, 2018)).

119. A second set of redemption shocks is calibrated using the adverse scenario. The banking sector adverse scenario is utilized to estimate redemption shocks for funds. Given the projected levels of macrofinancial variables, returns are estimated for each fund and given the flow-return relationship, net flows are estimated, as detailed in Appendix XII.[70] Overall, the redemption shocks are milder compared to the historical approach, with most funds facing levels of redemption below 3 percent (Table 1). However, under the adverse scenario, all funds face redemption shocks at the same time, which could result in a large amount of forced sales.

[69] As a robustness check, other thresholds and methods are used, resulting in twelve different redemptions shocks.

[70] Using the adverse scenario designed for the banking sector stress test allows the possibility to assess the aggregate impact of shocks across all mutual funds at the same time. This analysis therefore complements the historical approach, where results cannot be aggregated since the different fund categories would not face severe outflows all at the same time.

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Table 1. United States: Mutual Funds Stress Test—Sample and Approach

Sample of U.S. Mutual Funds

Fund category	Net asset Value (US $ bn)	Number of funds
Corp. IG	2,427	608
Mixed funds	1,752	792
Municipal	799	567
Multisector	432	182
Government	326	161
Corp. HY	257	192
Global	247	87
Loan funds	91	58
EM funds	66	96
Total	6,398	2,743

Sources: Morningstar, ICI, IMF staff calculations

Steps in Mutual Fund Stress Tests

Redemption Shocks by Fund Category

	Historical approach		Adverse scenario		
Fund category	Homogeneity	Heterogeneity	Returns (%)	Flow sensitivity to returns	Net flows
Municipal	6.8	5.8	-1%	0.5	0.7
Mixed funds	8.6	6.7	-10%	0.3	2.8
Corp. IG	12.9	10.3	-2%	0.7	1.1
Multisector	13.2	9.9	-3%	0.6	0.9
Loan funds	13.3	12.3	-1%	0.9	0.8
Global	14.3	11.8	-3%	0.3	0.6
Government	14.4	11.3	1%	0.3	-0.5
HY	15.0	11.8	-7%	0.6	4.8
EM funds	17.5	13.8	-11%	0.9	10.3

Redemption shocks in % of NAV. Median net flows under the heterogeneity approach. Positive values indicate outflows.
Sources: Morningstar, IMF staff.

Liquidity Demands Raising from Derivatives Exposures

120. Variation margins on swap and forward exposures are estimated in the context of interest rate and foreign exchange shocks. For a sample of 10 funds with large derivative exposures totaling US$41 billion in total assets, variation margins are estimated assuming a 50 basis points interest rate increase and a 1 percent depreciation of the U.S. dollar against all currencies. The variation margins are calculated using the duration of each instrument, based on regulatory filings by mutual funds (SEC form N-PORT as of end-2019). It is assumed that variation margins can only be paid in cash, in line with industry practices.[71]

[71] According to the 2018 ISDA margin survey, cash accounts for 75% of collateral posted for variation margins (ISDA, 2019).

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Ability of Funds to Withstand Shocks, Liquidation Rules, and Transmission of Shocks

121. Redemptions are compared to funds' holdings of highly liquid assets to assess their ability to withstand shocks. The redemption coverage ratio (highly liquid assets to redemption, both in percent of NAV) is used to estimate the ability of funds to meet redemptions without resorting to the sale of less liquid assets in their portfolio.

$$RCR = \frac{Highly\ liquid\ assets}{Redemption\ shock}$$

Highly liquid assets are estimated at fund-level using the composition of the portfolio and applying liquidity weights derived from Basel III framework for the calculation of High-Quality Liquid Assets (HQLAs).[72] When funds have an RCR below one, a liquidity shortfall is computed, as the difference between the redemption shock and the available highly liquid assets.

122. Fund managers can use different liquidation approaches when facing redemptions. Following the redemption shocks, we assume that fund managers will sell some of the fund assets to meet investors' redemptions. Different liquidation strategies can be used: vertical slicing (pro rata)—where the manager sells each asset class in proportion of their weight in the fund's portfolio—waterfall (where most liquid assets are sold first), or a mixed approach where cash is used first and then the manager follows a slicing approach.

123. The sales of securities by funds following redemptions can have an impact on markets. Given a redemption shock and a liquidation strategy, funds have to sell a given amount of securities across different asset classes. To estimate the price impact of the sales, the volume of sales is compared to the liquidity of the underlying market. Liquidity is measured by market depth which is positively related to the ratio of average daily trading volumes to asset volatility. Market depth is measured under average trading conditions and during stress periods (see Appendix XII for details).

Vulnerabilities of U.S. Mutual Funds and Interconnectedness

124. Some fund categories might be more vulnerable or more likely to transmit shocks than others. The analysis of vulnerabilities and interconnectedness within mutual funds is based on two concepts of risk. Vulnerable funds are funds that are likely to be in distress when other funds (or the market) are in distress. Spreader funds are institutions for which other funds are likely to be in distress when the spreader fund is in distress. The identification of vulnerable and spreader funds is based on two methodologies: tail-dependence using copula and the interconnectedness approach (Diebold and Yilmaz, 2016). Under the first approach, the dependence structure of net flows across funds categories is modelled using historical data, conditional on one fund category being in distress (i.e., facing large outflows), expected net flows for the other categories are then calculated. Under the interconnectedness approach, weekly returns for a sample of 70 funds (the 10 largest for 7 categories) are used to estimate spillovers from and to each fund in the sample.

[72] A similar approach was used for the 2017 Luxembourg FSAP (IMF, 2017).

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E. Results

Funds' Ability to Withstand Severe Redemption Shocks

125. Under the historical approach nearly all funds would be able to withstand severe redemptions, with the exception of high yield (HY) and loan mutual funds. Overall, more than 90 percent of the funds would have enough highly liquid assets to meet investors' redemptions. However, most funds exposed to HY and leveraged loans would not have enough highly liquid assets and would need to sell liquid securities in their portfolio, assuming that they do not use any liquidity risk management tools. The result remains valid when shocks are calibrated at category level (homogeneity) and at fund-level (heterogeneity).

126. Loan funds may be particularly vulnerable to redemption shocks, but a large majority has credit lines. Loan funds invest mainly in leveraged loans, which are less liquid than corporate bonds and are subject to relative long settlement (average of 10 days according to LSTA), which make them subject to significant potential liquidity risk (Figure 36). Most loans funds have credit lines in place, which usually are committed lines from banks, and most of them are shared with other funds. Such credit lines could provide liquidity buffers to funds experiencing large outflows. However, due to the shared nature of the credit lines, under stress other funds could need to draw on the same line at the same time.

Figure 36. United States: Loan Funds

Sources: Morningstar, IMF staff.

Sources: SEC form N-CEN, IMF staff.

127. Under the adverse scenario, almost all funds would be able to withstand redemptions (Figure 37). The result is directly related to the very mild shock in the adverse scenario (less than 3 percent of NAV for most funds). Only 1 percent of funds would not have enough highly liquid assets to meet redemptions, all HY funds.

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Figure 37. United States: Results of the Liquidity Stress Test for the Historical Approach

	Homogeneity			Heterogeneity			Adverse scenario		
Fund category	Funds with RCR<1	% funds with RCR<1	% NAV with RCR<1	Funds with RCR<1	% funds with RCR<1	% NAV with RCR<1	Funds with RCR<1	% funds with RCR<1	% NAV with RCR<1
Global	0	0%	0%	0	0%	0%	0	0%	0%
Gov	0	0%	0%	0	0%	0%	0	0%	0%
Mixed	0	0%	0%	0	0%	0%	0	0%	0%
Muni	1	0%	0%	0	0%	0%	0	0%	0%
IG	1	0%	0%	2	0%	0%	0	0%	0%
Multi	6	5%	2%	5	4%	2%	0	0%	0%
EM	4	6%	11%	2	3%	2%	0	0%	0%
HY	109	75%	71%	82	56%	39%	28	19%	18%
Loan	37	82%	86%	29	64%	67%	0	0%	0%
Total	158	8%	4%	120	6%	4%	28	1%	1%

Note: RCR is the Redemption Coverage Ratio (Highly Liquid Assets/Redemption shock).

Sources: Morningstar, IMF staff.

Share of funds with a liquidity shortfall

Note: Share of funds (by category) whose Redemption Coverage Ratio (highly liquid assets to redemption) is below one .

Sources: Morningstar, IMF staff.

128. Funds with large exposures to derivatives could face significant liquidity demands related to variation margins. A 1 percent depreciation of the USD and a 50 bp increase in interest rate would cause variation margins on the derivatives portfolio that would range between 3 percent and 10 percent of the NAV. For several funds the variation margins would be more than 50 percent of available cash and cash equivalents, depleting funds liquidity buffers (Figure 38). Results are illustrative since the sample is small and only focuses on simple derivatives. In practice, funds use other types of more complex derivatives (such as swaptions), which were not considered in the analysis.

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129. Under the current derivatives proposal, mutual funds using absolute Value at Risk (VaR) risk measures could potentially be substantially leveraged. Under the SEC proposed rule, synthetic leverage would be indirectly limited by a VaR limit of either 150 percent of a reference benchmark or 15 percent of the one-month VaR of a fund (absolute VaR), rather than by a limit based on the NAV. For funds using absolute VaR, allowable synthetic leverage could potentially be high, if the funds invest in a portfolio with a low VaR: for a portfolio with a VaR of 5 percent, the fund could lever up to 3x times to reach the 15 percent VaR limit (5 times for a VaR of 3 percent etc.). A simulation exercise shows that for the 15 percent VaR constraint to be binding, the volatility of the underlying portfolio would need to be very high (about 25 percent annualized volatility, see Box 1). In addition, the current proposal includes an exemption for some funds which would allow them to be leveraged up to three times (provided that (i) funds disclose in their prospectuses that they are not subject to the proposed limit on fund leverage risk and (ii) funds would be subject to sale practice rules).

Figure 38. United States: Use of Derivatives and Liquidity Demands

Sources: SEC form N-PORT, IMF staff.

Note: Variation margins in % of cash and cash equivalents as reported in B.2.f. Sources: SEC form N-PORT IMF staff.

Source: IMF staff calculations.

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Box 1. Maximum Allowable Leverage under the Absolute VaR Approach

For funds using the absolute VaR approach, leverage is indirectly limited by the absolute VaR limit: the one-month 99 percent losses should be below 15 percent of the NAV of the fund. To assess the maximum allowable leverage, it is assumed that the returns of the portfolio of a fund follow a lognormal distribution. The VaR depends solely on the expected returns and the volatility of the portfolio. The figure below shows the result one-month 99 percent VaR given different levels of asset volatility: if the asset volatility is 4 percent, then a fund could lever up to 5.6 times the NAV since the VaR would be 2.7 percent.

Note: Maxmimum leverage (y-axis) as a function of asset volatility (x-axis) and VaR (rhs, in % of NAV).
Source: IMF staff.

Impact of Funds' Forced Sales on Markets

130. Asset sales by mutual funds to meet redemptions could have a sizeable impact on markets, based on certain assumptions. Under the slicing approach—where funds sell securities in proportion of their weights in the portfolio—mutual funds exposed to less liquid asset classes (such as EM bonds, HY corporate bonds or leveraged loans) would sell large amounts of bonds, which would create some downward pressure on prices. Under the waterfall approach, the price impact would be more limited since funds would sell first their most liquid assets. However, remaining investors would end up with a less liquid portfolio, which could amplify the first-mover advantage (i.e., the incentive to redeem before other investors as trading costs are not passed on redeeming investors). At fund-level there is a trade-off between reducing the price impact of sales (thereby preserving the returns of the fund) and maintaining the portfolio allocation in line with the investment objective.

131. Under the historical approach, prices would experience large declines, especially under stressed conditions. Overall, the price impact of sales from mutual funds on their underlying

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market ranges between 50 to 200 basis points in normal times, and between 150 to 700 bps during stress periods under the slicing approach. If funds sell their most liquid assets first (waterfall approach), the price impact on underlying markets is muted (less than 100 bps under normal conditions and less than 200 bps under stress for most asset classes).

132. Under the adverse scenario, the combined sales of assets would mainly impact EM debt and HY bonds. Under the slicing approach, the price of HY bonds would decline by more than 300 bps, mainly due to sales from HY funds (220bps) (Figure 39). IG bond prices would decline by about 120 bps, due to the combined selling of IG bond funds (70bps) and mixed funds (40 bps). The impact on the sovereign bond market is muted due to limited sales and deeper liquidity.

Figure 39. United States: Market Impact: Historical Approach and Adverse Scenario

Note: Price impact of asset sales by liquidation strategy, in bps.
Sources: Morningstar, IMF staff.

Note: Price impact of asset sales by liquidation strategy, in bps.
Sources: Morningstar, IMF staff.

Source: IMF staff calculations.

133. Asset sales can generate second-round effects. Due to the price impact of asset sales, funds return would be negatively affected, causing additional outflows from investors. Overall, the second-round effects are limited under normal trading conditions, but outflows could be more sizeable under stress conditions, with additional outflows above 3 percent of NAV for IG, HY and loan funds under the historical approach. The higher effect for IG corporate bond funds is explained by the large size of IG corporate bond funds (US$2,427 billion) rather than by the relative liquidity of the IG corporate bond market.

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Vulnerability Analysis

134. Based on our assumptions, some fund categories are potentially more vulnerable to distress in the fund industry. When other fund categories are in distress (i.e., facing large outflows), EM bonds funds are likely to experience large outflows. IG corporate bond funds are also vulnerable to distress affecting municipal and government bond funds.

135. Based on our assumptions, some fund categories may be more systemic than others. When some fund categories are in distress, other funds' categories might also be in distress at the same time, indicating the systemic nature of the first category. Systemic categories include IG corporate bond funds, multi-strategy bond funds and to a lesser extent municipal bond funds, mixed funds and global funds. Fund categories which are most exposed to liquidity risk such as HY, EM and loan funds are not systemic since when they are in distress, other fund categories do not experience large outflows, partly due to substitution effects, with investors moving out of those funds into safer funds (government or IG corporate bond funds).

136. The interconnectedness analysis based on funds' returns yield similar results. According to our analysis, HY bond funds appear to be net receivers of spillovers from other funds and hence more vulnerable (Figure 40). Similarly, IG bond funds may be more vulnerable to spillovers from municipal and government bond funds. On the other side, government, municipal and corporate bond funds appear to be net senders of spillovers to the rest of the fund industry.

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Figure 40. United States: Vulnerability Analysis across Fund Categories

Average Net Spillovers

Note: Average spillovers from other fund categories.
Sources: Morningstar, IMF staff.

Potential Flow Spillovers

Note: Expected net flows conditional on distress in %.
Negative values indicate outflows.
Sources: Morningstar, IMF staff.

Heatmap: Relative Average Spillovers

		To:						
		EM	Gov	HY	IG	Loan	Mixed	Muni
From:	EM							
	Gov							
	HY							
	IG							
	Loan							
	Mixed							
	Muni							

Source: IMF staff calculations.

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MARKET RISK STRESS TESTING FOR MONEY MARKET FUNDS

A. Objective and Scope

137. The 2014 Money Market Fund reform required non-government institutional MMFs to maintain a floating NAV, reflecting the mark-to-market value of the fund instead of maintaining a constant NAV (CNAV). Since the reform, the overwhelming majority of the MMF market remains CNAV (government CNAV or Prime retail CNAVs), as VNAV prime funds only account for 15 percent of the industry and tax-exempt municipal MMFs for less than 1 percent (Panel 1).

138. Money market funds holdings are diversified according to the MMF type. Prime MMFs invest mainly in commercial paper and certificate of deposits, tax exempt MMFs in municipal debt, government MMFs in U.S. Agency debt and repo as well as UST debt and repo while Treasury MMFs invest in UST debt and repo (Panel 2).

139. U.S. MMFs have increased their exposures towards Federal Home Loan Banks and FICC through sponsored repos. Discount notes issued by FHLB account for 16 percent of U.S. MMFs holdings, and MMFs provide about 60 percent of FHLB funding through those instruments. Most FHLB notes are short-term (within 60 days) so that they can be considered weekly liquid assets according to the SEC definitions. Recently, MMFs have increased their exposures to FICC by entering into sponsored repo, where a large bank sponsors the MMF so that repo trades can be cleared through FICC (Figure 41). Sponsored repos are concentrated, with the top three banks accounting for 50 percent of repos.

140. As part of the 2014 Money Market Fund reform rules, the SEC requires MMFs to perform regular stress tests. MMFs using CNAV must be able to maintain a mark-to-market NAV within 0.5 cent of US$1, i.e., the shadow NAV must not fluctuate by more than 0.5 percent.

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Figure 41. United States: Money Market Funds (MMFs)

MMFs by type (USD billion)

Sources: OFR, IMF staff.

MMFs holdings (in % of NAV)

Note: Holdings by instrument and MMF type. Data as of December 2019. Sources: CRANE, IMF staff.

Source: IMF staff calculations.

Selected exposures of US MMFs (USD bn and % of NAV)

Sources: CRANE, IMF staff.

Impact of interest rate and credit spread shocks (% of NAV lhs, IR shocks in bps rhs)

Note: Impact of 100 bps interest rate and 100 spread shocks. Dots show required shocks (in bps, rhs) for MMFs to break the buck (except for Prime Ins.). Sources: CRANE, IMF staff.

Source: IMF staff calculations.

B. Methodology and Results

141. Stress tests estimate the impact of interest rate and credit spread shocks on the NAV of MMFs. The stress test was applied to 208 funds (see Table 2). MMFs are subject to two different and complementary shocks: (i) an increase in interest rates, and (ii) a widening of spreads on non-collateralized instruments held by MMFs. The impact of the shocks is calculated by computing the duration of each instrument in the portfolio of each MMF and using this measure to estimate the mark-to-market losses due to the shocks. The interest rate and credit spread shocks are calibrated based on the largest daily increase observed in 2008 and are both equal to 100 bps. The credit

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spread is applied to all MMFs holdings excluding UST and U.S. agency debt as well as UST and U.S. agencies repo.

142. All U.S. MMFs would be able to withstand large shocks to yields. Under a 100 bps interest rate shock, U.S. MMFs NAV would not fluctuate more than 0.16 percent, which is well within the allowable range, due to the low duration of MMF portfolio (about 0.1 year on average). Under a combined interest rate and spread shock of 100 bps each, prime retail funds would see their NAV fall up to 0.27 percent, within the allowable range.

143. Very large yield shock would be required for MMFs to break the buck. Reverse stress tests are used to estimate the interest rate shock required to produce a 0.5 percent deviation from US$1. Interest rates would need to rise by more than 600 bps on average to produce such a deviation. For MMFs, with the highest duration, the required shock would be about 350 bps.

144. Liquidity risk was not assessed for Prime MMFs. The stress tests did not asses the liquidity of MMFs which do not use constant net asset value (Institutional prime MMFs). During the beginning of the COVID outbreak in March 2020, institutional prime MMFs experienced very large outflows from investors. At the same time, prime MMFs faced challenges in selling their assets due to strains in short term money markets. As a result of those combined shocks on the asset and liability side, some prime MMFs received sponsor support in March. Two affiliate banks purchased assets from the MMFs to improve their liquidity position. Following multiple steps taken by a number of government agencies to support the economy liquidity stress receded and prime MMFs had inflows starting early April.

Table 2. United States: Results of the MMF Stress Test

				100 bps shock		100 bps shock+100 bps spread		Reverse stress test (bps)	
Type	Valuation	Size (USD bn)	No. of funds	Average	Max	Average	Max	Min	Average
Treasury Retail	CNAV	91	14	0.10%	0.14%	0.10%	0.14%	353	551
Prime retail	CNAV	460	27	0.09%	0.14%	0.17%	0.27%	364	622
Prime instit.	VNAV	605	38	0.08%	0.11%	0.15%	0.22%	444	675
Gov. retail	CNAV	627	37	0.08%	0.15%	0.08%	0.15%	326	710
Treasury Instit.	CNAV	781	40	0.10%	0.16%	0.10%	0.16%	319	560
Gov. Instit.	CNAV	1248	52	0.09%	0.15%	0.09%	0.15%	329	742
Total		3,812	208	0.09%	0.16%	0.11%	0.27%	319	660

Sources: CRANE, IMF staff

Note: Impact of a 100 bps interest rate shock on the NAV of the MMF and impact of a combined 100 bps interest rate shock and 100 bps increase in yields on uncollateralized instruments.

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THE INSURANCE SOLVENCY STRESS TESTS

A. Objective

145. To quantify the risks, the FSAP used a broad range of scenario analyses, sensitivity tests and exposure analyses. In addition to the macrofinancial scenario which is broadly aligned with the narrative and severity of the banking sector stress test, further insurance-specific sensitivity analyses were performed (Figure 42). These analyses included:

(i) a prolonged period of low interest rates;
(ii) a lapse and surrender event with liquidity outflows from the life insurance sector;
(iii) the default of the largest banking counterparty; and
(iv) a stock-take on exposures to carbon-intense sectors.
(v) The results of these analyses are not added to the outcome of the main stress scenario, although it is possible to assume that the materialization of the stress scenario coincides with (i) or (ii), or both of them.

146. Compared to the 2015 FSAP, the FSAP uses a broader variety of analytical tools and more granular data, in particular on the asset side (Figure 42). The NAIC has shared detailed asset holdings of insurance groups in the stress test sample, most notably Schedule D, which includes all equity and bond exposures. The cut-off date for all analyses is December 31, 2018.

Figure 42. United States: Risk Analysis Tools for the Insurance Sector

Source: IMF staff.

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B. Valuation and Capital Standard

147. An important point of context for the stress test is that statutory accounting and U.S. GAAP do not require a full market-consistent approach to the valuation of assets and liabilities. Under statutory accounting, the liabilities of P&C insurers are generally not discounted which adds a layer of conservatism. Also, under statutory accounting, life insurance liabilities are discounted with a rate that is set at the time when the policy is sold to the policyholder or with a discount rate based on the expected return of assets associated with the insurance liabilities. This currently results in average discount rates above current market rates. Under statutory accounting, amortized cost is the predominant accounting regime for fixed income assets,[73] which means that neither unrealized gains nor losses are recognized.

148. For the stress test model, this results in a significant difference in the impact of a shock to the risk-free interest rate: In a truly economic balance sheet with a fully market-consistent valuation of both assets and liabilities, life insurers, with their structural mismatch of assets and liabilities which is very common in that type of business, would see their liabilities increase more than their assets with falling interest rates. While the duration mismatch is usually smaller for non-life insurers, the same mechanics apply. State insurance regulation requires that companies perform an asset adequacy analysis at least annually to measure the structural mismatch of assets and liabilities under a range of different interest rate scenarios.

149. Under statutory accounting, also the impairment rules for life insurers differ from a fully market-consistent regime. Investment assets are impaired only when the fair value loss is deemed to be other than temporary. Once impaired, a bond cannot be written back up to its original fair value after recovery.

C. Sample

150. The macrofinancial stress test includes a sample of 50 insurance groups (See Appendix XV). FSAP insurance stress tests strive for a market coverage of at least 70 percent both in life and non-life, typically calculated based on gross written premiums. This target coverage was reached in the United States by including 21 groups predominantly active in life insurance business and 22 in Property & Casualty (P&C) business. In addition, seven health insurers with a market share of about 45 percent form a third group. For analytical purposes, sub-samples were formed of a) life insurers with a high share in VA business (6 companies) and b) foreign insurers (6) were formed. Most of the groups in the sample are publicly listed.

[73] The actual treatment depends on the credit quality: For life insurers, fixed income assets in NAIC credit quality buckets 1 to 5 (i.e., AAA – CCC) are valued at amortized costs, and so are, for P&C insurers, assets in buckets 1 and 2 (i.e., AAA – BBB). For the remaining credit quality buckets (6 in life and 3 to 6 in P&C) the lower value of amortized cost and market value is used.

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D. Stress Test: Adverse Scenario

151. The scenario for the insurance top down stress test builds on the narrative and severity of the banking sector stress test. Given the nature of insurance business and its balance sheet structure, the main focus of the stress test is on investment assets. The market risk stresses include shocks to bond holdings (sovereigns, municipals, and corporates), securitizations, equity, property and other investments (such as hedge funds and private equity). All stresses are assumed to occur instantaneously. Table 3 provides an illustration of the granularity of shocks.

152. Some shocks were slightly adjusted to make them more operational for the insurance stress test. The equity shock was re-calibrated and effectively lowered to be meaningfully applicable at end-2018 when equity markets were temporarily depressed. The yield increase of fixed-income instruments reflects a sizable portion in insurers' portfolios of debt instruments for which no market prices exist—hence the shocks are a bit lower than those shocks applied to the banks' trading books. Finally, the haircut on mortgage loans acknowledges a relatively high quality of the mortgage loan portfolio with average loan-to-value ratios about 60 percent.

Table 3. United States: Market Risk Parameters

		Impairment / Default	Yield increase
Equity	Unaffiliated	-40.4	--
	Affiliated	-20.0	--
Property held for sale		-23.2	
Fixed-income instruments	NAIC 1	--	--
	NAIC 2	--	--
	NAIC 3	-3.0	+2.8
	NAIC 4	-5.0	+4.0
	NAIC 5	-9.0	+5.3
	NAIC 6	-15.0	+7.0
Mortgage Loans	First Lien	-2.0	--
	Other	-10.0	--

Source: IMF staff.

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E. Stress Test: Modeling Assumptions and Output

153. The stress test used publicly available, consolidated data of insurance groups from regulatory returns. As data files published by S&P Global Market Intelligence lack the necessary granularity for some of the analyses proposed, the NAIC has provided data on investments on an asset-by-asset basis.

154. Given the specificities of the statutory accounting for insurance companies, the modelling of the adverse scenario included the following steps:

- Mark-to-market impairment, based on the macrofinancial scenario, for holdings in equity, fixed-income instruments below investment grade, other investment assets (so-called Schedule BA assets);
- Default losses in the corporate bond and securitizations portfolio as well as on mortgage loans.

155. The U.S. regulatory framework does not include a capital requirement for insurance groups at the consolidated level. Hence, the stress test produces only a balance sheet impact expressed as the reduction in statutory capital, in line with the 2015 FSAP methodology.

156. The stress test did not take into account any mitigating effect from hedging, profit-sharing, or other management actions. Insurance companies usually apply a sophisticated hedging strategy regarding their interest rates (mainly via swaps and swaptions), and also hedge against declines in the stock market via options and futures. As these hedging activities can vary substantially among companies, it is difficult to estimate the mitigating effect in times of stress. In any case, it is very likely that the stress test gives a maximum impact. A range of life insurance products includes profit sharing features between the insurance company and the policyholder which allow the insurer to (partially) pass on investment losses by reducing discretionary benefits. In a risk-based solvency regime, it is also possible for the companies to de-risk their investments in order to reduce their capital requirements, resulting in higher solvency ratios; similarly ceding risks to a reinsurance company could be considered. Finally, dividend policies, both up-stream from subsidiaries to the top (holding company) level and from the top level to shareholders can be actively managed, especially with larger and diversified groups. As the range of management actions is very broad, no general modeling result can be provided based on available data.

157. The stress test was performed before the COVID-19 outbreak started. Box 2 provides a summary of the outbreak impact on insurance sector.

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Box 2. COVID-19 Impact on the Insurance Industry

The insurance sector is affected by the pandemic mainly through higher claims, operational challenges and lower investment returns. Claims will be made under various types of household and commercial insurance. Revenues are expected to decline, at least temporarily, as the demand for insurance coverage declines. The risk of fraudulent claims increases when economic conditions deteriorate. All insurers face investment losses as a result of stock market declines, bond defaults and spread increases, while lower interest rates weigh heavily on life insurers with return guarantees. Equity exposures are material, but a substantial share of market-value changes is directly passed on to policyholders through investment-linked products. As the duration of the liabilities is generally longer than the assets, reinvestment risk has increased. Bond downgrades to non-investment grade would have substantial impact due to the requirement for capitalization of higher risk exposures. Finally, insurers are generally more liquid than their liabilities require, but some may face liquidity pressures if product cancellations and surrenders increase sharply while new business and renewals decline.

Life insurance

Beneficiaries on life insurance policies with a death coverage will submit claims on those policies, while annuity providers might experience reduced payouts given higher mortality rates. Excess mortality is covered by reinsurance to a large degree, mostly with U.S. affiliates of reinsurers outside the U.S.[74] One global reinsurer has indicated that its exposure to COVID-19 life and health insurance claims, even under a very severe 1-in-200 years scenario, is similar in scope to a medium-sized natural catastrophe. Mortality increases might appear to be an immediate financial gain for annuity providers, but many of these products have guarantees that effectively reduced any perceived benefit for the insurer. Lower investment returns are a significant negative for life insurers, both in terms of reinvestment risks and the difficulty to earn a guaranteed rate of return.

Health insurance

Health insurers face higher costs and claims as policyholders may require testing, more medical care, and hospitalizations. An increase in unemployment will affect the level of uninsured health expenses. Under the Affordable Care Act, consumers who lose their coverage or become eligible for subsidies due to loss of income are able to enroll in coverage on the Exchange and most state-based Exchanges have created special enrollment periods to facilitate coverage. COVID-19 testing, hospitalizations, and premium grace periods have impacted insurer costs and incomes. At the same time, delays in other, non-emergency care have significantly reduced insurer spending in the first part of 2020, and many are looking at, and some have announced, premium holidays.

The Families First Act and the CARES Act, complementing the Affordable Care Act, requires insurers to waive all cost-sharing, including deductibles, for medical services provided to people with any type of private health coverage related to medically necessary COVID-19 testing and associated visits. In addition, any preventive services, which include any future vaccine, must be covered by the principle of no cost-sharing. The new Act also enables states to provide free coverage for coronavirus testing for uninsured residents. However, the Act does not impose any federal requirement to waive cost-sharing for COVID-19 related medical treatments, and thus individuals may be subjected to significant out-of-pocket costs.

Property & casualty insurance

Most business interruption clauses included in commercial property insurance policies are only triggered in case of physical damage to the property of the policyholder due to a covered peril. There are differing views on whether the contamination of a property by a virus would be considered physical damage. Policies that more generally provide coverage for business interruption due to physical damage or loss of use may be more likely to be determined to provide coverage of pandemic-related business interruption losses. Many commercial policies apply exclusions that could apply to a viral contamination such as COVID-19. For example, the standard Insurance Services Office commercial property policy used in the U. S. applies an exclusion for "loss or damage caused by or

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Box 2. COVID-19 Impact on the Insurance Industry (concluded)

resulting from any virus, bacterium or other microorganism that induces or is capable of inducing physical distress, illness or disease." Yet it is unclear how many commercial policies do have such a clear inclusion or exclusion.

Major legal and regulatory risks may emerge. For example, in New Jersey, a legislative proposal has been put forward to require that all commercial property policies providing coverage for business interruption or loss of use of property also provide coverage for interruption resulting from COVID-19. As proposed, insurers that incur claims as a result of this legislation could seek reimbursement from the Commissioner of Banking and Insurance who would then recover those costs from all insurers writing business in New Jersey. While this legislation is on hold at the time of this report's finalization, a similar legislation has been introduced in Ohio and Massachusetts. At the federal level, a group of members of the House of Representatives has requested insurers to consider retroactively covering financial losses from COVID-19 under business interruption coverage provided in commercial policies, suggesting that containment measures should be considered as civil authority orders that trigger coverage. The NAIC has written to Congress noting that such a measure would result in substantial solvency risks for P&C insurers and significantly undermine the ability of insurers to pay other types of claims.[75]

Travel insurance is affected through coverage of medical treatments and trip cancellation. The overall industry exposure to trip cancellation claims is not significant relative to other lines of business. Some insurers have changed the terms of travel insurance policies or stopped selling new travel insurance policies. For existing policies, medical treatment during travel would be covered in most cases, unless a travel advisory was in place. Insurance coverage for trip cancellation will usually only reimburse expenses after all attempts for refunds have been exhausted and only when there are no official advisories against travel at the time of booking.

Claims can arise from liability insurance, including workers compensation. Employees may claim compensation for lost wages and medical expenses if they believe they were infected at workplace, which could invoke coverage under workers compensation insurance. They could also make claims for distress, bodily injury, discrimination or financial losses due to isolation that could potentially be covered by employment practices liability insurance. For businesses whose premises are accessible to the public or to their customers, claims could be made in case of infections provided a proof of negligence regarding the spread of the virus is obtained.

Motor insurance is contributing to an overall resilience of the P&C sector. Individual traffic has declined as a result of public health measures and lower economic activity results in reduced commercial road use. In the longer term, however, it is likely that renewals will reset and underwritten volumes will shrink.

[74] In U.S. individual life insurance, almost 30 percent is reinsured. The market for life reinsurance is highly concentrated both globally and, in the U.S., with the largest five reinsurers having a market share in the U.S. of around 90 percent. Of these five companies, four are part of European groups, and one is a domestic group. See Munich Re, 2018 Life Reinsurance Survey Results.

[75] See https://content.naic.org/article/statement_naic_statement_congressional_action_relating_covid_19.htm .

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F. Stress Test: Results

158. In the adverse scenario, the life sector experiences a substantial hit on its statutory capital, though it is overall largely shielded by the current valuation and capital framework (Figure 43). The aggregated reduction in statutory capital of US$226 billion equates to 30.9 percent of the sample's statutory capital and 3.9 percent of consolidated balance sheet assets—this equates to 1.1 percent of the U.S. GDP. Sizable parts of the balance sheet are not sensitive to market price fluctuations which would be different under a fully market-consistent valuation regime. The absence of a group capital framework in the U.S. makes it difficult to estimate the stress test outcome in terms of a risk-based solvency regime. Solvency ratios of U.S. solo companies tended to be well above the regulatory thresholds recently, so that based on the current calibration of the risk-based capital, it can be expected that even in this adverse scenario the vast majority would still continue to be adequately capitalized.

159. Stress test results are very heterogenous in the life and P&C sector. In the life sector, capital declines by US$74.3 billion (-35.7 percent), in P&C by US$149.8 billion (-31.7 percent), and in the health sector by only US$1.4 billion (-2.8 percent). Depending on the business model and investment allocation, the capital impact can differ significantly both within the life and the non-life sector. Among the 21 life insurance groups, the decline in capital ranges from 14 to more than 60 percent, with the median company recording a decline of 32 percent and 50 percent of companies ranging between -21 and -36 percent. In the P&C sector, the median company loses 19 percent of its capital, and results across the sample range from -5 to -53 percent.[76] Only in the health sector, companies' risk profiles are very similar, resulting in a low affectedness by the market stress scenario for all sample firms—for the median company, capital declines by just 1 percent, and even the most affected company sees its capital shrinking by only 8 percent.

160. Shocks to other investment assets, non-investment grade corporate bonds and stocks contribute most to reductions in statutory capital. In the life sector, the shock to other investment assets (Schedule BA) contributes most to the overall reduction in statutory capital, while in the P&C sector, the stock price decline is more relevant on aggregate. For most P&C firms, however, the equity exposure is relatively small, and the sector-wide impact is a bit overstated and driven by a very small number of larger companies with sizable investments. Mortgage defaults contribute 10 percent of the overall impact in the life sector, as companies in the other two sectors barely engage in such lending activities.

[76] Some groups are active both in life and non-life business, so that some outliers in each respective sector can be explained by relatively large activities in the other sector.

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Figure 43. United States: Insurance Stress Test Results

Statutory capital of the median life company declines by 32 percent, and by 19 percent for the median non-life insurer.

Reduction in Statutory Capital

Health insurers with their high pre-stress capital are barely affected by the market shock, while results in the other two sectors are very heterogenous.

Reduction in Statutory Capital

In the life sector, the shock to other investment assets (Schedule BA) contributes most to the overall reduction in statutory capital, while in the non-life sector, the stock price decline is more relevant (though a bit overstated as many non-life companies have only small exposures to the stock market, and the aggregated result is driven by a very small number of larger companies).

Aggregated Contribution of Individual Shocks

Source: IMF staff calculations based on NAIC data.

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G. Sensitivity Analysis

Low-for-Long Scenario

161. The analysis of a prolonged period of low interest rates ("low for long") focused on investment spreads and ultimately profitability. The NAIC has provided an analysis that compares the net investment yield of the life insurance sector against the average credited rate. For the years 2016–18, the resulting net investment spread averaged 1.1 percent (Figure 44). Like the 2015 FSAP, a future trend of the investment yield was projected, acknowledging that the downward trend in portfolio yields might flatten out in the future when fixed income instruments with higher coupons have already expired. The average credited rate would also decline, as new business would be issued with lower contractual guaranteed interest rates.

162. The low-for-long projection is conducted for the whole U.S. life insurance market. It is based on sector-wide aggregated data on investment yields and guaranteed rates, complemented by an approximated maturity profile based on the 21 life insurance companies of the stress test sample.

163. With continued low interest rates, the net investment spread is expected to decline further (Figure 44). The guaranteed rate in life insurance is relatively sticky but continues to decline. With about 7 percent of bond investments to be rolled over every year, the net portfolio yield is also declining, likely at a slightly higher pace than the guaranteed interest rate. By 2021, the net investment spread could therefore drop below 1 percent, only slightly above the recent minimum of 0.93 percent observed in 2017.

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Figure 44. United States: Life-Business: Investment Spread and Maturity of Fixed-income Assets

The net investment spread has been rather steadily declining since 2007 and will, in a scenario of persistent low rates, continue to be a drain on profitability.

Net Investment Spread
(Net portfolio yield over guaranteed rate)

Seven percent of the sample's fixed-income assets mature within less than a year and need to be rolled over.

Maturing Bonds in Life Insurers' Portfolios

Source: IMF staff calculations based on NAIC data.

Lapse/Surrender Event

164. To assess potential vulnerabilities from the trend towards less liquid investment, the impact of a sudden cash outflow from the life insurance sector was modeled. The scenario assumed that policyholders are incentivized to terminate their life insurance policies after a sharp hike in interest rates. In the past decade, termination rates in the U.S. life insurance sector have been rather stable, hovering about 6 percent recently with no significant difference between individual lines and group business (Figure 45).

165. The sample for the lapse/surrender event includes the same 21 life insurance groups as the macrofinancial scenario stress test. Data for the analysis stems from the annual regulatory reporting, obtained from S&P.

166. Net cash outflows stemming from higher lapse and surrender rates were modeled for each life insurance group in the sample. It is assumed that lapse rates for life policies (general account only) which can be terminated at book value without any adjustment would double compared to the 2018 rates. Policies which foresee a surrender charge of at least 5 percent were assumed to experience an increase in lapse rates of 50 percent (Scenario 1). Various alternative paths of lapse increases were modeled to better control for each company's own historic lapse pattern (see Figure 49 and the accompanying notes). All other policies (about two thirds of the general account) which cannot be withdrawn at the discretion of policyholders, or which are

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redeemed at fair value or with a market value adjustment, were not included in the analyses as their lapse rates are likely less sensitive to interest rate hikes. Termination of such policies might, however, increase in a recession scenario when household income shrinks.

Figure 45. United States: Life-business: Termination Characteristics

Annual termination rates were rather stable over the last decade, hovering about 6 percent.

Termination Rate
(Based on face amount)

29 percent of general account liabilities redeemable at book value without any adjustments.

Surrender Characteristics

Source: IMF staff calculations based on NAIC data.

167. Insurers were assumed to react to net cash outflows by liquidating investment assets. This results in the need to realize losses at distressed market levels. It is assumed that companies would sell up to 50 percent of their U.S. Treasury bonds, government-sponsored enterprises (GSEs) issues and municipals first, followed by corporate bonds starting with the highest rating category (NAIC 1). Cash positions and deposits are assumed to be kept unchanged to allow companies to make regular payments and expenses.

168. A few life insurers would need to liquidate sizable parts of their bond portfolio to meet cash outflows after a sharp increase of lapse rates (Figure 46). The sample of insurers can roughly be clustered in three categories of almost equal size. About one third is able to meet the outflow simply by selling parts of their U.S. Treasury bond portfolio which are generally seen as the most liquid asset. Another group would sell U.S Treasuries up to the assumed cap of 50 percent, and also sell some bonds of U.S. GSEs. Another four to six companies (depending on the scenario) would ultimately also have to liquidate parts of its corporate bond portfolio, even after having sold U.S. state and municipality bonds. These corporate bond holdings, despite carrying low credit risk, might be subject to (temporarily) restricted liquidity, so that large-scale sales are only possible at a discount. The total amount of U.S. Treasury bond sales in the four scenarios ranges from US$23–33 billion, while for U.S. GSEs and corporate bonds the ranges are from US$13–15 billion and from US$4–11 billion, respectively.

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Figure 46. United States: Need to Liquidate Assets after Lapse Shock

The need to liquidate investments after the realization of a lapse shock differs significantly among life insurers. While some companies can easily meet the cash outflows by selling moderate amounts of U.S. Treasury bonds, a few others would also need to liquidate corporate bonds in potentially less liquid markets.

Need to Liquidate Assets after Surrender Shocks: Scenario 1

Need to Liquidate Assets after Surrender Shocks: Scenario 2

Need to Liquidate Assets after Surrender Shock: Scenario 3

Need to Liquidate Assets after Surrender Shock: Scenario 4

Notes: In each panel chart, the five segments denote the waterfall of asset liquidations, namely U.S. Treasuries (I), U.S. GSEs (II), U.S. Political Subdivisions (III), U.S. State bonds (IV), and corporate bonds in the NAIC 1 rating category (V). Scenario 1 assumes an increase of the 2018 lapse rate by 100 percent for life policies which can be terminated at book value without any adjustment, and an increase by 50 percent for policies which foresee a surrender charge of at least 5 percent. Scenario 2 assumes lapse shocks which correspond to the maximum termination rate observed in the period from 2009 to 2018, and the 75th percentile observed in the same period, for the two types of policies respectively. Scenario 3 assumes an increase of the lapse rate by two standard deviations and one standard deviation, respectively. Finally, scenario 4 assumes a lapse rate equal to 200 and 150 percent of each company's mean lapse rate between 2009 to 2018, respectively.

Source: IMF staff calculations based on NAIC data.

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Weather-Related Catastrophes

169. The impact of more frequent or more severe weather-related natural catastrophes might potentially be uneven across the P&C sector, with smaller and regionally active insurers being more exposed. The 2015 FSAP found overall a manageable impact of a severe hurricane on the solvency position of P&C insurers which could be explained by the diversification of risks the large insurers of the sample have underwritten. Smaller P&C companies which are active only in one or a few states tend to be more vulnerable as their exposures to tail risks are more concentrated. While the overall risk is unlikely to be nationwide systemic, conclusions could be drawn on regional vulnerabilities and—from a microprudential point of view—risk management practices in these smaller institutions.

170. Vulnerable lines of business were identified based on their coverage in the event of natural disasters and the observed volatility of loss ratios. NAIC data provides the necessary insights (Figure 47). Based on gross premiums, the most relevant line of business is homeowners' multiple peril, followed by commercial multiple peril and allied lines—amongst these three, loss ratios are most volatile for allied lines business with peaks above 150 percent in 2005 (hurricanes Katrina, Rita and Wilma) and 2017 (hurricanes Harvey, Irma and Maria).

Figure 47. United States: Vulnerable P&C Lines of Business

Homeowners' multiple peril is the most sizable insurance class in terms of premiums which could be affected by natural disasters.

Composition of "vulnerable" lines of business in selected states

Loss ratios tend to be significantly more volatile in federal flood insurance, allied lines and private flood.

Loss ratios in "vulnerable" lines of business (nation-wide)

Source: IMF staff calculations based on NAIC data.

171. The analysis uses a bifurcated sample of (a) 538 solo entities being part of the 22 large and diversified P&C groups in the stress test sample as well as (b) 44 entities of small and regionally concentrated P&C insurers focused in nine Southeastern jurisdictions (Table 4). Those regionally active P&C insurers with concentrated exposures towards hurricanes and

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windstorms were identified based on the NAIC Market Share Report 2018, considering the distribution of their business across states and vulnerable lines of business.

Table 4. United States: Sample of Regionally Concentrated P&C Insurers

	State	Premiums, P&C ($ millions)	o/w in "vulnerable" states and lines (minimum)	Share of "vulnerable" states and lines (minimum; pct)	Notes
Company A	AL	0.04	0.04	100	1/
Company B	AL	1.35	0.31	23	
Company C	FL	0.87	0.36	41	
Company D	NC	n.a.	0.05	n.a.	
Company E	GA	n.a.	0.19	n.a.	
Company F	LA	0.07	0.05	75	
Company G	PR	n.a.	0.08	n.a.	
Company H	NC	1.15	0.39	34	
Company I	MS	1.50	0.19	12	
Subsidiary Ia	LA	0.15	0.09	64	1/, 3/
Subsidiary Ib	SC	0.08	0.07	84	1/, 2/, 3/
Company J	TX	1.30	0.45	34	
Company K	TX	n.a.	0.42	n.a.	
Company L	FL	0.69	0.61	88	
Company M	PR	0.72	0.13	18	
Company N	FL	1.19	0.94	79	
Company O	PR	0.03	0.02	45	2/

Notes:
1/ Total premiums as of 2017
2/ Total premiums sourced from AM Best
3/ Subsidiary of Company I

Source: IMF staff calculations based on NAIC data

Source: IMF staff calculation based on NAIC data.

172. A proper modeling of increased frequencies and varying degrees of severity would require detailed policy and exposure information from companies.[77] As a workaround, the one-off effect of a very severe event simultaneously hitting all "vulnerable" states equally[78] is modeled instead of assuming a higher frequency. Hence, the analysis cannot directly provide an estimate for the cumulated impact of a series of multiple events, e.g., a full hurricane season. Furthermore, the

[77] See e.g., Nicholson et al. (2018), The Florida Insurance Market: An Analysis of Vulnerabilities to Future Hurricane Losses, *Journal of Insurance Regulation*, Vol. 37, No. 3.

[78] Alternatively, each insurer is individually hit by a very severe event in the same year.

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analysis does not take into account any physical damage to an insurer's own properties or any second-round effects of a (regional) economic downturn after the hurricane.

173. The analysis draws on companies' own estimates of the impact of hurricanes on its coverage of the risk-based capital (RBC) requirement. As part of their regular reporting, insurers have to submit the impact of hurricanes at various occurrence probabilities, which include 1-in-50, 1-in-100, 1-in-250, and 1-in-500-year events. By design, the actual assumptions about which type of hurricane constitutes one of these events differ among companies—a 1-in-500-year hurricane in Puerto Rico will typically be different from a 1-in-500-year hurricane in Texas. Still, one hurricane might affect insurers in different states.

174. The NAIC has provided aggregate statistics for the RBC coverage ratios before and after stress. The dataset also includes the impact on the available capital with and without the mitigating effect from existing reinsurance contracts.

175. Large and diversified P&C insurers are relatively resilient to individual disasters, even of a larger scale (Figure 48). A single event which can be expected to occur every 50 years and assumed to hit all insurers simultaneously would result in an 8.1 percent reduction of available capital (gross)—taking into account recoverables paid by a reinsurer or recovered from alternative risk transfer instruments, the reduction is only 3.9 percent (net). For hurricanes with an occurrence expected every 250 and 500 years, the net capital impact increases to 5.8 and 8.6 percent, respectively. In the 1-in-250-year event, the capital of four out of 538 insurers would drop below the regulatory minimum, triggering supervisory action.

176. Smaller and more concentrated P&C companies would be severely affected by major hurricanes in their respective home markets. Smaller insurers rely substantially more reinsurance for more frequent hurricanes than larger firms. For a 1-in-50-year hurricane, that hit each insurer in this sample simultaneously, available capital in the sample of smaller P&C insurers would decline by 81.4 percent—taking reinsurance recoverables into account, the net impact amounts to only 5.7 percent. Excessive costs seem to prevent small companies from buying the same level of reinsurance coverage for more remote events. In case of a 1-in-250 and 1-in-500-year hurricane, the net impact on available capital is 58.6 and 164.3 percent, respectively. Already in the less severe of these two events, ten out of the 44 companies in the sample would record a shortfall in their capital adequacy.

177. The impact of insurance failures on policyholders is mitigated through various protection schemes. Insurance guarantee funds and, in states where those exist, dedicated catastrophe funds, funded by the P&C insurance sector as a whole would ensure that policyholder claims are paid out, however delays and disruptions in renewing contracts could occur and would require close attention by state supervisors.

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Figure 48. United States: Impact of Major Hurricanes

The claims stemming from a simultaneous 1-in-500 year hurricane would decrease the capital of large and diversified insurers by 9 percent (net, after reinsurance)...

Impact on available capital: Large, diversified insurers

...while for small and concentrated insurers, the same event would result in claims which equate 164 percent of statutory capital.

Impact on available capital: Small, concentrated insurers

A significant share of small companies would record a negative capital after a 1-in-500-year hurricane, and....

25th percentile of the RBC distribution

...already after a 1-in-250-year hurricane, four (out of 538) solo entities of large P&C groups would see their RBC ratio drop below 100 percent, as well as ten (out of 44) small insurers.

Percent of companies triggering RBC action

Source: IMF staff calculations based on NAIC data.

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Banking Counterparty Default

178. A further asset-side shock centered around a default of the largest banking counterparty. Like the natural disaster event, this analysis did not imply a homogenous scenario as the largest banking counterparty differs for each insurance company in the sample. Furthermore, this type of analysis can only show the direct impact of one isolated default—second-round effects or a more widespread contagion after a major bank's default are not factored in.

179. The sensitivity analysis was performed for the 50 insurance groups which were also subject to the macrofinancial stress test. The NAIC provided detailed asset exposures based on Schedule D, which allowed for the identification of relevant equity and bond exposures towards individual banks.

180. Shocks were applied as haircuts on investment assets. According to the nature of exposure, different haircut levels were applied. Equity exposures were assumed to lose their entire value, while the LGD for unsecured bond exposures was assumed to be 50 percent. Subordinated bonds would suffer from a 100 percent haircut, and the market value of secured bonds would decline by 15 percent.

181. The vast majority of insurance companies would experience a limited capital impact if the largest banking counterparty defaults (Figure 49). The median life company would lose 1.2 percent of its capital, and half of the sector's firms range between 0.8 and 1.8 percent. In the P&C and health sector, the concentration towards the largest banking counterparty is even lower—in both sectors, the median insurer would experience a 0.5 percent loss in capital. Outliers exist, in particular in those cases where an insurer holds a participation in a large bank.

Figure 49. United States: Default of the Largest Banking Counterparty

For the vast majority of insurance companies, the default of the largest banking counterparty has only a minor direct impact on the capital position. The median life company would lose 1.2 percent, and in the P&C and health sector, the loss in capital would amount to only 0.5 percent. However, outliers with much higher losses can be seen in the sample.

Source: IMF staff calculations based on NAIC data.

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Exposure Analysis: Carbon-Intense Investments

182. The FSAP undertook a stock-take of carbon-intense investments of the U.S. insurance sector—it did however not assume a change in the pricing of carbon-intense assets. While it can be assumed that global institutional investors will continue re-allocating parts of their assets from carbon-intense to less carbon-intense assets, this is expected to be more of a longer-term transitional risk. Technological shocks, like e.g., a breakthrough in battery technologies or substantial increases in the efficiency of renewable energies might speed up this transition, but unlikely impact assets prices in the very short term.[79]

183. Carbon-intense assets were identified by using the "FFI The Carbon Underground Top 200 List"[80] which identifies companies based on their carbon footprint—to a large extent, the list features fossil fuel producers and mining companies. Bonds and shares issued by those companies were matched against insurers' holdings are reported in Schedule D which was provided by the NAIC for this analysis. Additionally, further securities were included when the issuer name included terms like e.g., "oil", "coal", or "petroleum".

184. Carbon-intense assets in a very narrow sense do not represent a major asset class (Figure 50). Taking into account the limitations of the identification process, the share of bonds issued by carbon-intense companies amounts to 3.5 percent of all corporate bond exposures. In the equity portfolio, the share is 1.6 percent. Together, the identified carbon investments account for 1.1 percent of the sample's total balance sheet assets. Notwithstanding these small amounts, transition risks could also exist in other economic sectors, e.g., related to transport or heavy industries, which were not included in the analysis in the absence of missing data on direct or indirect carbon emissions.

185. Repricing risks in the transition to a less carbon-intense economy are likely not only restricted to carbon-intense equity and bond exposures. Mortgage loan exposures or mortgage-backed securities with collateral in areas becoming more frequently hit by windstorms, floods or wildfires could be repriced by investors, acknowledging more explicitly the underlying long-term risks. The same might apply to municipality bonds in such regions or to debt issued by local utility providers.

[79] A macrofinancial stress test with several different types of energy transition risks was developed and run by the Dutch Central Bank. See De Nederlandsche Bank (2018) An energy transition risk stress test for the financial system of the Netherlands, Occasional Paper, Volume 16-7.

[80] See www.fossilfreeindexes.com.

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Figure 50. United States: Insurers' Carbon-Intense Investments

Carbon-intense bond exposures account for 3.5 percent of all corporate bond investments...

Corporate Bonds

...while 1.6 percent of the equity investments are identified as carbon-intense.

Equity

Source: IMF staff calculations based on NAIC data.

SYSTEMIC RISK, INERCONNECTEDNESS, AND CONTAGION ANALYSIS

A. Scope

186. The systemic risk and interconnectedness analysis complements balance sheet stress tests and assesses the transmission of risks across the financial system. Previous sections focused on stress testing individual institutions and provided an overview of the resilience of the different sectors separately—namely, the banks, the mutual funds (including money market mutual funds), insurance companies, and nonfinancial firms. This section aims to bridge that analysis by providing a quantification of the transmission of risks and vulnerabilities across sectors of the U.S. financial and nonfinancial sectors.

187. Systemic risk assessment consists of two complementary analyses. The first one is the contagion analysis between banks, non-banks and nonfinancial companies, which accounts for the direct and indirect cross-sectoral interconnectedness in the U.S. financial landscape. The second one is the market-based analysis which aims at capturing important correlation and co-movement patterns embedded in financial asset prices across different institutions and sectors.

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B. Contagion Between Banks, Non-banks, and Nonfinancial Corporates

Overview

188. The domestic cross-sectoral contagion analysis aims at capturing potential spillover risks between banks and other financial and nonfinancial institutions. Given that over half of financial intermediation takes place outside of the banking system, this analysis aims to complement the banking sector network analyses described earlier by extending the coverage to include non-bank financial institutions (e.g., mutual funds, insurance companies, etc.). Moreover, this analysis aims at quantifying how the materialization of risk in a specific segment of the system transmits and reverberates across other segments of the financial system. In other words, and in contrast to previous sections where financial institutions (or sub-segments of the financial system) were analyzed in isolation, this part of the analysis takes into account how the endogenous behavior of certain institutions can affect other institutions across different segments of the financial system.

189. The analysis centers on assessing the resilience of banks and non-banks when facing potential stress in the corporate sector. Analysis of household and nonfinancial business sector resilience showed a rapid increase in vulnerabilities in the U.S. corporate sector, most notably among highly leveraged firms. Given the rapid rise of leveraged finance (e.g., leveraged loans, high yield, and private debt markets) and related products (e.g., CLOs), combined with a growing share of intermediation by the non-bank financial sector, this analysis focus on assessing the impact of potential stress in the corporate sector on both banks and non-bank financial institutions—including through their reaction in response to stress.

190. System-wide shocks could emerge and be transmitted instantly or via gradual adjustments in exposures of the financial institutions. An instant shock, such as for example the credit rating downgrade of many leveraged borrowers at the same time, would lead to fire-sales in the market. A gradual adjustment of exposures in the financial system would be due to rebalancing of portfolios of banks, insurers, mutual funds because of an increase in credit risk related losses but would not necessarily lead to a fire sale of corporate debt securities and leveraged loans. As gradual adjustment would be less severe than asset fire sales, in the subsequent analysis we focus on an instant market shock which lasts for one month and which leads to an immediate asset liquidation.

Exposures and Risk Transmission Channels

191. Direct exposures to the U.S. corporate sector are concentrated among the non-banks. Financial institutions exposures relate mainly to investment in nonfinancial firms' equities as well as holdings of corporate debt instruments (e.g., corporate bonds, commercial paper, etc.). Mutual funds, life insurers, and pension funds exhibit relatively large exposures to corporate securities (Figure 51), while bank holdings of these instruments are limited. Banks are exposed to the corporate sector mainly through bank term loans and revolvers (committed and uncommitted credit lines). Accordingly, non-bank financial institutions would suffer larger direct losses in case of financial stress in the corporate sector than banks.

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Figure 51. United States: Exposure to Nonfinancial Corporate Securities

Sources: FRB; and IMF staff estimates.
Note: * = includes corporate and foreign bonds

192. Corporate sector risks could manifest through the complex interlinkages with bank and non-bank financial institutions. Previous sections assessed the vulnerability of mutual funds to corporate debt. However, stress in the corporate sector could translate into wider losses throughout the entire system through direct linkages (i.e., cross-sectoral exposures) among different segments of the financial system, as well as indirect linkages—similar asset holdings, market reaction, asset liquidation, and marked-to-market losses.

193. The contagion analysis assumes that corporate stress impacts the mutual funds, which in turn lead to spillovers onto other financial institutions. Stress in the corporate sector manifests through rising corporate spreads. The shock to the BBB corporate spreads embedded in the FSAP stress scenarios is mapped into rising spreads across different credit ratings, with lower-quality rated companies experiencing a larger rise in spreads. Mutual fund returns suffer though their direct exposures to the corporate sector, which in turn may trigger redemption pressures for these funds. To meet redemptions, we assume that mutual funds will start to liquidate some of their assets, which—depending on the asset class and absorption capacity of the market—results in falling asset prices. Asset liquidations may lead to mark-to-market losses in other financial institutions, namely banks and insurance companies. These companies could also reduce funding means to the nonfinancial corporate sector, which could exacerbate the stress in that sector, feeding additional rounds of spillover. In addition to mark-to-market losses, banks might also face liquidity pressures from their committed credit lines to mutual funds (which themselves would be facing liquidity pressures).[81] These risk transmission dynamics are presented schematically in Figure 52.

[81] Conversely, if banks cut the credit lines to the mutual funds, it would exacerbate the potential liquidity stress in the mutual funds sector.

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Figure 52. United States: Schematic Representation of the Risk Transmission Mechanisms

Source: IMF staff estimates.

Price Impact and Potential Losses

194. Based on our assumptions, asset liquidations by mutual funds could potentially lead to significant price impacts on certain asset classes. Following the impact from stress in the corporate sector, we estimate that mutual funds would liquidate about US$97 billion (Figure 53). The liquidated amounts vary by the type of asset and the type of fund, with EM, HY, and EM funds suffering the largest redemption pressures. These asset liquidations translate to varying price impacts across asset classes (between 0.002 to 4.8 percent).[82] Appendix XVII provides details about fire-sale haircut estimation and market size of various securities.

195. Based on our assumptions, asset liquidations could lead to mark-to-market losses for mutual funds and reverberate through the financial system with non-negligible impact, particularly for non-banks. The shock was calibrated based on the corporate stress tests performed by the IMF, the linkages were analyzed based on balance sheet data. Although significant, potential losses appear to be manageable for the banking system, in large part owing to banks' limited direct exposure to the corporate sector. Assuming a market sentiment shock lasting for one month, liquidation losses for mutual funds amount to about US$0.9 billion (about 1 percent of the original value of assets sold). For banks, the resulting mark-to-market losses are close to US$10.8 billion (roughly equivalent to 0.06 percent of total assets). This would reduce banks' CET1 ratio by about 0.1 percentage points. In the case of insurance companies, this shock may roughly

[82] Price impact for sovereign IG, sovereign HY, corporate, securitized IG, securitized HY, and municipal securities are 0.0015, 0.4, 4.8, 0.2, 1.3, and 0.45, respectively.

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translate into losses at about 1 percent of insurance sector total assets. In case of a systemic credit risk-related stress (which leads to an increase of annual default rates of leveraged corporates of up to 6 percent), banks would face US$230 billion losses on commercial and industrial loans and CLO holdings.[83] Five Category IV banks (Non-GSIBS) would require recapitalization. Insurance sector will be hit by around US$300 billion losses, at the same time they do not have to mark these to market given the existing regulatory treatment of their asset valuation.

Figure 53. United States: Redemption Shock and Asset Liquidation of Mutual Funds: Price Impact Measures

Assets Sold
(In billions of U.S. dollars)

	Cash	SOV IG	SOV HY	Corp IG	Corp HY	Securitized IG (Agency)	Securitized HY	Equities	Muni Bonds	EM debt	Total	Return shock (in percent)	Redemption shock (in percent)
EM	0.4	2.4	0	0.3	1.3	0.0	0.1	0.0		2.0	6.4	-10.57	10.31
Global	0.1	0.4	0.0	0.1	0.0	0.0	0.1	0.0			0.7	-3.06	0.56
Gov	-0.1	-0.8	0.0	0.0	0.0	-0.3	-0.1	0.0			-1.3	1.31	-0.50
HY	0.6	0.2	0.0	0.9	9.8	0.0	0.1	0.3			12.0	-7.05	4.81
IG	1.2	7.1	0.0	8.8	0.3	1.7	5.7	0.0			24.7	-1.86	1.11
Loan	0.0	0.0	0.0	0.0	0.5	0.0	0.0	0.0			0.6	-0.86	0.81
Mixed	3.1	3.8	0.6	4.9	1.4	1.2	0.9	28.9			44.8	-10.49	2.82
Multi	0.4	0.6	0.1	0.7	0.3	0.5	0.8	0.1			3.4	-2.84	0.90
Muni	0.1	0.0	0.8	0.0	0.0	0.0	0.0	0.0	4.7		5.5	-0.76	0.70
Total	5.8	13.8	1.5	15.7	13.5	3.2	7.6	29.2	4.7	2.0	96.9		

Source: IMF staff estimates.

196. This analysis, nevertheless, warrants several important caveats. Contagion dynamics are highly nonlinear, and thus inherently difficult to quantify. For instance, the estimation of price impacts relies on assumptions of market absorption capacity and are based on observed historical patterns. The liquidation strategy of different financial institutions is difficult to predict, as is the willingness to cut credit lines in a situation of stress by the providers of such lines. Insurance companies do not need to actively mark-to-market all assets on their balance sheets, and such losses would mainly materialize when disposing of these assets.

197. Stress losses could be compounded by systematic mispricing of risk. During the global financial crisis, financial risk was underestimated across a range of financial instruments—as was notably the case for asset-backed security CDOs. That experience showed that it is not only the underlying risk in the individual elements of structured product that can lead to higher than expected losses, but also the default correlation across these elements. To assess the effect from underestimating this risk, we estimate default correlations based on realized defaults and compare these correlations to those implicitly used in the ratings of CLO tranches (Box 2). The estimated default correlations can then be used to adjust the holding of CLOs (based on their adjusted ratings) across the different financial institutions that invest in these products.

[83] This assumes that banks would provide at least part of their US$760 billion committed lines to corporates.

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Box 3. CLO Tranches, the Pricing of Risk, and Implications for Financial Institutions

Increased popularity of CLOs across different investors in recent years. Together with the rapid increased in leveraged finance—most notably, the so-called 'leveraged loans'—related structured products such as Collateralized Loan Obligations (CLO) has seen significant issuance in recent times. More than half of all leverage loan issuance ends up in CLOs. CLOs are securitized products which are in turn held by a wide range of investors, including domestic and foreign, insurance companies, mutual funds, hedge funds, among others. Different types of investors tend to invest in different CLO tranches. Banks tend to hold mainly triple-A-rated CLO tranches. Non-bank investors such as, for instance, asset managers, insurance companies, and hedge funds, tend to hold lower-rated tranches.

Default correlations are key for the adequate pricing of risk in CLO tranches. One of the lessons learnt from the global financial crisis is that the default correlation in structured products is a key driver of the overall creditworthiness of the bundled product. In particular, a large number of AAA-rated structured products, including several Mortgage Backed Securities (MBS) and Collateralized Debt Obligations (CDO), exhibited significantly larger than expected losses during the crisis. One of the main reasons was the systematic underestimation of default correlations. Since then, credit agencies have revised (up) some of the default correlations embedded in their ratings (see e.g., Nickerson and Griffin, 2017), but there has been limited quantitative work in estimating default correlation, particularly in the CLO market.[84]

This box presents quantitative estimates of default rates as well as default correlations of corporate debt instruments. Default correlations are estimated based on realized defaults in the spirit of Lucas (1995) and subsequent authors using a similar methodology (see Caceres et al. (2020b) for details). Default correlations are estimated for different elements within a given credit rating but also between different credit ratings. Essentially, the correlation between two elements (e.g., loan 1 and loan 2) with default events D_1 and D_2, with respective probabilities $P(D_1)$ and $P(D_2)$, is given by:

$$\rho_{D_1,D_2} = \frac{P(D_1, D_2) - P(D_1) \times P(D_2)}{\sqrt{P(D_1)\,(1 - P(D_1))} \times \sqrt{P(D_2)\,(1 - P(D_2))}}$$

The estimated default probabilities by credit ratings as well as the estimated default correlations within and between credit ratings can be seen in Table 6. As expected, lower-quality credit ratings tend to exhibit higher default correlations, suggesting that the most vulnerable elements tend to fall in distress concomitantly during periods of strain.

Applying the estimated default correlations to adjust the credit ratings of CLO tranches enables the computation of potential equity losses across financial institutions. Based on reported data of holding of CLOs by domestic banks and mutual funds, these holdings are repriced using the CLO tranche ratings implied from using the estimated default correlations.

[84] A few studies estimating default correlations include Lucas (1995), Nickerson and Griffin (2017), Li and Chen (2018), and Qi et al (2019).

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Box 3. CLO Tranches, the Pricing of Risk, and Implications for Financial Institutions (concluded)

Estimation Results

Estimated 1-year ahead default correlations, by credit rating:

	A-AAA	BBB	BB	B	C-CCC
A-AAA	0.25	0.11	0.24	0.60	0.99
BBB	0.11	0.31	0.40	0.59	1.00
BB	0.24	0.40	0.63	1.29	2.19
B	0.60	0.59	1.29	2.69	4.54
C-CCC	0.99	1.00	2.19	4.54	8.69

Estimated 2-year ahead default correlations, by credit rating:

	A-AAA	BBB	BB	B	C-CCC
A-AAA	0.29	0.24	0.66	1.16	1.38
BBB	0.24	0.89	0.92	1.37	1.97
BB	0.66	0.92	1.79	3.00	3.96
B	1.16	1.37	3.00	4.97	6.50
C-CCC	1.38	1.97	3.96	6.50	9.70

Estimated 5-year ahead default correlations, by credit rating:

	A-AAA	BBB	BB	B	C-CCC
A-AAA	0.36	0.63	1.35	1.93	1.83
BBB	0.63	1.02	1.88	2.86	2.74
BB	1.35	1.88	3.83	5.62	5.43
B	1.93	2.86	5.62	8.39	8.48
C-CCC	1.83	2.74	5.43	8.48	9.90

Sources: Caceres et al. (2020b); and IMF staff calculations.

C. Complementary Market-Based Contagion Analysis

198. A market-based analysis is performed to assess indirect spillover risks between domestic banking entities and large foreign entities due to co-movement in asset prices. The spillover risks are analyzed using publicly available daily financial market prices—i.e., equity price returns. The spillovers analysis uses Diebold and Yilmaz's (2014) approach. This analysis evaluates the directional co-movement through equity price returns, as equity prices could—to some extent—reflect banks' current and expected fundamentals. A financial spillover from firm A to firm B is defined as the share of the variation in firm B's equity returns shocks that can be attributed to (contemporaneous or preceding) shocks to firm A's equity returns. The concept stresses

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idiosyncratic shocks and excludes co-movement across markets that is driven by common factors. The VAR is estimated using a lasso-estimator (see Zou and Hastie, 2005). Estimations are conducted by controlling for global conditions by using the VIX index. The specification is as follows:

$$A(L)Y_t + B(L)X_t = \varepsilon$$

$$D^H = \left[d_{i,j}^H\right]$$

$$X_t = [VIX, \ldots]$$

Y is a vector of equity returns for all the firms in the sample, *X* is the Chicago Board Options Exchange Standard & Poor's 500 Implied Volatility Index (VIX), *A(L)* and *B(L)* are lag polynomials, *ε* is an error term, and *DH* is the H-step ahead generalized forecast error variance decomposition matrix.

199. The VAR model above is used to build a generalized forecast-error variance decomposition (GVD), using Pesaran and Shin's (1998) methodology, to identify uncorrelated structural shocks to FCIs.[85] The GVD for each firm is aggregated in a matrix, with the non-diagonal elements capturing spillovers effects. Specifically, the spillover from firm *i* to firm *j* is the percent of *j*'s total inward spillovers that are coming from i:

$$s_{ij} = \frac{d_{ij}}{\sum_{i\setminus\{j\}} d_{ij}}$$

The spillover therefore measures the fraction of the H-month ahead forecast error variance of firm *j*'s returns that can be accounted for by innovations in firm *i*'s returns.

200. Sample of institutions and calculations. The sample includes 160 large financial sector entities with asset size above US$100 billion in 20 countries. The analysis is performed using daily equity returns from 2015 through end-2019, estimated as log differences in equity prices. To control for the differences in trading hours in this cross-country setting, two-day averages are used (see Forbes and Rigobon, 2002). Estimations are conducted by controlling for global conditions by using the VIX index. Several sub-samples are assessed separately to explore domestic and cross-border equity return co-movement.

201. Results illustrate stronger equity return spillovers emanating from the U.S. G-SIBs. The directional co-movement —controlling for common global shocks through the vix index— shows relatively stronger co-movements in equity returns from the U.S. G-SIBs into domestic as well as foreign financial entities (Figure 54, panel 1). Inward spillovers from the U.S. G-SIBs into the U.S. Non-GSIBs are relatively high, while few Non-GSIBs with larger credit card operations reveal higher spillovers (Figure 54, panel 2). Large non-bank financial entities in the U.S. are also well connected with the domestic G-SIBs through equity return co-movement. Based on historical market conditions, spillovers emanating from Non-GSIBs and other U.S. non-bank financial entities are

[85] The GVD identification framework is order invariant by construction, hence avoids the ad hoc ordering of structural shocks characteristic of recursive identification.

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relatively subdued on average, compared to the spillovers from U.S. G-SIBs. In a nutshell, given the strong market-based interconnectedness between the G-SIBs' and other domestic financial entities as these results illustrate, monitoring market-based as well as exposure-based contagion between large domestic financial sector entities may provide room to identify potential vulnerabilities.

Figure 54. United States: Market-Based Banking Sector Interconnectedness vis-à-vis Domestic and Foreign Financial Sectors

Heat Map: Relative Spillovers, 2015–19

		From:					
		US GSIBs	US non-GSIBs	US Nonbank Financial Sector	Foreign GSIBs	Foreign non-GSIB banks	Foreign Nonbank Financial Sector
To:	US GSIBs						
	US non-GSIBs						
	US Nonbank Financial Sector						
	Foreign GSIBs						
	Foreign non-GSIB banks						
	Foreign Nonbank Financial Sector						

Equity Price Co-movement within the Domestic Banks: Net-Inward Spillovers

(Edge/line color = spillover transmitter color)

Sources: TR Datastream; Haver Analytics; IMF staff estimates.

Note: Data as of 2019:Q4. In panel 1, relative weighted average spillovers are shown. In panel 2, pink nods are domestic G-SIBs and green nods are other domestic BHCs in the FSAPs stress testing exercise. Edge width represents the intensity of the directional co-movement from similar colored nods into other nods.

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202. Market-based interconnectedness reveals higher spillovers on average from the U.S. G-SIBs to foreign non-G-SIB banks, compared to the spillovers potentially transmitted through other groups of entities. While the spillovers from the U.S. G-SIBs into foreign G-SIBs are large, potential spillovers from U.S. G-SIBs into other foreign financial and domestic financial entities on average are relatively higher (Figure 55). The analysis also reveals spillovers emanating from foreign G-SIBs into domestic financial entities, though at a relatively lower intensity compared to domestic G-SIBs. These results also reveal that many U.S. banks are closely connected with major domestic and foreign banks and therefore centrally clustered in the network (Figure 58, where closer to the center suggests larger co-movement levels). Overall, the analysis highlights the role of the U.S. G-SIBs as a potential risk transmitter, and emphasizes that vulnerabilities could potentially emanate into the domestic banks from foreign G-SIBs.

Figure 55. United States: Market-based Cross-Border Banking Sector Interconnectedness: Net Inward Co-movement of Domestic Banks and Large Foreign Banks

Sources: TR Datastream; Haver Analytics; IMF staff estimates
Note: Data as of 2019:Q4. For banks outside the US, bank names are not shown; country names are shown instead, with country names representing where the bank is domiciled. Red nodes are U.S. G-SIBs, green nodes are U.S. Non-GSIBs in the FSAPs stress testing exercise, blue nodes represent foreign G-SIBs, and orange nodes are other large foreign banks. Proximity to the center suggests greater co-movement of equity price returns.

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CONCLUSIONS

203. COVID outbreak put significant stress and amplified existing structural vulnerabilities in the financial system. The COVID-19 represents a real-life stress event, materializing through adverse shocks to both macroeconomic and financial conditions, exposing highly leveraged borrowers and lenders to default risks. US regulatory and supervisory agencies took swift and decisive actions to mitigate the effects of the outbreak on financial markets. Nevertheless, financial system is subject to numerous uncertainties related to the future financial conditions or borrowers, policy actions and priorities. Analysis conducted during the FSAP highlighted numerous changes compared to the previous crisis episodes, such as the GFC, differences of simulated shocks as well as remaining structural vulnerabilities.

204. After being at the epicenter of the global financial crisis, household mortgage debt has decreased substantially over the past decade, but other forms of consumer credit are on the rise. However, certain segments of consumer credit have seen a rapid growth in recent years. Auto loans now exceed US$1 trillion, and student loan debt is on the rise. If unabated, these segments could put pressure on households' debt servicing capacity, in light of tightened financial conditions, sharp increase in unemployment, exceeding the levels observed in the past crisis episodes. Banks stress test simulations reveal, that credit losses related to consumer credit and mortgages are the highest contributors to overall credit losses.

205. Corporate sector leverage is at its historic peak, while leveraged finance was growing rapidly. Increased financial risk taking, weakening underwriting standards and investor protections have allowed less creditworthy firms to access capital markets and increase their leverage. Much of this risk is distributed in the form of leveraged loans, private loans and CLOs, including abroad. Covenant protections for investors have weakened and the credit quality of new loans continues to deteriorate in light of COVID-19 shock. Important data gaps exist, particularly regarding direct and indirect exposures to leveraged and private loans across financial sub-sectors.

206. Corporate sector vulnerabilities could further amplify the COVID-19 shock to the most leveraged part of the corporate sector and delay an economic recovery as it reverberates through other sectors. Highly leveraged corporates already experience significant stress, leading to higher credit spreads, downgrades, inability to refinance debt, and defaults. As corporates de-lever and reduce costs, lay-offs would accelerate, consumer confidence decline, and the shock would spill to other segments of the economy. Financial institutions would suffer via direct and indirect exposures to the corporate and household sectors, resulting in funding liquidity stress, asset liquidations, and mark-to-market losses. Enhanced discretion resulting from weaker covenant protections for investors could imply delays in corporate restructurings and a subsequent economic recovery. Corporate stress test reveal, that up to 12 percent of corporates may face financial troubles in case of a prolonged recession, due to a second wave of COVID-19 infections. These results were taken into account in banking sector stress tests.

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207. The U.S. banking system entered COVID-19 crisis well prepared: with strong capital and liquidity buffers. Observed behavior of banks at the outset of the crisis showed banks' ability to extend credit to the real sector and thus contain further amplification of the crisis impact on cash strapped corporates and households. Part of the preparedness of the banks is attributable to the authorities' DFAST/CCAR stress tests which are based on a conservative scenario. FSAP analysis shows, that stress test results for banks are comparable to those published by FRB (DFAST and CCAR) and use of market data proxies (EDFs) leads to only marginally more conservative estimates of loan portfolio losses compared to accounting data (also taking into account that many smaller companies are non-public). Overall, additional sensitivity analysis reveals that CET1 and leverage ratios do depend significantly on a net income and expense before credit/market risk losses.

208. The largest loan losses in the industry are generated by the credit card-related net charge-offs, followed by residential real estate and commercial and industrial net charge-offs. Overall, loan loss provisions contribute only a smaller fraction of the CET1 decline. Smaller domestic banks (Non-GSIBS) face most volatile CET1 and leverage ratios during stress compared to G-SIBS which have stronger market power and well diversified loan book and funding structure.

209. Non-GSIBS do depend more on interest income from loans, have relatively higher exposure to credit card and small business loans which exhibit the highest credit loss rates in the adverse sensitivity scenarios. Large banks (G-SIBs, Trading Banks) derive a larger share of their revenue from trading books, and thus are subject to additional losses due to marking-to-market of these trading assets and counterparty defaults. Going forward, it is important to ensure that Non-GSIBs have enough capital to support lending as well as be able to absorb losses in case of further deterioration of economic environment. This can be achieved assuming conservative capital planning and reducing or stopping shareholder payouts during the time of the crisis. Nevertheless, banks' capital shortfalls is moderate in the Baseline and Adverse sensitivity scenarios, ranging from 0.3 to 1.3 percent of GDP. The wide range of shortfall estimates reflect uncertainty regarding duration and severity of the crisis, balance sheet growth, as well as dividend payout/share buyback policies in quarters preceding downturn.

210. Banks maintain healthy liquidity buffers and were able to withstand severe funding outflows, at the same time, market liquidity dried out not just of mortgage and corporate but also sovereign bonds. G-SIBs and Non-GSIBS have large amount of stable deposit funding, while some trading as well as foreign owned banks still rely on repo markets to obtain liquidity. Partial closure of the repo market (only treasury securities accepted as collateral) would not have a significant effect on liquidity of G-SIBs, except when banks are not able to sell outright large amounts of sovereign (Treasury) securities. A similar shock was observed at the outset of COVID-19 crisis but was mitigated by a swift intervention from the Federal Reserve. Banks remain significant providers of short-term funding, including liquidity to corporates, households (credit cards), other banks and non-bank financial institutions. It is important to ensure that in times of stress all large banks, including Non-GSIBs, have enough liquidity buffers to continue provide funding to their clients and counterparts.

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211. The U.S. banking system's vulnerability to shocks emanating from other banking systems is rather contained. The network analysis simulated a stress episode with shocks coming from credit and funding channels and evaluates the capital impairment due to contagion in the network of entities or banking systems. U.S. banking system play a larger role as a significant source of contagion. Results also suggest that capturing exposures based on different dimensions such as the level of consolidation and ownership reveal additional insights on where the pockets of vulnerabilities may arise and how the spillovers could amplify in potential stress episodes. A bank-level market-based analysis on equity return movements was also performed to complement the exposure-based analyses. The results reveal that the U.S. banks are closely connected with large foreign banks, thus centrally clustered in the network.

212. While the banking system was strengthened since the GFC, risks migrated to non-bank financial institutions. Highly leveraged institutions, such as investment, including hedge, funds, non-bank providers of funding such as mortgage lenders, may face higher liquidity and subsequent solvency risks during the downturn induced by COVID-19 pandemics.

213. Mutual funds are a key part of the U.S. financial system and are highly interconnected with other financial institutions through direct and indirect exposures. Some categories of mutual funds are subject to liquidity mismatches, as they invest in less liquid asset classes while providing daily redemptions. If significant in the aggregate, distress in the fund industry could have an important impact on financial stability.

214. Despite some mitigating effects stemming from the current valuation regime, parts of the insurance sector are vulnerable to severe market shocks and prolonged low interest rates. For insurance groups, analyses are complicated by the absence of a group capital requirement. The FSAP recommends the NAIC to develop and perform insurance solvency stress tests on a consolidated basis, in line with forthcoming group capital standards—also the work on liquidity stress tests should be further pursued. Public disclosures should be enhanced by requiring insurance companies to disclose market risk and interest rate sensitivities in a more harmonized manner.

215. Systemic risk analysis results indicate that not all institutions in the financial system are equally resilient: while banks have adequate capital and liquidity buffers, some risk takers (such as some categories of mutual funds, insurers) are more vulnerable. A marked rise in corporate stress would impact non-bank financial institutions, with a more moderate impact on banks, even though some large domestic banks are impacted more substantially. G-SIBs liquidity buffers are substantial, but high levels of utilization of credit and liquidity facilities would lead to a liquidity shortfall in some banks. Life insurers would face a significant reduction of their statutory capital in the adverse scenario, and a few less-diversified P&C insurers would face capital shortfalls after severe natural disasters. Most investment funds would be able to withstand severe redemptions, though high yield and loan funds would face significant shortfalls.

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Appendix I. Banking Sector Solvency and Liquidity Stress Testing Matrix

A. Banking Sector: Solvency Test			
Domain		**Framework**	
		TD by FRB	**TD by FSAP Team**
1. Institutional perimeter	Institutions included	18 BHCs classified as *large and complex* were assessed during the 2019 DFAST/CCAR exercise (8 G-SIBs, 4 other domestic BHCs, 6 IHCs) based on conservative scenarios.	34 largest BHCs/IHCs. The criteria used to determine the institutional perimeter include: (1) FRB stress test sample of banks used in the 2018 DFAST/CCAR exercise; (2) firms' balance sheet size at or above US$100 billion (including one bank which assets are close to US$100 billion).
	Market share	About 65 percent of total banking sector assets in the United States.	About 78 percent of total banking sector assets in the United States.
	Data	Effective date: December 2018. Data: Mostly based on confidential FR Y-14A/M/Q reports and publicly available FR Y-9C report Scope of consolidation: Consolidated group basis.	Effective date: March 2020. Data: Based on publicly available FR Y-9C report accessed via S&P Market Intelligence platform, and supplemented by other data sources including Bloomberg, Dealogic, Haver Analytics, Moody's KMV, International Financial Statistics (IFS), IMF Global Assumptions (GAS), and IMF WEO. Scope of consolidation: Consolidated group basis.
	Stress testing process	The path of any additional macroeconomic or financial variable is derived in a way which is consistent with the scenario using FRB own models.	The FSAP team conducted its own TD stress test using *June 2020 WEO Update* forecast paths (baseline) and forecast paths generated by IMF's Global Macrofinancial Model (adverse) for all material geographies of included banks. The path of any additional macroeconomic or financial variable required by the IMF models is derived in a way which is consistent with the scenario (e.g., real estate prices, credit growth, equity prices, corporate bond yields, term spreads, etc.).

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A. Banking Sector: Solvency Test			
Domain		**Framework**	
		TD by FRB	**TD by FSAP Team**
2. Channels of risk propagation	Methodology	FRB uses its own satellite models for: credit risk projections, bank interest rates and net interest margins, market risk, and banks' fee & commission income. FRB projects PPNR components using supervisory models that take the FRB's scenarios and firm-provided data as inputs. The FRB projects the paths of these variables as a function of aggregate macroeconomic variables included in the CCAR scenarios. FRB calculates projected pre-tax net income by combining projections of revenue, expenses, loan-loss provisions, and other losses.	FSAP team projected pre-tax net income at bank level by combining projections of PPNR components and loan loss provisions derived based on forecasted charge-offs and recoveries (57 separate specifications). The model's core set of regressions are used to forecast financial ratios related to pre-provision net revenue (PPNR), returns on AFS securities, and provisions conditional on macroeconomic conditions, lagged value of the ratio, and firm-level controls. FSAP team forecasted 26 PPNR-related ratios separately (8 interest income ratios, 7 interest expense ratios, 8 non-interest income ratios, and 3 non-interest expense ratios). The macroeconomic variables for these specifications are chosen based on the economic intuition rather than merely relying on the statistical significance. Bank-level controls such as various loan shares also enter the PPNR specifications to account for heterogeneity such as various business models these BHCs have. FSAP team forecasted charge-offs and recoveries ratios separately for 15 ratios (30 ratios in total) at industry-level as presented in the schematic below. The autoregressive nature of the specifications implies that the projected ratios will converge to their long-run steady state value. Solvency-funding cost interaction: bank-specific funding costs (interest expenses) conditional on stressed capital position.
3. Tail shocks	Scenario analysis	FRB scenarios is based on FRB policy statement and includes inter alia severe tail shocks such as increase in the level of unemployment by at least 4 p.p. up to a level not less than 10 percent. This corresponds to 1-in-100 years scenario.	The adverse scenario features a severe recession that occurs concurrently with significant financial market stress and a sharp housing and equity market correction and is characterized by a slow recovery. The main triggers are a deterioration of U.S. corporate debt markets and simultaneous downturns in Europe and China. The scenario is to a large extent similar to FRB's severely adverse scenario in terms of severity (less than 1 percent probability of occurrence).
	Sensitivity analysis	• Default of the largest counterparties	• Fintech impact on income and IT expenses. • Market shock on corporate loans, including CLOs/LLs. • Decreased reliance on FHLB funding.

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A. Banking Sector: Solvency Test			
Domain		**Framework**	
		TD by FRB	**TD by FSAP Team**
4. Risks and buffers	Positions/risk factors assessed	Credit risk Estimated according to the FRBs stress testing framework. Framework is based upon accounting classification of assets. CLOs and securitization exposures are included. Off-balance sheet exposures using baseline and stressed Credit Conversion Factors (CCFs) are included. Traded risks Mark-to-market valuation of securities (from shocks to interest rates and credit spreads). For banks with large trading books, trading book exposures are shocked through a set of Global Market Shocks (GMS) with losses recognized in the first quarter of the planning period. In addition, DFAST applies a largest counterparty default shock (LCPD) to the trading firms and two other firms with substantial process and/or custodial operations. Both GMS and LCPD are add-ons to the macroeconomic scenarios. All sovereign issuers relevant for banks are included. Market stress from shocks to risk-free interest rates, exchange rates, credit spreads, commodities, and equity prices. Profit loss recognition. Losses/gains are recognized in the same quarter that a shock hit. Evolution of RWAs. RWAs for credit risk evolve according to STA approach as well as balance sheet growth requirements embedded into scenario. Net trading income from equity positions, debt instruments, and trading derivatives. Interest income declines by the amount of lost income from defaulted loans.	Credit risks: Estimated based on 15 charge-off and recoveries specifications for: first lien and junior lien residential mortgages, home equity lines of credit (HELOC), construction loans, multifamily and non-residential commercial mortgages, credit cards, other consumer loans, commercia and industrial (C&I) loans, loans to foreign governments, loans to depository institutions, agriculture loans, other residential real estate loans, and all other loans. Traded risks: Realized gains on AFS securities is estimated separately following the original CLASS model. Realized AFS gains and losses reflect a combination of asset price shocks, credit events, behavioral decisions about asset sales, and accounting judgment. Due to lack of access to detailed risk information such as mark-to-market losses at loan-level, this model may be more effective in forecasting variables for diversified firms. Market stress from shocks to risk-free interest rates, credit spreads, and equity prices are also incorporated into the framework through the FSAP macro scenario. Profit loss recognition. Losses/gains are recognized in the same quarter that a shock hit. Balance sheet and RWA projections Growth path of assets over the stress testing horizon is used to forecast the balance sheet variables and RWAs. The FSAP team first uses a simple approach of using the long-run historical asset growth, supplemented by additional approaches for robustness. The latter include: (1) assuming a zero growth in balance sheet in the stress testing horizon; (2) forecasting balance sheet growth to reflect dynamics of the nominal GDP path in the scenario. Tax rate: Assumed at 21 percent in the forecasting horizon

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A. Banking Sector: Solvency Test			
Domain		Framework	
		TD by FRB	TD by FSAP Team
		Interest income from non-defaulting loans is estimated according to satellite models. Interest expenses increase due to rising funding costs linked to the macroeconomic scenario with empirically estimated pass-through, and add-on funding stress from a market event with no pass-through to lending rates. Net fee and commission income and other income evolve with macroeconomic conditions and banks' balance sheets. No change in business models (no rebalancing of portfolio). Balance sheets growth over the stress horizon. Starting in DFAST 2020, projections are based on the assumption that firms' balance sheets remain unchanged throughout the projection period. Also, in March 2020, the FRB amended its stress testing requirements to assume that a firm maintains a constant level of assets over the projection horizon and to assume that a firm will not pay any common dividends or make any issuance of common or preferred stock. Tax Rate The effective corporate income tax rate. Regulatory impact Stress tests results are compared against regulatory minima of CET1 and leverage ratios. G-SIB buffer is included into 4.5 percent CET1 minima and can be depleted. No conversion of additional Tier 1 capital is assumed during the stress horizon. If banks' capital ratio falls below regulatory minimum during the stress test horizon, banks are not able to return funds to shareholders (dividend payments as well as share buybacks).	Regulatory impact Stress test results are compared against a hurdle rate of 4.5. In addition to the hurdle rate, these BHCs are also subjected to a capital conservation buffer (CCB also includes the G-SIBs surcharge in the case of G-SIBs).
	Behavioral adjustments	Dynamic Balance Sheet: In line with 2019 FRB methodology.	Dynamic Balance Sheet: Balance sheet size is assumed to grow at historical industry growth rate

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A. Banking Sector: Solvency Test			
Domain		**Framework**	
		TD by FRB	**TD by FSAP Team**
		Dividend Policy: Payout ratio set by 2019 FRB methodology.	Dividend Policy: Payout ratio projected based on a partial adjustment model with a payout rate of 45 percent for a portion of the net income. The specification is as follows: (0.9*(previous period's dividends) +((1-0.9) *(0.45*net income)).
5. Regulatory and market-based standards and parameters	Calibration of risk parameters	Parameter definition Net charge off ratios for credit risk (accounting definition)	Parameter definition Accounting portfolios.
	Regulatory standards	Capital definition according to national implementation of Basel principles, including CET1, Tier 1, leverage ratio and total CAR. Capital components that are no longer eligible for additional Tier 1 and Tier 2 capital components follow Basel III transitional path.	
6. Reporting format for results	Output presentation	Bank-by-bank: • Minimum CET1, Tier 1, CAR, and leverage ratio • Composition of P&L • Capital ratios • Profitability metrics: ROE; ROA; NII.	Contribution of key drivers to aggregate CET1 capital ratios Number of banks and share of total assets below hurdle rates. Capital shortfall in terms of nominal GDP. System-wide and by groups of banks: • CET1, Tier 1, CAR, and leverage ratio • Distribution of capital ratios (box plots) • Profitability metrics: ROE; ROA; NII

B. Banking Sector: Liquidity Test		
Domain		**Framework**
		TD by FSAP Team
1. Institutional Perimeter	Institutions included	33 banks on the consolidated basis
	Market share	Over 80 percent of total banking sector assets
	Output presentation	Public data: LCR disclosure templates containing cash flow data for 30 days period. Consolidated basis. Banks grouped by business model Baseline date: December 31, 2019
2. Channels of risk propagation	Methodology	Cash flow-based analysis using contractual LCR cash flow data aggregated for all currencies with assumptions about combined interaction of funding and market liquidity and different degrees of central bank support. Integrated Solvency-Liquidity-Network contagion framework with sequential recalculation of key solvency, liquidity and risk parameters to incorporate feedback loops due to asset fire-sales.

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B. Banking Sector: Liquidity Test		
Domain		**Framework**
		TD by FSAP Team
	Feedback loops and links with solvency analysis	Solvency-Funding cost loop (price effect). Higher funding costs for those banks which experience significant decline in solvency ratios. CCP loop. Stress in collateral market (e.g., MBS, corporate securities downgrade etc.) leads to additional flows of collateral.
3. Sensitivity analysis	Perimeter and type of analysis	LCR distribution and volatility across banks
4. Tail Shocks	Size of the shock	Baseline: business as usual (as reported by banks under normal market conditions). Behavioral assumptions: all maturing liabilities are rolled-over. Collateral freeze scenario (e.g., due to cyber-risk related event at CCP) 1 day, 5 days and 1-month intermediate/severe market stress scenario: higher run-off rates on unsecured wholesale funding, and undrawn committed credit/liquidity lines on top of the mild stress scenario;
5. Regulatory and Market-Based Standards and Parameters	Regulatory standards	Threshold for cash flow-based analysis: net cumulative funding gap falls below 0.
6. Reporting Format for Results	Output presentation	Number of banks with negative net cumulative funding gaps; Aggregate negative cumulated counterbalancing capacity.

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Appendix II. Interconnectedness Stress Testing Matrix

Banking Sector: Contagion Risk		
Domestic Interconnectedness: Exposure Based		
1. Institutional Perimeter	Institutions included	• Six domestic G-SIBs.
	Market share	• About 50 percent of the banking sector assets.
	Data and baseline date	• Confidential bilateral exposure data collected by the FRB for the BIS G-SIB hub and confidential liquidity data from FR 2052a. Given the confidentiality of the data used for this exercise, FRB will implement the analysis for the FSAP team. Data cutoff is as of end-December 2019.
2. Channels of Risk Propagation	Methodology	• First stage (Liquidity Shock) ○ Calibration of net outflows shock and comparison to the counter-balancing capacity ○ Liquidity channel-related contagion to the other entities occur due to the price impact of asset sales ○ Loss in capital due to liquidity channel-related losses (liquidation losses plus marked-to-market losses). These capital levels will carry forward to the second stage as the starting capital levels. • Second stage (Credit Shock and Risk Transfers) ○ Based on a modified version of Espinosa-Vega and Sole (2010) with [8] exposure categories separately.
3. Tail shocks	Size of the shock	• Redemption shocks/run-off factors in the first stage is scenario-based, calibrated based on historical evidence • Loss given default rates (LGDs) in the second stage varies by exposure category
4. Reporting Format for Results	Output presentation	• Capital shortfall in percent of initial capital before stage 1, by bank (without identifying individual banks by name); • Capital shortfall, system wide (with min, max, median values); • Heatmap with number of failed institutions given defaults.
Banking Sector: Contagion Risk		
Cross-Border Interconnectedness: Exposure Based		
1. Institutional Perimeter	Institutions included	• 22 large banking systems (both nationality/consolidated and locational residency basis) depending on bilateral exposures data availability through BIS
	Market share	• Includes exposures of internationally active banks in these banking systems
	Data and baseline date	• Based on publicly available and confidential BIS consolidated and locational data. Data cutoff is as of end-September 2019

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Banking Sector: Contagion Risk		
Cross-Border Interconnectedness: Exposure Based		
2. Channels of Risk Propagation	Methodology	• Balance-sheet based; network contagion based on Espinosa-Vega and Sole (2010)
3. Tail shocks	Size of the shock	• Pure contagion: default of banking systems, 80-100 percent loss given default, 50 percent funding roll-over ratio. Further calibrations were conducted based on a range of LGD rates as sensitivity analyses.
4. Reporting Format for Results	Output presentation	• Capital shortfall, system wide on consolidated basis (i.e., based on nationality); • Capital shortfall, system wide on residency basis;
Banking Sector: Contagion Risk		
Domestic and Cross-Border Interconnectedness: Market Based		
1. Institutional Perimeter	Institutions included	• 120 depository institutions and 87 other financial entities in 23 countries. Out of the 207 total entities, 47 are U.S. entities.
	Market share	• All listed financial sector entities with consolidated assets above $100 billion.
	Data and baseline date	• Equity prices from Thompson Reuters DataStream (daily). Data cutoff is as of end-December 2019.
2. Channels of Risk Propagation	Methodology	• Market-based model: Diebold and Yilmaz's (2014) generalized forecast error variance decomposition approach. The analysis was conducted using either daily or weekly data. For daily data, following standard practice, two-day average was used to accommodate time differences across markets.
3. Tail shocks	Size of the shock	• Size of the correlation coefficient. Incorporates the asset size of these entities (i.e., asset-weighted coefficients).
4. Reporting Format for Results	Output presentation	• Heatmap of average co-movement between banks/non-banks in the US/Rest of the world • Network maps with co-movement between entities

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Appendix III. Insurance Stress Testing Matrix

		Top-Down by IMF
Insurance Sector: Solvency Risk		
1. Institutional perimeter	Institutions included	• Macrofinancial scenario: 21 life insurance groups, 22 non-life insurance groups, 7 health insurance groups. • Low-for long: Life insurance sector. • Mass lapse event: 21 life insurance groups. • Natural disaster: 538 non-life insurers (solo), 44 small, regionally concentrated non-life insurers (solo). • Banking counterparty default: 21 life insurance groups, 22 non-life insurance groups, 7 health insurance groups.

	Market share	• Macrofinancial scenario (based on gross written premiums):
		  • Life: 70 percent.
		  • Non-life: 70 percent.
		  • Health: 45 percent.

	Data	• Regulatory reporting.
	Reference date	• December 31, 2018. [Possible update as of December 31, 2019]
2. Channels of risk propagation	Methodology	• Investment assets: other-than-temporary impairments on securities after price shocks, increase in the default rate for corporate bonds and loan exposures. • Insurance liabilities: unaffected by change in interest rates as discount rates are based on historic cost accounting. • Sensitivity analysis: effect on statutory capital.
	Time horizon	• Instantaneous shock.
3. Tail shocks	Scenario analysis	• Adverse macrofinancial scenario: Equity prices -40.4 percent (unaffiliated) and -20.0 percent (affiliated); property held for sale -23.2 percent; impairment on fixed-income instruments between 3.0 percent (NAIC rating category 3) and 15.0 percent (NAIC rating category 6); corporate bond yield increase between 2.8 percentage points (NAIC rating category 3) and 7.0 percentage points (NAIC rating category 6); impairment on mortgages 2.0 percent (first lien) and 10.0 percent (other mortgages).
	Sensitivity analysis	• Low-for-long interest rate projections. • Mass lapse event, triggered by a +2.0 percentage points interest rate hike for U.S. Treasury bonds. • Natural disaster: 1-in-50, 1-in-100, 1-in-250, and 1-in-500 years hurricane. • Default of the largest banking counterparty.
4. Risks and buffers	Risks/factors assessed	• Market risks: interest rates, share prices, property prices, credit spreads. • Asset-liability risks. • Credit risks, incl. counterparty risks. • Natural catastrophe risks. • Summation of risks, no diversification effects.
	Buffers	• None.

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		Top-Down by IMF
Insurance Sector: Solvency Risk		
	Behavioral adjustments	• None.
5. Regulatory standards and parameters	Regulatory/ accounting standards	• U.S. Risk-Based Capital (RBC). • U.S. GAAP.
6. Reporting format for results	Output presentation	• Macrofinancial scenario: Impact on statutory capital and contribution of individual shocks; dispersion measures. • Low-for-long: Projection of net investment spread (investment return minus guaranteed interest rate). • Mass lapse event: Cash outflow, waterfall of assets which need to be liquidated; dispersion measures. • Natural disaster: Impact on statutory capital and RBC coverage ratio, number of companies with an RBC shortfall; dispersion measures. • Banking counterparty default: Impact on statutory capital; dispersion measures.

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Appendix IV. Mutual Funds Stress Testing Matrix

		Top-Down by IMF
Mutual Fund Sector: Liquidity Risk		
1. Institutional perimeter	Institutions included	• All fixed income and mixed mutual funds covered by Morningstar (2,733 funds with total net assets of US$6,319 billion).
	Market share	• About 100 percent of the fixed income and mixed fund sector
	Data	• Commercial data (Morningstar)
	Reference date	• December 31, 2019
2. Channels of risk propagation	Methodology	• Calibration of redemption shock and comparison to level of highly liquid assets • Price impact due to asset sales • Second-round effects based on flow-performance relationship
	Time horizon	• Instantaneous shock
3. Tail shocks	Scenario analysis	• Adverse scenario: same as the banking sector scenario but converted to monthly frequency. • Pure redemption shock: severe outflows based on historical distribution: 3 percent expected shortfall (average of 3 percent worst net flows)
4. Risks and buffers	Risks/factors assessed	• Market risk: interest rates, share prices, credit spreads. • Liquidity risk: severe redemption shock
	Buffers	• Level of highly liquid assets
	Behavioral adjustments	• Choice of liquidation strategy used: slicing (prorata), waterfall (most liquid assets first) and mixed approach (cash then slicing) • Liquidity Management Tools are not taken into account
5. Regulatory standards and parameters	Regulatory/accounting standards	• N/A
6. Reporting format for results	Output presentation	• Number of funds with a redemption coverage ratio below one (ratio of highly liquid assets to redemptions). • Price impact of asset sales. • Redemptions due to second-round effects
Mutual fund Sector: Vulnerability analysis and contagion		
1. Institutional perimeter	Institutions included	• All fixed income and mixed mutual funds covered by Morningstar (2,733 funds with total net assets of about US$6.3 billion) and fixed-income ETFs.
	Market share	• About 100 percent of the fixed income and mixed fund sector
	Data	• Commercial data (Morningstar)
	Reference date	• December 31, 2019
2. Channels of risk propagation	Methodology	• CoVaR applied to fund flows and returns by fund category to identify most vulnerable funds and most contagious • Diebold-Yilmaz methodology applied to funds to identify most vulnerable funds and most contagious • Tail-dependence using copula

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		Top-Down by IMF
Mutual Fund Sector: Liquidity Risk		
	Time horizon	• Monthly data
3. Tail shocks	Scenario analysis	• For Copula approach: expected net flows conditional on a fund category facing net flows worse than the 3 percent expected shortfall
4. Risks and buffers	Risks/factors assessed	•
	Buffers	•
	Behavioral adjustments	•
5. Regulatory standards and parameters	Regulatory/accounting standards	•
6. Reporting format for results	Output presentation	• Representation of interconnectedness among funds by fund category • Identification of fund categories most vulnerable to distress from other categories

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Appendix V. Grouping of Banks

We grouped banks into different categories depending on business model and size of the bank. Appendix Table V.1 below shows grouping of banks by four different categories, namely G-SIBS (excluding four G-SIBS which are grouped as Trading Banks given their focus on trading related activities, investment banking and asset management services), Trading banks, foreign-owned banks and domestically institutions not considered systemically important (Non-GSIBs).

Appendix Table V.1. Banks included in the Stress Testing

Name	Stress Testing Category	Assets (2020: Q1); in th. USD
JPMorgan Chase & Co.	G-SIB	3,139,431,000
Bank of America Corporation	G-SIB	2,619,954,000
Citigroup Inc.	G-SIB	2,219,770,000
Wells Fargo & Company	G-SIB	1,981,349,000
Goldman Sachs Group, Inc.	Trading bank	1,089,759,000
Morgan Stanley	Trading bank	947,795,000
U.S. Bancorp	Non-GSIB	542,909,000
Truist Financial	Non-GSIB	506,229,000
Bank of New York Mellon Corporation	Trading bank	468,155,000
TD Group US Holdings LLC	Foreign	447,268,871
PNC Financial Services Group, Inc.	Non-GSIB	445,567,546
Capital One Financial Corporation	Non-GSIB	396,878,031
State Street Corporation	Trading bank	362,528,000
HSBC North America Holdings Inc.	Foreign	297,535,664
BMO Financial Corp.	Foreign	187,756,342
American Express Company	Non-GSIB	186,054,000
Fifth Third Bancorp	Non-GSIB	185,391,070
BNP Paribas USA, Inc.	Foreign	183,085,293
Ally Financial Inc.	Non-GSIB	182,527,000
Barclays US LLC	Foreign	179,955,000
Citizens Financial Group, Inc.	Non-GSIB	176,981,456
MUFG Americas Holdings Corporation	Foreign	165,696,005
UBS Americas Holding LLC	Foreign	163,248,851
Northern Trust Corporation	Trading bank	161,709,179
KeyCorp	Non-GSIB	157,003,466
Santander Holdings USA, Inc.	Foreign	152,144,560
RBC US Group Holdings LLC	Foreign	137,944,290
Regions Financial Corporation	Non-GSIB	133,638,000
Credit Suisse Holdings (USA), Inc.	Foreign	131,778,058
M&T Bank Corporation	Non-GSIB	124,577,833
DB USA Corporation	Foreign	117,159,000
Huntington Bancshares Incorporated	Non-GSIB	113,897,248
Discover Financial Services	Non-GSIB	112,656,646
BBVA Compass Bancshares, Inc.	Foreign	94,325,559

Source: IMF staff; and S&P Market Intelligence

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Appendix VI. Risk Assessment Matrix

Nature of Risk	Overall Level of Concern	
	Medium-term Likelihood of Realization	Expected Impact if Risk Materializes
Sharper and longer growth slowdown	**High**	**High**
	Longer containment and uncertainties about the intensity and the duration of the COVID-19 outbreak reduce supply and domestic and external demand. Deteriorating economic fundamentals and the associated decline in risk appetite would result in a second wave of financial tightening and in debt service and refinancing difficulties for corporates and households.	A sharp recession would have a negative impact on both the U.S. and the global economy. Rising unemployment and bankruptcies would impact banks' NPLs and increase credit risks, translating into financial institutions' losses and forcing them to cut credit, with further adverse implications for growth.
Sharp rise in risk premia	**High**	**High**
	An abrupt deterioration in market sentiment (e.g., prompted by policy surprises, pandemic, trade or geopolitical tensions) could trigger risk-off events such as recognition of underpriced risk. Financial asset prices could fall sharply, and credit spreads widen given the bulk of securities in the lowest investment grade rating.	Liquidity could dry up in some funding and securities markets (e.g., leveraged loan market) reducing intermediation impacting banks and NBFIs. Higher risk premia cause higher debt service and refinancing risks; stress on leveraged corporates, and to a lesser extent households, disruptive corrections to stretched asset valuations—all depressing growth.
Cyber-attacks	**Low**	**High**
	Cyber-attack on the interconnected financial system reliant on a broadening array of interconnected platforms could trigger systemic financial instability or widely disrupt socio-economic activities.	Shock to critical infrastructure causes delay, denial, disruption, breakdown or loss of services, affecting many institutions that rely on the attacked hub. This could also lead to a loss of confidence in the functioning of the financial system.
Distress of a major CCP or other financial infrastructure	**Low**	**High**
	Regulation and oversight of systemically important U.S. FMIs are generally adequate and effective. However, outcomes of the implementation of the relevant internationally agreed risk management requirements by CCPs is uneven in certain areas at select CCPs that may potentially exacerbate financial stability risks.	The high interconnectedness and concentrated nature of major FMIs, interdependencies with the largest banks and quasi-monopolies for clearing specific asset classes could trigger a systemic event both domestically and globally.
Inadequate preparations for LIBOR transition	**Medium**	**Medium**
	While progress has been made in moving to a new benchmark, there are still significant risks that public and private entities may not be ready for the transition by the end of 2021.	With more than $200 trillion of LIBOR-based contracts, problems in transitioning to a new benchmark could cause very significant disruption in financial markets.

Note: The Risk Assessment Matrix shows events that could materially alter the baseline path (the scenario most likely to materialize in the view of IMF staff). It reflects views of the FSAP team on the sources of financial stability risks surrounding the baseline, relative likelihood of their realization sometime in the next three years, and the overall level of concern.

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Appendix VII. Structure of the U.S. Financial System

Appendix Figure VII.1. United States: Bank Funding and Shadow Banks

Number of commercial banks - FDIC insured

Sources: FDIC.

Distribution of banks by size

(in percent)

Sources: FDIC.

U.S. banking sector concentration is relatively low, compared to the peers…

Market Share of Top 5 Banks

(In percent)

Sources: Global Financial Development database.

…although a significant amount of assets is held by large banks

Banks by Asset Size

Sources: Flow of Funds.

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Appendix Figure VII.2. United States: Bank Funding and Shadow Banks

Structure of wholesale funding: commercial and saving bankds

Sources: FDIC.

Mortgage market

(billion of US$)

Sources: Federal Reserve (Flow of Funds).

Shadow banking system

(Billion US$)

Sources: Flow of Funds.

Mutual Funds assets

(billion $US)

Sources: Flow of Funds.

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Appendix Figure VII.3. United States: Banking Sector Indicators

Structural and regulatory specificities increase the average risk-weight of U.S. banks exposures....

Risk Weighted Assets-to-Total Assets
(In percent)

...contributing to relatively low leverage in the sector...

Capital-to-Total Assets
(In percent)

...despite average capital ratios below peers.

Tier 1 Capital-to-Risk Weighted Assets
(In percent)

Banks profitability is substantially above peers.

Liquid Assets-to-Short-Term Liabilities
(In percent)

Sources: IMF, Financial Soundness Indicators database; IMF staff calculations.

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Appendix Figure VII.4. United States: Banking Sector: Composition of Assets and Liabilities

There were a few shifts in composition of banks' balance sheets since the GFC: an increase in cash and CB reserves....

Composition of Assets
(In billions of US dollars; aggregate for 35 BHCs)

...and rising share of credit provided to non-bank financial institutions (incl. "shadow banks")

Composition of Loans and Leases
(In billions of US dollars; aggregate for 35 BHCs)

Loan market concentration is high by the 6 G-SIBs having a share almost four times higher than smaller domestic banks

Net Loans and Leases
(In billions of US dollars; as of 2019:Q3)

Sources: FRB; S&P Market Intelligence

Banks' funding remains domestic too: share of domestic deposits steadily went up, and foreign funding remains small

Composition of Liabilities
(In billions of US dollars; aggregate for 35 BHCs)

Most of the deposits concentrated in the largest 6 G-SIBS

Unused commitments represent the largest item in off-balance sheet exposures

Domestic Deposits
(In billions of US dollars; 2019Q3)

Sources: FRB; S&P Market Intelligence.

Off-balance Sheet Exposures

Sources: S&P; IMF staff calculations.
Note: In panels 3 and 5, the horizontal bars in between the boxes denote the median.

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Appendix Figure VII.5. United States: Banking Sector: Selected Off-Balance Sheet indicators

Unused commitments for the sample of 35 banks did not reach the levels seen during the GFC, however they show an increasing trend in the last couple of years…

Consumer credit cards is the largest item among unused commitments: credit and liquidity facilities.

For the most complex and largest banks (13 banks in the sample) which use Internal rating-based approach, off balance sheet commitments are stable in recent years and constitute about 40 percent of the on-balance sheet exposures….

…with unused commitments for corporate sector accounting for almost half of total commitments.

Residential real estate loans represent another significant share of off-balance sheet exposures.

Almost half of the commitments are unconditionally cancelable.

Sources: S&P; IMF staff calculations.

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Appendix Figure VII.6. United States: Banking Sector: Capital and Leverage

CET1 ratio increased almost three times since the GFC.....

...with foreign owned banks reporting the highest CET1 ratios on average

Sources: FRB; S&P Market Intelligence.

Leverage decreased steadily....

...although foreign banks remain the most leveraged institutions....

Sources: FRB; S&P Market Intelligence.

...which explained by the fact that while RWAs density went down...

Foreign and trading banks have lowest density due to high share of Treasury bonds and other low risk weight assets

Sources: FRB; S&P Market Intelligence.

Sources: S&P; IMF staff calculations.
Note: In panels 2, 4 and 6, the horizontal bars in between the boxes denote the median.

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Appendix Figure VII.7. United States: Banking Sector: Profitability

Return on equity steadily went up given strong demand for loans, increased share buybacks and dividend payments…

…but foreign owned banks still trailing behind domestic ones

Sources: FRB; S&P Market Intelligence.

Overall, U.S. banks are strongest performers across peers….

…maintaining healthy shares of interest and non-interest (less cyclical) income

Sources: S&P; IMF staff calculations.
Note: In panel 2, the horizontal bars in between the boxes denote the median.

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Appendix Figure VII.8. United States: Banking Sector: Loan losses

NPLs declined to its lowest level since the GFC.....

...with G-SIB and D-SIB having relatively higher levels of past loans reflecting their higher exposures to nonfinancial corporate and household sectors

Loans past-due by less than 90 days exhibit similar trends across different categories of banks....

U.S. has a relatively low level of NPLs compared with other large countries

Sources: S&P; IMF staff calculations.
Note: In panels 2 and 3, the horizontal bars in between the boxes denote the median.

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Appendix VIII. Stress Test Scenarios

Appendix Table VIII.1. Baseline Scenario Based on the *June 2020 WEO Update* Projections

	Real GDP Growth *(percent, Q-o-Q annualized)*	Unemployment Rate *(percent)*	3-Month Treasury Rate *(percent)*	10-Year Treasury Bond Yield *(percent)*	BBB Corporate Bond Yield *(percent)*	Stock Market Index *(2019Q4=100)*	House Price Index *(2019Q4=100)*
2019Q4	2.1	3.5	1.6	1.8	3.3	100.0	100.0
2020Q1	-5.0	3.8	1.1	1.4	3.3	92.9	101.3
2020Q2	-44.9	13.5	0.1	0.7	5.2	77.7	98.4
2020Q3	22.8	12.9	0.1	0.9	6.1	70.5	94.8
2020Q4	10.7	11.5	0.1	0.9	6.5	68.9	91.3
2021Q1	8.0	10.6	0.1	1.0	6.6	70.5	87.1
2021Q2	6.1	10.0	0.1	1.0	6.2	72.0	83.1
2021Q3	4.2	9.5	0.1	1.0	5.9	73.6	79.4
2021Q4	3.2	9.2	0.1	1.1	5.6	75.1	75.8
2022Q1	2.8	9.0	0.0	1.2	5.2	76.7	73.9
2022Q2	2.5	8.9	0.0	1.3	4.9	78.2	73.3
2022Q3	2.2	8.7	0.0	1.5	4.6	79.8	73.8
2022Q4	2.2	8.6	0.0	1.6	4.4	81.3	74.5
2023Q1	2.1	8.4	0.0	1.7	4.1	82.9	75.7
2023Q2	2.1	8.3	0.0	1.8	4.1	84.4	77.9
2023Q3	2.1	8.1	0.0	1.8	4.0	86.0	80.1
2023Q4	2.1	8.0	0.0	1.8	3.9	87.6	82.3
2024Q1	2.1	7.9	0.0	1.8	3.8	89.1	84.5
2024Q2	2.0	7.8	0.0	1.8	3.7	90.7	86.7
2024Q3	2.0	7.6	0.0	1.8	3.7	92.2	89.0
2024Q4	2.0	7.5	0.0	1.9	3.6	93.8	91.2
2025Q1	2.0	7.4	0.0	1.9	3.5	95.3	93.4
2025Q2	2.0	7.3	0.0	1.9	3.4	96.9	95.6
2025Q3	1.9	7.2	0.0	1.9	3.3	98.4	97.8
2025Q4	1.9	7.0	0.0	1.9	3.3	100.0	100.0

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Appendix Table VIII.2. Sensitivity Scenario 1

	Real GDP Growth *(percent, Q-o-Q annualized)*	Unemployment Rate *(percent)*	3-Month Treasury Rate *(percent)*	10-Year Treasury Bond Yield *(percent)*	BBB Corporate Bond Yield *(percent)*	Stock Market Index *(2019Q4=100)*	House Price Index *(2019Q4=100)*
2019Q4	2.1	3.5	1.6	1.8	3.3	100.0	100.0
2020Q1	-4.8	3.8	1.1	1.4	3.3	96.8	101.2
2020Q2	-66.8	22.8	0.1	0.6	5.8	72.9	93.3
2020Q3	29.5	25.3	0.1	0.8	6.8	66.6	89.9
2020Q4	21.6	23.3	0.1	0.8	7.1	66.1	86.6
2021Q1	16.1	21.1	0.1	0.9	7.1	68.4	82.6
2021Q2	7.3	19.5	0.1	0.9	6.7	69.7	78.7
2021Q3	4.2	18.3	0.1	0.9	6.4	71.0	75.2
2021Q4	3.2	17.4	0.1	1.0	6.0	72.3	71.9
2022Q1	2.8	16.7	0.0	1.1	5.6	73.6	70.1
2022Q2	2.5	16.1	0.0	1.3	5.3	74.9	69.6
2022Q3	2.2	15.5	0.0	1.4	5.0	76.3	70.4
2022Q4	2.2	15.0	0.0	1.5	4.8	77.6	71.3
2023Q1	2.1	14.4	0.0	1.6	4.4	78.9	72.6
2023Q2	2.1	13.9	0.0	1.7	4.3	80.2	75.0
2023Q3	2.1	13.4	0.0	1.7	4.3	81.5	77.4
2023Q4	2.1	12.8	0.0	1.7	4.2	82.8	79.8
2024Q1	2.1	12.3	0.0	1.7	4.1	84.2	82.2
2024Q2	2.0	11.8	0.0	1.7	4.0	85.5	84.6
2024Q3	2.0	11.2	0.0	1.7	3.9	86.8	87.0
2024Q4	2.0	10.7	0.0	1.7	3.8	88.1	89.4
2025Q1	2.0	10.2	0.0	1.7	3.7	89.4	91.8
2025Q2	2.0	9.7	0.0	1.8	3.7	90.7	94.2
2025Q3	1.9	9.1	0.0	1.8	3.6	92.1	96.6
2025Q4	1.9	8.6	0.0	1.8	3.5	93.4	99.0

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Appendix Table VIII.3. Sensitivity Scenario 2

	Real GDP Growth *(percent, Q-o-Q annualized)*	Unemployment Rate *(percent)*	3-Month Treasury Rate *(percent)*	10-Year Treasury Bond Yield *(percent)*	BBB Corporate Bond Yield *(percent)*	Stock Market Index *(2019Q4=100)*	House Price Index *(2019Q4=100)*
2019Q4	2.1	3.5	1.6	1.8	3.3	100.0	100.0
2020Q1	-4.8	3.8	1.1	1.4	3.3	96.8	101.2
2020Q2	-66.8	22.8	0.1	0.5	5.8	72.9	88.3
2020Q3	0.0	26.5	0.1	0.7	7.2	62.5	83.9
2020Q4	29.5	24.5	0.1	0.7	7.5	63.0	80.8
2021Q1	21.6	22.2	0.1	0.8	7.4	65.8	77.0
2021Q2	7.3	20.7	0.1	0.8	6.9	67.1	73.2
2021Q3	4.2	19.6	0.1	0.8	6.6	68.4	69.8
2021Q4	3.2	18.8	0.1	0.9	6.3	69.7	66.6
2022Q1	2.8	18.1	0.0	1.0	5.8	70.9	65.0
2022Q2	2.5	17.5	0.0	1.1	5.5	72.2	64.7
2022Q3	2.2	17.0	0.0	1.2	5.2	73.5	65.6
2022Q4	2.2	16.4	0.0	1.4	4.9	74.7	66.6
2023Q1	2.1	15.9	0.0	1.5	4.6	76.0	68.2
2023Q2	2.1	15.4	0.0	1.5	4.5	77.3	70.7
2023Q3	2.1	14.9	0.0	1.5	4.4	78.5	73.3
2023Q4	2.1	14.4	0.0	1.5	4.3	79.8	75.8
2024Q1	2.1	13.9	0.0	1.5	4.2	81.1	78.4
2024Q2	2.0	13.4	0.0	1.6	4.2	82.3	80.9
2024Q3	2.0	12.9	0.0	1.6	4.1	83.6	83.4
2024Q4	2.0	12.4	0.0	1.6	4.0	84.9	86.0
2025Q1	2.0	12.0	0.0	1.6	3.9	86.1	88.5
2025Q2	2.0	11.5	0.0	1.6	3.8	87.4	91.0
2025Q3	1.9	11.1	0.0	1.6	3.7	88.7	93.4
2025Q4	1.9	10.8	0.0	1.6	3.6	89.9	95.8

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Appendix Table VIII.4. Sensitivity Scenario 3

	Real GDP Growth *(percent, Q-o-Q annualized)*	Unemployment Rate *(percent)*	3-Month Treasury Rate *(percent)*	10-Year Treasury Bond Yield *(percent)*	BBB Corporate Bond Yield *(percent)*	Stock Market Index *(2019Q4=100)*	House Price Index *(2019Q4=100)*
2019Q4	2.1	3.5	1.6	1.8	3.3	100.0	100.0
2020Q1	-4.8	3.8	1.1	1.4	3.3	96.8	101.2
2020Q2	-66.8	22.8	0.1	0.5	5.8	72.9	83.3
2020Q3	29.5	25.3	0.1	0.6	6.8	66.6	79.1
2020Q4	21.6	23.3	0.1	0.6	7.1	66.1	76.2
2021Q1	-36.4	25.3	0.1	0.6	8.3	58.8	68.3
2021Q2	29.5	22.8	0.1	0.7	7.4	62.8	65.6
2021Q3	21.6	20.5	0.1	0.7	6.8	66.5	63.5
2021Q4	3.2	19.7	0.1	0.8	6.4	67.7	60.4
2022Q1	2.8	19.1	0.0	0.9	6.0	69.0	58.9
2022Q2	2.5	18.5	0.0	1.0	5.6	70.2	58.7
2022Q3	2.2	18.0	0.0	1.1	5.3	71.4	59.8
2022Q4	2.2	17.5	0.0	1.2	5.1	72.7	60.9
2023Q1	2.1	17.0	0.0	1.3	4.7	73.9	62.6
2023Q2	2.1	16.5	0.0	1.3	4.6	75.1	65.3
2023Q3	2.1	16.0	0.0	1.3	4.6	76.4	68.0
2023Q4	2.1	15.5	0.0	1.3	4.5	77.6	70.7
2024Q1	2.1	15.0	0.0	1.3	4.4	78.8	73.4
2024Q2	2.0	14.6	0.0	1.4	4.3	80.1	76.0
2024Q3	2.0	14.1	0.0	1.4	4.2	81.3	78.7
2024Q4	2.0	13.7	0.0	1.4	4.1	82.5	81.3
2025Q1	2.0	13.2	0.0	1.4	4.0	83.8	83.9
2025Q2	2.0	12.9	0.0	1.4	3.9	85.0	86.4
2025Q3	1.9	12.5	0.0	1.4	3.8	86.2	88.9
2025Q4	1.9	12.3	0.0	1.4	3.7	87.5	91.1

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Appendix IX. Class: Amendments and Econometric Estimation Results

The FSAP team made the following modifications/extensions to the CLASS model:

a. *Sample size*. The stress testing is adjusted to reflect largest bank holding companies with consolidated assets over $100 billion (35 largest bank holding companies covering about 80 percent of the banking sector is used in the stress testing exercise);

b. *Risks from foreign activities/exposures***.** Geographical segmentation of income: domestic vs. foreign.

c. *Interest income modeling, dynamic balance sheet and changes in assets/liabilities***.** The CLASS model estimates net interest income as one specification, and therefore there is no explicit modeling of funding costs and loan interest rates. This analysis models them separately to be able to capture changes in funding profiles (solvency-liquidity feedback) and composition of balance sheets (i.e., to be able to use dynamic stress tests).

d. *Losses and recoveries*. The CLASS model uses net charge-off, i.e., does not model losses and recoveries separately. To simulate delayed GDP recovery scenario, we model recoveries separately.

The modified model is based on 57 different income statement specifications to improve the quality of stress testing in the absence of access to confidential supervisory data. As illustrated in the figure on the bank solvency stress testing below (Appendix Figure IX.1), we forecast 26 pre-provision net revenue (PPNR)-related ratios separately (8 interest income ratios, 7 interest expense ratios, 8 non-interest income ratios, and 3 non-interest expense ratios). Such granularity in the income statement breakdown provides room to capture solvency-liquidity feedback loop dynamics such as those that are related to changes in funding profiles and other balance sheet components.

The macroeconomic variables used in the regression specifications are chosen based on the economic intuition rather than merely relying on the statistical significance to better capture the economic significance of forecasted variables.[1] The regressions are estimated in a fixed effects panel setting thus controlling for heterogeneity among the 35 banks in the sample (such as various business models) through panel fixed effects. An autoregressive term (AR1) also enters the model, thus implying that the projected ratios will converge to their long-run steady state value. For robustness, in cases where weaker predictive power and weaker relationships with macrofinancial variables exist, specifications are also estimated at industry-level. The following general form of the specification is used:

$$Ratio_{i,t} = \alpha + \beta_1 Ratio_{i,t-1} + \beta_2 Macro_t + \varepsilon_t ,$$

[1] Choice of macrofinancial variables are also conditional on other statistical issues such as multicollinearity (Such statistical properties are assessed before entering the regressors into specifications. For instance, within-correlations are also assessed when choosing variables).

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where, *i* stands for bank, and *t* stands for time (in quarters from 1991–2019). The next several paragraphs in this section explain in detail how the income statement and balance sheet line items are estimated.

Net Income Projections

Specifications for pre-provision net revenue, returns on available-for-sale (AFS) securities, and charge-offs and recoveries are modeled using fixed effects panel regressions thus also controlling for heterogeneities among the entities. Interest income and expense variables are modeled as a share of rate sensitive assets, while non-interest income and non-interest expense categories are modeled as a share of total assets. Returns of AFS securities are modeled as a share of AFS securities. Charge-off and recovery specifications are in percent of the respective loan portfolio. Each ratio for the forecasting horizon is predicted for each bank using estimated coefficients from the regressions, forecasted time series from the macrofinancial scenario, and the estimated lagged dependent variable in the previous iteration in the loop. Projected ratios for the forecasting horizon are converted into U.S. dollars by multiplying it with the forecasted growth of the denominator from the balance sheet.

Interest Income

Eight interest income specifications are modeled using a fixed effects panel framework with an AR1 term. As explained previously, separate specifications would allow us to better capture changes related to various segments of income (e.g., geographic segmentation, loan interest rate dynamics, etc.). Modeled variables include interest income on: (i) domestic real estate loans, (ii) other domestic loans, (iii) foreign loans, (iv) U.S. Treasury securities, (v) MBS, (vi) other securities, (vii) trading-related, (viii) other interest income not captured in i through vii. Short-term interest rates and the term spread (10 year minus 3 month) enter as common explanatory variables in most specifications. However, interest income on foreign loans is modeled as a function of foreign GDP growth (calculated as the first principle component of the growth in Euro Area, Japan, and the United Kingdom from the macroeconomic scenario).

Interest Expense

Seven interest expense regressions are estimated using fixed effects panels to project the interest expense categories subsequently mentioned. Estimated categories include interest income on: (i) domestic retail deposits, (ii) domestic wholesale deposits, (iii) other domestic deposits, (iv) foreign office deposits, (v) repo, (vi) trading-related, (vii) other interest expense not included in i through vi. Main explanatory variable common to all specifications in this category is the 3-month treasury yield, except for foreign office deposits where the foreign inflation is used as a predictor. The autoregressive term also enters the specifications to capture the convergence to the long-run steady-state values.

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Non-interest Income

Eight non-interest income regressions are estimated to model a diverse set of expense categories, which uses fixed effects terms as well as an AR1 term. Trading revenue is modeled by using the change in BBB spreads (vis-à-vis the 10-year yield). To capture the nonlinearity in BBB spreads during volatile times, an interaction term for the positive values of the BBB spreads was used in a robustness specification, but the interaction term was not statistically significant. Non-interest income related to service charges for deposits is modeled by using real GDP growth. Other non-interest specifications (fees and commissions from securities brokerage, investment banking, fees and commissions from insurance and reinsurance activities, asset sales income, securitization income, and other noninterest income) are explained more by variables such as the change in BBB spreads and the VIX.

Non-interest Expenses

Panel regressions using fixed effects are estimated to model wages, fixed assets, and other non-interest expenses (which typically includes costs related to operational-risk events among others)[2]. Historically, wages and other non-interest expense categories were over 1 percent of total assets. Due to the large size of these line items, PPNR projections are rather sensitive to the behaviors of these two expense items. Wages are therefore modeled as a function of equity price growth with the rationale that equity price movements reflect broader financial conditions and profitability. Thereby financial conditions would affect the size of the business, hence affecting the size of the employee base (i.e., the wages). Our model-based forecasted wages-to-assets ratio shows a decline in the ratio during crisis time (as was the case during the GFC period), alluding cost cutting measures of BHCs such as layoffs. The historical patterns of wages-to-assets ratios of the BHCs in the stress testing sample reveals that sharp decline in the ratio during the GFC period was recovered shortly after. Similarly, the forecasted ratio recovers to its long-run average subsequently. Other non-interest expenses are predicted using real GDP growth controlling for the securities portfolio of the banks, reflecting macroeconomic conditions and banks' capacity to liquidate assets in sudden stress events.

Returns on Available-for-Sale (AFS) Securities

Realized gains on AFS securities are estimated separately. Financial volatilities such as credit and asset price shocks may reflect sudden movements in this variable that is stationary in tranquil times. Therefore, the explanatory variables used for this specification include the change in the 10-year yield and an interaction term between changes in BBB corporate spreads and securities excluding U.S. Treasury and agency securities (i.e., unsafe assets).

[2] Given the structural changes incurred during the GFC period resulted in large adjustments in these ratios that are structural in nature, the long-run convergence to the steady-state is assumed to be similar to the ratios since 2012 (which corresponds to the end of TARP period); thus, these regressions are estimated starting 2012 (about 950 observations).

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Allowance for Loan Losses

Provisions are estimated through modeling charge-offs and recoveries on loans. Regressions are estimated separately for charge-offs and recoveries on 3 residential real estate loan categories, 3 commercial real estate loans categories, commercial and industrial loans, credit cards, other consumer loans, other real estate loans, depository institution loans, agriculture loans, leases, foreign government loans, and other loans. These categories are modeled using explanatory variables such as the unemployment rate, house price changes, commercial property price changes, real GDP growth, and BBB spreads in addition to the lagged depended variables.

Loan loss reserves are calculated based on modeled charge-offs and recoveries. This approach is used given that net charge-offs do not directly affect net income according to the U.S. accounting standards, but rather provisions that alter loan loss reserves affect the net income. The model assumes that allowances for loan losses are bounded by an upper and lower bound related to the modeled net charge-offs. Provisions are calculated as the difference between the loan loss reserves of the current period minus the previous period.

Taxes

The tax rate is assumed at 21 percent, which is the current US corporate tax rate. deferred tax assets (DTA) are calculated using data on deferred tax assets and liabilities and disallowed DTA. Allowed DTA above 10 percent of Tier 1 capital is held constant over the forecasting horizon as there are limits on how much DTA can be countered as regulatory capital.[3] Accumulated tax losses are combined with allowed DTA of the future periods as tax losses may be carried forward for regulatory capital purposes.

Dividends

A partial adjustment method is used as the dividend distribution rule. The model assumes that the dividends would converge to its historically observed payout ratio of 45 percent over the forecasting horizon. Sensitivity analyses using different assumptions are also performed as robustness checks. These additional assumptions include dividend payout ratio at 0, 20, and 45, dividend held constant at historical level observed in 2019:Q3.

Other Assumptions

Additional assumptions are used for the following items related to net income projections: realized gains on held-to-maturity securities are assumed at zero. Extraordinary items and other adjustments net of taxes are assumed to be zero. Minority interests are assumed to be as same as the latest historical period. Net sale of common, preferred, and treasury stocks are assumed to be zero. Other comprehensive income and net other are also assumed to be zero.

[3] Any allowed DTA above 10 percent of Tier 1 capital is assumed to be recoverable through loss carry-backs.

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Balance Sheet and Risk-Weighted Asset Projections

Balance sheet projections are modeled as a two-step process. First, the growth in total loans, total trading assets, and total other assets are modeled at industry level. Total loans are estimated using the AR1 term, nominal GDP growth, and the 3-month Treasury yield as explanatory variables. Trading asset growth is estimated using the change in BBB spreads and the 3-month Treasury yield as explanatory variables. Other asset growth is estimated using its lagged dependent variable and the 3-month Treasury yield as explanatory variables. The dollar value of total assets is then calculated as the sum of loans, trading assets, and other assets, derived based on the above 3 growth rates for the industry. Firm-level assets are then estimated using the forecasted industry-level projections. This is in line with the U.S. Federal Reserve's goal of helping to ensure that large financial firms remain sufficiently capitalized to accommodate credit demand in a downturn (assumption that the industry will continue to lend using the standards that are consistent with long-run behavior, which is in line with the FRB's goal of helping to ensure that large financial firms remain sufficiently capitalized to accommodate credit demand in a downturn).

Firm-level asset growth is forecasted separately for banks with larger trading books and for those with other business models using fixed effects panel regressions. For the banks in the latter group, firm-level total asset growth is forecasted using industry-level forecasted loans and other asset growth rates. For banks with larger trading books, total asset growth is modeled as a function of industry-level forecasted trading asset growth.

Total risk weighted assets are projected at firm-level in a panel fixed effects framework. Historical data for the 35 BHCs suggests that the RWAs closely follow the path of total assets. Therefore, total risk weighted asset growth is modeled as a function of total asset growth of the firm and the lagged dependent variable.

The growth of the subcomponents of risk weighted assets are forecasted with the following assumptions. Credit risk weighted assets, the largest RWA component, grows at the same rate as the forecasted total asset growth. Operational risk weighted asset growth and market risk weighted asset growth is held constant at their historical growth rates between 2014:Q2[4] through 2019:Q3 due to the high degree of model uncertainty related to the latter.

[4] Risk-weighted assets data for the 3 subcomponents are only available starting 2013:Q2 in FFEIC101.

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Regulatory Capital

Regulatory capital ratios are calculated by using the net income[5] estimated from the modeled variables above. Regulatory capital is calculated by first calculating the change in equity (which corresponds to net income minus the dividends, as these are the two main factors determining changes in equity and regulatory capital) and adding to the previous period's regulatory capital. Tier 1 capital is calculated by adding the change in the regulatory capital minus the disallowed DTA into the previous period's tier 1 capital. The CET1 level is calculated by assuming the wedge between the CET1 and Tier 1 observed in 2019:Q3 remain fixed in dollar terms throughout the forecasting horizon and adding it to the estimated tier 1 level. CET1 ratio is calculated as the CET1 level in percent of risk-weighted assets.

[5] Net income = PPNR – provisions + realized gains (losses) on AFS and HTM securities – income tax + extraordinary items and other adjustments + minority interest

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Appendix Figure IX.1. IMF Bank Solvency Stress Testing Framework

Source: IMF staff.

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Appendix Table IX.1. Estimation Results

Appendix Table IX.1a. Selected PPNR and Return on AFS Items

	Interest income						Non-interest income						
VARIABLES	real estate loans	other loans	US Treasuries	MBS	Other securities	Trading-related	Service charges for deposit accounts in domestic offices	trading revenue	Fees and comissions from securities brokerage	Investment banking and etc.	Fees and comissions from insurance and reinsurance activities	Asset sales income	Securitization income
Lagged dependent variable	0.445***	0.332**	0.836***	0.751***	0.771***	0.656***	0.882***	0.548***	0.809***	0.970***	0.109	0.061	0.793***
	(0.052)	(0.124)	(0.029)	(0.024)	(0.032)	(0.084)	(0.043)	(0.071)	(0.091)	(0.016)	(0.092)	(0.063)	(0.091)
3M T-bill rate	0.263***	0.421***	0.019***	0.050***	0.023***	0.018***							0.003*
	(0.037)	(0.052)	(0.006)	(0.009)	(0.005)	(0.007)							(0.002)
Term spread	0.261***	0.137**			0.016***								
	(0.045)	(0.058)			(0.005)								
Real GDP growth							0.001						
							(0.000)						
change in BBB spreads								-0.074***	-0.006*			-0.058***	-0.013
								(0.026)	(0.004)			(0.015)	(0.009)
Change in equity prices													
Change in VIX										-0.001***	-0.000		
										(0.000)	(0.000)		
Change in 10Y Yield													
Unsafe assets x change in BBB spreads													
Constant	0.310***	1.507***	0.003	0.173***	-0.002	0.072***	0.023**	0.059***	0.018**	0.010***	0.047***	0.108***	0.002
	(0.073)	(0.386)	(0.009)	(0.025)	(0.011)	(0.020)	(0.010)	(0.009)	(0.007)	(0.002)	(0.008)	(0.006)	(0.005)
Observations	1,317	1,372	1,904	1,915	1,926	1,862	2,765	2,765	2,765	2,765	301	1,575	2,765
R-squared	0.447	0.402	0.772	0.690	0.705	0.526	0.772	0.334	0.640	0.883	0.041	0.011	0.631

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Source: IMF staff.

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Appendix Table IX.1a. Selected PPNR and Return on AFS Items (continued)

	Intest Expense					Non-interest expense			
VARIABLES	Retail deposits	Wholesale dep	Other dep	Repo	Trading-related	Wages	Fixed assets	Other	Return on AFS assets
Lagged dependent variable	0.846***	0.772***	0.692***	0.812***	0.681***	0.160	0.213**	0.017	0.060
	(0.023)	(0.049)	(0.053)	(0.035)	(0.035)	(0.140)	(0.098)	(0.030)	(0.087)
3M T-bill rate	0.026***	0.027***	0.061***	0.056***	0.086***				
	(0.004)	(0.005)	(0.012)	(0.010)	(0.012)				
Term spread									
Real GDP growth								-0.044*	
								(0.023)	
change in BBB spreads							-0.026		
							(0.025)		
Change in equity prices						0.010***			
						(0.003)			
Change in VIX									
Change in 10Y Yield									-0.430**
									(0.177)
Unsafe assets x change in BBB spreads									-0.013
									(0.008)
Constant	0.009	0.006	0.035***	0.003	0.187***	1.345***	0.246***	1.732***	0.211***
	(0.007)	(0.005)	(0.007)	(0.012)	(0.021)	(0.251)	(0.037)	(0.114)	(0.055)
Observations	1,925	1,953	2,058	1,961	2,068	950	947	950	2,764
R-squared	0.889	0.823	0.893	0.864	0.791	0.086	0.080	0.012	0.026

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Source: IMF staff.

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Appendix Table IX.1b. Selected Charge-Off Specifications

VARIABLES	Residential real estate: first lien	Residential real estate: junior lien	Residential real estate: HELOC	CRE real estate: construction	CRE real estate: multi family	CRE real estate: NFNR	C&I	Credit cards	Other consumer	Lease	Other Real estate	Depositary corps	Agriculture
Lagged dep variable	0.905***	0.799***	0.885***	0.820***	0.775***	0.856***	0.881***	0.803***	0.707***	0.747***	0.476***	0.371**	0.615***
	(0.098)	(0.102)	(0.057)	(0.066)	(0.143)	(0.094)	(0.085)	(0.077)	(0.100)	(0.079)	(0.142)	(0.161)	(0.137)
House price growth	-0.004	-0.060**	-0.013*										
	(0.005)	(0.026)	(0.007)										
change in unemp	0.078**	0.090	0.088***					0.408***	0.170***	0.075***			-0.000
	(0.035)	(0.100)	(0.032)					(0.111)	(0.035)	(0.013)			(0.038)
Commercial property price growth				-0.040**	-0.011**	-0.009***					-0.008		
				(0.016)	(0.005)	(0.003)					(0.011)		
Real GDP growth				-0.023			-0.032**					-0.009	
				(0.042)			(0.014)					(0.018)	
Change in BBB spreads												0.090	
												(0.127)	
Constant	0.081	0.825***	0.200***	0.436***	0.107**	0.088***	0.181**	1.177**	0.794***	0.126***	0.426***	0.123**	0.231***
	(0.056)	(0.301)	(0.068)	(0.160)	(0.044)	(0.033)	(0.079)	(0.454)	(0.247)	(0.033)	(0.110)	(0.050)	(0.065)
Observations	71	71	78	79	79	79	79	75	79	51	79	59	79
R-squared	0.897	0.804	0.943	0.919	0.811	0.886	0.793	0.871	0.724	0.807	0.240	0.185	0.375

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Source: IMF staff.

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Appendix Table IX.1c. Selected Recoveries Specifications

VARIABLES	Residential real estate: first lien	Residential real estate: junior lien	Residential real estate: HELOC	CRE real estate: construction	CRE real estate: multi family	CRE real estate: NFNR	C&I	Credit cards	Other consumer	Lease	Other Real estate	Depositary corps	Agriculture
Lagged dep variable	0.746***	1.027***	0.960***	0.905***	0.752***	0.782***	0.838***	0.629***	0.811***	0.815***	0.660***	0.145	0.452***
	(0.122)	(0.138)	(0.063)	(0.083)	(0.105)	(0.106)	(0.080)	(0.105)	(0.090)	(0.108)	(0.229)	(0.155)	(0.087)
change in unemp	-0.005									-0.001	-0.004		-0.018***
	(0.003)									(0.003)	(0.010)		(0.007)
House price growth		0.002	0.001					0.003	0.004				
		(0.002)	(0.001)					(0.006)	(0.007)				
Real GDP growth				0.003	0.000	0.002	0.003					0.008	
				(0.004)	(0.001)	(0.001)	(0.003)					(0.007)	
Change in BBB spreads												0.004	
												(0.019)	
Foreign inflation													
Constant	0.015***	0.045	0.019**	0.016	0.009*	0.011**	0.025*	0.328***	0.141*	0.032	0.049*	0.023**	0.097***
	(0.005)	(0.039)	(0.009)	(0.010)	(0.005)	(0.005)	(0.014)	(0.094)	(0.075)	(0.020)	(0.026)	(0.010)	(0.016)
Observations	71	70	78	79	79	79	79	75	79	51	79	57	79
R-squared	0.657	0.687	0.841	0.823	0.562	0.618	0.727	0.580	0.717	0.696	0.436	0.077	0.284

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Source: IMF staff.

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Appendix X. Contribution to Losses in Terms of RWAs

Appendix Figure X.1a. Baseline Scenario

Contribution to Changes in Tier1 Ratio: GSIBs (In pct pnt of RWA)

Contribution to Changes in Tier1 Ratio: Trading Banks (In pct pnt of RWA)

Contribution to Changes in Tier1 Ratio: Foreign Banks (In pct pnt of RWA)

Contribution to Changes in Tier1 Ratio: Non-GSIBs (In pct pnt of RWA)

Appendix Figure X.1b. Adverse Scenario

Contribution to Changes in Tier1 Ratio: GSIBs (In pct pnt of RWA)

Contribution to Changes in Tier1 Ratio: Trading Banks (In pct pnt of RWA)

Contribution to Changes in Tier1 Ratio: Foreign Banks (In pct pnt of RWA)

Contribution to Changes in Tier1 Ratio: Non-GSIBs (In pct pnt of RWA)

Source: IMF staff.

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Appendix XI. Data and Sample of Funds Used in Stress Tests

Sample of Funds

The sample of funds is based on available data from Morningstar. The sample includes all U.S. mutual funds that belong to the following Morningstar global broad category group: Allocation, Taxable Bond and Municipal Bond. Target dates funds are excluded since they are not included in ICI categories. The remaining 2,743 funds were split into 43 fund Morningstar Global categories, which were then mapped into ICI categories using the correspondence table shown in Appendix Table XI.1. For the purpose of the stress tests, nine categories of funds are used, mainly based on the type of assets the funds invest in.

Appendix Table XI.1. Correspondence Table

Global Broad category group	Global category	ICI category	Fund category
Allocation	US Fund Allocation--15% to 30% Equity	Mixed	Mixed
	US Fund Allocation--30% to 50% Equity	Mixed	Mixed
	US Fund Allocation--50% to 70% Equity	Mixed	Mixed
	US Fund Allocation--70% to 85% Equity	Mixed	Mixed
	US Fund Allocation--85%+ Equity	Mixed	Mixed
	US Fund Convertibles	Mixed	Mixed
	US Fund Tactical Allocation	Mixed	Mixed
	US Fund World Allocation	Mixed	Mixed
Municipal	US Fund High Yield Muni	Muni	Muni
	US Fund Muni California Intermediate	Muni	Muni
	US Fund Muni California Long	Muni	Muni
	US Fund Muni Massachusetts	Muni	Muni
	US Fund Muni Minnesota	Muni	Muni
	US Fund Muni National Interm	Muni	Muni
	US Fund Muni National Long	Muni	Muni
	US Fund Muni National Short	Muni	Muni
	US Fund Muni New Jersey	Muni	Muni
	US Fund Muni New York Intermediate	Muni	Muni
	US Fund Muni New York Long	Muni	Muni
	US Fund Muni Ohio	Muni	Muni
	US Fund Muni Pennsylvania	Muni	Muni
	US Fund Muni Single State Interm	Muni	Muni
	US Fund Muni Single State Long	Muni	Muni
	US Fund Muni Single State Short	Muni	Muni
	US Fund Muni Target Maturity	Muni	Muni
Taxable Bond	US Fund Emerging Markets Bond	Global	EM
	US Fund Emerging-Markets Local-Currency Bond	Global	EM
	US Fund World Bond	Global	Global
	US Fund World Bond-USD Hedged	Global	Global
	US Fund Inflation-Protected Bond	Gov	Gov
	US Fund Intermediate Government	Gov	Gov
	US Fund Long Government	Gov	Gov
	US Fund Short Government	Gov	Gov
	US Fund High Yield Bond	HY	HY
	US Fund Bank Loan	HY	Loan
	US Fund Intermediate Core Bond	IG	IG
	US Fund Intermediate Core-Plus Bond	IG	IG
	US Fund Long-Term Bond	IG	IG
	US Fund Preferred Stock	IG	IG
	US Fund Short-Term Bond	IG	IG
	US Fund Ultrashort Bond	IG	IG
	US Fund Corporate Bond	IG	IG
	US Fund Multisector Bond	Multi	Multi
	US Fund Nontraditional Bond	Multi	Multi

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The nine categories are mixed, municipal, EM, HY, IG, loan, government, multi-strategy funds and global funds.

Appendix Table XI.2 displays the sample of funds compared to the ICI universe.

Appendix Table XI.2. Sample of Funds

Fund category	Net asset Value (US $ bn)	Number of funds
Corp. IG	2,427	608
Mixed funds	1,752	792
Municipal	799	567
Multisector	432	182
Government	326	161
Corp. HY	257	192
Global	247	87
Loan funds	91	58
EM funds	66	96
Total	6,398	2,743

Sources: Morningstar, ICI, IMF staff calculations

Data

For each fund in the sample, monthly data on flows, net asset value, portfolio composition and returns are retrieved over the 2017–2019 period. The sample of fund is based only on funds that were still alive as of end-2019.

Computation of net flows: For each fund, net flows in percent of NAV (f_t) are computed using the following formula:

$$f_t = \frac{FLOWS_t}{NAV_{t-1}}$$

Net flows whose absolute value is above 50% were excluded as they are likely related to reporting mistakes.

Portfolio composition: For each fund, the latest portfolio composition is retrieved. At the highest level, the portfolio is split into four categories: cash, equities, bonds and other. The fixed income portfolio (cash and bonds) is then split into further categories: government, municipal, corporate, securitized, cash and equivalents, and derivatives (Appendix Table XI.3). Each subcategory is subsequently split into further asset classes as detailed in Morningstar (2016).

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Appendix Table XI.3. Morningstar Portfolio Composition

Asset allocation	Fixed income classification
Equities	
Other	
Cash	*Cash and equivalents*
Bonds	*Government*
	Municipal
	Corporate
	Securitized
	Derivatives

Credit quality: For each fund, the latest data on credit quality are retrieved, i.e., the share of the bond portfolio split by credit rating. Morningstar does not provide the credit rating data by type of fixed income instrument (government, corporate bond, etc.). Therefore, credit rating by instrument is estimated by allocating the highest credit rating first to the government portfolio, then to corporate bonds and finally to securitized products.

Treatment of mutual funds using derivatives and leverage: When funds use derivatives and leverage Morningstar asset allocation weights will always add up to 100 percent, but the cash part will have negative values. In those cases, cash is set up equal to 0 percent, and put a 100 percent limit on the other parts of the portfolio. When the funds reports cash allocation above 100 percent, the cash is bounded to 100 percent.

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Appendix XII. Mutual Fund Stress Tests Methodology

This appendix outlines the different building blocks of the liquidity stress test.

I. Calibration of the redemption shock

a. Calibration of the redemption shock: historical approach

For each fund in the sample, the shock is calibrated on the distribution of net flows. The shock is an instantaneous shock, i.e., there is no persistence over several periods.

Under *the homogeneity assumption*, each fund within the same category (e.g., Corp. HY) face the same redemption shock. The shock is based on the distribution of all individual fund net flows belonging to this category. The calibration is based on the 3 percent Expected Shortfall (ES), which is equal to the average worst flows (below the 3th percentile) observed in the sample.

As a robustness check, redemption shocks are also calibrated at the 1 percent and 5 percent level for the expected shortfall, and also at the worst 1, 3, and 5 percent net flows observed ("VaR approach").

Under *the heterogeneity assumption*, the redemption shock is calibrated separately for each fund based only on its own historical data. The shock is based on the 3 percent expected shortfall. As a robustness check, the shock is also estimated at 1 percent and 5 percent level as well as using percentiles.

Overall, each fund is subject to 12 different redemption shocks (Appendix Table XII.1). The main focus of the stress test is on the homogeneity assumption—which allows funds to be compared within the same category—calibrated at the 3 percent level, with redemption shocks ranging from 7 percent for Municipal funds to 17 percent for EM bond funds.

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Appendix Table XII.1. Calibration of Redemption Shocks

	Homogeneity assumption		Heterogeneity assumption	
	ES	VaR	ES	VaR
	1st percentile			
Municipal	11	7	8	6
Mixed funds	15	8	9	6
Corp. IG	21	13	14	10
Multisector	22	12	13	10
Loan funds	19	13	15	12
Global	23	14	17	12
Government	24	14	15	11
HY	23	15	15	12
EM funds	26	18	19	13
	3rd percentile			
Municipal	7	4	6	4
Mixed funds	9	4	7	4
Corp. IG	13	7	10	6
Multisector	13	7	10	6
Loan funds	13	9	12	8
Global	14	7	12	7
Government	14	7	11	7
HY	15	8	12	8
EM funds	17	10	14	8
	5th percentile			
Municipal	5	3	5	3
Mixed funds	7	3	5	3
Corp. IG	10	5	8	5
Multisector	10	5	8	5
Loan funds	11	7	11	6
Global	11	5	9	5
Government	11	5	9	5
HY	12	6	10	6
EM funds	14	7	11	6

Note: Net outflows in % of NAV. Average flows by fund category for the heterogeneity assumption.
Sources: Morningstar, IMF staff.

b. Calibration of the redemption shock: adverse scenario

The adverse scenario designed for the banking sector stress test is used to project the net flows that funds would face. First, relevant macrofinancial variables are projected under the adverse scenario. Then, returns for each fund are estimated and finally net flows are projected based on the flow-performance relationship.

Step 1: Projection of macrofinancial variables

Since the adverse scenario is over a five-year horizon and at quarterly frequency, it needs to be converted to fit the shorter horizon used for the liquidity stress tests. Monthly projected changes are obtained using the following formula:

$$Monthly\ shock = \frac{\sqrt{20}}{\sqrt{60}} = 0.57$$

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Appendix Table XII.2 displays the relevant macrofinancial variables.

Appendix Table XII.2. Projected Macrofinancial Variables

	Quarterly change	Unit	Monthly change	Unit
3-Month Treasury Rate	-78	bps	-45.0	bps
10-Year Treasury Bond yield	-103	bps	-59.5	bps
BBB Corporate Bond Yield	161	bps	93.0	bps
Equities	-30	%	-17.3	%

Sources: IMF staff

Some of the relevant macrofinancial variables such as EM and HY yields along with the term structure of U.S. rates are not used in the adverse scenario and therefore needs to be projected separately.

For EM, HY and securitized yields, the projection is based on the shock to BBB yields multiplied by a conversion factor. The conversion factor is equal to the ratio of the projected change in BBB yields divided by the change observed in October 2008:

$$Conversion = \frac{\Delta BBB_{proj}}{\Delta BBB_{Oct.08}} = \frac{93}{163} = 0.57$$

ICE Bank of America Merrill Lynch indices are used to retrieve yield information and derive the relevant change which is applied in the adverse scenario.

Appendix Table XII.3. Projected Yields for Other Macofinancial Variables

Asset class	Oct.2008 change	Monthly change	Index name	Code	Source
BBB	163	93	US corporate index	C0A0	ICE BoAML
A corp	163	93	US AA corporate index	C0A3	ICE BoAML
AA corp	111	63	US AA corporate index	C0A2	ICE BoAML
HY	550	314	US HY index	H0A0	ICE BoAML
Leveraged loans	486	277	JPM Leveraged loan index	LILI	JPM
EM	416	237	Global EM sovereign and credit index	IM00	ICE BoAML
Municipal	75	43	US Municipal Securities Index	U0A0	ICE BoAML
Securitized Agencies	39	22	US MBS index	M0A0	ICE BoAML
Securitized	164	94	US ABS index	R0A0	ICE BoAML

Sources: IMF staff, Refinitiv Datastream

For the U.S. yield curve, the levels of interest rate are very close in the adverse scenario: 0.79 percent for the 3-Month rate and 0.62 percent for the 10Y rate as of 2020:Q1. This translates into 1.11 percent for the 3-Month rate and 1.06 percent for the 10Y rate over a one-month

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horizon. Therefore, the yield curve is assumed to be flat and the yield for the relevant maturity are linearly interpolated.

Step 2: Computation of funds' returns

Projected values for macrofinancial variables are combined with fund-level information on the composition of the portfolio by asset class, along with the modified duration to compute the projected returns. For each fund, data on modified duration are retrieved from Morningstar and when data are not available, the average duration of the relevant Morningstar fund category is used.

The table below shows the results obtained for the sample of funds, with large negative returns for EM and HY bond funds (due to the large increase in yields) and for mixed funds (mainly due to the large decline of equity prices). For government and municipal bond funds, most funds experience little change in their returns or positive returns. Loan funds experience relatively low shocks to returns despite the sizeable increase in spreads because of the very short duration of their portfolio (less than 0.5).

Appendix Table XII.4. Impact on Monthly Returns of the Adverse Scenario

	Monthly returns			
Fund category	Average	Median	Min	Max
EM	-11%	-10%	-20%	-1%
Global	-3%	-1%	-27%	4%
Gov	1%	0%	-4%	14%
HY	-7%	-7%	-12%	0%
IG	-2%	-1%	-12%	2%
Loan	-1%	-1%	-2%	0%
Mixed	-10%	-11%	-22%	9%
Multi	-3%	-2%	-24%	2%
Muni	-1%	0%	-16%	3%
Total	-4%	-2%	-27%	14%

Sources: IMF staff calculations

Step 3: Computation of funds' net flows

To assess the net flows from funds following the shocks, the flow-performance relationship is used. At fund category level, the flow performance is estimated following the Fama-McBeth (1973) two-step methodology. For each month, a cross-sectional regression is estimated, with twelve lags for returns and flows, and the lagged size of the fund as a control variable:

$$f_{i,t} = \alpha + \sum_{k=1}^{12} \beta_k f_{i,t-k} + \sum_{h=1}^{12} \gamma_h return_{i,t-h} + \log(size_{i,t-1}) + \varepsilon_{i,t}$$

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Then the time series average of the coefficient is calculated to get the parameter for the flow-performance relationship. For all fund categories, the parameter for lagged returns is significant at the 5 percent level. Table X shows the corresponding results.

Under the adverse scenario EM and HY funds would experience sizable outflows, Corporate and mixed funds would face more limited outflows and other fund categories would face small outflows (or inflows for government bond funds).

Appendix Table XII.5. Flow-Performance Relationship and Net Flows in the Adverse Scenario

Fund category	Parameter	Net flows in %
EM	0.85	-10.3%
Global	0.25	-0.6%
Gov	0.27	0.5%
HY	0.64	-4.8%
IG	0.71	-1.1%
Loan	0.91	-0.8%
Mixed	0.26	-2.8%
Multi	0.55	-0.9%
Muni	0.53	-0.7%

Sources: IMF staff calculations

II. Ability of funds to withstand shocks: the liquidity bucket approach

The ability of funds to withstand shocks is estimated by comparing the redemptions to the level of high liquid assets. High liquid assets are measured at fund level using the liquidity weights defined in the context of the Liquidity Coverage Ratio for banks. For each asset class, liquidity weights are defined based on the type of assets and for fixed income instruments the credit quality. Liquidity weights are taken from the Basel Committee rather than domestic implementation of the LCR, to allow for comparability.[1]

[1] For example, in the U.S corporate debt securities are not included in Level 2A assets (liquidity weight of 85 percent) but only to Level 2B (liquidity weight of 50 percent).

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Appendix Table XII.6: Liquidity Weights

	AAA-AA	A	BBB	Below BBB
Cash		100%		
Equities		50%		
Sovereign bonds	100%	85%	50%	0%
Corporate bonds	85%	50%	50%	0%
Securitized	85%	0%	0%	0%

Source: Basel Committee

As in the 2017 Luxembourg FSAP (IMF, 2017), the ability of funds to withstand redemption shocks is measured by the Redemption Coverage Ratio (RCR) defined as follows:

$$RCR = \frac{Highly\ liquid\ assets}{Redemption\ shock}$$

When the RCR is below 1, the fund does not have enough highly liquid assets to cover redemptions without selling fewer liquid assets. In that case, the liquidity shortfall is defined as the difference between the redemption shock and the stock of highly liquid assets:

$$Liquidity\ shortfall = Redemption\ shock - Highly\ liquid\ assets$$

For funds using derivatives, the adverse scenario is used to estimate potential variation margins. It is assumed that funds can only post cash as margins and for each fund a liquidity shortfall is defined as follows:

$$Liquidity\ shortfall = Variation\ margins - Cash$$

The variation margins are calculated as follows in the case of an interest rate swap:

$$Variation\ margins = shock * DV01 * Exposure$$

The first order approximations are the following for an interest rate swap (Bardoscia et al. (2019)):

$$\Delta V_t^{IRS}(T) \approx -ND_t\Delta\rho_t = -N\left[\frac{1}{2}\sum_{c=1}^{2T} e^{-i_{t,\frac{c}{2}}\frac{c}{2}}\right]\Delta\rho_t$$

And for FX forwards:

$$\Delta V_t^{FXF}(T) \approx -Nd_t^B\Delta S_t = -N\left[e^{-i^B_{t,T-t}(T-t)}\right]\Delta S_t$$

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III. Liquidation strategies and price impact of funds sales

Following the redemption shocks, fund managers have to sell some of the fund assets to meet investors' redemptions. Different liquidation strategies can be used: slicing (prorata)—where the manager sells each asset class in proportion of their weight in the fund's portfolio—waterfall (where most liquid assets are sold first), or a mixed approach where cash is used first and then the manager follows a slicing approach.

The choice of the liquidation strategy can have a sizeable impact on remaining investors. Under the slicing approach, the manager maintains the profile of the portfolio, in line with the investment policy, but this might require selling fewer liquid assets which could lead to a high price impact.[2]

Under the waterfall approach, the manager sells the most liquid assets first, which mitigates the price impact of sales but generates costs for remaining investors as they are left with a portfolio which is less liquid than initially. When the waterfall approach is used, the liquidation strategy is based on the ordering stemming from HQLA liquidity weights (cash then AAA-AA sovereign bonds, A sovereign bonds, AAA-AA corporate bonds, BBB sovereign bonds, A corporate bonds, AAA-AA securitized assets, and BBB corporate bonds). When assets with positive liquidity weights have been entirely sold, managers use unrated sovereign bonds, corporate bonds and finally securitized assets.

Appendix Figure XII.1. Waterfall Liquidation Strategy

[2] Using data on U.S. mutual funds, Girardi et al. (2017) show that funds with relatively low levels of cash tend to have worse performance than their peers, due to the price impact of their trades.

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Generally, asset managers use the slicing approach, but in some cases the waterfall approach can be better for both redeeming and remaining investors as well as for the market as large (AMIC, 2019; Blackrock, 2019).

In the stress test analysis, liquidity management tools (LMTs) such as in-kind redemptions, swing pricing or suspension of redemptions or credit lines are not taken into account. By design, the objective of the stress test is to analyze the ability of the funds to withstand shocks without resorting to extraordinary measures.

Price impact of funds sales

Given a redemption shock and a liquidation strategy, funds have to sell a given amount of securities across different asset classes. To estimate the price impact of the sales, the volume of sales is compared to market depth. Following Cont and Schaaning (2017), market depth is equal to:

$$MD(\tau) = c\frac{ADV}{\sigma}\sqrt{\tau}$$

The market depth over a time horizon τ is a function of a scaling factor c, times the ratio between the average daily trading volumes and the asset volatility, multiplied by the square root of the time horizon. The price impact is therefore lower, when the time horizon is longer. The estimation of the parameters will follow the approach used by Cont and Schaaning (2017) and Coen et al. (2019), using high-level data on trading volumes and bond indices to estimate the volatility.

For each asset class, the daily volatility is computed over different periods. Appendix Table XII.7 shows the corresponding measures of market liquidity obtained.

Appendix Table XII.7. Price Impact Measures by Asset Class

Asset class	ADV (US$ bn)	Average volatility	2008 Volatility	Market Depth (US$ bn)	Impact of $ 1bn of sale (in bps)	Market Depth (US$ bn)	Impact of $ 1bn of sale (in bps)
UST	545	0.28%	0.55%	77,857	0.1	39,636	0.3
Corp. IG	21	0.30%	0.65%	2,800	3.6	1,292	7.7
Corp. HY	12	0.31%	1.07%	1,548	6.5	449	22.3
Leveraged loans	3	0.18%	0.64%	556	18.0	156	64.0
EM debt	8	0.40%	1.36%	750	13.3	221	45.3
Municipal bonds	11	0.19%	0.64%	2,316	4.3	688	14.5
Securitized Agencies	220	0.19%	0.44%	46,316	0.2	20,000	0.5
Securitized	2	0.11%	0.27%	727	13.8	296	33.8
Equities	320	1.12%	3.60%	11,429	0.9	3,556	2.8

Sources: Refinitiv Datastream, SIFMA, JPMorgan, EMTA, IMF staff
Note: 2008 volatility estimated over September-December 2008

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When trading volumes are large, using a linear price impact can lead to inconsistencies. Therefore, the correction suggested by Cont and Schaaning (2017) is used, by setting up a floor on the price impact during fire asset sales. The floor is set at 50 percent, implying that when prices fall that much, opportunistic investors will step in to buy undervalued assets, hence stabilizing the market.

Second-round effects

Once the price impact of sales is estimated, the NAV of each fund is recalculated to reflect the costs due to the liquidation of assets on the remaining portfolio of securities. As a result of negative returns, a second wave of redemption will occur, whose magnitude depends on the flow-performance relationship (as described previously).

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Appendix XIII. Mutual Fund Stress Tests Results

The table below outlines the results for the 12 different redemption shocks calibrated on funds net flows based on two set of assumptions: homogeneity approach (same shock for funds within the same category but shocks different across categories) and heterogeneity approach (shock calibrated only on each individual fund net flows). For each approach, six shocks are defined using either the expected shortfall (average of worst net flows below a threshold) or the VaR (percentile of net flows) at three different levels: 1 percent (most conservative), 3 percent, and 5 percent.

Appendix Table XIII.1

	Homogeneity assumption		Heterogeneity assumption	
	ES	VaR	ES	VaR
	1st percentile			
Municipal	0%	0%	0%	0%
Mixed funds	0%	0%	0%	0%
Corp. IG	1%	0%	0%	0%
Multisector	10%	5%	9%	4%
Loan funds	96%	82%	82%	62%
Global	0%	0%	0%	0%
Government	0%	0%	0%	0%
HY	90%	75%	66%	55%
EM funds	20%	6%	11%	3%
	3rd percentile			
Municipal	0%	0%	0%	0%
Mixed funds	0%	0%	0%	0%
Corp. IG	0%	0%	0%	0%
Multisector	5%	2%	4%	2%
Loan funds	82%	42%	64%	42%
Global	0%	0%	0%	0%
Government	0%	0%	0%	0%
HY	75%	48%	56%	37%
EM funds	6%	0%	3%	2%
	5th percentile			
Municipal	0%	0%	0%	0%
Mixed funds	0%	0%	0%	0%
Corp. IG	0%	0%	0%	0%
Multisector	4%	1%	3%	2%
Loan funds	76%	27%	58%	24%
Global	0%	0%	0%	0%
Government	0%	0%	0%	0%
HY	65%	26%	48%	25%
EM funds	0%	0%	2%	0%

Note: Share of funds with RCR<0, in percent.
Sources: Morningstar, IMF staff.

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Appendix XIV. Analysis of Vulnerabilities and Interconnectedness (Mutual Funds)

The analysis of vulnerabilities and interconnectedness within mutual funds is based on two concepts of risk. Vulnerable funds are funds that are likely to be in distress when other funds (or the market) are in distress. Spreader funds are institutions for which other funds are likely to be in distress when the spreader fund is in distress.

The identification of vulnerable and spreader funds is based on two methodologies: tail-dependence using copula, and the interconnectedness approach (Diebold and Yilmaz, 2016).

Tail-dependence using copula

For each of the fund categories in the sample, aggregated net flows are computed for each month over the period 2007–2019.

The dependence structure across fund categories is modelled using copulas.

A n-dimensional copula is a function $C: [0,1]^n \rightarrow [0,1]$ which satisfies the following conditions:

- $C(1,1,\dots,u_{i,},\dots,1,1) = u_i$ for every $i \leq n$
- $C(u_{1,},\dots,u_{n,}) = 0$ if $u_i = 0$ for any $i \leq n$
- C is n-increasing

According to Sklar's theorem, given H, a n-dimensional cumulative density function with one-dimensional marginals $F_1,\dots,F_n$, then there exists a copula C such that

$$H(x_1,\dots,x_n) = C(F(x_1),\dots,F(x_n)), \forall (x_1,\dots,x_n) \in \mathbb{R}^n$$

Therefore, the copula captures the dependence structure of the joint cumulative density function.

The copula framework is applied to net flows by fund categories. This allows the estimation of the expected net flows of a given fund style conditional on another fund-type being in distress. Formally, it is equal to the conditional expectation of net flows for fund category A conditional of fund category B being in distress (net flows below a threshold α):

$$E(f_A | f_B < \alpha) = \int_{-\infty}^{+\infty} \int_{-\infty}^{\alpha} x h(x,y) dx dy$$

The dependence structure between fund flows is modelled using a Student t-copula with ν degrees of freedom, which allows for tail dependence:

$$C_{\nu,\Sigma}^{t} \ (u_{1,},\dots,u_{n,}) = t_{\nu,\Sigma} \ (t_{\nu}^{-1}(u_1),\dots,t_{\nu}^{-1}(u_n))$$

With $t_{\nu,\Sigma}$ the joint cumulative density function of the multivariate distribution.

The copula requires the input parameter $\sum$ which represents the correlation matrix:

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$$\sum = \begin{pmatrix} 1 & \cdots & \rho_{1,n} \\ \vdots & \ddots & \vdots \\ \rho_{n,1} & \cdots & 1 \end{pmatrix}$$

The parameters of the Student copula are estimated by maximum likelihood, using observable correlations among series as input for $\sum$.

In the estimation, a parametric approach for the marginal distribution is first used. The logistic distribution provides the best fit for the distribution of flows by types. The probability density function is given by:

$$f(x;\mu,s) = \frac{e^{-\frac{x-\mu}{s}}}{s\left(1+e^{-\frac{x-\mu}{s}}\right)^2} \tag{8}$$

With μ the mean and s the scale parameter. Both parameters are estimated by maximum likelihood.

Finally, the expectation can be calculated using numerical integration or Monte-Carlo simulations.

As an example, Appendix Figure XIV.1 shows the histogram of IG fund flows along with the corresponding pdf derived from the logistic distribution.

Appendix Figure XIV.2 illustrates the results by displaying the observed and simulated values (see Yan (2007) for details about the estimation procedure). Appendix Figure XIV.2 illustrates the results by displaying the observed and simulated values (see Yan (2007) for details about the estimation procedure).

Appendix Figure XIV.1

Appendix Figure XIV.2

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Appendix Table XIV.1 shows an example of the output. Vulnerable categories can be identified as the categories in the columns, which experience high outflows when other fund categories (in row) are in distress. Spreader categories can be identified in as the categories in row, which are coupled with distress on other categories (in column).

In the example, EM funds are vulnerable since they experience high outflows when IG and MISC categories are in distress. On the opposite, Municipal bond funds are not vulnerable since they do not experience large outflows when other funds are in distress.

IG funds are identified as spreaders: when IG funds are in distress, both HY and EM funds also experience high outflows. On the opposite, HY funds are not identified as spreaders: when HY funds are in distress, other fund categories do not experience large outflows (and some of them such as government bond funds experience inflows due to flight to safety effects).

Interconnectedness approach

The Diebold-Yilmaz interconnectedness approach is applied to funds returns and fund flows. Weekly returns for each individual fund are retrieved from Morningstar. The methodology is the same as the one presented in the section on market-based contagion analysis and is reproduced below.

The interconnectedness approach is based in the spillover analysis of Diebold and Yilmaz (2014). A financial spillover from firm A to firm B is defined as the share of the variation in firm B's equity returns shocks that can be attributed to (contemporaneous or preceding) shocks to firm A's equity returns. The concept stresses idiosyncratic shocks and excludes co-movement across markets that is driven by common factors. The VAR was estimated using a lasso-estimator (see Zou and Hastie 2005).

The VAR model above is used to build a generalized forecast-error variance decomposition (GVD), using Pesaran and Shin's (1998) methodology, to identify uncorrelated structural shocks to FCIs.[1] The GVD for each firm is aggregated in a matrix, with the non-diagonal elements capturing spillovers effects.

The spillover therefore measures the fraction of the H-month ahead forecast error variance of firm j's returns that can be accounted for by innovations in firm i's returns. In this application, the focus is on the 3-week ahead forecast error.

[1] The GVD identification framework is order invariant by construction, hence avoids the ad hoc ordering of structural shocks characteristic of recursive identification.

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Appendix XV. Sample Selection for Insurance Stress Tests

a. Starting from the NAIC Market Share Reports 2018, both for life&health[1] and P&C[2] insurers, the Top 25 companies from each sector were identified. In addition, the largest health insurers were identified[3], however, due to the higher concentration in that market segment and the homogeneity in business models, a significantly smaller sample was deemed sufficient. A company or a group is only included in one of the three samples—in case a company writes business in different sectors, it is allocated to that sector for which premiums are highest.

b. Large providers of variable annuities (VA) were identified from a research report by LIMRA Secure Retirement Institute.[4] To be included in the VA sub-sample, premiums written in that respective line must be greater than 30 percent of total life&health premiums. This method excludes some large VA providers, but focuses on those which have a large concentration in VA business.

c. Finally, subsidiaries of foreign insurance groups were identified based on the ultimate ownership.

The three insurance sectors differ significantly in terms of average size and capital position (Table XV.2). Life insurers have much larger balance sheet assets than the other two sectors and lower levels of statutory capital which is a typical characteristic. However, the distinction between life and P&C insurers is not always perfectly clear-cut as some groups are active in both sectors—the allocation of such groups was made based on the split of gross premiums. This results in some rather large companies also in the P&C sample which are also active in life business. The health insurance sample comprises relatively small companies in terms of balance sheet assets, which hold a very high amount of statutory capital—their premium volume, however, is sizable.

[1] Life Insurance Industry; Life/Health and Fraternal Insurers 2018 Market Share Report – Total Premium; Totals Life Insurance, Annuity, Deposit-Type Contracts, Other Considerations, and Accident&Health; States, U.S. Territories, Canada, Aggregate Other Alien.

[2] Property and Casualty Insurance Industry 2018 Market Share Report – Total Premium; States, U.S. Territories, Canada, Aggregate Other Alien; Total All Lines.

[3] Accident and Health Insurance Industry; Property/Casualty, Life/Health, Fraternal and Health Insurers 2018 Market Share Report – Total Premium; States, U.S. Territories, Canada, Aggregate Other Alien.

[4] https://www.limra.com/globalassets/limra/newsroom/fact-tank/sales-data/2018/q4/2018_q4_annuity_company_rankings_total_va_fixed_updated.pdf.

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Appendix Table XV.1. Sample for the Insurance Stress Test

Life	P&C (diversified)	Health
Allianz Insurance Group	Aflac Group	Anthem Inc Group
AXA Insurance Group	Allstate Insurance Group	Centene Group
Global Atlantic Group	American Financial Group	Cigna Health Group
Jackson National Group	American International Group	CVS Group
John Hancock Group	Amtrust Financial Services Group	Humana Group
Lincoln National Group	Auto Owners Group	Kaiser Foundation Group
Mass Mutual Life Insurance Group	Berkshire Hathaway Group	UnitedHealth Group
Metropolitan Group	Chubb Ltd Group	
Minnesota Mutual Group	CNA Insurance Group	
Mutual of Omaha Group	Erie Insurance Group	
Nationwide Corp Group	Fairfax Financial Group	
New York Life Group	Farmers Insurance Group	
Northwestern Mutual Group	Hartford Fire&Casualty Group	
Pacific Life Group	Liberty Mutual Group	
Principal Financial Group	Markel Corp Group	
Prudential of America Group	Progressive Group	
Thrivent Financial for Lutherans	State Farm Group	
TIAA Family Group	Tokio Marine Holdings Inc Group	
Transamerica Group	Travelers Group	
Voya Financial Group	USAA Group	
West Southern Group	WR Berkley Corp Group	
	Zurich Insurance Group	
Market share >70 percent	**Market share >70 percent**	**Market share ~45 percent**

Appendix Table XV.2. Sample Characteristics for the Insurance Stress Test

		Life	P&C (diversified)	Health
Number of groups		21	22	7
Balance sheet assets (USD bn.)	Min	3.7	8.9	3.5
	25th percentile	135.6	20.3	9.2
	Median	195.0	36.0	15.2
	75th percentile	254.9	67.0	21.9
	Max	577.9	321.4	34.4
Statutory capital / Assets	Min	2.0%	3.3%	32.5%
	25th percentile	3.3%	23.8%	41.9%
	Median	4.6%	26.8%	46.2%
	75th percentile	6.4%	33.3%	47.2%
	Max	12.1%	56.7%	48.5%

Source: IMF staff calculations.

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Appendix XVI. Solvency-Liquidity Network Model

I. Data

FR2052a data on different types of secured financing transactions are aggregated into 4 buckets (HQLA1, HQLA2a, HQLA2b and Non-HQLA). HQLA is further disaggregated into more granular buckets using data from FR Y-9C.

Parameters such as Price Impact, Corwin-Schultz measures are estimated using TRACES data. Estimation methods and models are provided below.

Data for the interbank network is sourced from the bilateral exposures data (i.e., "i-to-i") for the domestic G-SIBs that the FRB has access to via the BIS G-SIB hub database. These exposures enter the interbank network under separate exposure categories (i.e., lending-unsecured, ST money placement, issuer risk (equities and fixed income), and CDS). In addition, a separate category for risk transfers is sourced from DTCC data. Loss-given-default rates and the risk transfer parameter are proxied by the IMF team based on information available through prior research, Moody's defaults and recoveries and CreditEdge databases, etc.

II. Risks and scenarios. Funding shock.

The scenario consists of a set of inflow/outflow/CBC (Counterbalancing capacity) parameters. Each scenario has two types of parameters: (i) fixed (i.e., the ones which remain constant) and (ii) varying, (i.e., the ones which are changing by a 5 percent or 10 percent increment to allow for sensitivity simulation). To simulate a liquidity shock, the user needs to apply the respective scenario embedded in the tabs Scenarios_Flows_LCR (same shocks to flows for all banks) and Scenarios_Flows_All_Repo_Cls (same shocks to flows for all banks). Scenarios_Flows_*BankName* allow to run a customized scenario for each bank (it is not used for the US FSAP purposes). Scenario type

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and severity, time horizon is embedded in the tabs and depends on data availability. Below is the illustration of shock parameters we suggest running for two main scenarios:

i) LCR
ii) Closure of repo markets for non-Treasury securities.

LCR scenario. In addition to the average, system-wide LCR inflow/outflow rates, the scenario assumes that each bank in the network faces increase in demand for committed facilities, withdrawal of wholesale funding, own credit rating downgrade and subsequent loss of rehypothecation rights, additional margin calls for derivative positions etc. (we do not assume that liquidity is redistributed from bank X to bank Y, in the nutshell this scenario tests what would happen if each of the bank in the network would face shocks and interbank network is not functioning due to a risk aversion of participants). Asset fire-sales prices are applied to balances of other banks which hold same types of securities (marked-to-market accounting). Stylized balance sheet allows to determine CAR and liquidity position after such a shock and simulate second round effects.

Closure of Repo market. Scenario assumes that a bank is not able to repo assets to obtain liquidity, except using HQLA1 treasury securities. All other parameters are same as in the LCR scenario.

The same variable parameters are applied to obtain sub-scenarios:

a) Outstanding Draws on Revolving Credit Facilities (shocks from 100% to 0%);
b) Credit Facilities (shocks from 0% to 100%);
c) Retail Mortgage Commitments (shocks from 0% to 100%)
d) Liquidity Facilities (shocks from 0% to 100%)
e) Federal Home Loan Bank Advances (all types of HQLA) (shocks from 0% to 100%)
f) Draws on committed lines (shocks from 0% to 100%)
g) MTM Impact on Derivative Positions (shocks from 100% to 0%)
h) Loss of Rehypothecation Rights, Total Collateral Required Due to a Notch Downgrade Total Collateral Required Due to a Change in Financial Condition (all types of downgrades). (shocks from 0% to 100%)
i) Combined scenarios: all shocks as above.

III. Network.

The network analysis comprises a system consisting of N entities (i.e., banks operating in the U.S. in the case of the domestic interbank network). A key ingredient in the network analysis is the availability of exposure data between these N financial institutions, forming a NxN matrix of 'interbank exposures.' The analysis then quantifies what are the consequences of a hypothetical 'stress event' (e.g., the default in a given bank on its interbank obligations to other banks in the network), and then assess the potential credit risk and funding risk related losses on other banks of the system.

Decomposition of assets and liabilities. The asset side of a bank is decomposed into the following items: cash and CB reserves, unencumbered securities (available for liquidity purposes), reverse repos, collateral swaps, secured loans ('rehypothecatable'), derivatives receivable, loans and all other

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assets (residual). The liabilities side of a bank consists of the following items: unsecured and secured wholesale funding, wholesale borrowing on and off-shore, repos, operational and non-operational wholesale deposits, liquidity and credit facilities, derivatives payable and all other liabilities (residual). Assets are decomposed into different types of collateral, namely Level 1, Level 2a, Level 2b, non-HQLA. The decomposition is used to evaluate bank's ability to raise liquidity in times of funding shocks. Non-HQLA securities are further decomposed by issuer/CUSIP number to allow for specific haircuts to be applied.

Counterparty information allows linking of assets and liabilities by different types of counterparties. Information is aggregated by sector using the following broad categories of counterparties: bank; mutual fund; insurance company; hedge fund; pension fund; CCP; other non-bank financial company; nonfinancial entity; other.

The balance sheet information is obtained from FR2052a report and covers three-time horizons: open + Day1; open+Day1….Day 5; Open + Day 1….Day 30. All other contractual inflows and outflows not included into those horizons are treated as other assets/liabilities in the stylized balance sheet.

The following two sub-sections describe the main two types of shocks being assessed in the network analysis, namely credit and funding risk shocks.

Simple Credit risk shock

The stylized balance sheet of a given bank *i* can be expressed as satisfying the following fundamental identity:

$$\sum_{k,j=1}^{N} a_{i,j}^{(k)} + \sum_{k} a_{i}^{(k)} = c_i + \sum_{k,j=1}^{N} d_{i,j}^{(k)} + \sum_{k} d_{i}^{(k)}$$

where $a_{i,j}^{(k)}$ and $d_{i,j}^{(k)}$ are the matrices of asset and liabilities exposures according to the different tenors (as in contractual cash flow report), respectively, of type of exposure *k* of bank *i* relative to another bank *j* in the network; $a_i^{(k)}$ and $d_i^{(k)}$ are other type-*k* assets and liabilities, respectively, of bank *i* (which are not direct exposures to other banks); and c_i is the regulatory capital of bank *i*.

The credit risk analysis assesses the impact of a hypothetical simulated 'default' of a given bank *h* in the network. In particular, when bank *h* defaults on its obligations, the direct credit losses of bank *i* can be expressed as $\lambda_{i,h}^{(k)}\, a_{i,h}^{(k)}$ where $a_{i,h}^{(k)}$ is the asset exposure of bank *i* to bank *h*, and $\lambda_{i,h}^{(k)}$ is the expected loss-given-default on that particular asset exposure. The after-shock balance sheet identity then becomes:

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$$\sum_{k,j=1,j\neq h}^{N} a_{i,j}^{(k)} + \sum_{k} a_{i}^{(k)} + \sum_{k}\left(1-\lambda_{i,h}^{(k)}\right) a_{i,h}^{(k)} = \underbrace{\left[c_i - \sum_{k} \lambda_{i,h}^{(k)}\, a_{i,h}^{(k)}\right]}_{c_i'} + \sum_{k,j=1}^{N} d_{i,j}^{(k)} + \sum_{k} d_{i}^{(k)}$$

The amount of capital accounting for the direct credit losses is c_i'. This capital is then compared to a minimum threshold level c^*. If the resulting capital is below c^*, then bank i is considered to be 'in default' and the cascade effect continues.

IV. Funding risk shocks

A bank's capital falls below its minimum required solvency ratio and thus the bank experiences funding withdrawals over 1-, 5-, and 30-day period (separate scenarios). The analysis aims to assess how a given set of shocks would affect markets as well as banks and non-bank financial intermediaries. The following parameters were applied: wholesale funding outflows – commercial funding (no ability to borrow; maturing securities must be redeemed); wholesale borrowing (all counterparties) – 50,75,100 percent outflows; repos (non-HQLA) – maturing repos are not renewed; transactional, operational accounts – 2,5,10 percent outflows; non-operational accounts: 25,50,75 percent outflows. Liquidity facilities provided to a bank – not available. Credit facilities provided by bank – granted (to avoid reputational risk). Derivatives payable – 25,50, 100 percent outflows. Because of outflows, bank needs to use cash/CB reserves available as well as to sell or repo securities to meet its liquidity needs due to wholesale funding outflows.

V. Determination of Haircuts[1]

We assume that a bank can use up to the full amount of cash and CB reserves, however haircuts were determined by the amount of assets liquidated. There can be several types of haircuts:

(i) *Scenario based*: term and risk premiums to be in line with macroeconomic stress test scenario (which are also used in the other segments of the FSAP financial stability analysis). We assume that risk and term premiums shocks are realized immediately.

(ii) *Security based*: CB eligible assets. Based on the Fed's collateral framework, we assume that a bank is able to obtain liquidity form the Fed with minimal costs via repos.

(iii) *Security based*: market repos. We assume that a bank is able to repo securities using market haircuts.

[1] For details see Han, F. and M. Leika "Integrating Solvency and Liquidity Stress Tests: The Use of Markov Regime-Switching Models". IMF Working Paper No. 19/250.

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(iv) *Security based*: fire-sales. We assume that securities for which repos would not be available (non-HQLA), bank may need to liquidate in the market. Haircuts were determined by the total amount of securities a given bank as well as other banks sell. Calculations could be done assuming 50 percent implementation shortfall (see methodology explained below).

Security-level measures of market liquidity are aggregated for a certain asset class to obtain measures of aggregate market liquidity. Different measures of market liquidity at the security level have been developed in literature. Two widely-used market liquidity measures of price impact in literature (see, for example, IMF, 2015b) are: (i) the Amihud (2002) measure—defined as the ratio between the absolute value of daily returns and daily trading volume of a frequently-traded security, and (ii) the price impact measure (PI)—defined as the slope coefficient of a regression of price change on signed order flow (buyer-initiated trades minus seller-initiated trades). The price impact measure assigns "signs" to trades, making it more suitable for modeling the haircuts for asset fire sales as most fire sales are seller- rather than buyer-initiated trades. As shown by the 2017 Japan FSAP (IMF, 2017), the Amihud measure of the Japanese stock market varies over time and exhibits regime switching. Similarly, IMF (2015) showed that the price impact measure for European sovereign bonds increased rapidly during the global financial crisis and European debt crisis.

IMF team used daily TRACE trading data to construct price impact measures for following security classes: corporate bonds, agency, ABS, CMO, MBS, TBA. The aggregation is needed as data by CUSIP or other higher level of granularity is not available. In general, the higher the aggregation level the higher the PI as diversification effects are lost in the aggregation process.

The following steps are used to estimate a simple regime-switching model for the aggregate market liquidity measure of each asset class:

- Step 1: identify the marketable asset classes and securities that banks hold as CBC and calculate the price impact measure (PI) at the security level using transaction data;[2]
- Step 2: average the security-level price impact measures for all securities in the same asset class to obtain aggregate price impact measure for each asset class;
- Step 3: for each asset class j, estimate the following baseline Markov regime-switching model:[3]

$$PI_t^j = \beta_0^{j,s} + \varepsilon_t^{j,s}, \qquad (1)$$

where PI_t^j is the aggregate price impact measure averaged across all securities in the asset class j, and s denotes the regime of the aggregate price impact measure. For simplicity, two regimes are assumed, notably, a non-stress (or high-liquidity) regime and a stress (or low-liquidity) regime, but one could also choose a different number of regimes based on the estimation results. $\beta_0^{j,s}$ is the

[2] The price impact measure is calculated daily in this paper.

[3] The specification is similar to Flood and others (2015).

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constant of interest that varies across regimes and $\varepsilon_t^{j,s}$ is the error term with mean zero and variance σ_s^2. The variance σ_s^2 is also assumed to vary across the two regimes.[4]

The impact of asset sales on the prices depends on the price impact measure of that asset class and the total amount of securities offered to sell in that asset class. To determine the amount of sales for each asset class, one would need to use information or make assumptions about the pecking (liquidation) order of sales. Amount of securities a bank needs to liquidate to offset the negative funding gap is available from liquidity stress test. In other words, one would need the information on how much securities in each asset class will be sold at which order and time horizon for each bank. Since the focus of the analysis is to estimate the haircuts, we do not attempt to model the pecking order and time horizon of sales and simply assume that bank i needs to liquidate Vol_i^j amount of securities that belong to asset class j. [5] Therefore, the total amount of securities in asset class j that will be liquidated by all banks, Vol_{all}^j, can be expressed as:

$$Vol_{all}^j \equiv \sum_{i=1}^{N} Vol_i^j \quad (2)$$

where N is the total number of banks in the system.[6]

Based on the baseline Markov regime-switching model, we calculate the price impact for each asset class using the total amount of fire sales. More specifically, since the price impact measure indicates the impact of a one-unit (net) trade on the price, we can assume a linear relationship with a scenario based floor[867] between the price impact of fire sales and the total amount of fire sales.[8] the price impact for each asset class j in regime s can be calculated as $\beta_0^{j,s} \cdot Vol_{all}^j$.[9] Since we assume that market liquidity of an asset class remains in the non-stress regime in idiosyncratic fire-sale events, then the price impact for asset class j in idiosyncratic events could be calculated as:

$$\beta_0^{j,non-stress} \cdot Vol_{all}^{j,non-stress} \quad (3)$$

[4] We also consider the case where the variance of the error term is the same across regimes.

[5] Time horizon of sales is implicitly linked with stress testing scenario, i.e., 1,5 30 days.

[6] Given that the time period of liquidation could be longer than one day (e.g., weeks), one could assume different scenarios of liquidation strategies. In this context, the total amount of liquidation on a particular day would depend on the specific liquidation strategy.

[7] The floor is important as without the model which estimates demand of securities it would be possible to have haircuts which would exceed realistic values (i.e., may even become negative). Assumed floors depend on types of securities and can be very high for sovereign bonds and low for illiquid, opaque securities.

[8] This is a simplifying assumption as the actual price impact of a trade could be a nonlinear function of the size of the trade. Moreover, a linear relationship implies that a sufficiently large trade could lead to a price decline of over 100 percent, which would never happen. Having said that, since the price impact measure quantifies the "average" impact of a one-unit trade on prices, one may make the simplified assumption when the size of the trade is not "too" large in the sense that post-trade prices would become negative.

[9] As explained above, the total amount of fire sales is obtained from the liquidity stress test, and a pecking order of fire sales of different asset classes need to be assumed before applying the methodology.

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where $Vol_{all}^{j,non-stress}$ represents the total amount of securities in asset class j that are liquidated by all banks in the non-stress regime. Similarly, since we assume that market liquidity of an asset class switches from the non-stress regime to the stress regime when banks start to liquidate this asset class, the price impact should be calculated as:

$$\beta_0^{j,stress} * Vol_{all}^{j,stress} \quad (4)$$

where $Vol_{all}^{j,stress}$ denotes the total liquidation amount by all banks in the stress regime. The price impact can be much larger in the stress regime than in the non-stress regime, depending on the total fire-sale amount and the specific asset class.[10]

VI. Estimated haircuts

Estimated Price Impact of Securities

	Volume-based (per US$ 100 mil)		Corwin-Schulz	
	Stress regime	Non-stress regime	Stress regime	Non-stress regime
US Treasuries	...	...	0.00097	0.00001
RMBS: pass-through	0.06058	0.01691	0.00159	0.00069
RMBS: other	0.02440	0.00552	0.00117	0.00064
CMBS	0.10874	0.01598	0.00753	0.00045
ABS and other structured products	...	...	0.00053	0.00012
Corporate securities	0.12906	0.03047	0.00336	0.00004

Sources: FINRA, TRACE; Bloomberg LP; IMF staff

[10] It is worth noting here that aggregating security-level price impact measures to the asset class-level is to simplify the calculation, and the calculation could also be conducted at the security level if more granular data of each bank's CBC are available.

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Sources: SIFMA and IMF calculations.

VII. Network algorithm and cascade effects

The network algorithm comprises of a system consisting of *N* nodes (each node representing a banking system/bank) and with a structure of inter-node (or interbank) loans represented by the *N x N* matrix, *X*, with a generic element denoted by an array of exposures x_{ij}—note that these exposures are direct exposures across nodes. Let F_t be the set of failed institutions and let NF_t be the set of not-failed institutions in round *t* of the simulations.

To initialize the credit shock simulation (simulation 1), assume that institution h fails at t=0, and thus a fraction λ of its debts to the rest of institutions will not be repaid. Then, for each one of the not-failed institutions, $j \in NF_t$, the algorithm checks whether the amount of losses suffered by that institution is larger than the amount of capital of that institution. If that is the case, then that institution is also driven to bankruptcy. That is,

$$\text{if} \sum_{h \in F_t} \lambda x_{ht} > k_j \rightarrow j \text{ defaults too} : j \in F_{t+1}$$

The algorithm is said to converge once there are no further failures: that is, $F_t = F_{t+1}$.

For the credit-plus-funding shock simulations (simulation 2), the previous shock is compounded by the funding-shortfall induced loss, $\delta\rho x_{ih}$. That is, at each stage of the simulation, an institution's capital may be negatively affected by the asset fire sale, and hence the default condition is given by:

$$if \sum_{h \in F_t} \lambda x_{ht} + \sum_{h \in F_t} \delta\rho x_{jh} > k_j \rightarrow j \text{ defaults too} : j \in F_{t+1}$$

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We would recalculate banks solvency position after each shock (in terms of shareholders' equity, CET1 ratio, total CAR). There are several thresholds, like illiquidity (inability to maintain positive cash flows after use of available counterbalancing capacity) within 1,5,30 days horizon; inability to maintain CET1 ratio above minimum requirements (4.5 percent); inability to maintain positive shareholders equity.

Shocks are transmitted to banks and other non-bank financial intermediaries via funding, liquidity and solvency channels. Funding channels assume that bank which faces liquidity shortage cancels credit lines to other banks/non-bank financial institutions; liquidity channels – asset fire-sale affects other financial intermediaries via marked-to-market pricing; solvency channel – failing financial institution would not redeem its own securities, deposits held by other banks and non-bank financial institutions. Second/third round effects were calculated.

The FSAP team uses two dimensions of market liquidity—cost and quantity—to measure the impact and the ability to execute sizable securities transactions to fulfill funding gaps incurred by the G-SIBs in the network. These estimates are used to assess the degree of price impact haircuts due to direct liquidation losses as well as marked-to-market losses in fire sale events. The calculations are performed at securities transactions level for seven asset classes (Corporate, ABS, RMBS pass-through, RMBS other, CMBS, Agency, Treasuries) using FINRA TRACE data (with the exception of U.S. treasuries, where the data comes from Bloomberg given lack of access to this asset class in FINRA TRACE subscription).

Following IMF's 2015 October GFSR chapter 2 on market liquidity, we estimate two measures to assess the cost dimension of market liquidity: 1) a regression-based price impact measure; 2) Corwin-Schultz (2012) high-low spread. The first measure (i.e., price impact measure) is calculated as the slope coefficient of a regression that uses price changes and sigh-ordered buy and sell transaction volumes (see the equation below). The estimation is performed at securities transaction level during a given day.

$$\Delta \mathrm{Price}_{s,t} = \alpha + \beta \mathrm{Trading\ Volume}_{s,t} + \varepsilon,$$

Where:

s = security;

t = time between two transaction within a day (typically in milliseconds).

Given that the size of the coefficient (β) is determined by the size of trades in the sample (i.e., the quantity), simply multiplying these coefficients by the amount of assets needed to fulfill the funding gap may result in erroneous elasticities when the funding gaps are substantially larger than the trading volumes in the securities samples. Therefore, we compliment the cost-based market liquidity measures by incorporating a trading volume parameter, thus also capturing the quantity-dimension of market liquidity. Specifically, we use two volume constrains: 1) amount of assets needed to liquidate are divided into transactions before applying the price impact coefficient, where the number of transactions is based on the maximum per transaction volume in the sample of each asset class and the amount of assets needed to liquidate to cover the gap; 2) total amount of assets

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that can be liquidated is constrained by a daily total trading volume constrain, where the total trading volume is the total daily trading volume observed in the sample. Given the latter amount is the total liquidity available to all participants in the market, and the G-SIBs in the network may not necessarily be able to use the entire amount, we further refine the constraint by allowing only a share of the total daily trading volume to be available to the 6 G-SIBs (this is proxied based on the banking sector share in the financial sector under relevant instruments in U.S. flow of funds data). To account for the uncertainly associated with the daily total trading volume constrain assumption, we also incorporate a parameter that ranges from half-to 5 times the threshold.

As an additional cost-based market liquidity measure, Corwin-Schultz (2012) high-low spread is used. Spreads (S) are estimated using two-day high and low prices of the securities in the 7 asset classes as a nonlinear function, where:

$$S = \frac{2(e^{\alpha} - 1)}{1 + e^{\alpha}};$$

α is defined as $\frac{\sqrt{2\beta} - \sqrt{\beta}}{3 - 2\sqrt{2}} - \sqrt{\frac{\gamma}{3 - 2\sqrt{2}}}$,
β is defined as $\ln\left(H_t/L_t\right)^2 + \ln\left(H_{t+1}/L_{t+1}\right)^2$,
γ is defined as $\left[ln\left(\frac{H_{t,t+1}}{L_{t,t+1}}\right)\right]^2$,
H is the daily high price of the security,
L is the daily low price of the security, and
t stands for time (in days).

In line with Corwin-Schultz (2012), we assign a zero value to estimated high-low spreads that are less than zero (i.e., negative values); negative values could particularly occur in the presence of large price fluctuations where the 2-day variance in the prices may exceed the single-day variance. Subsequently,

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Appendix XVII. Network Algorithm for Contagion (Cross-Border Interconnectedness)[187]

The network algorithm comprises of a system consisting of *N* nodes (each node representing a banking system/bank) and with a structure of inter-node (or interbank) loans represented by the *N x N* matrix, *X*, with a generic element denoted by x_{ij}—note that these loans are direct exposures across nodes. Let F_t be the set of failed institutions and let NF_t be the set of not-failed institutions in round *t* of the simulations.

To initialize the credit shock simulation (simulation 1), assume that institution h fails at t=0, and thus a fraction λ of its debts to the rest of institutions will not be repaid. Then, for each one of the not-failed institutions, $j \in NF_t$, the algorithm checks whether the amount of losses suffered by that institution is larger than the amount of capital of that particular institution. If that is the case, then that institution is also driven to bankruptcy. That is,

$$\text{if} \sum_{h \in F_t} \lambda x_{ht} > k_j \rightarrow j \text{ defaults too} : j \in F_{t+1}$$

The algorithm is said to converge once there are no further failures: that is, $F_t = F_{t+1}$.

For the credit-plus-funding shock simulations (simulation 2), the previous shock is compounded by the funding-shortfall induced loss, $\delta\rho x_{ih}$. That is, at each stage of the simulation, an institution's capital may be negatively affected by the asset fire sale, and hence the default condition is given by:

$$if \sum_{h \in F_t} \lambda x_{ht} + \sum_{h \in F_t} \delta\rho x_{jh} > k_j \rightarrow j \text{ defaults too} : j \in F_{t+1}$$

[1] Based on Espinosa-Vega and Sole (2010).

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United States: Financial System Stability Assessment

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UNITED STATES

FINANCIAL SYSTEM STABILITY ASSESSMENT

August 2020

This Financial System Stability Assessment paper on United States was prepared by a staff team of the International Monetary Fund. It is based on the information available at the time it was completed on July 31, 2020.

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INTERNATIONAL MONETARY FUND

UNITED STATES

FINANCIAL SYSTEM STABILITY ASSESSMENT

July 17, 2020

KEY ISSUES

Context: Much of the Financial Sector Assessment Program (FSAP) work was conducted prior to the COVID-19 pandemic. The lockdown of the economy has led to a massive growth shock. Following the precipitous fall, risk asset prices have rebounded, and financial conditions eased. The vulnerability analysis has been updated and largely captures this shock. Recommendations on strengthening policy and institutional frameworks remain pertinent. The approach to financial regulation and supervision was risk-focused given the high degree of compliance against international standards assessed during the 2015 FSAP.

Findings: The financial system entered the crisis with strong buffers, but the rise in corporate leverage and migration of risks to nonbank financial institutions compounded with ongoing economic disruption could result in a severe financial strain. Banks' capital depletion rates in the stress test are high, yet manageable, and limiting shareholder payouts would help conserve banks' capital. Most investment funds would be able to meet severe redemptions. Some life insurers face a significant capital reduction in the adverse scenario, but the valuation and capital framework largely mitigates the impact. The Federal Reserve's response to market dysfunction was timely and forceful helping to preserve financial stability. Relaxation of prudential requirements has led to fewer banks being subject to full Basel standards. There are few tools to deal with the ongoing migration of risks to nonbanks. Key insurance reforms remain outstanding. Recent changes require fewer banks to prepare recovery and resolution plans.

Policies: The development of macroprudential tools to deal with the growing risks in nonbanks is a priority. The overall stringency of prudential requirements for non-internationally active banks should be maintained. The Federal Reserve should take measures to durably bolster money market resilience and strengthen liquidity backstops. More comprehensive system-wide supervisory stress tests should be developed for central counterparties (CCP) and the consistency of risk management outcomes by CCPs should be strengthened. Group capital requirements should be developed for insurers. The Commodity Futures Trading Commission (CFTC) and the Securities and Exchange Commission (SEC) should be granted greater budgetary independence. The authorities should mitigate the impact of reduced firm-developed recovery and resolution plans through recovery plan requirements, their own resolution plans, and intensified crisis preparedness.

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Approved By
Aditya Narain and Nigel Chalk
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This report is based on the work of the FSAP mission that visited the United States during October 22–November 8, 2019 and February 18–March 6, 2020. It has been factually updated to incorporate COVID-19-related events in March and April 2020. The FSAP findings were discussed with the authorities in May 2020.

- The team was led by Michaela Erbenová (Mission Chief) and included Peter Breuer and Darryl King (Deputy Mission Chiefs); Atilla Arda, Kelly Eckhold, Caio Ferreira, Tamás Gaidosch, Mindaugas Leika, Fabian Lipinski, Luc Riedweg, Dulani Seneviratne, Richard Stobo, Froukelien Wendt, and Peter Windsor (all MCM); Carlos Caceres (WHD); Steve Dawe, Kathleen Kao, and Nadine Schwarz (LEG); and Antoine Bouveret, Timo Broszeit, Rama Cont, Patrick Honohan, Klaus Löber, Jennifer Long, Ron Morrow, Lyndon Nelson, Stuart Wason, and Mark Zelmer (experts). Eva Yu (MCM) assisted research and analysis. Marina Agnese and Ramanjeet Singh (MCM) provided administrative support. Aditya Narain (MCM) provided oversight and joined selected meetings.

- The mission met with Under Secretary of the U.S. Department of the Treasury Brent McIntosh; Vice Chair for Supervision of the Board of Governors of the Federal Reserve System (FRB) Randal Quarles; Chairman and Chief Executive of the Commodity Futures Trading Commission (CFTC) Heath Tarbert; and a number of senior officials at the FRB, Consumer Financial Protection Bureau (CFPB), CFTC, Federal Deposit Insurance Corporation (FDIC), Federal Housing Finance Agency (FHFA), Securities and Exchange Commission (SEC), Office of the Comptroller of the Currency (OCC); Office of Financial Research (OFR), and other agencies at the federal and state level. The mission also met industry associations, banks, insurance companies, auditors, academics, market analysts, and fintech companies.

- FSAPs assess the stability of the financial system as a whole and not that of individual institutions. They are intended to help countries identify key sources of systemic risk in the financial sector and implement policies to enhance its resilience to shocks and contagion. Certain categories of risk affecting financial institutions, such as operational or legal risk, or risk related to fraud, are not covered in FSAPs.

- The United States is deemed by the Fund to have a systemically important financial sector according to Mandatory Financial Stability Assessments Under the Financial Sector Assessment Program—Update SM 11/18/2013, and the stability assessment under this FSAP is part of bilateral surveillance under Article IV of the Fund's Articles of Agreement.

- This report was prepared by Michaela Erbenová, Peter Breuer, and Darryl King, with contributions from the FSAP team. It is based on information available as of May 15, 2020.

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Glossary

ACA	Affordable Care Act
AML/CFT	Anti-Money Laundering/Combating the Financing of Terrorism
BCBS	Basel Committee on Banking Supervision
BCP	Basel Core Principles for Effective Banking Supervision
BHC	Bank Holding Company
BIS	Bank for International Settlements
BNYM	Bank of New York Mellon
BO	Beneficial Ownership
Bps	Basis points
CAR	Capital Adequacy Ratio
CARES Act	The Coronavirus Aid, Relief, and Economic Security Act
CCAR	Federal Reserve's Comprehensive Capital Analysis and Review
CCB	Capital Conservation Buffer
CCFs	Credit Conversion Factors
CCP	Central Counterparty
CCyB	Countercyclical Capital Buffer
CET1	Common Equity Tier 1 Capital
CFPB	Consumer Finance Protection Bureau
CFTC	Commodity Futures Trading Commission
C&I	Commercial and Industrial (loan)
CLASS	Capital and Loss Assessment under Stress Scenario
CLO	Collateralized Loan Obligation
CME	Chicago Mercantile Exchange
CMG	Crisis Management Group
CPMI	Committee on Payments and Market Infrastructures
CPSS	Committee on Payment and Settlement Systems
DFA	Dodd-Frank Wall Street Reform and Consumer Protection Act
DFAST	Dodd-Frank Act Stress Test
DIS	Deposit Insurance System
EBITDA	Earnings before interest, taxes, depreciation, and amortization
ELA	Emergency Liquidity Assistance
EM	Emerging Market (mutual fund type)
EPS	Enhanced Prudential Standards
ETF	Exchange Traded Fund
FATF	Financial Action Task Force
FCA	Farm Credit Administration
FDIC	Federal Deposit Insurance Corporation
Fed	The Federal Reserve System
FFIEC	Federal Financial Institutions Examination Council
FHFA	Federal Housing Finance Agency

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FHLB	Federal Home Loan Bank
FICC	Fixed Income Clearing Corporation
FinCEN	Financial Crimes Enforcement Network
FMI	Financial Market Infrastructure
FMU	Financial Market Utility
FRB	Board of Governors of the Federal Reserve System
FRBNY	Federal Reserve Bank of New York
FSAP	Financial Sector Assessment Program
FSB	Financial Stability Board
FSSA	Financial System Stability Analysis
FSOC	Financial Stability Oversight Council
FHLMC	Federal Home Loan Mortgage Corporation ("Freddie Mac")
FSOC	Financial Stability Oversight Council
GAAP	Generally Accepted Accounting Principles
GCC	Group Capital Calculation
GFSR	Global Financial Stability Report
GDP	Gross Domestic Product
GECC	General Electric Capital Corporation, Inc.
GFC	Global Financial Crisis
GNMA	Government National Mortgage Association ("Ginnie Mae")
GSE	Government-Sponsored Enterprise
G-SIB	Global Systemically Important Bank
GSS	Government Securities Settlement
HELOC	Home Equity Lines of Credit
HQLA	High-Quality Liquid Asset
HUD	Housing and Urban Development
HY	High Yield (mutual fund type)
ICC	Ice Clear Credit
ICPs	Insurance Core Principles
ICS	Insurance Capital Standard
IDI	Insured Depository Institution
IFS	International Financial Statistics
IG	Investment Grade (mutual fund type)
IHC	Intermediate Holding Company (of a foreign banking organization)
IOSCO	International Organization of Securities Commissions
IT	Information Technology
LAC	Loss-Absorbing Capacity
LCR	Liquidity Coverage Ratio
LIBOR	London Interbank Offered Rate
LLs	Leveraged Loans
M&A	Mergers and Acquisitions
MBS	Mortgage-Backed Securities

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MFs	Mutual Funds
MMF	Money Market Fund
MPI	Macroprudential Initiative
MWCB	Market-Wide Circuit Breaker
NAIC	National Association of Insurance Commissioners
NAV	Net Asset Value
NFA	National Futures Association
NMA	National Mortgage Association ("Fannie Mae")
OBFR	Overnight Bank Funding Rate
OCC	Office of Comptroller of the Currency
OFR	Office of Financial Research
OLA	Orderly Liquidation Authority
OMO	Open Market Operation
ORSA	Own Risk and Solvency Assessment
Non-GSIB	Non-Global Systemically Important Bank
OTC	Over-the-Counter (derivatives)
PBR	Principles-Based Reserving
PFMI	Principles for Financial Market Infrastructure
PMI	Private Mortgage Insurer
PMIERs	Private Mortgage Insurer Eligibility Requirements
PPNR	Pre-provision Net Revenue
PSPA	Preferred Stock Purchase Agreement
P&C	Property & Casualty (insurance firms)
QM	Qualified Mortgage
RAM	Risk Assessment Matrix
RBC	Risk-Based Capital
ROA	Return on Assets
ROE	Return on Equity
RRP	Recovery and Resolution Plan/Planning
RWA	Risk-Weighted Asset
SEC	Securities and Exchange Commission
SOFR	Secured Overnight Financing Rate
STA	Standardized Approach (to calculating risk weights
TN	Technical Note
T-bill	Treasury bill
UPB	Unpaid Principal Balance
VA	Virtual Asset
VASP	Virtual Asset Service Provider
VAWG	Valuation Analysis Working Group
WEO	World Economic Outlook

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EXECUTIVE SUMMARY

The longest expansion in the recorded U.S. history has come to an abrupt end. The economy will contract sharply in 2020 on the back of the COVID-19 outbreak and associated containment efforts, with significant lingering risks and a high degree of uncertainty. The economic rebound in 2021 is predicated critically on the pandemic fading and effective economic policy actions stemming widespread corporate bankruptcies, extended employment losses, and system-wide financial disruption. Banks have entered the crisis with strong buffers and households have deleveraged, but the rise in corporate leverage and migration of risks to nonbank financial institutions in recent years compounded with ongoing economic disruption could result in severe financial strain. The highly interconnected financial sector is also exposed to cybersecurity and operational risk events that could lead to distress in a major financial firm or market infrastructure.

The FSAP was conducted prior to the pandemic onset and has been factually updated to incorporate events that followed. Reflecting the post-mission developments, the economic growth projections have been significantly revised downward in the *June 2020 World Economic Outlook (WEO) Update*. The U.S. authorities implemented urgent measures to address health concerns, to safeguard economic and financial stability and to prevent adverse macrofinancial feedback loops. The assessment of the full impact of the shock and the effectiveness of mitigation policy measures would be premature. The FSAP's risk analysis nonetheless remains broadly relevant, with stress test scenarios aiming to capture wide uncertainty related to the time profile and other specifics of the COVID-19 shock. A combination of monetary, fiscal and financial sector policies may continue to be needed to support stability of the financial system and to preserve soundness of financial institutions, especially if economic activity remains paralyzed for longer than anticipated. The FSAP's recommendations on strengthening policy and institutional frameworks— including for regulation, supervision, contingency planning, and crisis preparedness and management—remain pertinent and should be considered once the crisis containment phase has concluded.

FSAP stress tests indicate that the financial system entered the crisis generally well-prepared to an array of severe shocks. Susceptibility of the U.S. banking system to inward spillovers remains limited, but it could become a source of contagion to foreign banking systems. Equity and bond market valuations appear stretched, while the assessment is hampered by the still unfolding events as markets remain vulnerable to new bouts of volatility. A marked rise in corporate stress would impact nonbank financial institutions, with a more moderate impact on banks. Given the sharp economic contraction, bank capital depletion rates are high in the baseline scenario yet remain manageable overall. With the uncertain duration of the shock, retaining earnings and limiting shareholder payouts would help preserve capital and limit recapitalization needs. Global systemically important banks' (G-SIBs') liquidity buffers are substantial, but high utilization of credit and liquidity facilities could lead to a liquidity shortfall at some banks. The financial stability risks stemming from the insurance sector appear contained for now. Some life insurers would face a significant capital reduction in the adverse scenario, but the valuation and capital framework largely mitigates the impact on statutory capital. Most investment funds would be able to withstand severe redemptions, though high yield and loan funds could face significant shortfalls.

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The FRB's response to the extreme market dysfunction was timely and forceful and has thus far helped preserve financial stability. Market resilience has been declining for some time and was severely tested in the March–April COVID-19 crisis period but was backstopped by a plethora of timely actions. Once the crisis abates, the FRB should take measures to durably bolster market resilience through permanent operational framework adjustments and by retaining some aspects of its crisis response that have improved access to its liquidity backstops—regular open market operations (OMOs) and encouragement to banks to explicitly allow for use of the Discount Window to monetize high-quality liquid assets (HQLAs) in their short-term liquidity planning. Other priorities include addressing the vulnerability from having a sole provider in the government securities settlement and tri-party repo markets, restoring the FRB's ability to provide liquidity backstops to systemically designated nonbanks, developing the capacity for foreign currency liquidity backstops for banks and designated central counterparties (CCPs), and setting firm targets backed by supervisory action to promote transition from the London Interbank Offered Rate (LIBOR).

The Financial Stability and Oversight Council (FSOC) plays the leading role in systemic and emerging risk identification, and a broader toolkit would help bolster the authorities' policy framework. Continuing full operational independence of all member agencies is critical, and providing them with explicit financial stability mandates would bolster the framework. The activities-based approach will help in addressing risks in nonbanks, but more clarity is needed on its implementation. The development of macroprudential tools for nonbanks is an important priority as is ensuring sufficient buffers are retained to accommodate macro-relevant vulnerabilities. Addressing remaining data gaps is key to enhancing the assessment of interconnections, vulnerabilities, and risks across the financial system. The FSOC and its member agencies should intensify crisis preparedness for decisive responses to contingencies.

Strong prudential regulation has contributed to a sound banking system, but certain requirements are being reduced at a time when financial stability risks are rising. For the U.S. G-SIBs, considered as internationally active banks by the authorities, capital and liquidity requirements meet and sometimes exceed the Basel standards. However, recent reforms emphasizing a tailored approach will require fewer banks (other than the G-SIBs) to be subject to the full set of Basel standards. Fewer banks are subject to annual supervisory stress tests while recent changes to the Comprehensive Capital Analysis and Review (CCAR) program and the implementation of the Stress Capital Buffer will likely lower capital requirements for some large banks. The 2018 statement on the role of supervisory guidance could create obstacles to the implementation of key supervisory expectations. Authorities should consider rewriting certain prudential guidance as regulation; and maintaining the overall stringency of prudential requirements for non-internationally active banks.

While much progress has been made since 2015, the size, complexity, and global importance of the U.S. capital markets call for continued reform and oversight strengthening. U.S. authorities have taken prompt action to maintain orderly functioning of securities and derivatives markets. Reform priorities include greater budgetary autonomy for the SEC and CFTC; completion of the work on market-wide circuit breakers; the deepening of joint work on new concerns, such as

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leveraged loans; and the monitoring of financial stability risks related to mutual funds (including through SEC-led stress testing). Legislative action to enable greater scrutiny of new registrants, reducing reliance of the National Futures Association (NFA) on self-certifications, and a strategic review of the SEC's oversight of exchanges are all also priorities for the agenda.

Key reforms in the regulation and supervision of insurance are under development or remain outstanding. These include greater independence for the state regulators, strengthening of risk-based supervision, consistency in liability valuation methodologies for life insurers, implementation of a total balance sheet approach to risk and solvency assessment, and progress on the group capital requirements. Strengthening the solvency regime for insurers is particularly important. Regulatory responses to natural catastrophe risks need to capture the increasing risk to policyholders and incentivize risk mitigation measures and closing protection gaps.

The increased reliance of the financial system on financial market infrastructures (FMIs) underlines the importance of FMI resilience for the United States and global financial stability. FMIs appeared so far sufficiently robust to surges in volumes and volatility in financial markets. The regulation, supervision, and oversight of systemically important U.S. FMIs is broadly adequate; but there is room to strengthen the consistency of outcomes of CCP risk management practices. As in other countries, new nonbank players are entering the payments space with innovative services. A review of regulatory requirements for payments may be warranted so as to allow for a proactive, comprehensive, and risk-based response to the potential systemic risks that these new providers may bring.

The authorities have mainstreamed consideration of cybersecurity and other aspects of technological resilience into both regulation and supervision. Public-private partnerships enable information sharing. Both industry and supervisors have programs in place to improve resilience.

Financial integrity has been strengthened since 2015 in relation to beneficial ownership identification and verification. Addressing high-risk sectors and misuse of legal entities remain priorities, including by requiring beneficial ownership information to be collected upon company formation and ensuring that investment advisers, lawyers, accountants, and company service providers are effectively regulated and supervised in line with risks.

Considerable progress has been made with the largest and most-complex financial companies' resilience, recoverability, and resolvability; but recent changes could lower their focus and resource allocation on these matters. The reduction in coverage and frequency of firm-developed recovery and resolution plans (RRPs) could weaken the impact these plans have made on financial companies' management. The Federal Banking Agencies (FBAs) should continue to actively mitigate this challenge through recovery plan requirements, their own annual resolution plans, and intensified crisis preparedness. Further refinements relating to cross-border resolution framework also deserve attention. CCP recovery and resolution planning should include more firms.

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Table 1. United States 2020 FSAP: Key Recommendations		
	Responsible Authority	Horizon[1]
Systemic Risk Oversight and Macroprudential Framework		
Provide an explicit financial stability mandate to all federal FSOC members.	Congress	MT
Prioritize the development of macroprudential tools to address risks and vulnerabilities in the nonbank sector.	FSOC	MT
Intensify efforts to close data gaps, including reporting disclosures of holdings of collateralized loan obligations (CLOs) and repo markets, to reinforce market discipline.	OFR	I
Banking Regulation and Supervision		
Review prudential requirements for non-internationally active banks (Category III and IV) and ensure they are and continue to be broadly consistent with the Basel capital framework and appropriate concentration limits; and consider extending the full liquidity coverage ratio (LCR) to them.	FBAs	ST
Streamline regulatory requirements and consider rewriting key prudential guidance as regulation.	FBAs	MT
Introduce heightened standards on the governance of large and complex bank holding companies (BHCs), enhance the related-party framework, introduce rules on concentration risk management, and include more quantitative standards regarding interest rate risk in the banking book.	FBAs	ST
Insurance Regulation and Supervision		
Increase independence of state insurance regulators, with appropriate accountability.	States	MT
Require all in-force life insurance business be moved to principles-based reserving (PBR) after a five-year transition period, adjust asset valuation approach to ensure consistency between assets and liabilities, and recalibrate risk-based capital (RBC) to the revised valuation approach.	NAIC and states	MT
Develop a consolidated group capital requirement similar to GAAP-Plus insurance capital standard (ICS) for internationally active groups and optionally for domestic groups in parallel with the development of aggregation approaches by the FRB and NAIC.	NAIC, FRB, and states	MT
Regulation, Supervision, and Oversight of FMIs		
Increase CFTC resources devoted to CCP supervision and strengthen rule-approval process to an affirmative approval with a public consultation.	CFTC	ST
Collaborate to analyze differences in outcomes of CCP risk management practices and adopt an appropriately consistent, conservative implementation of risk management standards across CCPs.	FRB, CFTC, SEC	ST
Develop and execute more comprehensive systemwide CCP supervisory stress tests.	FRB, CFTC, SEC	ST

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Table 1. United States 2020 FSAP: Key Recommendations (concluded)		
	Responsible Authority	Horizon[1]
Securities Regulation and Supervision		
Give CFTC and SEC greater independence to determine their own resources, with appropriate accountability.	Congress	ST
Assess financial stability risks related to mutual funds and stable net asset value (NAV) money market funds (MMFs), including through SEC-led liquidity stress testing.	SEC	I
Conclude implementation of new broker-dealer capital rules; finalization of market-wide circuit breakers, and delivery of the Consolidated Audit Trail.	SEC	ST
Increase scrutiny of new registrants and reduce reliance on self-attestations where applicable.	SEC, CFTC, NFA	I
AML/CFT		
Legislate to collect beneficial ownership information on formation of U.S. corporations, maintain it, and ensure timely access for authorities.	Congress	ST
Ensure that investment advisers, lawyers, accountants, and company service providers are effectively regulated and supervised for AML/CFT in line with risks.	Treasury	ST
Systemic Liquidity		
Promote the fungibility of Treasury Securities and Reserves by adjusting assumptions about firms' access to the Discount Window in liquidity metrics.	FRB	ST
Continue to operate regular fine-tuning OMOs.	FRB	I
Advance arrangements for providing liquidity to systemic nonbanks and CCPs under stress, and reconsider restrictions on bilateral emergency liquidity assistance (ELA) to designated systemically important nonbanks.	FRB, Treasury & Congress	ST
Develop robust and effective backup plans in the event the sole provider, Bank of New York Mellon (BNYM), is not able to settle and clear repo transactions.	FRB	MT
Enhance arrangements to provide liquidity support in foreign currencies to banks and designated systemically important CCPs.	FRB	MT
Crisis Preparedness and Management		
Intensify crisis preparedness.	FSOC, FBAs, UST	ST
Continue to use agency discretion actively to subject a wider array of firms to RRP.	FBAs	ST
Continue to undertake, at least yearly, Dodd-Frank Act (DFA) Title II plans, resolvability assessments, and crisis management group (CMG) discussions of RRPs and assessments.	FRB, FDIC	ST
Extend OLA powers to cover FBOs' U.S. branches; ensure equal depositor preference ranking for overseas branch deposits with domestic deposits; introduce powers to give prompt and predictable legal effect to foreign resolution measures.	Congress	MT

[1] I: Immediate; ST: short term= less than 1 year; MT: medium term= 1–5 years.

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MACROFINANCIAL SETTING

1. The FSAP takes place against the background of rising medium-term financial vulnerabilities and the COVID-19 pandemic. Following the longest expansion in its recorded history, the U.S. economy has decelerated sharply on the back of the pandemic outbreak. The containment measures introduced in March have brought large parts of the economy to a standstill, with growth in 2020 expected to decline by most since the Great Depression, followed by a partial recovery in 2021 (Table 2). The fiscal deficit is projected to exceed 20 percent of GDP, leading to a sharp increase in U.S. public debt, which was already on an unsustainable path before the crisis. Financial conditions tightened initially—reflecting a broad-based market correction driven by investors' assessment of the impact of the virus and the collapse of oil prices—but have recovered somewhat on the back of a quick policy action. Nonetheless, the sharp economic deterioration will have a long-lasting impact on the financial system. The economic outlook is subject to an unusually high degree of uncertainty.

2. The extended period of easy financial conditions until early 2020 has been accompanied by a buildup of medium-term vulnerabilities. Overall, vulnerabilities have grown relative to the 2015 FSAP (Figure 1). The continued low interest rate environment has pushed investors to take more risks in the search for yield. While banks and household balance sheets have strengthened, vulnerabilities have grown in nonfinancial corporates and in the nonbank financial system. At the same time, bank capital and liquidity requirements have been eased for a large part of banking sector following the *2018 Economic Growth, Regulatory Relief, and Consumer Protection Act* and subsequent regulatory measures, which could reduce banks' resilience in the downturn.

3. Corporate sector entered the current crisis episode with historically high debt relative to the size of the economy and leveraged finance growing rapidly. Nonfinancial business debt rose to almost 75 percent of GDP (about US$16 trillion) toward the end of 2019—slightly higher than at the onset of the Global Financial Crisis (GFC). The largest portion (US$10 trillion) relates to corporate sector debt, including corporate bonds and commercial paper (US$6.5 trillion, about 80 percent at investment grade); bank and leveraged loans (about US$1.5 trillion and US$1.2 trillion, respectively); and other debt (less than US$1 trillion). Increased financial risk taking and weakening underwriting standards have allowed less creditworthy firms to access capital markets and increase leverage (Figure 2). The leveraged loans[1] account for roughly 7 percent of total business sector debt (5 percent of GDP), comparable in size to the high-yield corporate bond debt market (Box 1). At the onset of the pandemic, these risks were mitigated by significant liquid assets on corporate balance sheets, and the fact that many firms have extended maturities, with most debt maturing after 2022, while the costs of financing have fallen.[2]

[1] Term loans to indebted and lower-rated corporates originated by bank syndicates and sold to institutional and other investors.

[2] See the Global Financial Stability Report (GFSR), Chapter 1, October 2019, https://www.imf.org/en/Publications/GFSR/Issues/2019/10/01/global-financial-stability-report-october-2019 .

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Figure 1. United States: Financial Vulnerabilities Radar Chart—COVID-19 Prologue

Source: IMF staff estimates.

Note: The chart is based on data available as of March 2020 and shows vulnerabilities in six sectors in the U.S. based on the pooled percentile rank as determined in the Indicator-Based Framework of the Global Financial Stability Report (see Online Annex April 2019). Vulnerabilities arise from leverage, liquidity, maturity, and currency mismatches and are shown relative to those of other 19 systemically important advanced economies and across time from 2000 onward.

4. Households have reduced their overall indebtedness post-GFC, but high unemployment could impair debt servicing capacity. Over the last decade, residential mortgage debt has decreased substantially across all income groups, with low delinquencies, falling debt servicing costs and extended maturities as households refinanced their mortgages (Figure 2). That said, the mortgage market is large, with outstanding mortgages exceeding US$10 trillion (roughly 50 percent of GDP, or two-thirds of total household debt), and a deterioration in credit quality could impact financial stability. The government continues to play a central role in housing through the government-sponsored enterprises (GSEs), most notably Federal National Mortgage Association ("Fannie Mae") and the Federal Home Loan Mortgage Corporation ("Freddie Mac"), which currently own or guarantee roughly half of outstanding mortgage debt and represent about 85 percent of the mortgage-backed securities (MBS) market. Student loans and some segments of consumer debt (e.g., auto loans) have been on the rise, albeit a large part of that growth accrues to households with prime credit scores. The COVID-19 outbreak has triggered unprecedented job losses. If persistent, high unemployment and falling income would put pressure on households debt servicing capacity.

5. The banking system entered the COVID-19 outbreak well-prepared, but additional challenges loom on the horizon. Banks accumulated considerable capital and liquidity buffers, maintained low levels of nonperforming loans and robust profitability (Table 3). Banks' exposures and funding remain to a large extent domestic. The share of stable funding increased reflecting growth of retail deposits and longer-term securities. The COVID-19 outbreak was followed by a significant immediate increase in provisioning, a decline in profitability, and use of accumulated buffers. The Federal Reserve System's (Fed) actions supported credit flow to the real economy (Figure 3). In the short term, loan losses are likely to grow while bank profitability will be reduced,

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leading to a further decline in capital buffers. In the medium to long term, the growing competition for deposits, fee revenues, and payment services from fintech companies will pose challenges to banks' business models and call for increased investments into information technology (IT).

6. The authorities acted decisively to counter the immediate effects of the pandemic and safeguard financial stability. Recent money market volatility has been forcefully responded to, and U.S. authorities have taken prompt action to maintain orderly function in the securities and derivatives markets. The comprehensive set of measures by the Fed included cutting the Fed funds rate to close to zero, ensuring an ample supply of reserves through scaling up term and overnight repurchase agreements, encouraging depository institutions to use the discount window, and plans to purchase unlimited amounts of Treasuries and MBS. The Fed also announced facilities to further support the flow of credit to corporates and to the broader economy. The Coronavirus Aid, Relief, and Economic Security (CARES) Act provided almost 10 percent of GDP in tax, spending, and liquidity support measures.[3] Subsequent appropriations have boosted this support to about 15 percent of GDP, including measures for small businesses and hospitals. Nonetheless, the impact of COVID-19 has been far-reaching, with more than 30 million new unemployment insurance claims filed in the first six weeks of containment measures and a range of indicators pointing to an unprecedented contraction in output in the second quarter.

7. While the collapse in economic activity appears to have bottomed-out in May–June, there are sizable risks ahead. The principal risk a resurgence in the number of COVID-19 cases, which—in turn—could necessitate a renewed partial shutdown of the economy. Additional headwinds could come from potential fracturing of a range of employee-employer relations that will take time to repair, corporate bankruptcies, global supply chains disruptions, and tightening financial conditions. Large negative growth, earnings surprises, or an abrupt reversal of the partial recovery in financial market conditions also represent material risks. The most vulnerable segments include U.S. firms with high leverage, in particular those in the energy sector, small businesses, and workers relying on hourly pay to meet basic needs. Bouts of sell-off in risk markets, increased volatility and flight to quality make judgments on risk premia and financial assets valuations uncertain at the time of the completion of this report. Market valuations appear stretched across equity and corporate bond markets.[4] Markets remain vulnerable to a decompression of risk and term premia, which could potentially close debt markets to new issuance, trigger deleveraging and create broader volatility. A combination of monetary, fiscal and financial sector policies may continue to be needed to support stability of the financial system and to preserve soundness of financial institutions, especially if economic activity remains paralyzed for longer than anticipated.

[3] Under the CARES Act, US$500 billion was appropriated to the Treasury for purposes of making loans, loan guarantees and other investments, including to support facilities established by the Federal Reserve under section 13(3) of the Federal Reserve Act. The CARES Act funds levered with Federal Reserve lending facilities may result in substantially greater lending capacity—more than US$4 trillion–than the appropriated funds alone under the CARES Act.

[4] See Global Financial Stability Update, June 2020.

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Figure 2. United States: Corporate Borrowing and Household Mortgages

Average Leverage and Coverage Ratios on New Issue Leveraged Loans
(Multiple)

Sources: Worldscope; IMF staff calculations.

Leveraged loan Issuance by Leverage Multiple
(In percent)

Sources: S&P Leveraged Commentary & Data ; IMF staff calculations.

Household and Not-For-Profits Debt
(In percent of GDP)

Sources: Federal Reserve Board; Bureau of Economic Analysis; and IMF staff estimations.

Household Debt Service Ratio
(In percent of disposable income)

Sources: Federal Reserve; Haver Analytics; Bureau of Economic Analysis; and IMF staff estimates.

Mortgage Debt Across Income Distribution
(In percent of gross income)

Sources: PSID; and IMF staff estimates.

Consumer Credit Debt Ratio
(In percent of disposable income)

Sources: FRBNY Consumer Credit Panel/Equifax; Haver Analytics; Bureau of Economic Analysis; and IMF staff estimates.

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Figure 3. United States: Asset Valuations

S&P-500 Equity Price Index
(December 2007 = 100)

Sources: Standard & Poor's; and IMF staff estimations.

CBOE Market Volatility Index: VIX

Sources: Thomson Reuters Datastream; and IMF staff estimates.

Cyclically Adjusted Price-to-Earnings Ratio
(In percent)

Sources: Standard & Poor's; and IMF staff estimations.

House-Price-to-Income Ratio
(In percent)

Sources: Standard & Poor's; Bureau of Economic Analysis; and IMF staff estimates.

RISKS AND VULNERABILITIES

A. What Are the Key Macrofinancial Risks?

8. The financial system faces domestic and external risks (Risk Assessment Matrix, Appendix I). The key external risks are tighter financial conditions, structurally weak growth in major advanced economies, and a significant slowdown in global growth—including, in the near-term, through a larger-than expected impact from the COVID-19 virus outbreak. On the domestic front, there is a risk of a sharper-than-expected and more-prolonged slowdown and a significant deterioration in corporate earnings, particularly if financial conditions tighten again for an extended period. A deterioration in market sentiment (e.g., prompted by a widening public health crisis, policy surprises, trade or geopolitical tensions) could trigger risk-off events. While these risks would

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typically be considered as independent of one another, they may overlap in the present environment, potentially setting the stage for a perfect storm. These risks are further analyzed using an array of quantitative approaches. Risks that are addressed qualitatively by the FSAP include a failure of large globally significant U.S. FMIs,[5] which could trigger a major market dislocation because of their quasi-monopoly position in the market. Increasing reliance on outsourcing, shared services, and cloud computing across interconnected platforms increases the risk that a cybersecurity event could have severe negative consequences for the provision of financial services. Other important risks are related to potential dislocations from the transition away from LIBOR.

9. Financial vulnerabilities in the corporate sector and among nonbank financial firms can amplify the impact of shocks.

- Corporate vulnerabilities are of concern due to high debt burdens and weakened underwriting standards. Following a shock to earnings or availability of new financing, highly leveraged corporates may experience significant stress, leading to higher credit spreads, potential downgrades, inability to refinance debt, and defaults. As corporates de-lever and reduce costs, lay-offs would accelerate, consumer confidence may decline, and the shock could impact other segments of the economy. Much of this risk is distributed in the form of leveraged loans, private loans and CLOs, including to overseas bank and domestic nonbank investors. Covenant protections for investors have weakened and the credit quality of new loans has been deteriorating. Important data gaps exist, particularly regarding direct and indirect exposures to leveraged and private loans across financial sub-sectors.

- Financial institutions could suffer via direct and indirect exposures to the highly leveraged corporate and COVID-19 affected household sectors, resulting in credit losses. Enhanced management discretion resulting from weaker covenant protections for leveraged loan investors could imply delays in corporate restructurings and a subsequent economic recovery. Funding liquidity stress, asset liquidations, and mark-to-market losses are to a large extent contained at this stage by the recent actions of the FRB and other central banks around the world.

- A long period of very low rates has contributed to a buildup of vulnerabilities among investment funds, pension funds, and life insurers. Low yields promote an increase in portfolio similarities among some types of investment funds, which may amplify market selloffs in stressed conditions. Pension funds may need to satisfy contingent calls arising from illiquid investments, which could constrain their traditional role of stabilizing markets during periods of stress. Low yields and guarantees are a risk for life insurers under a low-yield environment, with the former driving an increase in riskier investments by some insurers.

[5] The U.S. authorities use the term Financial Market Utility (FMU), defined in Title VII of the DFA as any person that manages or operates a multilateral system for the purpose of transferring, clearing, or settling payment, securities or other financial transactions among financial institutions or between financial institutions and the person. FMUs, which do not include trade repositories, are generally referred to as FMIs outside of the United States.

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10. The COVID-19 crisis added stress for an already leveraged corporate sector. Corporates face the effects of recent financial market volatility, oil price shock, tightening in financing conditions and, for many, a collapse in sales. Corporate short-term liquidity needs are large, notably for the energy sector; but most of these are concentrated in investment-grade companies whose debt markets are supported by the Federal Reserve liquidity facilities—including the so-called "fallen angels" that have recently lost their investment grade status. However, with the potential of a protracted economic slowdown and behavioral changes induced by evolving social-distancing norms, the long-term sustainability of certain business models could be challenged. Solvency risks could materialize, leading to large credit losses. Energy sector, entertainment and leisure services, retail, and durable-goods manufacturers appear to be among the most vulnerable.

11. Corporate sector stress tests suggest that potential losses could be significant (Box 1). Stress tests suggest that leveraged firms—those firms with a debt-to-EBITDA ratio higher than 5—are likely to experience relatively large solvency and funding pressures, representing about three-quarters of all firms with negative equity under the baseline scenario. In such a situation, and despite the relatively small size of the leveraged loan market, these firms would account for a large share of the potential losses (over 80 percent of the US$400 billion in debt-related losses). In a more severe scenario, which assumes a second wave of infections toward the end of 2020 (c.f., FSAP *Sensitivity Scenario 3* below), losses from corporate debt could reach US$675 billion (US$465 billion related to leveraged firms). Although the losses are sizeable on aggregate, banks have limited direct exposure to these products.[6] Indirect exposures and market dislocations combined with liquidity shortages could amplify the stress.

B. How Resilient is the Financial System?[7]

12. The United States has a highly diversified financial system, which is the largest and among the most developed in the world, with deep and liquid core funding markets (Figures 4–6). In 2019, total assets of financial institutions surpassed US$100 trillion (around five times the GDP), while outstanding debt securities and stock market capitalization were more than twice the size of GDP, each. With an average daily turnover value in 2018 of US$208 billion,[8] U.S. equity markets are substantially larger than those of any other jurisdiction. Of the US$3 trillion interest rate derivatives traded daily globally, US$1.2 trillion is traded in the United States, more than in any other jurisdiction.[9] The United States has the world's largest single-country insurance market, with 28 percent of global direct premiums written in 2018. Exposure of foreign financial institutions

[6] Banks hold slightly less than 20 percent of outstanding corporate bonds and loans, representing roughly one-tenth of their own assets.

[7] This Section covers events after the conclusion of the FSAP on-site visits in early March 2020. The characterizations of the programs are based on public announcements by U.S. government agencies and, like the scenarios and analysis discussed in this section, do not reflect the same depth of discussions and information-gathering as the rest of the document.

[8] World Federation of Exchanges Annual Statistics Guide 2018, equity tables 1.1 and 1.6.

[9] Bank for International Settlements, OTC single currency interest rate derivatives turnover by country and instrument in April 2016, "net-gross" basis, daily averages, at https://stats.bis.org/statx/srs/table/d12.5?o=8:TO1

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Box 1. Corporate Sector Vulnerabilities

Business sector debt is at record highs relative to GDP. Following short-lived deleveraging after the GFC, nonfinancial business debt has risen rapidly, and now stands close to US$16 trillion (roughly 75 percent of GDP). Most of this relative increase is due to the U.S. corporate sector—with overall indebtedness close US$10 trillion currently having grown at an annual average of 5.4 percent since 2010—and the remaining accrued to noncorporate businesses, whose debt levels have grown on average by 4.2 percent, in line with the nominal GDP, over the past decade. Corporate debt consists of corporate bonds and commercial paper (US$6.5 trillion)—of which roughly 80 percent is investment grade and 20 percent is high yield—bank loans (US$1.5 trillion), leveraged loans (about US$1.2 trillion), and other debt.

Source: FRB Financial Stability Report (November 2019); Financial Accounts of the United States; and IMF staff calculations.

Exposures are concentrated in the nonbank financial institutions. Mutual funds have the largest direct exposure to the corporate sector (US$13.5 trillion, representing over 80 percent of their assets). Life insurers and pension funds also hold relatively sizeable amounts of corporate securities. Banks' exposures are more limited, accounting for less than 10 percent of assets, a large part (about 60 percent) is in the form of loans. Corporate exposures of closed-end funds are small in dollar terms, but significant relative to assets.

Source: Financial Accounts of the United States; Haver Analytics; and IMF staff calculations.

Vulnerabilities in riskier debt markets increased, most notably in the leveraged loan market. Leveraged loans are generally syndicated loans provided to highly leveraged firms (i.e., with high debt-to-EBITDA multiples), or with low credit ratings, and are mainly used for mergers and acquisitions (M&A), leveraged buyouts, recapitalization, or debt refinancing. The leveraged loan market has seen double digit growth in recent years, accompanied by weakening underwriting standards. The share of the "covenant-lite" loans has grown substantially over time. Lowering financial maintenance covenants may reduce the probability of liquidation bankruptcy, but in turn could delay corporate restructuring and reduce the recovery rate in case of default.

Securitization of corporate leverage through products such as Collateralized Loan Obligations (CLOs) has grown rapidly. Most CLOs are issued offshore (e.g., the Cayman Islands), with those onshore issued mainly in Delaware. CLOs hold more than half (about US$700 billion) of the total outstanding leveraged loans. CLOs themselves are held by a wide range of investors including domestic and foreign banks (US$200 billion), insurers (US$135 billion), and exchange traded funds (ETFs) and mutual funds (US$130 billion).[1]

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Box 1. Corporate Sector Vulnerabilities (continued)

The U.S. banks have a multi-faceted exposure to this market. Bank exposures include retained portions in the loan book, credit lines and revolving lines of credit (revolvers), and warehousing some of the products (subject to "pipeline risk"). The largest U.S. banks hold mostly higher quality (AAA-rated) CLO tranches in their investment books. Lower-rated tranches are mainly held by both domestic and foreign asset managers, insurers, hedge funds, and structured credit funds.[2]

Maturity mismatches on investors balance sheet could pose challenges in a situation of stress. An advantage of the CLO structure is that it provides some stability to market liquidity pressures. CLOs usually have a relatively long (two year) "no-call" period, during which securities issued are non-callable. Moreover, CLOs are not required to mark-to-market their assets (except on any amount exceeding the 7.5 percent threshold on holdings of CCC-rated assets), and early investor redemptions are generally not allowed. These features make them less vulnerable to runs, and CLOs can thus act as potential stabilizers in the market. In contrast, institutions with daily redemptions could face significant liquidity pressures in times of stress, triggering asset liquidations and mark-to-market losses.

Stress testing suggests sizeable potential losses, particularly among leveraged firms. The sample covered about 2,000 U.S. nonfinancial firms active in the corporate bond and leveraged loan markets, with total debt outstanding of about US$9 trillion. The tests were designed to assess corporates' solvency and funding risks using the FSAP stress test scenarios over the period 2020–25[3] Leveraged corporates appear to be more vulnerable in terms of profitability in the stress scenario and exhibit larger funding needs, making them more susceptible to solvency and funding pressures. Given the COVID-19 outbreak, the largest losses are concentrated in 2020. In the baseline scenario (corresponding to the *June 2020 WEO Update* projections), almost 5½ percent of the firms in the sample could fall into negative equity in 2020, with the majority the leveraged segment (accounting for 73 percent of all firms with negative equity in the stress scenario). In this scenario, the aggregate amount of outstanding debt of firms potentially in distress is about US$400 billion. More strikingly, if a scenario entailing a second wave of COVID-19 infection were to materialize, about 11 percent of the corporates in our sample would fall into negative equity, accounting for about US$675 billion of outstanding debt, and with an initial equity value of US$256 billion. These potential losses are substantial, although they remain broadly covered by existing financial sector buffers, particularly in the case of banks which have a moderate direct. However, the growing size of these risky credit markets—particularly when adding the high yield and private debt markets to the leveraged loan market—combined with potential losses stemming from other sectors in a downturn (e.g., households, noncorporate businesses) calls for close monitoring.

Indirect losses and potential market dislocations from corporate stress could widen depending on market liquidity conditions, particularly industries affected by the COVID-19 outbreak and collapse in oil prices. In the short term, corporates will face a shock to their liquidity position both from the uncertain market appetite for new issuance—particularly for lower rated credits—and from an expected collapse in revenues. The energy sector will face significant near-term challenges: it accounts for 10 percent of investment grade loans and bonds (10 percent of the debt service due in the remainder of 2020) and 5 percent of non-investment-grade liabilities (11 percent of debt service), with total outstanding debt is US$580 billion. Over the medium term, if rising spreads and corporate downgrades translate into system-wide asset liquidations under stress, then price impacts of fire sales and mark-to-market losses could reverberate through the system, leading to indirect losses even for the banks. Conversely, the availability of "dry powder" (e.g., from private equity investors) or structures with liability "lock-in" features could dampen potential contagion.

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Box 1. Corporate Sector Vulnerabilities (concluded)

Note:: the FSAP baseline scenario corresponds to the *June 2020 WEO Update* projections.

Source: IMF staff calculations.

[1] See Financial Stability Board report on "*Vulnerabilities associated with leveraged loans and collateralized loan obligations*", published on December 19, 2019.

[2] See Federal Reserve Board's "*Financial Stability Report,*" May 2019 edition.

[3] See Caceres, C., Cerdeiro, D.A., Pan, D., and Tambunlertchai, S., 2020, *"Stress Testing U.S. Leveraged Corporates,"* IMF Working Paper, 20/XX (forthcoming), for a detailed description of the methodology.

to U.S. rate, credit, and equity market risk is substantial, acting as an amplification channel of adverse U.S. shocks.

13. Nonbanks play a vital role in financial intermediation. Domestic financial intermediation is diversified, and the system is highly interconnected. Mutual funds hold around a sixth of the U.S corporate bond market and serve as a key source of funding for U.S. corporates and a major destination for U.S. household savings. The banking sector accounts for about 20 percent of overall financial system assets and—notwithstanding the presence of eight G-SIBs—is less concentrated

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than in other advanced economies.[10] FMIs are highly concentrated and very interdependent; their global systemic importance has grown as a result of post-crisis internationally agreed reforms. Eight systemically important FMIs, each dominating a particular market, are globally critical for U.S. dollar clearing, the clearing and settlement of U.S. Treasuries, and clearing of the exchange-traded or over-the-counter (OTC) derivatives (Figure 7).

14. The rapid expansion of nonbank mortgage lenders might lead to rising risks (Box 2). These companies have become prominent in the origination and servicing of residential mortgages. They are highly leveraged and rely on short-term funding, often from banks, to finance their operations, including pipeline, day-to-day expenses, and backstops for borrowers' delinquencies. Balance sheet funding needs are limited, however, by the fact that nonbank mortgage lenders do not hold mortgages themselves. Their rapid growth, limited coverage within a federal regulatory perimeter, low transparency and disclosure requirements, multifaceted operations, and complex interlinkages with the rest of the housing finance market could lead to significant risk buildups with consequences for other financial institutions and GSEs. Adequate regulation and supervision of these nonbanks is important to support macrofinancial stability and to protect taxpayers

15. In 2019, the authorities announced recommendations for GSE reform that would limit taxpayer risk and allow for private competitors to develop.[11] The GSEs (under federal conservatorship since 2008) have fostered the widespread availability of the 30-year fixed-rate mortgages which improve access to credit and mitigate interest rate risks to households. The roadmaps include recapitalization and tailoring government support; more stringent capital and liquidity regulation; expansion of credit risk transfer to private investors; a resolution framework requiring GSEs to maintain a minimum amount of bail-in-able loss-absorbing capacity (LAC); scaling back GSEs non-core operations; and raising competition by allowing the FHFA to charter private competitors to the GSEs while eliminating GSEs' exemptions from certain CFPB requirements—most notably the Qualified Mortgage (QM) patch.[12] The authorities' plans articulate a reasonable approach broadly consistent with past staff advice. The implementation timeline remains unclear.

16. Reforms should seek to mitigate risks of mortgage and MBS market dislocations. At roughly US$8.5 trillion (with average daily-trading volume over US$200 billion), the Agency MBS market is one of the largest and most liquid fixed-income markets with important role in banks' liquidity risk management. A reduction in the GSE's footprint may reduce intermediation for various

[10] G-SIBs account for about 57 percent of total banking sector assets and about 11 percent of total financial sector assets.

[11] The Treasury Housing Reform Plan https://home.treasury.gov/news/press-releases/sm769 and the Department of Housing and Urban Development plan https://www.hud.gov/press/press_releases_media_advisories/HUD_No_19_135

[12] The CFPB QM rule provides a compliance standard for assessing a consumer's ability to repay a mortgage loan. Under the temporary QM patch, loans eligible to be purchased or guaranteed by GSEs receive a presumption of compliance as a Qualified Mortgage. These loans are not required to meet the CFPB's General QM standard, including the maximum 43 percent debt-to-income limit. The CFPB announced in July 2019 that the QM patch would expire in January 2021 or after a short extension. On June 22, 2020, the CFPB proposed two rules pursuant to this July 2019 advanced notice of proposed rulemaking.

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Figure 4. United States: Large and Diversified Financial Sector

The U.S. financial sector is the largest among peers…

Size of Financial Sector Assets
(As of end-2019 or latest available)

Sources: Flow of Funds, Haver Analytic.

…including for banks, though not when scaled by GDP.

Size of Banking Sector Assets
(As of end-2019 or latest available)

Sources: FSI database, Haver analytic.

Financial intermediation is dominated by nonbanks…

Share of Financial Sector Assets
(In percent of total)

Source: FRB, Flow of Funds; Haver Analytics.

…while total financial system assets have levelled off.

Financial System Size and Internationalization
(In percent of GDP)

Sources: FRB, Flow of Funds; BIS

Financial sector assets grew sharply by end-2019, while the share of financial assets held by the nonresidents remained stable.

Financial Sector Asset Growth and the Share Held by the Rest of the World
(In percent)

Sources: FRB, Flow of Funds; Haver Analytics.

Financial intermediation is highly diversified.

Financial Sector Composition[1/]
(In percent of total)

Source: FRB, Flow of Funds; Haver Analytics.
1/ Data as of 2019:Q4. MMF stands for money market funds.

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Figure 5. United States: Bank Funding, Shadow Banks, and Markets

Number of Commercial Banks—FDIC Insured

Sources: FDIC.

Banks by Asset Size

(left scale = unit; right scale = billions of US$)

Sources: Flow of Funds.

Wholesale Funding: Commercial and Savings Banks

(left scale = billions of US$; right scale = in percent)

Sources: FDIC.

Shadow Banking System

(In percent of GDP)

Sources: Flow of Funds.

Domestic Market Capitalization: Selected Exchanges

(US$ billions; end-2018)

Source: World Federation of Exchanges Annual Statistics Guide 2018.

Mutual Funds Assets under Management

(US$ billions)

Sources: Flow of Funds, Refinitiv Datastream.

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Figure 6. United States: Cross-Sectoral Interconnectedness

Sources: FRB, Flow of Funds, and IMF staff calculations.

Note: A claims (color A) on B. Size of the link reflects the relative significance of claims; therefore, each sector shows both assets and liabilities. The numeric values refer to values in trillions of U.S. dollars based on levels in U.S. flow of funds as of 2018:Q4. Numeric values in black-colored fonts correspond to assets of the respective sector, while numeric values in pink-colored fonts corresponds to the area with liabilities coming into the sector.

Figure 7. United States: FMI Landscape

Source: IMF staff estimates.

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Box 2. Nonbank Mortgage Lenders[1]

Nonbank mortgage companies originate over half of residential mortgages, up from a quarter in 2007, and provide about half of mortgage servicing.[2] Quicken Loans is the largest, having originated some 6 percent of total home loans in 2018, followed by United Shore Financial Services LLC and LoanDepot LLC, with about 2 percent market share.[3] This compares to Wells Fargo Bank with a 3.2 percent and JP Morgan Chase Bank 2.3 percent market shares, respectively.

Activities in a typical mortgage loan process

- ***Origination***. Nonbank originators rely on short-term credit lines from warehouse lenders to extend mortgages. Mortgage originators seek to sell the mortgages on a timely basis to repay the credit lines.

- ***Distribution.*** Most of the loans are ultimately sold as securities guaranteed by GSEs and by Ginnie Mae ("agency MBS"), as the market for private-label residential MBS dried up post-GFC. Loans underlying these securities have to meet standards set by the GSEs and federal agencies that back loans in the Ginnie Mae pool. Ginnie Mae guarantees are explicitly backed by the government.

Basic structure of the non-bank mortgage market

- ***Servicing***. Servicers collect payments and forward them to tax authorities, insurers, and investors. These payments have to be made even if the loans are delinquent ("advances").

Multifaceted risks

Liquidity stress for servicers is a key risk. As borrower delinquencies increase, nonbank servicers will have to make advanced payments. Their liquidity buffers thus fall and their borrowing needs rise when financial conditions are tightening. Ginnie Mae servicers appear most vulnerable, these loans tend to have worse credit quality than GSE loans, and Ginnie Mae servicers generally cannot use the "advances" as funding collateral.

The ongoing COVID-19 pandemic is a real-time liquidity stress test for mortgage servicers. Mortgage servicers had been operating with low delinquency rates prior to the pandemic (0.65 percent for GSE loans, 1.92 percent for VA loans, and 3.47 percent for FHA loans in 2019).[4] Mortgages in forbearance increased rapidly with the onset of COVID-19, implying that advance payments by servicers are multiple times their "normal" amounts. The sharp tightening in financing conditions in markets without official interventions makes it harder for servicers to obtain bridge financing. Even though the Federal Housing Finance Agency (FHFA) has subsequently allowed the GSEs to provide relief, servicers still generally need to make payments in the initial four months following the forbearance on a single-family mortgage. Whereas FHFA provided a degree of certainty to servicers as to the duration of the servicing advance requirement, , Ginnie Mae opted to provide direct liquidity assistance to its servicers.

Share of Mortgage Loans in Forbearance following the COVID-19 Outbreak

Source: Mortgage Banker Association's Forbearance and Call Volume Survey.

Other risks include solvency and loss of market depth. Changes to the GSE regime could impact market depth. A slowdown in securitization could make it difficult for originators to repay the credit lines. Originators could incur valuation losses on unsold loans, and servicers losses in servicing delinquent loans. With the COVID-19 outbreak, some

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Box 2. Nonbank Mortgage Lenders (concluded)

loans entered in forbearance before being sold to the GSEs. Even though GSEs made an exception to temporarily purchase such loans, a haircut of 5–7 percent to the loan value will be applied, representing a loss for originators.

Macrofinancial exposures and implications of disruptions to nonbank mortgage firms

- ***Warehouse creditors***. Warehouse creditors (mostly large banks) could incur losses if originators fail to pay back the credit lines. Such potential losses are likely limited, as credit lines are secured by mortgages with a haircut. Moreover, the system's aggregate exposure to warehouse credit is relatively limited.[5]

- ***MBS investors***. Even though investors in GSEs and Ginnie Mae securities are protected from losses, they could potentially be affected if mortgage servicers do not function properly. This is exacerbated by the concentration of the servicing market. Non-agency MBS investors bear the entire credit risk on their holdings of non-guaranteed mortgage loans, including those originated by nonbanks which tend to have lower credit quality than bank loans.

- ***Shareholders of nonbank businesses***. Nonbank mortgage companies are typically organized as monolines but some are affiliated with other financial institutions (e.g., private equity firms). Some real estate investment trusts (REITs) hold mortgage-servicing rights. While shareholders serve as potential source of liquidity, they could be negatively impacted by loses of associated mortgage companies.

Widespread disruptions to nonbank mortgage firms could adversely impact broader housing market. Lower credit availability will likely affect Ginnie Mae's borrowers the most—nonbanks are currently originating about 90 percent of Ginnie Mae loans, most of which are to borrowers with lower credit score and lower income. Although a number of mitigators exist (e.g. loan-loss mitigation procedures and improved risk assessment practices by GSEs which will also benefit Ginnie Mae given their shared nonbank counterparties), a "moral hazard" risk remains important. Research found that the transfer of credit risk through the originate-to-distribute channel resulted in originations of inferior-quality mortgages, although securitized-loan quality has improved following the introduction of the Dodd-Frank Act.[6] Higher GSE losses could pose challenges to the reform plans.

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[1] This discussion excludes insurers.

[2] See "*Reengineering Nonbank Supervision*." Chapter three: Overview of Nonbank Mortgage, The Conference of State Bank Supervisors, September 2019.

[3] See "*Data Point: 2018 Mortgage Market Activity and Trends*", The Consumer Financial Protection Bureau, 2019.

[4] See "*Global Markets Analysis Report, April 2020*" by Ginnie Mae.

[5] Data on aggregate exposure are not available. Assuming that mortgage loans usually sit on the credit line for about 15 days, a total mortgage origination by nonbanks of about US$500 billion per annum would be backed by credit lines of about US$20 billion.

[6] See Purnanandam, A., 2011, *"Originate-to-Distribute Model and the Sub-Prime Mortgage Crisis,"* The Review of Financial Studies, Volume 4, Issue 6, Oxford University Press, June 2011.

mortgage-related products, if not offset by increased private participation. The increase in interest spreads on long-term fixed-rate mortgages is often seen as one of the most important potential impacts. Changes to the GSEs' underwriting standards and rules may result in less access for lower-income borrowers. Requirement that the GSEs maintain a nationwide presence and preclusion from holding mortgages in their own portfolio beyond the level needed to facilitate their securitizations would lower the GSEs' profitability, making it potentially harder to attract private capital.

17. Changes to the GSE framework could impact Private Mortgage Insurers (PMIs) whose financial strength significantly improved post-GFC. GSEs are required by statute to obtain credit enhancement on all purchased mortgages with a loan-to-value ratio greater than 80 percent. More than 98 percent of this enhancement constitutes insurance with PMIs. In 2015, the GSEs put in place

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Private Mortgage Insurer Eligibility Requirements (PMIERs)—further updated in 2018—which provide a comprehensive set of operational and risk-based financial requirements. PMIs must always meet PMIERs to be eligible to write mortgage guaranty insurance for mortgages acquired by the GSEs. PMIERs financial requirements are considerably stronger than the current minimum capital requirements by the states. Revised state requirements for PMIs are under development. When capital requirements for the GSEs are developed, further modification of PMIERs financial requirements would be necessary to avoid capital arbitrage.

Risk Analysis Approaches

18. Financial system resilience was assessed by analyzing solvency of banks and insurers; liquidity of banks, mutual funds (MFs), and money market funds (MMFs) under stress; and system interconnectedness (Figure 8, Appendices II–V). The FSAP approach recognizes high complexity and strong cross-sectoral linkages in the U.S. financial system, the relatively large number of G-SIBs, and the large number and size of MFs and insurers. Emphasis was put on the impact of delayed recovery from the COVID-19 outbreak and potential impact of additional containment measures due to a potential second wave of the pandemics. Parts of the analysis (interconnectedness, MFs) were finalized before the COVID-19 outbreak and focused on asset fire-sales, e.g., due to materialized risks in the corporate sector.[13] The COVID-19 shock has introduced a considerable uncertainty about future economic developments and may lead to structural breaks in consumer and corporate behaviors. A number of indicators are pointing to a possibility of a stronger output contraction in 2020 and an elevated level of unemployment remaining for longer. The stress testing results should therefore be interpreted with caution.

Figure 8. United States: FSAP Systemic Risk Assessment Framework

Source: IMF staff analysis.

[13] Further description of the models, methodologies, and stress test scenarios in the Technical Note on *Risk Analysis and Stress Testing the Financial Sector*.

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Scenarios

19. The following scenarios have been used for the stress tests (Figure 9):

- The FSAP *Baseline scenario* follows the *June 2020 WEO Update* projections.[14] It entails a sharp contraction (mainly in 2020:Q2) owing to containment measures in response to the COVID-19 outbreak, and subdued activity and reduced demand in sectors affected by social-distancing norms. This is then followed by a tepid economic recovery as the economy starts to open again, but private sector balance sheet deterioration—with the unemployment rate peaking at 13½ percent in 2020:Q2—combined with long-lasting behavioral changes, keeping GDP below its pre-crisis (i.e., 2019:Q4) level through end-2022. Asset prices face a commensurate short-term fall, and then recover back to their previous levels within two-year horizon.

- Three alternative sensitivity scenarios are also considered, which assume different length of containment and de facto mobility measures:

  (i) *Sensitivity Scenario 1*: relative to the baseline, this scenario assumes that the reduced de facto mobility observed during the containment period lasts for the entire second quarter of 2020. Output losses during this period are assumed to be 25 percent (non-annualized) relative to pre-COVID levels. In other words, the level of economic output in 2020:Q2 is equivalent to 75 percent of the pre-shock quarterly output level. This is then followed by a slower economic recovery relative to the baseline, hysteresis losses are assumed to be commensurately larger. The fall in financial asset prices is proportionately adjusted to the severity of the output losses embedded in the scenario.

  (ii) *Sensitivity Scenario 2*: this scenario follows the same logic as *Sensitivity Scenario 1*, but the containment measures and reduced mobility are assumed to last for another quarter. In other words, output levels in both 2020:Q2 and 2020:Q3 are only 75 percent of the pre-crisis level. This would lead to larger employment, income, and business losses, thus also translating into larger and longer-lasting economic "scarring" relative to the previous two scenarios.

  (iii) *Sensitivity Scenario 3*: initially, this scenario follows the same pattern as *Sensitivity Scenario 1*, but assumes another wave of increased infections followed by a new containment period in the first quarter of 2021. This leads to a "W-shaped" path of the level of output, triggering more economic and balance sheet losses for longer. Consequently, economic activity recovers even slower in this scenario in subsequent years.

20. Compared to historical patterns observed in previous economic crises, the economic losses in the FSAP scenarios are unprecedented, reflecting the unprecedented nature of the ongoing pandemic. The sharp real GDP contraction in 2020:Q2 in the *June 2020 WEO Update* is equivalent to 12 times the historical standard deviation of the quarterly GDP growth series recorded

[14] https://www.imf.org/en/Publications/WEO/Issues/2020/06/24/WEOUpdateJune2020 .

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since the end of WWII. This same variable's path corresponds to 17 standard deviations in the case of the adverse scenarios. The FSAP stress test scenarios of financial variables are adjusted proportionately to the severity of the output losses. This includes large shocks to corporate risk premia, stock market prices, and real estate prices (which tend to exhibit a more delayed response).

Figure 9. United States: Stress Test Scenarios

Delayed recovery leads to subdued activity ....

Real GDP Levels
(Index: 2019Q4=100)

... and more persistent unemployment

Unemployment Rate
(In percent)

House prices fall...

House Price Index
(Index; 2019Q4=100)

...following a contraction in the stock market

Stock Market Index
(Index; 2019Q4=100)

Risk premiums go up, especially for lower rated corporates....

BBB Corporate Spread
(In percent)

...despite policy rates expected to remain low for longer

Slope of the Yield Curve
(In percentage points; 10-year minus 3-month yield)

Sources: FRB, CCAR scenarios; Haver Analytics; IMF staff estimates.

Note: The FSAP Baseline Scenario refers to the *June 2020 WEO Update* projections.

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Banking Sector Resilience

21. The banking system entered COVID-19 crisis with sizeable capital buffers, though future capital depletion is subject to multiple sources of uncertainty, including duration and intensity of COVID-19 containment measures. Solid buffers allowed banks to extend credit lines to cash strapped corporates and households. Were the macroeconomic forecasts produced before the COVID-19 outbreak to materialize, banks would maintain high capital buffers and profitability. The uncertainty around the duration of the crisis required simulation of several adverse scenarios—complementing the already severe baseline—and utilization of ad hoc assumptions to analyze sensitivity of capital positions to different duration of containment, assumptions about payouts to shareholders, dynamics of non-interest expenses, and credit portfolio growth. The stress tests, however, were not able to fully incorporate the impact of various fiscal measures in the CARES package and the temporary postponement of loan repayments granted to banks' borrowers.

22. The FSAP corporate stress analysis and market data informed calibration of corporate and commercial real estate (CRE) loss rates. The corporate and commercial real estate loan portfolios were hit by an unprecedented shock of the containment measures, with expected losses far exceeding observed banks' loss rates during previous cyclical downturns. Further, historic commercial and industrial (C&I) loan loss data may not reflect the structural break related to the rapid growth of leveraged loans with few covenants in recent years. Thus, C&I loan losses follow the path derived from the above corporate sector stress test results. The potential loss rate from the C&I loans under the *Baseline scenario* reaches 11.2 percent and is four times higher than the rate observed during the GFC; losses under the *Adverse Sensitivity Scenario 1* reach 14.9 percent and are five times higher than those observed during the GFC. Projections of CRE loan losses are based on market sources, with the COVID-19 impact up to three times larger than the CRE loan losses in 2008–09.[15]

23. To gauge the sensitivity of the results to behavioral assumptions, the stress test considered two options for shareholder payouts. The main set of simulations involved an assumption that banks would continue shareholder payouts at historic average rates (i.e., at approximately 40 percent of net earnings, excluding share buybacks) and will reduce other expenses, while balance sheets will grow at the rate of up to 4 percent per year reflecting lower demand for credit compared to average growth rates of 7.5 percent recently. An alternative set of simulations assumed that banks would temporarily reduce shareholder payouts to zero for the duration of the crisis. Based on these assumptions and the four scenarios, eight simulations were performed in total.[16]

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[15] See Moody's report: *"Coronavirus (COVID-19): Credit Risk Impact on Commercial Real Estate Loan Portfolios."* https://www.moodysanalytics.com/-/media/article/2020/covid19-credit-risk-impact-cre.pdf

[16] The bank solvency stress test uses public data and the Capital and Loss Assessment under Stress Scenario (CLASS) top-down model developed by the Federal Reserve Bank of New York and augmented by the FSAP team.

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24. Capital depletion rates are high in the *Baseline scenario* yet remain manageable (Figure 10, Appendix VI provides sample grouping). The impact of COVID-19 plays out mainly via two channels: (i) immediate increase in credit losses, especially exposures to credit cards (losses of up to 3 percent of risk-weighted assets (RWAs)) and C&I loans (losses of up to 1.8 percent of RWAs); and (ii) growth of RWAs due to a utilization of credit and funding lines leading to an additional depletion of CET1 of up to 1 percentage point[17] Net interest income offsets the majority of losses, but declining margins resulting from low policy rates reduce pre-provision net revenue.[18] Policy rates have a small additional positive effect on funding costs but a significant negative one on loan interest rates. Cumulative five-year gross interest income goes down from 15.5 percent to 12.2 percent of total assets when compared to the pre-crisis level. This leads to a 360-basis point annual capital uplift from net interest income compared to 420 basis points (bps) estimated before the COVID-19 outbreak. If shareholder payouts remain at a historic level, up to four banks in the sample (none of which is one of the eight G-SIBs) would need additional capital to meet the 4.5 CET1 hurdle requirement within the three-year horizon, with aggregate recapitalization needs amounting to 0.4 percent of GDP. No G-SIB would fall below the 4.5 CET1 hurdle also over the five-year horizon, while a total of five non-GSIBs would require additional capital of about 0.8 percent of GDP in aggregate. If shareholder payouts were zero for the stress test horizon, only four non-GSIBs would need additional capital with the recapitalization needs falling to 0.6 percent of GDP over the five-year horizon.

25. Banks with a high share of retail funding, diversified asset portfolios, and high initial CET1 capital buffers are more resilient. G-SIBs[19] with diversified business lines fare well, with trading banks[20] experiencing a limited impact on their balance sheets, mainly due to prompt actions from the FRB setting up the lending facilities to stabilize market liquidity. Non-GSIBs[21] and some foreign-owned banks with considerable exposure to C&I loans, lower capital buffers, and large shareholder payout ratios are relatively more vulnerable to shocks. Non-GSIBs are primarily exposed to losses from unsecured lending to households (e.g., credit cards), secured loans (e.g., residential mortgages), and C&I loans, as well as commercial real estate lending. Some smaller non-GSIBs have high exposure to consumer lending, such as credit cards. Moreover, banks differ in terms of exposures to various sub-segments of consumer credit, with some banks having targeted lower-income households, which were particularly strongly hit by the crisis.

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[17] Assuming a system-wide expected utilization of 20 percent and a credit conversion factor of 50 percent.

[18] Non-interest expenses show high historic volatility stemming from large one-off litigation costs or operational risk events, adding to the overall model estimations uncertainty. These have been capped in the stress testing model.

[19] For the stress test purposes, G-SIB group includes four universal banks designated as G-SIB (Bank of America Corporation, Citigroup Inc., J.P. Morgan Chase & Co, and Wells Fargo & Company) and excludes the other four G-SIBs, which fall under the trading banks category due to the underlying business model.

[20] Trading banks group includes banks with a high share of trading-related income and trading assets, *inter alia* also four G-SIBs (Bank of New York Mellon, Goldman Sachs Group, Inc., Morgan Stanley, and State Street Corporation).

[21] This group includes large banks with consolidated total assets above US$100 billion, excluding U.S. G-SIBs and Intermediate Holding Companies. See Appendix VI.

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Figure 10. United States: Bank Solvency Stress Testing Results—IMF Baseline Scenario

Banks started with strong capital position to support further growth of balance sheets, but declining interest margins coupled with high credit losses could lead to four non-GSIBs falling below minimum requirements...

CET1 Ratio in Baseline Scenario

...G-SIBs have enough buffers to continue expanding loans yet the shareholder payouts at the current rates would reduce buffers going forward...

CET1-Ratio in Baseline Scenario- GSIBs

...as do trading banks, which have low exposure to consumer loans.

CET1 Ratio in Baseline Scenario - Trading Banks

Foreign banks fare relatively well, though some with significant retail exposures face a challenge...

CET1 Ratio in Baseline Scenario- Foreign Banks

...as do non-GSIBs, which started with lower levels of capital and profitability and have less diversified credit portfolios.

CET1 Ratio in Baseline Scenario- Non-GSIBs

Non interest expenses may be further optimized: cost optimization, lower shareholder payouts would help in preserving capital base.

Contributions to CET1 Base

(In billions of U.S. Dollars)

Sources: IMF staff estimates.

Note: See Appendix VI for bank grouping. The box plots illustrate the interquartile range through the orange rectangular shaped objects, while the wiskers denote upper and lower bounds (latter is set to zero). The Baseline Scenario assumes shareholder payouts at 40 percent.

26. A more prolonged economic disruption would lead to a further depletion of banks' capital buffers, yet no G-SIB falls below the minimum required CET1 level within the three years (Figure 11). Focusing on the three-year period, up to six banks (all of them non-GSIBs) would need additional capital in the *Adverse Sensitivity Scenario 1*, though capital gap would be small and amounts to 0.5 percent of GDP.

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Figure 11. United States: Bank Solvency Stress Testing Results—Adverse Sensitivity Scenario 1

Most of the banks would stay above 4.5 percent CET1 minimum within the first year of the scenario.

CET1 Ratio in Sensitivity Scenario 1

G-SIBS show greatest resilience due to the diversified nature of their business models and high initial capital buffers…

CET1-Ratio in Sensitivity Scenario 1- GSIBs

…while banks focused on market trading are hit less because of higher relative exposore to market and counterparty risks, which are not assumed to materialize due to monetary and market support measures.

CET1 Ratio in Sensitivity Scenario 1 - Trading Banks

Some foreign banks would need additional capital buffers, especially those exposed to consumer lending segment…

CET1 Ratio in Sensitivity Scenario 1 - Foreign Banks

…as would Non-GSIBs, especially those with lower initial capital bufers and higher expsoure to consumer and C&I loans

CET1 Ratio in Sensitivity Scenario 1- Non-GSIBs

Overall, credit cards, C&I loans are the largest contributors to credit risk…

Loan Losses
(In billions of US dollars)

Sources: IMF staff estimates.

Note: See Appendix VI for bank grouping. The box plots illustrate the interquartile range through the orange rectangular shaped objects, while the wiskers denote upper and lower bounds (latter is set to zero).

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27. Sensitivity analysis using different assumptions about duration of the current crisis and a hypothetical second infection wave indicates a range of impact on banks' capital positions. An additional quarter of lockdown in *Sensitivity Scenario 2* results in a system wide CET1 ratio falling on average by additional 90 bps (2022:Q2); up to eight non-GSIBs would need additional capital with the overall capital shortfall against the 4.5 percent CET1 hurdle of about 0.6 percent of GDP. In case of a second wave of infections and subsequent reactivation of full containment measures under *Sensitivity Scenario 3*, the CET1 declines by additional 450 bps in the third year compared to the *Baseline*. Overall, this would lead to 10 non-GSIBs failing to meet minimum CET1 hurdle within the first three years of the crisis with the aggregate capital shortfall of about 0.8 percent of GDP. The recapitalization needs would be on average 0.1 percentage point lower in the scenarios that assume that shareholder payouts are zero during the simulated crisis period.

28. Even under the adverse scenarios most of the banks earn enough interest income to offset credit risk-related losses, and non-interest expenses drive the overall impact on capitalization (Figure 12). U.S. banks have a track record of reducing operational expenses quickly by closing branches and reducing workforce and staff compensation. However, were the longer duration of stress to materialize, further growth of the loan portfolio in the adverse scenarios would require a higher share of earnings to be retained. This would also help banks to maintain staffing ensuring robust business continuity. In particular, by keeping shareholder payouts at zero for the duration of the crisis, banks would save an average of 60 bps of CET1 by 2022:Q2 in the *Baseline Scenario*.

Figure 12. United States: Solvency Stress Testing Results—Sensitivity to Assumptions about Shareholder Payouts

Systemwide CET1 ratio would remain above the 4.5 percent CET1 minimum within the stress test horizon…

CET1 Ratio—With Historic Level of Payouts
(In percent of risk-weighted assets)

…and retaining all earnings would help to conserve additional capital in case of an extended duration of the current pandemics.

CET1 Ratio—Without Payouts
(In percent of risk- weighted assets)

Source: IMF staff estimates
Note: In panel 1, payouts include forecasted dividend payouts but exclude share buybacks.

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29. Most of the banks would be able to maintain leverage ratios above the minimum requirement (Figure 13). Some trading banks designated as G-SIBs would face a challenge in maintaining a 6 percent supplementary leverage ratio without reducing the dividend payout ratio or asset growth.[22] Foreign banks and some non-GSIBs, which are not subject to the supplementary leveraged ratio rule, would need additional capital to remain within the minimum Tier 1 leverage ratio of 4 percent.

Figure 13. United States: Bank Solvency Stress Testing Results—Leverage Ratio

Sources: IMF staff estimates.

Note:The box plots illustrate the interquartile range through the orange rectangular-shaped objects, while the wiskers denote upper and lower bounds (latter is set to zero).

30. The potential impact of competition from fintech companies is relatively small for now (Figure 14). Applying assumptions derived from industry surveys and rating company reports, a sensitivity test leads to a 10-basis point decline in potential CET1 ratio.[23] The growing competition for deposits, fee revenues, and payment services from fintech companies will pose risks to banks' business models in the medium term, unless banks increase their spending on IT and innovative technologies. Non-GSIBs are the most vulnerable given their market share in deposits. The analysis

[22] The analysis did not take into account the temporary rule announced in April, which excludes U.S. Treasury securities and deposits at Federal Reserve Banks from the calculation of the supplementary leverage ratio and will be in effect until March 31, 2021. See https://www.federalreserve.gov/newsevents/pressreleases/bcreg20200401a.htm.

[23] See *Technical Note on Risk Analysis and Stress Testing the Financial Sector* for details on assumptions and methodology. The sensitivity analysis was performed using 2019:Q3 data.

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was conducted before COVID-19, and the impact of COVID-19 on digitalization of retail banking and pressures for cost cutting via closure of physical branches may accelerate further.

Figure 14. United States: Sensitivity Analysis—Impact of Fintech on Banks

Sources: IMF staff estimates.

Note: The box plots in the right panel illustrate the interquartile range through the red rectangular-shaped objects, while the wiskers denote upper and lower bounds. The horizontal black bars in the middle of the interquartile range denote the median.

31. Based on public disclosures, banks' liquidity risks appeared moderate at the crisis onset (Figure 15). The banks in the sample obtain more than half of their funding from domestic deposits. The COVID-19 crisis and market liquidity support by the FRB led to a significant (US$1 trillion) increase in bank deposits by households and corporates in 2020:Q1. Some foreign banks do depend on repo markets for their short-term funding and are thus more exposed to wholesale funding shocks. All banks held enough high-quality liquid assets (HQLA) to fund projected cash outflows for 30 days: average Liquidity Coverage Ratio (LCR) was 133 in 2019:Q3. Their total contractual 30-day funding gap was relatively modest, and mostly driven by off-balance sheet financing commitments. On-balance sheet inflows and outflows over a 30-day period constituted on average around half of banks' balance sheets. Off-balance sheet credit and liquidity facilities constituted another 25 percent of total assets. Most of these commitments are credit lines to corporations (revolvers) and households (credit cards, mortgages), and loans to other financial institutions—including mutual, investment, and hedge funds.

32. An increased utilization of credit and liquidity facilities could lead to a significant shortage of liquidity and a substantial decline in CET1 ratios (Figure 16). As evidenced in previous crises and during the COVID-19 stress period, nonfinancial corporates and households increase their utilization of bank facilities. If drawdowns exceeded 30 percent, many banks (including G-SIBs) would need additional liquidity to provide funding to distressed corporates and other

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Figure 15. United States: Bank Structural Liquidity Ratios

Domestic deposits are the largest funding source for banks.

The median LCR ratio has increased since 2018 and all banks have buffers above 100 percent…

*Data for 8 banks **Data for 17 banks; 2019 and onwards: data for 33 banks

…although non-GSIBs' LCR ratio is higher due to a 70 percent cap on outflows….

…and the highest average share of deposit funding among the peer groups of banks.

System-wide liquidity risk expsoure is modest: 30-day funding gap is close to 35 percent of total assets…

…with off-balance sheet funding and liquidity facilities being the key contributing factors among unsecured liabilities in the 30-day time horizon.

Sources: IMF staff estimates using public LCR and FR 9Y disclosure data.

Note: The box plots illustrate the interquartile range through the gray rectangular-shaped objects, while the wiskers denote upper and lower bounds. The yellow dots denote the mean.

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institutions in times of wholesale funding stress or adverse market conditions market.[24] Depending on the share of committed and uncommitted credit lines, assumed credit conversion factors—additional depletion of CET1 ratios due to the increase in RWAs—would be from 20 bps (minimum of 5 percent drawdown) to 250 bps if banks were to allow full drawdown of the lines. Failure to grant credit lines would lead to various non-linear feedback effects within the financial sector and further defaults of cash-strapped corporates. While post COVID-19 Fed actions helped to shore up liquidity, it is important that banks maintain high enough liquidity buffers and predictable access to central bank liquidity facilities going forward.

Figure 16. United States: Bank Liquidity Stress Testing Results

System-wide liquidity needs are small in case of increase in drawdowns on revolvers of up to 30 percent of utilization rates....

...with some non-GSIBS driving the overall impact due to assumptions about low expected drawdowns.

Sources: IMF staff estimates using public LCR and FR 9Y disclosure data.

Note: The box plots illustrate the interquartile range through the gray rectangular-shaped objects, while the wiskers denote upper and lower bounds. The yellow dots denote the mean.

33. Additional cash flow-based stress tests assessed funding and market liquidity risks in the network of U.S. G-SIBs.[25] The test focused on two scenarios: (i) the LCR-based shock scenario, which used LCR stress parameters but assumed more severe outflow rates on contingent liquidity items, such as credit and liquidity facilities, derivatives, and loss of rehypothecation rights; and (ii) the LCR-based shock scenario coupled with the assumption of a closure of repo markets (i.e., repos with MBS, agency and corporate securities not possible) and outflow rates on selected cash flow items the same as in scenario (i).

34. G-SIBs appear to have enough liquidity to withstand a severe LCR-like liquidity shock coupled with additional contingent liquidity and committed line outflows over a 1-, 5-, and 30-day horizon. Compared to the results of the analysis above conducted for 35 banks using public

[24] The test assumed that banks' inflows/outflows follow LCR rates, except for higher (standardized for all banks) utilization rates for credit and liquidity facilities. The full amount of HQLA without haircut is used to cover the gap. The test does not distinguish between committed/uncommitted lines.

[25] The analysis was performed by the FRB staff using IMF scenarios and models in March 2020, and it does not reflect the views of the U.S. regulators.

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LCR data (where a number of non-GSIBs were illiquid), the G-SIBs do not have a gap after HQLA asset sales and do not need to repo assets. The liquidity gap and impact on CET1 is thus zero across all scenarios and maturity horizons. There is also no further transmission of funding risk in the network due to counterparty exposures among the G-SIBs.

35. Closure of the repo market for non-Treasury securities would lead to a small and short-lived cash flow gap in several G-SIBs, but the system-wide impact from asset fire-sales is small. Unless daily asset trading volume exceeds five times the historic average, an immediate closure of the non-Treasury repo markets affects banks during the one-day to five-day horizons (Figure 17). The worst observed cash flow gap (before a bank needs to repo treasury securities) would be from 0.09 percent of total assets (one day) to 0.27 percent (one week). This gap is fully covered by other inflows on the 30-day horizon (i.e., no shortage of liquidity is observed). If affected banks liquidate assets in stressed markets, this would lead to an insignificant 9 bps decline of CET1 on average (because the assets liquidated are Treasury securities). No G-SIB would become technically illiquid and there would be no additional losses due to interconnectedness among G-SIBs. It is worth noting that in case of a complete closure of repo markets (i.e., including Treasury securities), affected banks would face higher asset liquidation needs, although the probability of such a scenario is very low. Withdrawal of funding from Federal Home Loan Banks (FHLB)—an important source of HQLA—would not lead to a cashflow gap.

36. Closure of repo markets may lead to illiquidity of a G-SIB when this severe shock is combined with an increased utilization of credit and liquidity facilities by other financial institutions or corporates. The stress test found one G-SIB illiquid, albeit under an assumption of very high outflow rates from the credit and liquidity facilities (40 percent and above) and only under a 30-day test horizon. Overall, the impact of an asset fire-sale, including repricing of remaining assets on affected G-SIBs balance sheets, is small with a similar decline in CET1 capital by 9 bps as in the previous case, and funding gap of only 7 bps of total assets in the worst-case scenario.

Mutual Fund Resilience

37. Given the market footprint of MFs, asset sales by managers could have a sizeable impact on market prices, thereby transmitting shocks to the financial system. FSAP liquidity tests examined funds' ability to meet severe-but-plausible redemption shocks and the extent to which funds can transmit shocks through asset sales. Using commercially available fund-level data on all U.S. fixed income and mixed MFs (2,734 funds with total net assets of US$6.4 trillion), potentially vulnerable funds were identified on the basis of historical redemption data and their ability to meet redemption shocks with highly liquid assets using assumptions about investor and manager behavior, and excluding managers' use of liquidity management tools. In this context, the price impact of asset sales under different liquidation strategies was considered. A sensitivity analysis of a small set of funds (10) with large derivatives exposures to foreign exchange and shocks to term premium was also conducted. Further, the potential for funds to transmit shocks in distress, including through fire sales that would affect other parts of the financial system, was assessed.

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Figure 17. United States: Liquidity and Asset Fire-Sales Scenario for U.S. G-SIBs

Impact of the closure of the repo market is small, and on its own will not lead to illiquidity of banks (one-week horizon is shown), especially if they can sell multiple amounts of liquid securities (five times average daily trading volume in the figure below means that the gap becomes zero).

Under the 30-day scenario, all G-SIBs would retain positive cash flow gap if outflow shock on credit facilities would remain below 40 percent.

CET1 capital impairment solely due to liquidation losses is around 4.5 basis points (bps)...

...while mark-to-market losses are around the same level, yielding a combined CET1 impact of 9 bps.

Sources: IMF calculations performed by the FRB staff in March 2020 based on FRB supervisory data.

38. While nearly all funds would be able to withstand severe redemptions in the FSAP stress test, high yield and loan MFs would face significant shortfalls. More than 90 percent of funds (measured by assets under management) would have enough highly liquid assets to meet investors' redemptions. However, funds exposed to high yield and leveraged loans would need to sell less-liquid securities in their portfolio (assuming that they do not use any liquidity risk management tools), potentially giving rise to fire-sale dynamics (Figure 18). These results remain valid whether shocks are calibrated based on historical data at the fund category level (homogeneity) or at the individual fund level (heterogeneity). Two behavioral scenarios of the asset

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sales were analyzed. Under the slicing approach—where funds sell securities in proportion of their weights in the portfolio—the price impact from MF sales ranges from 50 to 200 bps in normal times and between 150 and 700 bps during stress periods. In addition, funds with large exposures to derivatives could face significant liquidity demand stemming from variation margin. The illustrative analysis shows that a 1 percent depreciation of the U.S. dollar and a 50-basis point increase in the interest rates would prompt margin calls on the derivatives portfolio ranging between 3 and 10 percent of the net asset value (NAV).

39. When certain fund categories are in distress, other fund categories may be in distress at the same time. Such categories include investment-grade corporate, multi-strategy bond funds and to a lesser extent municipal bond funds, mixed funds and global funds (Figure 18). Emerging market bond funds may be likely to experience large outflows when other fund categories are in distress. Fund categories which are most exposed to liquidity risk under the FSAP analysis include high yield (HY), emerging market (EM), and loan funds are not systemic in the sense that when they are in distress other fund categories do not experience large outflows. This is partly due to substitution effects, whereby in periods of stress investors may move out of the HY, EM, and loan funds (which are a smaller share of the market) into safer government or investment-grade (IG) corporate bond funds.

Money Market Fund Resilience

40. As part of the 2014 MMF reform rules, the SEC requires MMFs to perform regular stress tests. MMFs using stable NAV must be able to maintain a mark-to-market NAV within 0.5 cent of US$1.00, i.e., the shadow NAV must not fluctuate by more than 0.5 percent.

41. Stress tests by the FSAP indicate that all MMFs using stable NAV would be able to withstand large interest rate and credit spread shocks. A sample of 208 MMFs, covering 95 percent of the universe were subject to 100-bps interest rate and credit spread shocks. Results show that the NAV of MMFs would not fluctuate more than 0.16 percent for the interest rate shock (well within the 0.5 percent allowable range) and no more than 0.27 percent for a combined 100-bps interest rate and spread shock. Very large shocks would be required for MMFs to “break the buck” (more than 350 bps). The stress tests did not asses the liquidity of MMFs, which do not use stable NAV (Institutional Prime MMFs). During the beginning of the COVID-19 outbreak in March 2020, Institutional Prime MMFs experienced very large outflows from investors (Figure 19). At the same time, Prime MMFs faced challenges in selling their assets due to strains in the short-term money markets. As a result of those combined asset and liability shocks, some Prime MMFs required sponsor support in March. Two sponsors purchased assets from the MMFs to ensure compliance with their daily and weekly liquidity requirements while allowing investors to redeem their shares. Following the FRB support to the commercial paper market and to MMFs, stress receded and prime MMFs saw inflows starting early April.

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Figure 18. United States: Mutual Funds Stress Tests Results

MFs have enough highly liquid assets, except HY and Loan funds.

Share of Funds with a Liquidity Shortfall

Note: Share of funds (by category) whose Redemption Coverage Ratio (highly liquid assets to redemption) is below one .
Sources: Morningstar, IMF staff.

Asset sales by MFs can have a sizeable impact on the market.

Price Impact of Asset Sales on Underlying Market

Note: Price impact of asset sales by liquidation strategy, in bps. The chart shows the impact of sales for each category of funds on its underlying market (EM bond fund sales impact on EM bond market etc.)
Sources: Morningstar, IMF staff.

Liquidity demands for MFs using derivatives can be large.

Variation Margins
(In percent of cash and cash equivalents)

Note: Variation margins in % of cash and cash equivalents as reported in B.2.f.
Sources: SEC form N-PORT IMF staff.

When IG and mixed MFs are in distress, other fund categories are also affected, while EM funds are particularly vulnerable.

Potential Flow Spillovers among Fund Categories

Note: Expected net flows conditional on distress in %.
Sources: Morningstar, IMF staff.
Negative values indicate outflows.

Insurance Sector Resilience

42. The FSAP used a broad range of scenario analyses, sensitivity tests, and exposure analyses to quantify insurance sector risks. The scenario for the top-down stress test built on the narrative and severity of the banking sector stress test, focusing more on market shocks, assumed to occur instantaneously. Additional sensitivity analyses included (i) prolonged low interest rates, (ii) higher lapse rates with liquidity outflows, (iii) the default of the largest banking counterparty, and (iv) a stock-take on carbon-intense assets. Publicly available data of 50 insurance groups and more granular investment data provided by the NAIC were used for the analysis.[26] The COVID-19 pandemic will impact the insurance industry primarily through the impact on investments and to a lesser extent through changing claims patterns (Box 3). At the time of this report finalization, these

[26] The test covered 21 life, 22 property & casualty, and 7 health insurers and was finalized in March 2020. Shocks were slightly adjusted to make them more operational for the insurance stress test and recalibrated to be meaningfully applicable at end-2018 when equity markets were temporarily depressed.

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do not invalidate stress testing conclusions. The stress test, however, does not include a scenario with major rating downgrades in the financial and corporate sector, which would increase insurers' capital requirements, especially when assets lose IG rating.

Figure 19. United States: Money Market Funds—Flows and Fed Facilities

Inflows into government MMFs were large after the shock...

Note: Net assets of Prime and Government and Treasury MMFs, in USD bn.

...and the Fed facilities served as an important market backstop.

Note: Holdings of Prime MMFs and MMFs repo with the Federal Reserve, in USD bn.

Source: SEC MMF Statistics, Form N-MFP Data, filings through April 13, 2020.

43. In the adverse scenario, some life insurers would face a significant statutory capital reduction in the adverse scenario, but the current valuation and capital framework largely mitigates the impact (Figure 20). The aggregated loss in capital of US$226 billion equates to a 31 percent reduction (3.9 percent of consolidated balance sheet assets), mostly driven by shocks to non-IG corporate bonds, stocks, and other investment assets. In the life sector, aggregated capital declines by US$74.3 billion (-35.7 percent), in P&C by US$149.8 billion (-32 percent), and in the health sector by only US$1.4 billion (-2.8 percent). Unlike in a fully market-consistent valuation, sizable parts of the balance sheet are not sensitive to market price fluctuations. The absence of a consolidated group capital framework complicates estimating the stress impact. Nonetheless, as solvency ratios of U.S. solo companies tended to be well above regulatory thresholds, it can be expected that even in this adverse scenario the vast majority would still continue to meet capital requirements based on the current calibration of risk-based solvency regime.[27]

A few life insurers would need to liquidate sizable parts of their bond portfolio to meet cash outflows after a large increase of lapse rates. Assuming a sharp interest rate hike, policyholders would be incentivized to terminate those policies that can be terminated at book value or those with

[27] At end-2018, about 94 percent of U.S. life insurers (at the solo level) had an RBC coverage of more than 200 percent, i.e., they could withstand a 50 percent decline of capital without violating the regulatory threshold. Those life insurers which had a decline of more than 50 percent of their available capital in the FSAP stress test reported an RBC coverage (at the level of the largest solo entity) well above 300 percent.

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Box 3. COVID-19 Impact on the Insurance Industry

The insurance sector is affected by the pandemic mainly through higher claims, operational challenges, and lower investment returns. Claims will be made under various types of household and commercial insurance. Revenues are expected to decline, at least temporarily, as the demand for insurance coverage declines. Changes in operating conditions and new processes to facilitate remote interactions with clients and business partners increase costs. The risk of fraudulent claims increases when economic conditions deteriorate. All insurers face investment losses as a result of stock market declines, bond defaults, and spread increases; while lower interest rates weigh heavily on life insurers with return guarantees. Equity exposures are material, but a substantial share of market-value changes is directly passed on to policyholders through investment-linked products. As the duration of the liabilities is generally longer than the assets, reinvestment risk has increased. Bond downgrades to non-investment grade would have substantial impact due to the requirement for capitalization of higher risk exposures. Finally, insurers are generally more liquid than their liabilities require, but some may face liquidity pressures if product cancellations and surrenders increase sharply while new business and renewals decline.

Life insurance

Beneficiaries on life insurance policies with a death coverage will submit claims on those policies, while annuity providers might experience reduced payouts given higher mortality rates. Excess mortality is covered by reinsurance to a large degree, mostly with reinsurers outside the United States.[1] One global reinsurer has indicated that its exposure to COVID-19 life and health insurance claims, even under a very severe 1-in-200 years scenario, is similar in scope to a medium-sized natural catastrophe. Mortality increases might appear to be an immediate financial gain for annuity providers, but many of these products have guarantees that effectively reduced any perceived benefit for the insurer. Lower investment returns are a significant negative for life insurers, both in terms of reinvestment risks and the difficulty to earn a guaranteed rate of return.

Health insurance

Health insurers face higher costs and claims as policyholders may require testing, more medical care, and hospitalizations. An increase in unemployment will affect the level of uninsured health expenses. Under the Affordable Care Act (ACA), consumers who lose their coverage or become eligible for subsidies due to loss of income are able to enroll in coverage on the ACA Exchange and most state-based Exchanges have created special enrollment periods to facilitate coverage. COVID-19 testing, hospitalizations, and premium grace periods have impacted insurer costs and incomes. At the same time, delays in other, non-emergency care have significantly reduced insurer spending in the first part of 2020, and many are looking at, and some have announced, premium holidays.

The Families First Act and the CARES Act, complementing the ACA, require insurers to waive all cost-sharing, including deductibles, for medical services provided to people with any type of private health coverage related to medically necessary COVID-19 testing and associated visits. In addition, any preventive services, which include any future vaccine, must be covered by the principle of no cost-sharing. The new Act also enables states to provide free coverage for coronavirus testing for uninsured residents. However, the Act does not impose any federal requirement to waive cost-sharing for COVID-19 related medical treatments, and thus individuals may be subjected to significant out-of-pocket costs.

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Box 3. COVID-19 Impact on the Insurance Industry (concluded)

Property & casualty (P&C) insurance

Most business interruption clauses included in commercial property insurance policies are only triggered in case of physical damage to the property of the policyholder due to a covered peril. There are differing views on whether the contamination of a property by a virus would be considered physical damage. Policies that more generally provide coverage for business interruption due to physical damage or loss of use may be more likely to be determined to provide coverage of pandemic-related business interruption losses. Many commercial policies apply exclusions that could apply to a viral contamination such as COVID-19. For example, the standard Insurance Services Office commercial property policy used in the United States applies an exclusion for "loss or damage caused by or resulting from any virus, bacterium, or other microorganism that induces or is capable of inducing physical distress, illness, or disease." Yet it is unclear how many commercial policies do have such a clear inclusion or exclusion.

Major legal and regulatory risks may emerge. For example, in New Jersey, a legislative proposal has been put forward to require that all commercial property policies providing coverage for business interruption or loss of use of property also provide coverage for interruption resulting from COVID-19. As proposed, insurers that incur claims as a result of this legislation could seek reimbursement from the Commissioner of Banking and Insurance, who would then recover those costs from all insurers writing business in New Jersey. While this legislation is on hold at the time of this report's finalization, similar legislation has been introduced in Ohio and Massachusetts. At the federal level, a group of members of the House of Representatives has requested insurers to consider retroactively covering financial losses from COVID-19 under business-interruption coverage provided in commercial policies, suggesting that containment measures should be considered as civil authority orders that trigger coverage. The NAIC has written to Congress noting that such a measure would result in substantial solvency risks for P&C insurers and significantly undermine the ability of insurers to pay other types of claims.[2]

Travel insurance is affected through coverage of medical treatments and trip cancellation. The overall industry exposure to trip cancellation claims is not significant relative to other lines of business. Some insurers have changed the terms of travel insurance policies or stopped selling new travel insurance policies. For existing policies, medical treatment during travel would be covered in most cases, unless a travel advisory was in place. Insurance coverage for trip cancellation will usually only reimburse expenses after all attempts for refunds have been exhausted and only when there are no official advisories against travel at the time of booking.

Claims can arise from liability insurance, including workers compensation. Employees may claim compensation for lost wages and medical expenses if they believe they were infected at workplace, which could invoke coverage under workers compensation insurance. They could also make claims for distress, bodily injury, discrimination, or financial losses due to isolation that could potentially be covered by employment practices liability insurance. For businesses whose premises are accessible to the public or to their customers, claims could be made in case of infections provided a proof of negligence regarding the spread of the virus is obtained.

Motor insurance is contributing to an overall resilience of the P&C sector. Individual traffic has declined as a result of public health measures and lower economic activity results in reduced commercial road use. In the longer term, however, it is likely that renewals will reset, and underwritten volumes will shrink.

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[1] The market for life reinsurance is highly concentrated both globally and in the United States, with the largest five reinsurers having a market share of about 90 percent in the United States—of these five companies, four are part of European groups, and one is a domestic group. See Munich Re, 2018 Life Reinsurance Survey Results.

[2] See https://content.naic.org/article/statement_naic_statement_congressional_action_relating_covid_19.htm.

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a flat surrender charge.[28] About one-third of the life insurers would be able to meet the outflow simply by selling parts of their (highly liquid) U.S. Treasury bonds. Up to six companies would ultimately also have to liquidate corporate bonds, which might be subject to temporarily restricted liquidity, allowing large-scale sales only at a discount. The total amount of U.S. Treasury bond sales in the four scenarios ranges from US$23–33 billion, while for U.S. GSEs and corporate bonds the ranges are US$13–15 billion and from US$4–11 billion, respectively.

44. With continued low interest rates, net investment spreads in the life sector are expected to decline further (Figure 21 panel 1). Average credited rates would decline, as new business would be issued with lower contractually guaranteed interest rates. Projecting investment yields assumes that the recent downward trend will flatten out in the future, when fixed-income instruments with higher coupons would have already expired. With about 7 percent of bond investments to be rolled over every year, the net portfolio yield still declines, likely at a slightly higher pace than the guaranteed interest rate. By 2021, the net investment spread could therefore drop below 1 percent, adding further pressure on life insurers' profitability.

45. If the largest banking counterparty defaults, the vast majority of insurers would experience a limited capital impact (Figure 21 panel 2). The median life company would lose 1.2 percent of its capital, and half of the sector's firms range between 0.8 percent and 1.8 percent. In the P&C and health sector, concentration towards the largest banking counterparty is even lower, but outliers exist, in particular when an insurer holds a participation in a large bank.

46. Large, diversified P&C insurers are relatively resilient to natural disasters, even of a larger scale, but smaller and more concentrated P&C companies would be severely affected by major hurricanes (Figures 21, panels 3 and 4). A single event, expected to occur every 50 years, reduces capital of large firms by 8.1 percent—including reinsurance recoverables, the reduction is only 3.9 percent. For hurricanes with an occurrence expected every 500 years, capital (after reinsurance) declines by 8.6 percent, and drops below the regulatory minimum for 18 out of 538 insurers. Smaller local insurers rely more on reinsurance for less severe hurricanes than larger firms, mitigating the impact significantly. However, excessive costs seem to prevent small firms from buying the same level of reinsurance coverage for more remote events. In a 1-in-500 years event, their aggregated capital declines by 164 percent—14 companies would record a capital shortfall. The impact on policyholders is however mitigated through various protection schemes.

47. Carbon-intense assets in a narrow sense do not represent a major asset class. Narrowly focusing on oil, gas, and mining companies, the exposure amounts to 3.5 percent of all corporate bond holdings and 1.6 percent of the equity portfolio. Together, the identified investments account for 1.1 percent of the sample's total balance sheet assets. Notwithstanding these small direct-exposure amounts, transition risks could also arise for other exposures, e.g., transport or heavy industries, which were not included in this analysis. Similar to other countries, mortgage loan or MBS collateral in areas becoming more frequently hit by windstorms, floods, or wildfires could be

[28] The upward interest rate shock is one of possible triggers for increased lapses. Similarly, higher lapse rates might be observed in a recession when household income and wealth declines as it happened in 2009.

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repriced by investors, acknowledging underlying long-term physical risks. The same might apply to debt issued by municipalities and utility providers in affected regions.

Figure 20. United States: Insurance Stress Test Results

Statutory capital of the median life company declines by 32 percent, and by 19 percent for the median non-life insurer.

Reduction in Statutory Capital
(In percent)

Health insurers are barely affected by market shocks, while results in the other sectors are very heterogenous.

Reduction in Statutory Capital
(In percent)

In the life sector, the shock to other investment assets (Schedule BA) contributes most to the overall reduction in capital, while in the non-life sector, lower stock prices are more relevant (though aggregates are driven by very few larger companies while many non-life companies hold only few stocks).

Aggregated Contribution of Individual Shocks
(In percent)

Source: IMF staff calculations based on NAIC data.

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Figure 21. United States: Insurance—Sensitivity Analyses

(a) Net investment spreads have been rather steadily declining since 2007 and will, assuming persistent low rates, continue to weigh on profitability.

Net Investment Spread
(Net portfolio yield over guaranteed rate)

(b) For the vast majority of insurers, the default of the largest banking counterparty has only a minor direct impact on capital, but outliers exist.

Reduction in Statutory Capital
(In percent)

(c) Claims stemming from a 1-in-500 years hurricane would reduce capital of large and diversified insurers by 9 percent (net, after reinsurance)...

Impact on available capital:
Large, diversified insurers
(In percent)

...while (d) for small and concentrated insurers, the same event would trigger claims equating 164 percent of statutory capital.

Impact on available capital:
Small, concentrated insurers
(In percent)

Source: IMF staff calculations based on NAIC data.

C. What Are the Financial Stability Implications of Interconnectedness?

Domestic Interconnectedness

48. The high degree of interconnectedness implies a considerable potential for shocks to reverberate through the financial system. Both banks and nonbanks have sizeable direct exposures to households and corporates (Figure 22). Nonbanks intermediate twice as much credit to

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the real economy than depository institutions. Intra-financial system interconnectedness is also significant with linkages between banks and nonbanks, amounting to over 30 percent of their assets. In addition, these sectors are indirectly interconnected through common exposures to asset classes such as corporate bonds, equities, agency, and Treasury securities markets.[29] Common exposure to asset classes could amplify risk transmission. Moreover, the banking sector has off-balance sheet exposures similar in size to the overall balance sheet. Unused commitments such as credit lines amount to about 40 percent of the aggregate balance sheet of the bank sample. In case of severe corporate stress, these may be drawn down, exacerbating other simultaneous pressures.[30]

Figure 22. United States: Macrofinancial Linkages

Source: U.S. Flow of Funds; IMF staff analyses.

Note: Node size reflects the intra-sectoral flow of funds. Edge color denotes assets of the sector with the same colored node vis-à-vis the other sector (i.e., liabilities and equities of the other sector)

49. Direct funding and credit contagion among G-SIBs is small, however, and a failure of one G-SIB would not lead to direct default of another one. The interconnectedness modelling exercise performed by the FRB staff using IMF scenarios and models assessed the propagation of idiosyncratic and systemic shocks through the network of U.S. G-SIBs, linking solvency and liquidity risks (Figure 23). The analysis considered unsecured, secured (repos/reverse repos, swaps, etc.), and contingent (derivatives, CDS contracts) exposures among the six largest G-SIBs. While the closure of

[29] For example, banks, insurers, pension funds, money market and mutual funds hold about US$4–7 trillion in debt securities each.

[30] Revolver drawdowns reported in 8-k filings between March to mid-April 2020 surpassed US$200 billion.

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non-Treasury repo markets coupled with severe scenario parameters would lead to one G-SIB becoming illiquid over 30-day horizon, even in this extreme case the asset fire-sale impact on remaining banks in the network is rather limited: the decline in CET1 would be 25 bps, depending on asset liquidation strategies banks would choose (Figure 24).[31]

Figure 23. United States: Enhanced Interconnectedness Analysis—Solvency and Liquidity Risk Linkages

Source: IMF staff analysis.

Note: The analysis is based on two stages. First stage—funding liquidity risk based on cash flow data (paragraphs 25–28 of this report); second stage—network contagion model. The first stage simulates conditions under which a bank would be illiquid or insolvent under severe yet plausible funding shocks; in the second stage a bank which fails the first stage (illiquid because of revaluation of its assets using fire-sale prices) does not meet its contractual obligations to the other banks in the network.

50. Complementary analysis of a corporate sector shock shows that it would reverberate through the financial system with non-negligible impact, particularly for nonbanks. The shock was calibrated based on the FSAP corporate stress tests, and the linkages were analyzed using balance sheet data. Although significant, potential losses appear to be manageable for the banking system, in large part owing to banks' limited direct exposure to the corporate sector. For the short-term market sentiment shock lasting for one month, liquidation losses for mutual funds amount to about US$0.9 billion (about 1 percent of the original value of the total assets sold). For banks, the resulting mark-to-market losses are close to US$10.8 billion (roughly equivalent to 0.06 percent of assets). This would reduce banks CET1 ratio by about 0.1 percentage points. In the case of insurance

[31] The test used two strategies: waterfall when banks liquidate most liquid assets first, and slicing when banks liquidate proportional amount of each type of security.

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Figure 24. Liquidity and Asset Sales Scenario Propagation in the U.S. G-SIBs Network

The impact of asset sales on CET1 would be 9 basis points (bps) for affected banks if they use proportional liquidation approach to sales (slicing)...

...the network contagion and fire-sales impact would be higher under waterfall liquidation strategy (i.e., liquidate most liquid assets first), albeit no bank would be insolvent and final impact would be 25 bps of CET1 loss.

Sources: IMF calculations performed by the FRB in March 2020 based on FRB supervisory data.

companies, these may roughly translate into losses at about 1 percent of insurance sector total assets. In case of a systemic credit risk-related stress (which leads to an increase of default rates of leveraged corporates of up to 6 percent), banks would face US$230 billion losses on commercial and industrial loans and CLO holdings (assuming that banks would be providing at least part of their US$760 billion committed lines to corporates). Ten non-GSIBs would fall below the CET1 hurdle rate of 4.5 percent. Insurance sector will be hit by about US$300 billion in losses, at the same time they do not have to mark these to market given the existing regulatory treatment.

Cross-Border Interconnectedness

51. Although U.S. banks hold nearly a quarter of their claims against foreign borrowers, they are a larger source of outward spillovers than the rest of the world is for inward spillovers to them.[32] Under the very conservative but illustrative assumption that all claims are unsecured and the loss-given default is at 100 percent, comparable foreign shocks would result in U.S. bank losses amounting to 2–8 percent of system-wide capital, while foreign banking systems would suffer losses of 10–40 percent of capital (Figure 25).[33] Contagion from the U.S. to foreign

[32] These conclusions are based on an analysis using the model in Espinosa-Vega, M. A., and Sole, J., 2010, "Cross-Border Financial Surveillance: A Network Perspective," IMF Working Paper 10/105, International Monetary Fund.

[33] The analysis covered (1) exposures capturing the role of financial intermediation by financial centers; (2) exposures in the presence of foreign subsidiaries and branches, for instance, owing to dollar funding activities by foreign banks; and (3) consolidated exposures capturing claims and liabilities of domestically incorporated banks. Under a different assumption where the loss-given default is 50 percent, the inward spillovers to the U.S. banking system is between 1–3 percent, while the contagion into other banking systems is 5–15 percent of initial regulatory capital.

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banking systems is partially driven by the fact that nearly half of global cross-border claims are denominated in U.S. dollars. In systemic stress episodes with fragilities in dollar funding markets, lending in U.S. dollars by foreign banks could become a shock-propagation mechanism. A market-based spillover analysis based on equity return movements confirms that U.S. G-SIBs are the largest potential source of spillovers to large global financial sector entities, followed by the foreign G-SIBs.[34]

Figure 25. Average Spillovers between U.S. Banking System and Foreign Banking Systems

(In percent of initial capital of spillover recipient)

Sources: BIS; IMF, IFS; IMF staff estimates.

Note: Consolidated data covers exposures between U.S.-owned banks and foreign-owned banks excluding intra-group positions. Unconsolidated nationality basis data covers exposures between U.S.-owned banks and foreign-owned banks including intra-group positions. Unconsolidated residency basis data covers exposures between U.S.-domiciled banks and foreign-domiciled banks including intra-group positions.

D. Funding Market Fragility: Are there Systemic Liquidity Concerns?

52. While usually highly liquid, indicators of money market resilience showed signs of decline from 2017, with shocks causing sharp spikes in rates in September 2019 and March 2020. Financial institutions mainly use the very large and generally resilient repo market rather than other money market segments, such as the much smaller Fed funds market, for liquidity management and funding (Figure 26, top-left panel). The Fed's balance sheet normalization during 2015–19 reduced the supply of Fed reserves (Figure 26, top-right panel) and started to more obviously impact money markets from early 2017.[35] The level and volatility of short-term interest rates drifted up relative to the Fed's target range and become more sensitive to changes in reserve

[34] The analysis is based on Diebold, F.X. and Yilmaz, K., 2014, "On the Network Topology of Variance Decompositions: Measuring the Connectedness of Financial Firms," Journal of Econometrics, 182, pp. 119–134.

[35] The FRB announced plans to implement monetary policy with an ample supply of reserves, without conducting regular OMOs. See https://www.federalreserve.gov/monetarypolicy/policy-normalization.htm. From mid-2017, the FRB began tapering its reinvestments in maturing securities and, in March 2019, it announced that the reduction in the balance sheet would be completed in September 2019.

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Figure 26. United States: Systemic Liquidity Developments

Repo markets are the center of money market activity…

Traded volumes in key money market segments (2019 daily average, USD billions)

Sources: Federal Reserve Bank of New York, SIFMA

…markets tightened as the Fed balance sheet reduced.

SOFR, GCF Repo, Fed Funds Rates (Percent, USD billions)

Sources: Federal Reserve Bank of New York, DTCC

The liquidity demand curve has steepened.

Fed Funds Effective less IOER vs. Reserve Balances (Percent, USD millions)

Sources: Federal Reserve Bank of New York, IMF Staff calculations

The Fed's response to extreme volatility was forceful…

Federal Reserve treasury bill holdings and repos outstanding
(USD bilions)

Sources: Federal Reserve Bank of New York, IMF Staff calculations

…and extremely effective in quelling pressures.

5. Distribution of intraday repo market trading versus approximate volumes traded above the Federal funds target range
(Percent, USD billions)

Sources: Federal Reserve Bank of New York, IMF Staff calculations

Market reliance on LIBOR is very high.

Volumes of Instruments Tied to USD LIBOR (USD trillions, end 2016)

Sources: ARRC Second Report, 2018

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supply (Figure 26, middle-right panel). Interest rates spiked sharply in September 2019, and even more significant disruption occurred in March 2020 as the COVID-19 crisis unfolded.

53. Since late 2019, the Fed shifted to actively managing reserves, scaling up liquidity provision which effectively quelled market pressures. The Fed shifted quickly from passive to active liquidity management and boosted reserves from September 2019 (Figure 26, top-right panel), while regular Open Market Operations (OMOs) resumed after a long hiatus (Figure 26, middle-right panel). Major disruption following the COVID-19 outbreak prompted a broad and far-reaching Fed response that eventually settled markets.[36]

54. The period of decreased reserve availability exposed structural money market rigidities. Quantitative easing and associated ample reserves underpinned money market liquidity post-GFC with banks opting to comply with tighter liquidity regulation through higher levels of reserves, while also substantially upgrading liquidity risk management frameworks. Banks have become more conservative and reluctant to rely on the Fed's liquidity backstops in their liquidity planning and are working harder to optimize balance sheets to boost returns. These desirable changes came hand in hand with increased cost of intermediation, reduced incentives for banks to take advantage of arbitrage opportunities and decreased bank flexibility when shocks hit markets. Market resilience has thus declined. Separating individual contributions to this complex nexus of factors is difficult, but available estimates suggest that a steady state G-SIB demand for reserves is now significant.[37]

55. The Fed could help rebuild market resilience by adjusting its ample reserves operational framework and improving access to liquidity backstops once the crisis abates:

- *Regular OMOs should continue and the operating target should be adjusted to help provide greater liquidity certainty*. This could help reduce the demand for reserves and flatten the slope of the demand curve while still retaining ample reserves. Adjusting the operating target to encompass repo rates would help reduce uncertainty on the FRB's reaction function when pressures build. The ample reserves framework supports the resiliency of the money markets and should be retained.

- *Banking regulators should encourage banks to explicitly allow for use of the Discount Window in their short-term liquidity planning to monetize U.S. Treasury securities*. Banks could be given guidance to incorporate Discount Window use for monetizing U.S. Treasury securities holdings

[36] Crisis Preparedness and Management, Section C below, provides more detail on the COVID-19 response.

[37] For example, see Bush et al. (2019) https://libertystreeteconomics.newyorkfed.org/2019/02/stressed-outflows-and-the-supply-of-central-bank-reserves.html, which estimated Day 1 stressed liquidity outflows of the U.S. G-SIBs to be in the order of US$587–934 billion—much of which would need to be covered by cash holdings given the challenges of liquidating a large volume of other HQLA within one day.

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in their liquidity planning.[38] This approach is consistent with international standards[39] and that taken by other major central banks (e.g., the Bank of England[40] and the Bank of Canada). It would encourage G-SIBs to include in their liquidity plans access to the Fed's liquidity facilities for meeting regulatory requirements for intra-day liquidity needs or during resolution, thereby reducing incentives for cash hoarding and increasing incentives for large banks to make liquidity available to the wider nonbank market.

- *Adjusting the price of primary credit or implementing a standing repo facility could help reduce Discount Window stigma and boost market resilience*. Continuing to offer Primary Credit at a price closer to normal market rates than prior to March 2020 may help reduce Discount Window stigma. Alternatively, a standing repo facility, similar to the Primary Dealer Credit Facility, but perhaps limited to Treasury securities, could be considered if there is ongoing reluctance to access Primary Credit. There are, however, a number of significant design challenges with such a facility, with difficult trade-offs in terms of counterparty access and pricing versus stigma and moral hazard risks to negotiate.

56. The authorities should work with market participants to mitigate the risks stemming from concentration of repo settlement (Box 4). The concentration of repo settlements with Bank of New York Mellon (BNYM) is a vulnerability. Both the cleared and tri-party repo market depends on the BNYM to settle transactions as does the Fed when it conducts repo OMOs.

57. Reliance of banks on funding from Federal Home Loan Banks (FHLBs) increases interconnectedness. FHLBs play an important intermediation and funding role in the money markets as funding from FHLBs remains relatively generously treated in the LCR.[41] Treating funding from FHLBs similarly to that from other unsecured borrowers in the Fed funds market would help reduce concentration risks on FHLBs and enhance the resilience of markets in situations where FHLBs themselves run into liquidity problems.

58. The Alternative Reference Rates Committee (ARRC) and the authorities have made excellent progress in transitioning away from LIBOR but more needs to be done. The U.S. authorities have been heavily engaged with the ARRC in promoting the transition away from LIBOR by end-2021.[42] Most of the nominal LIBOR-related exposures are in the derivatives markets where

[38] Vice Chair Quarles, in a personal February 2020 speech discussed this type of policy option—see https://www.federalreserve.gov/newsevents/speech/quarles20200206a.htm,

[39] See FSB "Guiding principles on the temporary funding needed to support the orderly resolution of a global systemically important bank" (2016) at https://www.fsb.org/2016/08/guiding-principles-on-the-temporary-funding-needed-to-support-the-orderly-resolution-of-a-global-systemically-important-bank-g-sib/ for a discussion of options.

[40] See https://www.bankofengland.co.uk/-/media/boe/files/prudential-regulation/consultation-paper/2019/cp2719.pdf.

[41] The treatment of FHLBs in the LCR rule has been assessed by the Basel Committee in 2017 as part of the Regulatory Consistency Assessment Programme. See https://www.bis.org/bcbs/publ/d409.htm.

[42] The ARRC is private sector-led, convened by the Federal Reserve Board and Federal Reserve Bank of New York (FRBNY), with the SEC and CFTC among the public-sector ex-officio members. For information on the ARRC and its work program see https://www.newyorkfed.org/arrc.

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Box 4. United States: Bank of New York Mellon (BNYM)—A Uniquely Important Financial Institution

The BNYM plays a unique role in the government securities clearing, global collateral management and tri-party repo market. As a G-SIB with global operations, it has a diversified portfolio of fee-generating investment services and investment management businesses, total assets of US$381 billion, US$1.9 trillion under management, and US$37.1 trillion of client assets under custody at end-2019. The withdrawal of JP Morgan Chase for government securities settlement (GSS) in 2016 left BNYM as the sole provider of GSS and tri-party repo services. The BNYM acts as a custodian, settles repos and government securities, and takes care of back-office functions. The FRBNY is reliant on the BNYM for the conduct of OMO repos. The BNYM plays a key settlement role for FICC-sponsored repo transactions and is a major sponsor itself.

The FRB has crafted a hybrid approach to the supervision of BNYM. Co-location of the critical infrastructure role in one group with an entity that also provides commercial banking services raises specific issues from both a supervisory and resolution planning standpoint. The BNYM's U.S. government securities settlement and tri-party repo services are comparable in importance to the FMIs that have been designated as systemically important by the FSOC.[1] As one of eight U.S.-based G-SIBs, the BNYM is subject to heightened capital and liquidity requirements, dedicated on-site supervision, and recovery and resolution planning requirements to ensure the continuity of critical services. In addition, it is subject to some components of the PFMI, notably for governance and operational reliability.

Given its sole provider status in a high volume and high value market, ensuring continuity of operations is a key focus of the bank's planning and of its supervisor's concerns. The BNYM has invested heavily in IT infrastructure in recent years to build in resilience and redundancy, as well as a geographic dispersion of its activities across several sites of concurrent operations. Regular testing and various outage contingencies are part of the setup. The FRB conducts logistical planning in a range of contingencies with the objective of keeping the functions going in the event of disruptions of service or failure. While separability is required for BNYM's GSS operations (which are part of a separate legal entity with own governance structure), actual separation could prove very protracted and challenging. The BNYM would also be eligible for guarantees and liquidity support under the Dodd-Frank Wall Street Reform and Consumer Protection Act (DFA) Title II in resolution. There is, however, no alternative to the BNYM in the event it ceases operations or exits the market, and it would be left to the FRBNY to manage the GSS system. In other major jurisdictions, either the central bank or privately operated central securities depositories play this role.

The authorities should work with market participants to establish backups to preserve GSS and repo market functioning in the unlikely event that the BNYM runs into problems. While the current approach provides for a thorough set of prudential safeguards to reduce the likelihood of such an event materializing, the FRB is encouraged to enhance its comfort by conducting a full assessment of the PFMI to further identify specific clearing and settlement risks, for example, with regard to the potential risk of unwinding, delivery-versus-payment mechanisms, and access criteria. The FRB should undertake a simulation exercise to test a response to a tail risk of a protracted BNYM operational outage or reduction in BNYM capacity.

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[1] See speech by J.H. Powell, "The Evolving Structure of the U.S. Treasury Market: Second Annual Conference of the Federal Reserve Bank of New York," October 24, 2016, https://www.federalreserve.gov/newsevents/speech/powell20161024.htm.

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significant progress has occurred and where new markets that reference the Secured Overnight Financing Rate (SOFR) are developing fast. Less progress is evident in the smaller but still material corporate securities and loan markets accessed by a wide variety of users where some more significant changes in the structure of instruments are required. Market participants need to continue work on transition as quickly as possible. The authorities should remain focused on ensuring regulated firms manage and disclose LIBOR-related risks effectively, and increasingly set harder targets with deadlines for when firms start transitioning from doing business based on LIBOR to SOFR or other reference rate-based products.

FINANCIAL SECTOR OVERSIGHT

59. The supervisory and regulatory framework is sound overall, but remaining gaps relative to international standards need to be addressed. The U.S. framework was found to have a high degree of compliance with international standards in the 2015 FSAP, however, a number of the recommendations remain outstanding (Appendix VII).[43] In addition to full adherence to international standards, the FSAP considers that additional strengthening in some areas may be warranted given the system structure and evolution of new risks.

A. What Are the Regulatory Challenges in a Changing Financial System?

60. The U.S. regulatory and supervisory architecture is complex, putting a premium on coordination and cooperation across agencies (Figure 27). In banking, the Federal Financial Institutions Examination Council (FFIEC) provides an effective coordinating mechanism with joint issuance of Notices of Proposed Rulemaking by banking agencies enhancing consistency in approach and messaging. Across the securities and derivatives markets, there is no formal coordination mechanism between the CFTC and the SEC, although Memoranda of Understanding (MOUs) are in place for data sharing and there is frequent informal coordination. The FSOC provides an effective mechanism for coordination across all financial sector agencies.

61. The rapidly changing financial landscape poses additional challenges. Technological and financial innovation is lowering barriers to entry and allowing firms that may sit outside of the regulatory perimeter to provide financial services: (i) financial innovations have resulted in mortgage activity migrating out of banks; (ii) virtual assets (VAs) and virtual asset service providers (VASPs) offer services, which may be very similar to those of traditional securities intermediaries or other financial institutions (issuance, operation of a trading platform, custody) but without being subject to the same standards and obligations; and (iii) providers of critical payment services either fall outside direct supervision or are only partially supervised through third-party service provider regimes whereby risks by the third parties are expected to be managed by the banks.

[43] The 2015 FSAP produced Detailed Assessment Reports on banking, insurance, and securities, as well as a pilot review of the compliance with the Key Attributes for Effective Resolution with respect to the banking and insurance sectors. Given that the main standards and their assessment methodologies have not changed, this FSAP covered financial sector oversight in a targeted manner focusing on macrofinancially relevant themes.

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Figure 27. United States: Complex Regulatory Architecture

Source: A Financial System that Creates Economic Opportunities: Banks and Credit Unions, Report to President Donald J. Trump by the United States Treasury, June 2017, page 29 at https://www.treasury.gov/press-center/press-releases/Documents/A%20Financial%20System.pdf.

Note: The figure depicts the primary regulators in the U.S. financial regulatory structure and their primary oversight responsibilities. A list of acronyms is available on page iv. There are additional agencies involved in regulating the financial markets and there may be other possible regulatory connections than those depicted. See Government Accountability Office Report on Financial Regulation: Complex and Fragmented Structure Could Be Streamlined to Improve Effectiveness, GAO-16-175, February 2016, at: https://www.gao.gov/assets/680/675400.pdf.

62. National charters and FSOC designation may be avenues for ensuring the regulatory perimeter is appropriately defined. The OCC proposed in 2016 a special purpose national bank charter, which could attract firms like marketplace lenders or payment companies because the national charter could reduce compliance costs by consolidating supervision under one primary national regulatory structure. The FSOC has the power to designate activities and entities as systemically important and recommend heightened prudential standards as it deems appropriate. It also is tasked with identifying gaps in the regulatory framework; however, its ability to act is limited where there is no primary regulator.

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B. Are Systemic Risks Adequately Identified and Can They be Mitigated?

Institutional Arrangements for Systemic Risk Oversight

63. The FSOC provides the framework for systemic risk oversight, and a forum for the U.S. regulators to collectively identify risks and encourage individual agencies to respond. It was established in 2010 with three primary purposes: to identify risks to U.S. financial stability; to promote market discipline by eliminating expectations that the government will shield shareholders and counterparties from losses; and to respond to emerging threats to financial stability. It provides a systematic approach for the effective identification of vulnerabilities working primarily through enhancing coordination of the work of the 15 member agencies, of which 10 are voting members.

64. While buy-in to the process is strong, many member agencies do not have a clearly defined financial stability objective. Continuing full operational independence of member agencies is critical to discharging their mandates but creates challenges for the operation of the FSOC. Supplementing FSOC members' mandates and mission statements with a more explicit financial stability mandate would help address these challenges without undermining the FSOC authority, increase the focus on financial stability issues, and incentivize actions to address systemic financial stability risks. Such objective in the mandate would largely relate to issues within an agency's sphere that could potentially spill over to the wider financial sector.

65. Financial stability communication centers on the FSOC Annual Report with reports from other agencies adding breadth to the discussion.[44] The FSOC's report largely covers structural vulnerabilities with many carried over from previous years reflecting the long-lived nature of financial stability risks (e.g., in 2019, cybersecurity risk and CCP risk management). The Office of Financial Research (OFR) continues to publish its high-quality annual report, and the FRB issued the first of its semi-annual Financial Stability Reports (FSR) in November 2018. The FSR covers mainly cyclical issues (asset valuations, borrowing by businesses and households, financial sector leverage, and funding) and complements well the work of the FSOC, while also contributing to the determination of the scenarios used in its stress tests and helping inform the setting of the countercyclical capital buffer (CCyB).

66. Strengthening FSOC communication to better link actions with identified vulnerabilities would improve effectiveness. Regulatory changes made by member agencies are listed in the Annual Report but are not linked back to identified vulnerabilities, and in many cases are unrelated to any listed vulnerability. Consideration could be given to releasing more detailed minutes of FSOC meetings (for the meetings that are not open to the public) recognizing the trade-off between the benefits of enhanced transparency and the need to protect supervisory and other market-sensitive data from disclosure in order to prevent destabilizing market speculation that could occur if that information were to be disclosed. To improve traceability, and with it

[44] For example: FDIC Risk Review—https://www.fdic.gov/bank/analytical/risk-review/index.html, and the OCC's Semiannual Risk Perspective—https://www.occ.treas.gov/publications-and-resources/publications/semiannual-risk-perspective/index-semiannual-risk-perspective.html.

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transparency, specific actions being considered by member agencies to mitigate identified potential systemic risks should be identified, where possible. Subsequently, actions taken should be linked back to identified vulnerabilities.

67. The OFR has undergone a significant restructuring. The OFR's mandate is to support the FSOC through data collection, research, and measuring and monitoring risks. It plays a vital role in connecting the dots across the system and undertaking analyses of systemic issues. Staffing had fallen significantly since 2017 although there is stated aim now to rebuild staff levels.

68. Addressing remaining data gaps is key to enhancing the assessment of interconnections, vulnerabilities, and systemic risks. Progress has been made in addressing some of the data gaps and inter-agency data-sharing shortcomings identified in previous FSAPs. This includes the completion of the pilot on data collections on bilateral repurchase agreements and securities lending activity as well as adoption of SEC rules to provide regulators with conditional access to security-based swap data held by SEC-registered repositories. However, important data gaps remain. Data gathering on bilateral repos, tri-party repos, securities lending, and asset management is at early stages. The Trade Reporting and Compliance Engine (TRACE) pilot for data reporting on Treasury securities should be a permanent feature of the system. Finally, to build a clear view of interconnections, data on interbank exposures should be expanded from the six U.S. G-SIBs to a fuller sample of banks and a better picture is needed of the holdings of CLOs, institutions' direct and indirect exposures to leveraged and private loans, and the various channels that connect nonbanks with the rest of the system.

The Toolkit

69. Tools to address potential systemic risks are distributed across FSOC members, who are collectively accountable for identifying and responding to threats to financial stability.[45] The toolkit mainly consists of agencies exercising their own powers vis-à-vis the entities they oversee to either mitigate potential systemic risks or strengthen the resilience of the financial system against systemic risk events. Tools that reside with the FSOC consist of its authority to issue recommendations for new or heightened regulatory standards to financial regulators; designate nonbank financial companies for consolidated supervision and enhanced prudential standards; and designate financial market utilities as well as systemic payment, clearing, and settlement systems as systemically important, subjecting them to enhanced standards. The United States, however, stands out among its peers as not having any borrower-based tools in the housing sector.[46]

70. Tools to deal with structural vulnerabilities in the banking system are generally sufficient, while coverage of the CCyB should be extended to improve effectiveness. Tools to enhance the structural resilience of the banking system include the G-SIB capital surcharge as well

[45] IMF Macroprudential Policy Survey: https://www.elibrary-areaer.imf.org/Macroprudential/Pages/Reports.aspx.

[46] Specific market structure in the United States makes international comparisons difficult. Of the US$11 trillion in residential mortgages, only US$3.6 trillion (33 percent) is held by banks, representing 20 percent of banking sector assets. Over one-half of the mortgages are originated by nonbank mortgage companies (see Box 2).

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as enhanced capital and liquidity standards for large non-GSIBs, and the recently introduced Stress Capital Buffer, which also potentially has a cyclical element. The CCyB is applicable to Category I–III banks and has not been activated since introduction in 2010. The FRB's implementation framework recognizes that while empirical models that capture a manageable set of quantitative indicators (e.g., combinations of credit-to-GDP to trends in residential and commercial real estate) can be useful input into the setting of the CCyB, no fixed set of indicators can adequately capture all the financial sector vulnerabilities.[47] In this context, it will also consider whether activating the CCyB could lead to migration of credit activity to banks that are not subject to the CCyB, or to nonbanks. For this reason, the FRB should consider expanding CCyB to Category IV banks, which would increase the coverage from about 70 percent of banking sector assets to 80 percent.

71. In late 2019, the FSOC adopted final interpretive guidance describing the activities-based approach to identify and address potential risks to U.S. financial stability. As part of the activities-based approach, the FSOC will examine a diverse range of financial products, activities, or practices that could pose potential risks to financial stability. The FSOC intends to allow relevant financial regulatory agencies, which generally possess greater information and expertise with respect to company, product, and market risks, to address potential risks. If the FSOC believes that these actions are inadequate to address an identified risk, it can publicly issue recommendations to agencies under the DFA s120. In cases where a regulator would not be expected to conduct a cost-benefit analysis, the FSOC itself will—prior to making a final recommendation under s120—conduct such an analysis. Finally, if the FSOC's engagement with regulators under the activities-based approach does not adequately address a potential threat identified, it may evaluate nonbank financial companies for an entity-specific determination under DFA s113. The FSOC will perform a cost-benefit analysis prior to making any such determination.

72. Effective implementation of the activities-based approach will be challenging. To foster confidence, the FSOC should communicate as much detail as possible about the process. Potential challenges to effective implementation include the following:

- While the requirement of a cost-benefit analysis is appropriate, in practice it may be very difficult to conduct with precision given that a probability of a risk being realized must be assigned; and
- The entity designation process must be timely, meaning that on the occasion where it is deemed necessary to designate an entity, such designation must occur within a timeframe that mitigates the financial stability risks. In this regard, there must be due recognition given to speed with which financial risks can build up in complex financial institutions.

73. The FSOC should encourage its members to prioritize the development of tools to address risks and vulnerabilities in the nonbank sector. The most pressing case is to develop

[47] Federal Register 09/16/2016: Regulatory Capital Rules: The Federal Reserve Board's Framework for Implementing the U.S. Basel III Countercyclical Capital Buffer.

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tools to address the systemic risks arising from very high leverage in nonfinancial corporates (as highlighted in the vulnerabilities analysis). Further, the following measures should be considered:

- **Tools to address the build-up of risks in housing financing will be needed.** As the Treasury and FHFA are examining options for ending the GSEs conservatorship, the CFPB is deliberating changes to the qualified mortgages (QM) definition.[48] This provides an opportunity to assess the interaction of the GSE capital regime and other potential liquidity sources for the housing market, mortgage underwriting and insurance standards, and lending restrictions aimed at ensuring borrowers' ability to repay their mortgage loan. Consideration should be given to how best to integrate and calibrate a full range of macroprudential tools (e.g., debt service ratio and other borrower-based standards, or CCyB-type capital requirements) to improve financial system resilience.

- **Changes should be considered to mitigate liquidity risks in fund management.** The SEC should consider requiring mutual funds to perform liquidity stress tests as part of their liquidity risk management program. Mandatory liquidity buffers for mutual funds exposed to liquidity risk should also be considered.

- **Analysis of insurance sector risks should be expanded and deepened.** While the NAIC's framework for monitoring individual asset-side risks is quite advanced, scenario-based solvency and liquidity stress testing would add value. State supervisors and the NAIC should continue to closely monitor reinvestment risks and search-for-yield behavior in a low interest rate environment, together with insurers' risk management capabilities when investing in higher risk assets. They should also analyze exposures of primary insurers to natural disasters and reinsurance capacity, including catastrophe or guarantee funds in the analysis for relevant states.

C. How Safe are Financial Market Infrastructures?

74. Given the global systemic importance of some of the U.S. FMIs, it is imperative that their regulation and supervision are effective. Eight firms designated by the FSOC as systemically important Financial Market Utilities (FMUs) are regulated, supervised, and overseen by the FRB, SEC, or CFTC (depending on their activities). The DFA authorized the FRB to promote uniform standards for the management of risks by systemically important FMUs. The increased global reliance on central counterparties (CCPs), following mandatory clearing requirements, underlines the crucial role of regulatory oversight and internal risk governance to ensure their resilience and adequate risk management.

[48] The DFA (s1411 and s1412) requires that, for residential mortgages, creditors must make a determination that the consumer has a reasonable ability to repay the loan. Congress established a presumption of compliance for "QMs," which are mortgages that meet criteria as defined in CFPB rules. The category of General QM Loans prohibits negative amortization, interest-only payments, terms greater than 30 years and balloon payments. The total points and fees paid for origination must not exceed a certain percentage of the loan amount and the consumer's ratio of debt service to income cannot exceed 43 percent. A separate category of QM Loans that are eligible to be purchased or guaranteed by either GSE has the aforementioned requirements, except the debt-to-income limit.

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75. While regulation and supervision have strengthened since 2015, further improvements to CFTC supervision are needed. Important milestones since the last FSAP are the adoption of SEC rules for CCPs and Central Securities Depositories, and the CFTC stress tests for CCPs. The regulation, supervision, and oversight of systemically important U.S. FMIs are generally adequate and effective, but the CFTC's rule approval process and its resources need strengthening. CFTC staffing increased since the 2015 FSAP, but the increase has not kept up with additional responsibilities, which likely hampers the CFTC's effectiveness. The FRB (and, under delegated authority, the individual Federal Reserve Banks), the CFTC, and the SEC actively cooperate—a prerequisite for effective supervision in the U.S. regulatory landscape—but supervisory crisis management arrangements for FMIs could be strengthened.

76. Authorities have implemented the relevant international standards, the Principles for Financial Market Infrastructures (PFMI),[49] through dedicated regulations; but consistency of outcomes could be further enhanced. FMIs appeared so far sufficiently robust to manage surges in volumes and volatility in financial markets during the crisis. The analysis of the credit and liquidity risk management frameworks of four selected CCPs shows that they are broadly sound.[50] However, in analyzing the outcomes of certain risk management measures, the mission found that in some cases the outcome of the implementation of PFMI risk management standards by the CCPs was uneven, specifically regarding the independence of the risk management function, the conservativeness of the Margin Period of Risk (MPOR), and the implementation of intra-day margining rules. It is recommended that the FRB, CFTC, and SEC collaborate to analyze these differences and adopt an appropriately consistent, conservative implementation of the PFMI where financial stability or market efficiency could be negatively impacted. More comprehensive supervisory stress tests for CCPs may contribute to this objective by helping authorities to understand where risks could materialize during a stress event.

77. A review of the regulatory and supervisory framework for the payments ecosystem may be warranted to comprehensively address relevant risks. As in other countries, new players are entering the payments space offering innovative services. The current regulatory framework forms a complex pattern and as a result, money transmitters are subject to diverging sets of rules and multiple and overlapping examinations depending on the location and nature of their activities. Banks are expected to manage all risks raised by third-party relationships, including those related to payments. Risks posed by other providers of potentially critical payment services (e.g., card payment schemes, electronic wallet providers, payment gateways, aggregators, or platform providers), such as operational risks, either fall outside direct supervision or are supervised only partially through third-party service provider regimes. The current regulatory framework may not be future-proof so as to ensure risk sensitivity, comprehensiveness, and consistency of requirements for the possible emergence of new payment service providers, irrespective of their status as bank, money

[49] The PFMI were issued by the CPMI (then CPSS) and IOSCO in 2012 and are the internationally agreed standards for FMIs, including CCPs, https://www.bis.org/cpmi/publ/d101.htm.

[50] The analysis focused on CCPs critical for the respective markets they serve in the United States: ICE Clear Credit for credit default swaps; the Options Clearing Corporation for U.S. equity and index options; the Chicago Mercantile Exchange for futures and commodity derivatives (CME Base) and interest rate swaps (CME IRS); and the FICC for U.S. government securities.

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transmitter, or nonbank. The FSOC has recognized the need to evaluate potential risks to payment system integrity and operational risk, among other, as well as appropriate approaches to reduce regulatory fragmentation, while supporting innovation.

D. Is Oversight of Markets Commensurate with the Changing Financial Intermediation?

78. The SEC and CFTC took prompt action to address disruption to securities and derivatives markets arising from the COVID-19 pandemic through the issuance of orders, no-action relief, and guidance.[51] The SEC's actions included an order designed to facilitate open-end funds' (other than MMFs) borrowing from an affiliated person and using inter-fund lending arrangements in the face of severe redemption pressures, thereby preventing fire sales of assets. The CFTC issued no-action letters providing temporary, targeted relief to futures commission merchants, introducing brokers, swap dealers, retail foreign exchange dealers, floor brokers, and other market participants covering, inter alia, regulations requiring recording of oral communications related to voice trading and other telephonic communications, as well as audit trail and related requirements. In addition, circuit breakers that triggered temporary trading halts on several occasions in March 2020 promoted orderly trading during the periods of most extreme volatility.[52]

79. The size, complexity, and importance of U.S. capital markets call for continued reform in oversight. Measures taken since the 2015 FSAP include an increase in the coverage of examination of investment advisers, mutual fund liquidity management reforms, and changes to reduce the potential for—and impact of—disruption in equity trading. There is, however, a continued need for the SEC and CFTC to have more budgetary independence, and autonomy over their resource allocation, with appropriate accountability for the deployment of the sums raised through their industry fees. Other priorities include deepening of joint work on topics of common interest (e.g., leveraged loans). New registrants should be subject to increased scrutiny and the National Futures Association's (NFA's) reliance on self-certifications should be reduced.

80. There is scope to strengthen the regulation and supervision of the fund management sector. The SEC has introduced important reforms since the 2015 FSAP but areas for improvement remain, including in the coverage of investment adviser inspections, rules on funds' use of derivatives, and an assessment of the impact and effectiveness of the mutual fund liquidity management reforms aimed at reducing liquidity vulnerabilities. The CFTC has not implemented the still relevant recommendations of the 2015 FSAP, which include requirements for commodity pool

[51] The analysis set out in this section focuses on the medium-term challenges and policy priorities for regulation and supervision of securities markets in the United States and does not cover the COVID-19 outbreak or the related policy response, which has since become the overarching near-term priority. The FSAP recommendations are meant to be considered once the impact of the pandemic on the economy and the securities sector becomes clearer.

[52] The current framework for Market-Wide Circuit Breaker (MWCB) was introduced as a multi-year pilot and takes the form of temporary rules.

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operators to implement internal controls and risk management, and addressing the way investors are to be treated if they are adversely affected by pricing errors in a commodity pool. With respect to MMFs, the reforms introduced in 2010 and 2014 are now fully implemented and represent important additional safeguards. However, with about 87 percent of MMF assets having a stable NAV, close monitoring by SEC is essential, including stress testing and contingency planning for a stress situation where the NAV of one or more of these funds falls below US$1.00.[53]

81. Welcome progress has been made on equity market structure and the regulation of trading; however, more remains to be done. The United States and other jurisdictions have made progress in implementing internationally agreed reforms to OTC derivatives ("swaps" and "security-based swaps") markets. In addition to changes in market structure, including an increased proportion of trading concentrated in closing auctions, these markets are faced with threats of wider significance such as to technological and cybersecurity-related resilience. It is important to finalize arrangements for market-wide circuit-breakers (MWCB) for trading in all equities and options markets,[54] implement the new capital rules for broker-dealers, and deliver the long-planned Consolidated Audit Trail. The SEC should also focus on off-exchange trading given that over a third of equity trading is executed outside exchanges, including 20 percent that takes place outside national securities exchanges or regulated alternative trading systems, and there is the potential for this proportion to grow. The SEC should also carry out a strategic review of its supervision and oversight of exchanges to ensure that there is sufficient focus on material areas of risk.

82. The CFTC and SEC should closely collaborate to complete implementation of the post-crisis reforms to OTC derivatives markets and make targeted adjustments to current arrangements. While data suggest that changes have been successful in incentivizing central clearing, the authorities need to finalize a regime for security-based swaps and to address barriers to increased trading on swap execution facilities and the resultant liquidity fragmentation.

83. Service providers conducting activities involving VAs that constitute securities are subject to AML/CFT regulation and supervision by the SEC. To the extent that a VA is considered an investment contract, and therefore a security under the Howey test, or another type of security, the SEC has regulatory and enforcement authority over the safekeeping and administration of the VA or the provision of financial services relating to the offer, sale, or issuance of the VA. In addition, enforcement action has been taken in circumstances involving alleged violations of the federal securities laws where a VA is a security. However, a notable gap in the current framework relates to the spot market for VAs that are commodities that are not securities. While the CFTC has exclusive jurisdiction over derivatives on commodities that are not securities, it has only general anti-fraud

[53] The majority of MMFs with a stable NAV are government MMFs.

[54] In this regard, the United States faces particular challenges compared to other jurisdictions due to the complexity of coordination across all relevant trading venues, which arises from the mandatory routing of orders in National Market System stocks through the National Market System (the national system for trading equities).

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and anti-manipulation powers in relation to the spot market for the underlying commodity itself.[55] As a result, no federal agency is directly overseeing the spot market for Bitcoin[56]—by far the largest VA by market capitalization. Market participants are also closely monitoring regulatory enforcement action as a means of better understanding the agencies' approach to perimeter issues (Box 5).

E. Have Bank Regulatory Standards Been Weakened?

84. The FSAP's targeted review of the key aspects of the banking regulatory framework focused on the recent tailoring of regulatory requirements and stress tests. The 2015 assessment of compliance with the Basel Core Principles for Effective Banking Supervision (BCPs) found a high degree of compliance. The mission leveraged that assessment by reviewing the main supervisory and regulatory developments since 2015 and assessing the progress achieved in addressing recommendations to ensure the completion of key elements of Basel III. The FSAP team has not covered in detail the impact of COVID-19 outbreak on banks and has not discussed with authorities the related policy response. The FSAP recommendations are meant to be considered once the impact of the pandemic on the economy and the banking sector becomes clearer.

85. The U.S. should implement remaining aspects of the BCPs, some of which persist from the previous assessment and require further attention. The authorities should finalize heightened standards on governance for large and complex bank holding companies, enhance the related-party framework, introduce rules on concentration risk management, and include more quantitative standards on interest rate risk in the banking book. Remaining weaknesses in relation to beneficial ownership identification and verification also need to be addressed. Finally, the authorities should also review the regulatory framework (aiming to streamline and simplify requirements) and consider rewriting certain prudential guidance as regulation.

The overall stringency of prudential regulation has been reduced while medium-term financial stability risks are rising. The scope of application of the recent tailoring reforms is wide ranging, and all the recent adjustments have been made in the same direction, i.e., to lessen requirements (Appendix VIII). Regulatory changes will reduce the number of banks that must comply with the full set of Basel standards and will no longer require non-internationally active banks to comply with the full set of the Basel standard (Appendix IX). Furthermore, fewer banks are subject to annual supervisory stress tests and recent changes to the CCAR program, which appears to be the binding capital constraint for most banks, as well as the implementation of the Stress Capital Buffer will likely result in meaningfully lower capital requirements for several large banks, and possibly also for the G-SIBs in the current stage of the economic cycle.

[55] Unless the transaction is done on a leveraged, margin, or financed basis.

[56] With the exception of FinCEN for AML/CFT purposes.

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Box 5. Regulation and Oversight of Virtual Assets (VAs)

The VA sector in the United States is currently small as a proportion of the overall financial system but has grown rapidly in recent years.[1] VAs can fall into a range of categories depending on their specific features including securities, commodities, derivatives and currencies. The universe of virtual asset service providers (VASPs), meanwhile, spans small start-ups that are providing financial services for the first time through to major financial institutions.[2] Key activities that carried out by VASPs include issuance (typically through initial coin offerings (ICOs)), transfer of VAs from one party to another, exchange between different VAs and with fiat currency, custody, and operation of trading platforms.

There is no bespoke U.S. regulatory framework for VAs and VASPs. Depending on the features of a particular VA, and the nature and geographical reach of the activity being performed in relation to it, regulatory oversight may lie with the SEC, the CFTC, Financial Crimes Enforcement Network (FinCEN), or one of the state regulators. This leads to fragmentation, both in relation to the rules that apply and the agency that applies them. Individual agencies have taken steps to clarify in which circumstances a VA falls under its oversight. In April 2019, SEC staff issued a "Framework for "Investment Contract" Analysis of Digital Assets;" however, this does not have the status of a formal rule or agency guidance. Entities considering whether their VA activities would constitute a violation of the federal requirements can seek clarification from SEC or CFTC staff, as applicable (for example, by requesting a "no-action letter"). Market participants are also closely monitoring regulatory enforcement action and speeches by individual Commissioners as a means of better understanding the agencies' approach to perimeter issues.

One notable gap in the current framework relates to the spot market for VAs that are commodities and not securities. While the CFTC has exclusive jurisdiction over derivatives on commodities, it has only general anti-fraud and anti-manipulation authority in relation to the spot market for the underlying commodity itself (unless a transaction is done on a leveraged, margin, or financed basis), meaning that it can only act after the fact. As a result, no federal agency is directly overseeing the spot market for Bitcoin,[3] which is by far the largest VA by market capitalization. This gap raises questions on the risks of derivatives on VAs that are commodities and creates general customer protection risks.

VAs may be marketed to investors as an entirely new asset class while in fact sharing key characteristics of securities, commodities, or even certain types of investment fund. The appearance of innovation creates asituation in which less sophisticated investors may be misled and subject to fraud. Both the SEC and CFTC have made substantial efforts to inform investors about VAs and the risks inherent to them. A notable initiative undertaken by the SEC was the so-called Howeycoin, in which investors were presented with marketing material for an apparent ICO promising high returns on investment. Any attempt by an investor to buy the coins led them to the SEC's dedicated investor education website, which explained that Howeycoins were fake and that investors should be wary of such scams. The initiative triggered widespread coverage in local and national media. More generally, both agencies have set up dedicated internal units to work on VAs and VASPs (as part of the broader fintech sector) and brought in staff with specialist expertise.

Risks to financial stability from VAs appear low at present given the small size of the sector. However, there is currently a lack of reliable, comprehensive data on VAs, rendering a definitive assessment of the potential systemic relevance of the sector more challenging. Agencies have generally not put in place specific reporting requirements for VA-related activity and rely instead on individual engagement with regulated entities and input from third-party data providers. The FRB, for example, conducts a bi-annual survey of the banks it supervises to determine the exposures they have to VAs. The lack of dedicated reporting may be explained in part by VASPs operating in non-compliance with registration and reporting requirements, but may also be due to issues of categorization and fragmentation, given that there are so many different types of VA and determining the responsible regulatory agency may not be straightforward. Under the current regulatory architecture, it is more feasible to expect individual agencies to introduce their own reporting requirements. Also, the spot market for commodities that are not securities currently is not overseen by the SEC or CFTC.

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Box 5. Regulation and Oversight of Virtual Assets (VAs) (concluded)

The complexity of the framework underlines the importance of cooperation between agencies both at the federal and state levels. The SROs, FINRA and NFA, have a key role to play in ensuring consistent application of the framework. It will also be important for the Conference of State Banking Supervisors to continue its efforts to ensure consistency of approaches across the state banking regulators, including finalization and adoption of the model law for money services businesses.

AML/CFT

The U.S. framework is largely compliant with the new AML/CFT standard relating to VAs and VASPs. The United States was one of the first countries to address the ML/TF risks related to VAs prior to the 2018 issuance of the new FATF standard. In February 2020, the FATF concluded that, overall, the authorities had a good understanding of the risks associated with VA activities and that the regulatory framework captured the majority of VA activities as most VASPs in the U.S. fall within one of the categories of financial institutions under the purview of FinCEN, the SEC, or the CFTC. The U.S. also has had several successful enforcement actions targeting the illicit use financial institutions to understand and mitigate the risk associated with VAs were not explicit and the threshold for mandatory customer due diligence of VAs.

Further efforts are nevertheless needed to continue the momentum. While acknowledging the comprehensiveness of the U.S. framework, the FATF noted minor deficiencies (requirements for (CDD) measures for occasional transactions involving VAs was too high) and questioned whether AML/CFT oversight over VASPs was fully in line with the risk profile of the industry. The impact of these shortcomings in practice appears, however, to be very low given the robustness of the existing AML/CFT framework. The authorities continue to study the virtual landscape and consider ways to improve the regulatory framework. In this context, the United States should address remaining minor deficiencies by (i) lowering the threshold for CDD measures for occasional transactions to US$1,000 or lower; and (ii) explicitly requiring financial institutions to identify, understand, and address risks related to VAs.

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[1] A VA as defined by the Financial Action Task Force (FATF) is a digital representation of value that can be digitally traded, or transferred, and can be used for payment or investment purposes.

[2] VASP as defined by the FATF is any natural or legal person who as a business conducts one or more of the following activities or operations for or on behalf of another natural or legal person: (i) exchange between virtual assets and fiat currencies; (ii) exchange between one or more forms of virtual assets; (iii) transfer of virtual assets; (iv) safekeeping and/or administration of virtual assets or instruments enabling control over virtual assets; and (v) participation in and provision of financial services related to an issuer's offer and/or sale of a virtual asset.

[3] With the exception of FinCEN for AML/CFT purposes.

87. Authorities are encouraged to maintain the overall stringency of prudential requirements for non-internationally active banks. The U.S. authorities have maintained the broad compliance with Basel III of the regulation applicable to banks that are considered internationally active (i.e., the eight U.S. G-SIBs in Category I and one bank in Category II). The other banks, including large banks classified in Categories III and IV, are no longer required to comply with the full set of Basel capital and liquidity standards. As required under the BCPs, non-internationally active banks should be required to comply with capital requirements that are broadly consistent with the Basel capital framework and appropriate large exposure limits. Authorities should consider moving capital standards for non-internationally active banks closer to those required for internationally active banks. Authorities may also want to consider extending the full LCR requirements to all non-internationally active banks in Categories III and IV. In addition, considering the increase in financial stability risks, it is important to continue thoroughly scrutinizing banks'

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ability to absorb shocks, including by maintaining the frequency of stress tests for Category IV banks.

88. A number of measures to address the impact of the COVID-19 pandemic on the banking sector have been taken swiftly and effectively by the U.S. authorities. They aim to support the provision of credit to the real economy while mitigating potentially negative impacts to financial stability and maintaining banks' operational resilience. The FBAs have encouraged banks to work constructively and prudently with borrowers affected by COVID-19 crisis and issued statements supporting banks that choose to use their capital and liquidity buffers to lend to households and corporates. The FRB has also allowed bank holding companies subject to the supplementary leverage ratio (SLR) to exclude Treasuries and deposits held at Federal Reserve Banks from the SLR calculation. Additionally, supervisory priorities have been adjusted to minimize burden on banks, scale back non-essential activities and focus on monitoring efforts. Lastly, accounting and prudential changes to minimize the immediate impact of forthcoming loan losses on the regulatory capital have been introduced in law and regulation. Most of these measures are temporary and include a phase-out period. Going forward, it will be important to ensure compliance with international standards where exceptions have been temporarily introduced.

89. The U.S. regulatory capital stress test program is rigorous and comprehensive. The FBAs are encouraged to continue exploring second-round effects, possibly by integrating capital and liquidity stress tests. They may also wish to consider leveraging the stress test framework to probe the prudential implications of longer-term structural issues in the banking industry. Removing the CCAR qualitative objection places added pressure on bank supervision.

90. Maintaining high-quality bank supervision remains essential. The FBAs have been very successful in fulfilling their mandate and enhancing the resilience of the banking sector. However, to effectively face new challenges arising from regulatory changes, rapid technological transformation of financial services, renewed industry pressure against supervisory actions and vulnerabilities that continue to build in a maturing credit cycle, it is key to maintain the intensity of supervisory scrutiny and being agile in responding to new threats to financial stability. As supervisory stress tests have become less frequent and capital and liquidity requirements less stringent for some non-GSIBs, supervision needs to remain intrusive and continue enhancing its effectiveness to ensure that banks remain appropriately governed and incentivized to manage their risks to remain financially resilient.

F. Has Insurance Regulation and Supervision Been Strengthened to Address the Rising Risks?

91. State insurance regulators took numerous actions in response to the COVID-19 crisis, including facilitating late payment of premiums by policyholders while maintaining coverage and banning health insurers from imposing cost sharing for COVID-19 tests. State insurance regulators also heightened the monitoring of insurers. The recommendations are meant to be considered once

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the impact of the pandemic on the insurance sector becomes clearer and when extraordinary measures can be eased.

92. The targeted review of the state-based insurance regulation and supervision found that supervisory independence remains to be addressed. Supervisory independence—perceived or actual—is likely to be undermined by the appointment of insurance commissioners and their senior staff by state governors in several states or the direct election of the commissioners in others. There are also concerns about state governments' control of supervisors' budgets and constraints on staff remuneration. Reforms of the appointment and dismissal of commissioners are recommended as well as a more flexible remuneration to attract and retain sufficiently qualified staff. All cost recovery assessments should be passed to the insurance regulators for their budgetary independence. Financial stability should be included as a core objective of all state insurance regulators' mandates.

93. Reserving and asset valuation for life insurance should be strengthened expeditiously. Principles-Based Reserving (PBR) was made mandatory only for new life insurance business from January 2020, leading to a very slow evolution of reserving which it will be impossible to match with the asset valuation methodology. All reserves should be moved to a consistent PBR basis after a five-year transition period, the asset valuation approach should be adjusted to ensure consistency between assets and liabilities with risk-based capital (RBC) recalibrated accordingly.

94. Further steps are needed to strengthen risk-based supervision and implement a group capital requirement. Off-site analysis and examinations should be better integrated to enhance regulators understanding of firms' risk culture, governance, and the quality of risk management. More frequent, focused, and thematic examinations should replace the current five-year examination cycles. Both the FRB and the NAIC are developing aggregation approaches to group capital, which contrasts with the more usual consolidated approaches implemented in other jurisdictions. These two U.S. aggregation approaches may diverge in certain technical areas while aiming for comparable outcomes over time. The U.S. authorities should develop the GAAP Plus version of the Insurance Capital Standard (at least for Internationally Active Insurance Groups) with a view to implementation in parallel with their own aggregation approaches.[57]

95. Regulatory responses to the increasing risk and severity of natural catastrophes need to be strategically focused on the medium to long term; ensuring that risks are appropriately priced to increase resilience through incentivizing mitigation:

- The regulatory response in California to exceptional losses from wildfires in 2017–18 has focused on protecting policyholders from significantly increased rates while ensuring continuity in the availability of insurance in the short term. The authorities and industry need to collaborate and develop a medium- to long-term plan incorporating risk-based pricing to incentivize insurers to remain in the market, while allowing time for development of standard mitigation measures, and

[57] In November 2019, the IAIS agreed to consider the comparability of the Aggregation Method and the IAIS ICS reference method. The outcome of this assessment is not available at the time of the report finalization.

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for policyholders to adjust to higher premiums as necessary. Long-term solutions require policies among multiple agencies to reduce the risks loss from wildfires.

- After hurricane-related crises (1990s and 2000s), the Florida homeowners insurance market eventually stabilized, and the state settled on a system of regulation that appears to be working and may provide some lessons for other states that are facing increasing catastrophe losses.
- There are likely to be significant protection gaps[58] arising from flood risks that need to be first assessed, and then addressed. While addressing the protection gap is difficult, the authorities are urged to consider a range of possible solutions to closing the gap in the medium to long term.

96. The NAIC and state insurance regulators need to quickly finalize post-crisis reforms to requirements for PMIs. The binding financial requirements for PMIs are PMIERs imposed by the GSEs rather than minimum capital requirements of state regulators.[59] The NAIC and state regulators are working on a risk-based capital requirement that includes a countercyclical factor to capture risks from rising house prices compared to incomes. This should be quickly finalized including regulatory intervention levels.

G. How is Cybersecurity Risk Being Incorporated in Financial Oversight?

97. Cybersecurity risk preparedness is a top concern for both the financial sector intermediaries and their supervisors. Cybersecurity recommendations featured prominently in the 2017–19 FSOC annual reports, and FSOC members are increasingly focusing on the cyber resilience of the institutions that they supervise. These issues carry even more relevance in the environment imposed by COVID-19 mitigation measures. Key components of the U.S. financial sector are considered critical infrastructure, and its cybersecurity is a matter of national security. A National Infrastructure Protection Plan (NIPP) sets out the general framework for strengthening the resilience of the critical infrastructure.[60] The Treasury is designated as the financial sector-specific agency responsible for a sector-specific protection plan, which—together with the NIPP—provides a mechanism for coordination between the public and the private sector. Most relevant response and recovery plans are at the individual institutions' level.

98. Regular security testing is an established practice. Banking regulators generally do not mandate but rather include the use of security tests in their broader guidance. In addition, industry-wide tabletop cybersecurity exercises with the participation of systemic financial institutions and FMIs, industry associations and government stakeholders are conducted regularly, coordinated by the Treasury. A key result of the sectoral exercises was the establishment of a last resort

[58] The protection gap is the difference between total asset losses in a possible catastrophic event and the possible insured asset losses.

[59] For the discussion of PMIERs see paragraph 18.

[60] See https://www.cisa.gov/national-infrastructure-protection-plan.

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standardized and highly secure financial data restoration facility that makes it possible to restore bank account information after catastrophic failures of participants' critical systems.

99. FBAs run risk-based, mature, policy-driven, and highly formalized cybersecurity supervisory processes. Notwithstanding the complex institutional structure, cybersecurity expectations and supervisory practices have a strong common base. Banking regulators all use the FFIEC principles, standards, and tools as the foundation of their cybersecurity supervisory activities. Cybersecurity regulation and guidance are sufficiently principles-based to facilitate risk-based supervision well-integrated into the overall supervisory cycle, and to maintain relevance despite the changing threat landscape. The Cybersecurity Information Sharing Act provides sound legal basis for information sharing, and established fora and protocols are part of a national framework. Public-private partnerships are key enablers of voluntary information sharing between the industry and government agencies.

100. The CFTC and SEC have mainstreamed consideration of cybersecurity, business continuity, and other aspects of technological resilience into both regulation and supervision. This has included sharing of key findings from examinations for the benefit of other registrants, enabling a wider dissemination of lessons learned and good practices. Both agencies have regulatory requirements that take industry best practices into consideration, which allows them to remain relevant as tools, technologies, and the associated standards evolve.

101. The FBA's supervisory remit over third parties that provide core information technology services to their regulated firms is well established. To further enhance third-party service provider information security, in its 2019 Annual Report the FSOC recommended Congress pass legislation providing this authority to additional agencies, including the National Credit Union Administration.

H. Is the Financial Integrity Framework Effective?

102. Financial integrity has been strengthened since the last FSAP in relation to beneficial ownership (BO) identification and verification for some covered financial institutions'[61] customers; addressing high risk sectors and misuse of legal entities remain priorities.[62] In 2016, the U.S. AML/CFT framework was assessed as very effective[63] in most areas, but fundamentally

[61] Banks, brokers, or dealers in securities, mutual funds, and future commission merchants and introducing brokers in commodities.

[62] Beneficial ownership means the natural person(s) who ultimately owns or controls a customer and/or the natural person on whose behalf a transaction is being conducted. It also includes those persons who exercise ultimate effective control over a legal person or arrangement. Reference to "ultimately owns or controls" and "ultimate effective control" refer to situations in which ownership/control is exercised through a chain of ownership or by means of control other than direct control.

[63] Under the common AML/CFT assessment methodology, a High level of Effectiveness (HE) is the highest rating a country can achieve. A Substantial level of Effectiveness (SE) is the second top rating—it entails that the country has reached a specific outcome to a large extent and that moderate improvements are needed. The other two ratings are a Moderate (ME) and Low (LE) levels of Effectiveness, in which major and fundamental improvements are needed, respectively. The U.S ratings were four HE, four SE, two ME, and one LE, one of the better results from the latest round of assessments.

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weak for mitigating risks of misuse of legal persons.[64] There were also major weaknesses in AML/CFT obligations for investment advisers, lawyers, accountants, and company service providers, and for identifying and verifying BO for covered FIs' customers and politically exposed persons. The authorities recognize that these weaknesses facilitate the misuse of legal persons and increase ML risks for high-end real estate.[65] They have imposed a new BO rule which requires all covered FIs, including smaller institutions, to collect and verify BO information for companies and some trusts that are customers, although minor deficiencies remain.[66] It is too early to tell if this materially improves timely access to BO information about all entities. The other major weaknesses remain unaddressed. The United States should rapidly fix those weaknesses, including by requiring BO information to be collected upon company formation rather than when companies enter into customer relationships with covered FIs. U.S. compliance with new FATF requirements on virtual asset service providers is discussed in Box 5.

CRISIS PREPAREDNESS AND MANAGEMENT

A. Bank Resolution and Deposit Insurance

103. Recovery and Resolution Planning (RRP) for and by the largest and most complex bank holding companies (BHCs) under the DFA is the centerpiece of orderly resolution. After a decade of resolution planning, the development of the U.S. resolution regime is more advanced than in other major jurisdictions and has improved firms' capabilities to recover from financial distress and to be resolved in an orderly way under court-governed bankruptcy procedures. The initial requirement to submit annual comprehensive resolution plans under DFA Title I has had far-reaching effects. Firms have reconfigured their financial, legal, and operational structures, underpinned by strengthened governance arrangements; they increasingly assess business decisions through a "resolution lens," ensuring that acquisitions and new activities do not adversely affect resolvability. BHCs' Title I resolution planning has helped the FBAs to better prepare for administrative resolution under the DFA Title II orderly liquidation authority (OLA).

104. Deposit insurance by the Federal Deposit Insurance Corporation (FDIC) is an effective tool to limit the damage caused by the failure of insured depository institutions (IDIs). For failed IDIs, the FDIC's preferred resolution method is a purchase and assumption (P&A) transaction, which is a time-tested and cost-effective resolution method. Supported by effective recordkeeping by IDIs for timely deposit insurance determination, P&A transactions have provided access to insured—and often also uninsured—deposits typically within one business day. This was also the

[64] The assessment was conducted jointly by the Financial Action Task Force (FATF) and the Asia/Pacific Group on Money Laundering (APG, the FATF-style regional body for the Asia/Pacific)) as the United States is a member of both.

[65] See: https://home.treasury.gov/system/files/136/National-Strategy-to-Counter-Illicit-Financev2.pdf.

[66] The FATF upgraded the U.S. technical compliance with customer due diligence requirements from partially to largely compliant, see: http://www.fatf-gafi.org/media/fatf/documents/reports/fur/Follow-Up-Report-United-States-March-2020.pdf.

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case during the GFC. Since 2012, to support its preparedness, the FDIC requires large IDIs to submit annual resolution plans under the Federal Deposit Insurance Act (FDI Act).

105. Requirements for financial companies' DFA Title I resolution plans have been reduced since the previous FSAP. The Economic Growth, Regulatory Relief, and Consumer Protection Act of 2018 (EGRRCPA) increased the thresholds established under the DFA for mandatory Title I plans from US$50 billion to US$250 billion, while giving the FRB discretion—which it has exercised—to apply the requirement to BHCs with assets between US$100 billion and US$250 billion. Under rule changes in 2019 by the FRB and the FDIC, the 74 financial companies subject to DFA Title I resolution plans—including the eight U.S. G-SIBs and several large regional U.S. BHCs and FBOs—follow longer two-or three-year cycles (depending on their size and complexity), alternating full and targeted plans, or even less extensive reduced plans.[67] BHCs with assets under US$100 billion are not required to submit resolution plans.

106. Recovery plan requirements have also been reduced. Dovetailing these changes, in 2019, the OCC increased the threshold for its recovery planning guidelines from US$50 billion to US$250 billion, reducing the number of national banks to which the guidelines apply from 25 to 8. The FRB's recovery planning requirements continue to apply to only the eight U.S. G-SIBs (including the BHC parents of four banks subject to OCC guidelines). For other financial institutions, regular supervision includes overseeing aspects of recovery capabilities; for example, through contingency planning and capital management requirements, without additional or enhanced requirements.

107. Exercising their discretion actively, the FBAs should continue to keep a wider array of firms focused on improving critical capabilities for resiliency, recoverability, and resolvability. The FBAs retain discretion to prescribe more comprehensive and frequent RRP, and to apply these to BHCs with assets above US$100 billion. The FDIC should continue to review these firms' resolvability at least annually and promptly discuss the plans and resolvability assessments in crisis management groups (CMGs). All BHCs and IDIs that are subject to resolution plan requirements should also be subject to recovery plan requirements; other firms should adopt credible, enhanced contingency funding plans—emulating recovery plans—subject to the FBAs' critical supervisory assessment. Any increase of the threshold (from the current US$50 billion) for IDI resolution plans should be very limited. Ensuring the credibility of recovery plans—as is now being done for resolution plans—and the complementarity between recovery and resolution plans is an important priority.

108. Loss-absorbing capacity (LAC) additional to regular capital requirements should be considered for some non-GSIB U.S. financial companies. So far, the U.S. authorities have focused on G-SIBs' LAC. However, the simultaneous failure of smaller or less complex companies could also impact financial stability. This risk could be mitigated, and resolvability improved, by requiring some non-GSIB financial companies—prioritizing those that are subject to resolution planning or have a large regional presence—to hold LAC additional to regular capital requirements, in the form of

[67] Firms are still required to report material changes as they occur, and the FBAs can request that firms focus on specific topics, as needed, allowing targeted reviews of core elements of resolvability.

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subordinated debt or otherwise. This is consistent with the Key Attributes, and it is the practice in other major jurisdictions such as the European Union and the United Kingdom.

109. Further refinements relating to cross-border resolution also deserve attention, as the 2015 FSAP pointed out. OLA powers do not cover FBOs' U.S. branches. While judicial recognition of a foreign resolution action may be possible under the doctrine of comity, a specific statutory mechanism to recognize and support foreign resolution actions does not exist. The depositor preference rule discriminates based on the jurisdiction where deposits are payable.

B. CCP Recovery and Resolution Planning

110. Important progress has been achieved in recent years on recovery planning for CCPs; resolution for CCPs is still work in progress. Since the 2015 FSAP, CCPs have developed recovery plans as required by new and dedicated requirements, with guidance from primary regulators. The FDIC is developing resolution strategies for select CCPs in cooperation with relevant domestic and foreign supervisors, for example—but not only—through so-called CCP CMGs for the CME and ICC. Coordination of the FDIC with domestic regulators is a good and necessary development and should continue, for example, to broaden resolution planning to other CCPs than the ones currently selected; to further develop a policy approach on the interaction between recovery and resolution; and to participate in CCP supervisory stress tests.

C. Liquidity Backstops

111. The Fed rolled out a comprehensive set of liquidity support measures from March 2020 to combat widespread market dysfunction and to enhance monetary policy transmission. The sequence of measures combined significant monetary policy easing, outright long-term asset purchases, expansion of standard repo OMOs, enhancement of the Primary Credit Facility, elimination of reserve requirements, globally coordinated U.S. dollar liquidity provision through an expanded FX swap line network and introduction of a panoply of crisis liquidity support measures using section 13-3 of the FRA (Figure 28).[68] The initial policy response targeted extreme dysfunction in money and securities markets and included coordinated global central bank action to help stabilize FX swap markets. Many of the support measures were a reactivation of GFC-era liquidity facilities with the support of the Treasury to help manage the elevated risks.

112. The FRB's actions were effective in bringing markets under control. Much of the impact in March was an announcement effect as few of the newly announced facilities were immediately operational, implying high credibility of the FRB's timely measures. Money market volatility came down relatively quickly, and repo and Fed funds rates moved back within the Fed funds target

[68] The authorities also implemented complementary regulatory changes which reduced bank balance sheet constraints—for example, adjustments to the Liquidity Coverage Ratio Rule published on May 6, 2020 that require banking organizations to neutralize the effect under the LCR rule of participating in some Fed emergency programs; https://www.federalregister.gov/documents/2020/05/06/2020-09716/liquidity-coverage-ratio-rule-treatment-of-certain-emergency-facilities.

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range. Commercial paper and other securities markets took longer to respond reflecting the significant uncertainty about corporate credit quality and the underlying business environment.

Figure 28. United States: Measures in Response to COVID-19 Crisis as of end-March 2020

Source: IMF staff analysis.

Note: The figure includes actions taken up to end March 2020. In April 2020, the Federal Reserve introduced new facilities to provide liquidity to provide liquidity to businesses via the Paycheck Protection and Main Street Lending Programs. The figure does not show other measures in the area of bank regulation and guidance that were also taken in March 2020 to increase the efficacy of these programs.

Depository Institutions

113. The Fed has a broad and scalable toolkit to backstop liquidity pressures at depository institutions. The Discount Window covers all depository institutions in a variety of circumstances and has wide collateral eligibility. The Discount Window has two main parts: the Primary Credit Facility, which provides collateralized liquidity to well-capitalized depository institutions on a no-questions-asked basis; and the Secondary Credit Facility, which provides liquidity to less well-capitalized depository institutions to assist them quickly returning to the market for funding as well as facilitating an orderly resolution, if required. Significant collateral is pre-positioned at the Fed. The term auction facility is fully developed and provides a scalable tool to provide term funding.

114. Stigma is a longstanding challenge to the effectiveness of the Discount Window. Large banks are usually unwilling to use the Discount Window, which partially reflects perceptions that even the Primary Credit Facility is not merely for helping meet normal day-to-day needs and its use is indicative of more serious problems. Stigma is less evident in banking systems where standing facilities are more frequently used in business-as-usual situations. Encouraging banks to incorporate Discount Window use in their liquidity planning and making Discount Window credit available at a cost closer to normal bank funding rates might improve its effectiveness.

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Nonbanks

115. The DFA narrowed the FRB's powers to lend to systemically important nonbanks, leaving an important gap in the toolkit. The DFA restricted the FRB's powers in that lending to nonbanks under section 13(3) of the Federal Reserve Act is now only possible in exigent circumstances as part of a broad-based program available to at least five nonbanks approved by the Treasury Secretary.[69] Bilateral liquidity support to individual systemically important nonbanks (for example, of the nature of the GFC lending to American International Group and Bear Stearns) is no longer feasible. Restoring such powers is desirable.

Central Counterparties

116. The DFA provided the FRB with the power to provide liquidity support under Title VIII of the DFA to FSOC-designated FMUs. This is desirable given the prominent role these firms play in the management of liquidity and risk in the financial markets. The DFA appropriately sets a high bar for lending to FMUs, which puts appropriate pressure on FMUs and their regulators to ensure that robust liquidity management processes and buffers are in place that reduce the need for official sector support.

117. Early warning processes are well established but preparedness for liquidity support to CCPs could be improved. Regulators have well-developed oversight arrangements that provide timely and granular information on the liquidity situation of CCPs. While CCP supervisors have taken steps to ensure that CCP liquidity will be adequate in stressed market conditions, very extreme circumstances could still conceivably challenge the stressed liquidity plans. The FRB should enhance arrangements to provide liquidity support in a very extreme and likely fast-moving situation.

Market-Wide Liquidity Support

118. Preparedness to provide liquidity support to key securities markets and to quickly implement broad-based liquidity support programs to nonbanks could be further upgraded. The U.S. financial system depends heavily on securities markets for funding and risk management. The Fed deployed programs to support key securities markets in both the GFC and the recent COVID-19 crisis period, which emphasizes the importance of these tools. Preparedness would be enhanced if the FRB developed a more formal framework and associated operational modalities, to determine where and how to quickly provide support to key securities markets.

Foreign Exchange Liquidity Support

119. The capacity for the FRB to provide liquidity support in foreign currencies deserves further attention. The system of standing central bank FX swap lines provides a potentially useful

[69] See https://www.federalreserve.gov/aboutthefed/section13.htm.

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source to finance FX liquidity provision. It is recommended that the FRB develops its FX liquidity support protocols to both banks and CCPs.

D. Collective Crisis Preparedness and Management

120. The FSOC should more actively facilitate and engage in preparedness for a banking sector crisis. So far, the FSOC has focused less on how interagency cooperation would function in contingencies where risk reduction has not succeeded. The FSOC should devote greater attention to ensuring that the FBAs and the Treasury have comprehensive and complementary organization-wide crisis preparedness plans. The FSOC should also prepare the modalities for crisis cooperation, particularly where crisis responses require far more than individual agencies' regular planning. This applies to, for example, national financial crisis communications, and in the rare possibility of a DFA Title II resolution without prior Title I planning. The FBAs should also prepare mitigating actions for a case in which several (larger) institutions will need to simultaneously activate their recovery or contingency funding plans. Considering the increased role of the Treasury Secretary in activating important crisis response tools (some of them still untested), it is critical to decisive crisis action that the modalities for the interactions between the Treasury and the FBAs be operationalized, documented, and regularly reviewed and tested. The FSOC should prioritize this work.

121. Building on the extensive preparation for the resolution of individual large banks, the authorities should consider how a future systemic financial crisis extending beyond the banking sector would best be handled. It is widely acknowledged that the ingenuity and shared vision of the several agencies and of the Treasury during the GFC facilitated what was sufficiently decisive action at most of the key decision points. A next crisis might have its origin and important parts of its transmission in new types of failure and in new types of financial or nonfinancial firms. Needed action might, sooner or later, involve agencies other than the FBAs. Although the FRB would surely still play a leading part, it might have to interact with unfamiliar counterparts and with its freedom of action constrained.

122. The FSOC's crisis preparedness work must cover the entire financial system and include all its member agencies. The FSOC has a broad membership and its mandate covers both the identification of financial stability risks and the response to emerging financial stability threats; it is primarily a forum for coordination between operationally autonomous agencies and has limited decision-making powers. This design puts a premium on advance collective crisis preparation to ensure decisive and coordinated responses from the entire FSOC community. The FSOC should devote greater attention to preparing the modalities for crisis coordination that could be activated at the time of a next financial crisis. Such modalities would not substitute for the member agencies' statutory responsibilities, which they should continue to exercise autonomously. Similar to the preparedness for a banking sector crisis as discussed above, the FSOC should ensure that all member agencies and U.S. Treasury have comprehensive and complementary organization-wide crisis preparedness plans to support the FSOC mandate, ensuring collective and decisive responses to contingencies.

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Table 2. United States: Selected Economic Indicators, 2018–25

(In percentage change from previous period, unless otherwise indicated)

	2018	2019	Projections 2020	2021	2022	2023	2024	2025
National production and income								
Real GDP	3	2	-7	4	3	2	2	2
Real GDP (q4/q4)	3	2	-7	5	3	2	2	2
Net exports 1/	0	0	0	0	0	0	0	0
Total domestic demand	3	2	-6	4	3	2	2	2
Final domestic demand	3	2	-6	4	3	2	2	2
Private final consumption	3	3	-8	5	4	2	2	2
Public consumption expenditure	2	2	2	2	1	1	1	1
Gross fixed domestic investment	4	2	-5	1	3	3	3	3
Private fixed investment	5	1	-7	1	4	3	3	3
Public fixed investment	2	4	3	3	2	2	2	1
Change in private inventories 1/	0	0	-1	0	0	0	0	0
Nominal GDP	5	4	-5	6	5	4	4	4
Personal saving rate (% of disposable income)	8	8	16	11	8	8	8	8
Private investment rate (% of GDP)	18	17	17	16	16	17	17	17
Unemployment and potential output								
Unemployment rate	4	4	9	8	6	5	4	4
Labor force participation rate	63	63	62	62	63	62	62	62
Potential GDP	2	2	-1	1	2	2	2	2
Output gap (% of potential GDP)	0	1	-5	-2	-1	0	0	0
Inflation								
CPI inflation (q4/q4)	2	2	1	2	2	2	2	2
Core CPI Inflation (q4/q4)	2	2	1	2	2	2	2	2
PCE Inflation (q4/q4)	2	1	1	2	2	2	2	2
GDP deflator	2	2	1	2	2	2	2	2
Government finances								
Federal balance (% of GDP) 2/	-4	-5	-18	-10	-5	-5	-5	-5
Federal debt held by the public (% of GDP)	77	79	100	107	107	107	107	108
General government budget balance (% of GDP) 2/	-6	-6	-23	-12	-7	-7	-6	-6
General government gross debt (% of GDP)	107	109	138	142	143	144	145	147
Interest rates (percent; period average)								
Merchandise trade balance (billions of dollars)	-880	-864	-796	-824	-861	-893	-919	-947
Merchandise trade balance (billions of dollars)	-880	-864	-796	-824	-861	-893	-919	-947
Merchandise trade balance (billions of dollars)	-880	-864	-796	-824	-861	-893	-919	-947
Balance of payments								
Current account balance (billions of dollars)	-450	-480	-436	-447	-478	-496	-500	-510
Merchandise trade balance (billions of dollars)	-880	-864	-796	-824	-861	-893	-919	-947
Current account balance (% of GDP)	-2.2	-2.2	-2.2	-2.1	-2.1	-2.1	-2.0	-2.0
Merchandise trade balance (% of GDP)	-4.3	-4.0	-3.9	-3.8	-3.8	-3.8	-3.7	-3.7
Export volume (NIPA basis, goods)	4.3	0.2	-11.2	6.3	5.5	4.6	2.9	2.3
Import volume (NIPA basis, goods)	5.0	0.3	-9.2	6.9	4.6	3.7	2.4	2.1
Net international investment position (% of GDP)	-47.0	-51.6	-61.2	-59.8	-58.8	-58.5	-58.3	-58.2
Saving and investment (% of GDP)								
Gross national saving	18.4	18.1	17.9	17.4	17.4	17.6	17.8	18.0
General government	-3.3	-3.8	-15.1	-9.1	-4.9	-4.0	-3.9	-3.9
Private	21.8	21.9	32.9	26.5	22.3	21.5	21.7	21.9
Personal	5.9	6.1	13.1	8.7	6.4	5.9	5.9	5.9
Business	15.9	15.8	19.8	17.7	15.9	15.7	15.9	16.0
Gross domestic investment	21.0	20.9	20.7	20.1	20.1	20.2	20.4	20.6
Private	17.6	17.5	16.9	16.4	16.4	16.6	16.7	16.9
Fixed investment	17.4	17.2	17.1	16.6	16.6	16.8	17.0	17.1
Inventories	0.3	0.3	-0.3	-0.2	-0.2	-0.2	-0.2	-0.2
Public	3.3	3.4	3.8	3.7	3.7	3.7	3.7	3.7

Sources: BEA; BLS; FRB; Haver Analytics; and IMF staff estimates.

1/ Contribution to real GDP growth, percentage points.
2/ Includes staff's adjustments for one-off items, including costs of financial sector support.

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Table 3. United States: Core Financial Soundness Indicators for Deposit Takers, 2011–19

(In percent unless stated otherwise, end-of-period)

	2011	2012	2013	2014	2015	2016	2017	2018	2019
Regulatory capital to risk-weighted assets	14.7	14.5	14.4	14.4	14.1	14.2	14.5	14.8	14.7
Regulatory tier 1 capital to risk-weighted assets	12.6	12.7	12.8	13.1	13.1	13.2	13.5	13.8	13.8
Non-performing loans net of provisions to capital	17.6	15.7	11.7	8.8	7.2	6.6	5.7	4.7	4.3
Non-performing loans to total gross loans	3.8	3.3	2.5	1.9	1.5	1.3	1.1	0.9	0.9
Sectoral distribution of total loans: residents	95.6	95.5	95.2	95.6	95.8	96.1	96.0	96.3	96.3
Sectoral distribution of total loans: deposit-takers	6.0	6.0	5.0	4.1	3.6	3.8	3.9	5.5	4.8
Sectoral distribution of total loans: other financial corporations	3.8	4.4	5.2	6.2	6.7	6.7	6.9	7.3	7.7
Sectoral distribution of total loans: general government	0.9	1.1	1.2	1.3	1.4	1.5	1.6	1.5	1.4
Sectoral distribution of total loans: nonfinancial corporations	31.8	32.1	33.3	34.2	35.0	35.5	35.4	35.3	35.5
Sectoral distribution of total loans: other domestic sectors	53.1	51.9	50.5	49.8	49.1	48.5	48.2	46.7	46.8
Sectoral distribution of total loans: nonresidents	4.4	4.5	4.8	4.4	4.2	3.9	4.0	3.7	3.7
Return on assets	0.3	0.3	0.4	0.3	0.4	0.4	0.3	0.4	0.4
Return on equity	2.3	2.7	3.3	2.8	3.0	3.2	2.9	3.4	3.5
Interest margin to gross income	65.2	60.8	63.5	63.7	63.4	65.1	67.0	68.3	66.2
Non-interest expenses to gross income	64.5	63.6	61.7	64.7	60.7	59.6	61.6	58.4	57.3
Liquid assets to total assets (liquid asset ratio)	12.7	13.4	14.5	14.5	13.2	12.8	13.2	12.7	11.7
Liquid assets to short term liabilities	66.1	74.1	88.3	90.0	91.2	98.2	97.7	89.3	80.6

Source: IMF, Financial Soundness Indicators and IMF staff calculations.

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Appendix I. FSAP Risk Assessment Matrix

Nature of Risk	Overall Level of Concern	
	Medium-term Likelihood of Realization	**Expected Impact if Risk Materializes**
Prolonged COVID-19 outbreak	**High**	**High**
	Longer containment and uncertainties about the intensity and the duration of the COVID-19 outbreak reduce supply, as well as domestic and external demand. Deteriorating economic fundamentals and the associated decline in risk appetite would result in a second wave of financial tightening, and in debt service and refinancing difficulties for corporates and households.	A sharp recession would have a negative impact on both the U.S. and the global economy. Rising unemployment and bankruptcies would impact banks' NPLs and increase credit risks, translating into financial institutions' losses and forcing them to cut credit, with further adverse implications for growth.
Sharp rise in risk premia	**High**	**High**
	An abrupt deterioration in market sentiment (e.g., prompted by policy surprises, pandemic, trade or geopolitical tensions) could trigger risk-off events such as recognition of underpriced risk. Financial asset prices could fall sharply, and credit spreads widen given the bulk of securities in the lowest investment-grade rating.	Liquidity could dry up in some funding and securities markets (e.g., leveraged loan market) reducing intermediation impacting banks and NBFIs. Higher risk premia cause higher debt service and refinancing risks; stress on leveraged corporates, and to a lesser extent households, disruptive corrections to stretched asset valuations—all depressing growth.
Cyber-attacks	**Low**	**High**
	Cyber-attack on the interconnected financial system reliant on a broadening array of interconnected platforms could trigger systemic financial instability or widely disrupt socio-economic activities.	Shock to critical infrastructure causes delay, denial, disruption, breakdown or loss of services, affecting many institutions that rely on the attacked hub. This could also lead to a loss of confidence in the functioning of the financial system.
Distress of a major CCP or other financial infrastructure	**Low**	**High**
	Regulation and oversight of systemically important U.S. FMIs are generally adequate and effective. However, outcomes of the implementation of the relevant internationally agreed risk management requirements by CCPs are uneven in certain areas in select CCPs, which may potentially exacerbate financial stability risks.	The high interconnectedness and concentrated nature of major FMIs, interdependencies with the largest banks and quasi-monopolies for clearing specific asset classes could trigger a systemic event both domestically and globally.
Inadequate preparations for LIBOR transition	**Medium**	**Medium**
	While progress has been made in moving to a new benchmark, there are still significant risks that public and private entities may not be ready for the transition by the end of 2021.	With more than US$200 trillion of LIBOR-based contracts, problems in transitioning to a new benchmark could cause very significant disruption in financial markets.

Note: The Risk Assessment Matrix shows events that could materially alter the baseline path (the scenario most likely to materialize in the view of IMF staff). It reflects views of the FSAP team on the sources of financial stability risks surrounding the baseline, relative likelihood of their realization sometime in the next three years, and the overall level of concern.

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Appendix II. Banking Sector Stress Testing Matrix

A. Banking Sector: Solvency Test			
Domain		**Framework**	
		TD by FRB	**TD by FSAP Team**
1. Institutional perimeter	Institutions included	18 BHCs classified as large and complex were assessed during the 2019 DFAST/CCAR exercise (8 G-SIBs, 4 other domestic BHCs, 6 IHCs) based on conservative scenarios.	34 largest BHCs/IHCs. The criteria used to determine the institutional perimeter include: (1) FRB stress test sample of banks used in the 2018 DFAST/CCAR exercise; (2) firms' balance sheet size at or above US$100 billion (including one bank which assets are close to US$100 billion).
	Market share	About 65 percent of total banking sector assets in the United States.	About 78 percent of total banking sector assets in the United States.
	Data	Effective date: December 2018. Data: Mostly based on confidential FR Y-14A/M/Q reports and publicly available FR Y-9C report Scope of consolidation: Consolidated group basis.	Effective date: March 2020. Data: Based on publicly available FR Y-9C report accessed via S&P Market Intelligence platform, and supplemented by other data sources including Bloomberg, Dealogic, Haver Analytics, Moody's KMV, International Financial Statistics (IFS), IMF Global Assumptions (GAS), and IMF WEO. Scope of consolidation: Consolidated group basis.
	Stress testing process	The path of any additional macroeconomic or financial variable is derived in a way which is consistent with the scenario using FRB own models.	The FSAP team conducted its own TD stress test using *June 2020 WEO Update* forecast paths (baseline) and forecast paths generated by IMF's Global Macrofinancial Model (adverse) for all material geographies of included banks. The path of any additional macroeconomic or financial variable required by the IMF models is derived in a way which is consistent with the scenario (e.g., real estate prices, credit growth, equity prices, corporate bond yields, term spreads, etc.).

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A. Banking Sector: Solvency Test			
Domain		Framework	
		TD by FRB	TD by FSAP Team
2. Channels of risk propagation	Methodology	FRB uses its own satellite models for: credit risk projections, bank interest rates and net interest margins, market risk, and banks' fee & commission income. FRB projects PPNR components using supervisory models that take the FRB's scenarios and firm-provided data as inputs. The FRB projects the paths of these variables as a function of aggregate macroeconomic variables included in the CCAR scenarios. FRB calculates projected pre-tax net income by combining projections of revenue, expenses, loan-loss provisions, and other losses.	FSAP team projected pre-tax net income at bank level by combining projections of PPNR components and loan loss provisions derived based on forecasted charge-offs and recoveries (57 separate specifications). The model's core set of regressions are used to forecast financial ratios related to pre-provision net revenue (PPNR), returns on AFS securities, and provisions conditional on macroeconomic conditions, lagged value of the ratio, and firm-level controls. FSAP team forecasted 26 PPNR-related ratios separately (8 interest income ratios, 7 interest expense ratios, 8 non-interest income ratios, and 3 non-interest expense ratios). The macroeconomic variables for these specifications are chosen based on the economic intuition rather than merely relying on the statistical significance. Bank-level controls such as various loan shares also enter the PPNR specifications to account for heterogeneity such as various business models these BHCs have. FSAP team forecasted charge-offs and recoveries ratios separately for 15 ratios (30 ratios in total) at industry-level as presented in the schematic below. The autoregressive nature of the specifications implies that the projected ratios will converge to their long-run steady state value. Solvency-funding cost interaction: bank-specific funding costs (interest expenses) conditional on stressed capital position.
3. Tail shocks	Scenario analysis	FRB scenarios is based on FRB policy statement and includes inter alia severe tail shocks such as increase in the level of unemployment by at least 4 p.p. up to a level not less than 10 percent. This corresponds to 1-in-100 years scenario.	The adverse scenario features a severe recession that occurs concurrently with significant financial market stress and a sharp housing and equity market correction and is characterized by a slow recovery. The main triggers are a deterioration of U.S. corporate debt markets and simultaneous downturns in Europe and China. The scenario is to a large extent similar to FRB's

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A. Banking Sector: Solvency Test			
Domain		**Framework**	
		TD by FRB	**TD by FSAP Team**
			severely adverse scenario in terms of severity (less than 1 percent probability of occurrence).
	Sensitivity analysis	• Default of the largest counterparties	• Fintech impact on income and IT expenses. • Market shock on corporate loans, including CLOs/LLs. • Decreased reliance on FHLB funding.
4. Risks and buffers	Positions/risk factors assessed	Credit risk Estimated according to the FRBs stress testing framework. Framework is based upon accounting classification of assets. CLOs and securitization exposures are included. Off-balance sheet exposures using baseline and stressed Credit Conversion Factors (CCFs) are included. Traded risks Mark-to-market valuation of securities (from shocks to interest rates and credit spreads). For banks with large trading books, trading book exposures are shocked through a set of Global Market Shocks (GMS) with losses recognized in the first quarter of the planning period. In addition, DFAST applies a largest counterparty default shock (LCPD) to the trading firms and two other firms with substantial process and/or custodial operations. Both GMS and LCPD are add-ons to the macroeconomic scenarios. All sovereign issuers relevant for banks are included. Market stress from shocks to risk-free interest rates, exchange rates, credit spreads, commodities, and equity prices. Profit loss recognition. Losses/gains are recognized in the same quarter that a shock hit. .	Credit risks: Estimated based on 15 charge-off and recoveries specifications for: first lien and junior lien residential mortgages, home equity lines of credit (HELOC), construction loans, multifamily and non-residential commercial mortgages, credit cards, other consumer loans, commercia and industrial (C&I) loans, loans to foreign governments, loans to depository institutions, agriculture loans, other residential real estate loans, and all other loans. Traded risks: Realized gains on AFS securities is estimated separately following the original CLASS model. Realized AFS gains and losses reflect a combination of asset price shocks, credit events, behavioral decisions about asset sales, and accounting judgment. Due to lack of access to detailed risk information such as mark-to-market losses at loan-level, this model may be more effective in forecasting variables for diversified firms. Market stress from shocks to risk-free interest rates, credit spreads, and equity prices are also incorporated into the framework through the FSAP macro scenario.

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A. Banking Sector: Solvency Test			
Domain		Framework	
		TD by FRB	TD by FSAP Team
		Evolution of RWAs. RWAs for credit risk evolve according to STA approach as well as balance sheet growth requirements embedded into scenario. Net trading income from equity positions, debt instruments, and trading derivatives. Interest income declines by the amount of lost income from defaulted loans. Interest income from non-defaulting loans is estimated according to satellite models. Interest expenses increase due to rising funding costs linked to the macroeconomic scenario with empirically estimated pass-through, and add-on funding stress from a market event with no pass-through to lending rates. Net fee and commission income and other income evolve with macroeconomic conditions and banks' balance sheets. No change in business models (no rebalancing of portfolio). Balance sheets growth over the stress horizon. Starting in DFAST 2020, projections are based on the assumption that firms' balance sheets remain unchanged throughout the projection period. Also, in March 2020, the FRB amended its stress testing requirements to assume that a firm maintains a constant level of assets over the projection horizon and to assume that a firm will not pay any common dividends or make any issuance of common or preferred stock. Tax Rate The effective corporate income tax rate. Regulatory impact Stress tests results are compared against regulatory minima of CET1 and leverage ratios. G-SIB buffer is included into 4.5 percent CET1 minima and can be depleted. No conversion of additional Tier 1 capital	Profit loss recognition. Losses/gains are recognized in the same quarter that a shock hit. Balance sheet and RWA projections Growth path of assets over the stress testing horizon is used to forecast the balance sheet variables and RWAs. The FSAP team first uses a simple approach of using the long-run historical asset growth, supplemented by additional approaches for robustness. The latter include: (1) assuming a zero growth in balance sheet in the stress testing horizon; (2) forecasting balance sheet growth to reflect dynamics of the nominal GDP path in the scenario. Tax rate: Assumed at 21 percent in the forecasting horizon Regulatory impact Stress test results will be compared against a hurdle rate of 4.5. In addition to the hurdle rate, these BHCs are also subjected to a capital conservation buffer (CCB also includes the G-SIBs surcharge in the case of G-SIBs).

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A. Banking Sector: Solvency Test			
Domain		**Framework**	
		TD by FRB	**TD by FSAP Team**
		is assumed during the stress horizon. If banks' capital ratio falls below regulatory minimum during the stress test horizon, banks are not able to return funds to shareholders (dividend payments as well as share buybacks).	
	Behavioral adjustments	Dynamic Balance Sheet: In line with 2019 FRB methodology. Dividend Policy: Payout ratio set by 2019 FRB methodology.	Dynamic Balance Sheet: Balance sheet size is assumed to grow at historical industry growth rate Dividend Policy: Payout ratio projected based on a partial adjustment model with a payout rate of 45 percent for a portion of the net income. The specification is as follows: (0.9*(previous period's dividends) +((1-0.9) *(0.45*net income)).
5. Regulatory and market-based standards and parameters	Calibration of risk parameters	Parameter definition Net charge off ratios for credit risk (accounting definition)	Parameter definition Accounting portfolios.
	Regulatory standards	Capital definition according to national implementation of Basel principles, including CET1, Tier 1, leverage ratio and total CAR. Capital components that are no longer eligible for additional Tier 1 and Tier 2 capital components follow Basel III transitional path.	
6. Reporting format for results	Output presentation	Bank-by-bank: • Minimum CET1, Tier 1, CAR, and leverage ratio • Composition of P&L • Capital ratios • Profitability metrics: ROE; ROA; NII.	Contribution of key drivers to aggregate CET1 capital ratios Number of banks and share of total assets below hurdle rates. Capital shortfall in terms of nominal GDP. System-wide and by groups of banks: • CET1, Tier 1, CAR, and leverage ratio • Distribution of capital ratios (box plots) • Profitability metrics: ROE; ROA; NII

B. Banking Sector: Liquidity Test		
Domain		**Framework**
		TD by FSAP Team
1. Institutional Perimeter	Institutions included	33 banks on the consolidated basis

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	Market share	Over 80 percent of total banking sector assets
	Output presentation	Public data: LCR disclosure templates containing cash flow data for 30 days period. Consolidated basis. Banks grouped by business model Baseline date: December 31, 2019
B. Banking Sector: Liquidity Test		
Domain		**Framework**
		TD by FSAP Team
2. Channels of risk propagation	Methodology	Cash flow-based analysis using contractual LCR cash flow data aggregated for all currencies with assumptions about combined interaction of funding and market liquidity and different degrees of central bank support. Integrated Solvency-Liquidity-Network contagion framework with sequential recalculation of key solvency, liquidity and risk parameters to incorporate feedback loops due to asset fire-sales.
	Feedback loops and links with solvency analysis	Solvency-Funding cost loop (price effect). Higher funding costs for those banks which experience significant decline in solvency ratios. CCP loop. Stress in collateral market (e.g., MBS, corporate securities downgrade etc.) leads to additional flows of collateral.
3. Sensitivity analysis	Perimeter and type of analysis	LCR distribution and volatility across banks
4. Tail Shocks	Size of the shock	Baseline: business as usual (as reported by banks under normal market conditions). Behavioral assumptions: all maturing liabilities are rolled-over. Collateral freeze scenario (e.g., due to cyber-risk related event at CCP) 1 day, 5 days and 1-month intermediate/severe market stress scenario: higher run-off rates on unsecured wholesale funding, and undrawn committed credit/liquidity lines on top of the mild stress scenario;
5. Regulatory and Market-Based Standards and Parameters	Regulatory standards	Threshold for cash flow-based analysis: net cumulative funding gap falls below 0.
6. Reporting Format for Results	Output presentation	Number of banks with negative net cumulated funding gaps; Aggregate negative cumulated counterbalancing capacity.

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Appendix III. Interconnectedness Stress Testing Matrix

A. Banking Sector Domestic Interconnectedness: Exposure Based		
1. Institutional Perimeter	Institutions included	• Six domestic G-SIBs.
	Market share	• About 50 percent of the banking sector.
	Data and baseline date	• Confidential bilateral exposure data collected by the FRB for the BIS G-SIB hub and confidential liquidity data from FR 2052a. Given the confidentiality of the data used for this exercise, FRB staff implemented the analysis for the FSAP team. Data cutoff as of end-December 2019.
2. Channels of Risk Propagation	Methodology	• First stage (Liquidity Shock) ○ Calibration of net outflows shock and comparison to the counter-balancing capacity. ○ Liquidity channel-related contagion to the other entities occur due to the price impact of asset sales. ○ Loss in capital due to liquidity channel-related losses (liquidation losses plus marked-to-market losses). These capital levels are carried forward to the second stage as the starting capital levels. • Second stage (Credit Shock and Risk Transfers) ○ Based on a modified version of Espinosa-Vega and Sole (2010) with 7 exposure categories separately.
3. Tail shocks	Size of the shock	• Redemption shocks/run-off factors in the first stage are scenario-based, calibrated based on historical evidence. • Loss given default rates (LGDs) in the second stage vary by exposure category.
4. Reporting Format for Results	Output presentation	• Capital shortfall in percent of initial capital before stage 1 in the network (without identifying individual banks by name); • Capital shortfall, system wide (with max values).
B. Banking Sector Cross-Border Interconnectedness: Exposure Based		
1. Institutional Perimeter	Institutions included	• 22 large banking systems (both nationality/consolidated and locational residency basis).
	Market share	• Includes exposures of internationally active banks in these banking systems.
	Data and baseline date	• Based on publicly available and confidential BIS consolidated and locational data. Data cutoff end-September 2019.

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2. Channels of Risk Propagation	Methodology	• Balance-sheet based; network contagion based on Espinosa-Vega and Sole (2010).
3. Tail shocks	Size of the shock	• Pure contagion: default of banking systems, 50–100 percent loss given default, 50 percent funding roll-over ratio.
4. Reporting Format for Results	Output presentation	• Capital shortfall, system wide on consolidated basis (i.e., based on nationality); • Capital shortfall, system wide on residency basis.
C. Domestic and Cross-Border Interconnectedness: Market Based		
1. Institutional Perimeter	Institutions included	• 120 depository institutions and 87 other financial entities in 23 countries. Out of the 207 total entities, 47 are U.S. entities.
	Market share	• All listed financial sector entities with consolidated assets above US$100 billion.
	Data and baseline date	• Equity prices from Thompson Reuters DataStream (daily). Data cutoff as of end-December 2019.
2. Channels of Risk Propagation	Methodology	• Market-based model: Diebold and Yilmaz's (2014) generalized forecast error variance decomposition approach. The analysis is conducted using either daily or weekly data. For daily data, following standard practice, two-day average is used to accommodate time differences across markets.
3. Tail shocks	Size of the shock	• Size of the correlation coefficient. We further refined it by incorporating the asset size of these entities (i.e., asset-weighted coefficients).
4. Reporting Format for Results	Output presentation	• Heatmap of average co-movement between banks/nonbanks in the US/Rest of the world. • Network maps with co-movement between entities.

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Appendix IV. Mutual Fund Stress Testing Matrix

Mutual Fund Sector: Liquidity Risk		
1. Institutional perimeter	Institutions included	• All fixed income and mixed mutual funds covered by Morningstar (2,733 funds with total net assets of US$6,319 billion).
	Market share	• Around 100 % of the fixed income and mixed fund sector.
	Data	• Commercial data (Morningstar).
	Reference date	• December 31, 2019.
2. Channels of risk propagation	Methodology	• Calibration of redemption shock and comparison to level of highly liquid assets. • Price impact due to asset sales. • Second-round effects based on flow-performance relationship.
	Time horizon	• Instantaneous shock.
3. Tail shocks	Scenario analysis	• Adverse scenario: same as the banking sector scenario but converted to monthly frequency. • Pure redemption shock: outflows based on historical distribution: 3% expected shortfall (average of 3% worst net flows).
4. Risks and buffers	Risks/factors assessed	• Market risk: interest rates, share prices, credit spreads. • Liquidity risk: severe redemption shock.
	Buffers	• Level of highly liquid assets.
	Behavioral adjustments	• Choice of liquidation strategy used: slicing (prorated), waterfall (most liquid assets first), and mixed approach (cash then slicing). • Liquidity Management Tools are not taken into account.
5. Regulatory standards and parameters	Regulatory/accounting standards	• N/A
6. Reporting format for results	Output presentation	• Number of funds with a redemption coverage ratio below one (ratio of highly liquid assets to redemptions). • Price impact of asset sales. • Redemptions due to second-round effects.
Mutual Fund Sector: Vulnerability analysis and contagion		
1. Institutional perimeter	Institutions included	• All fixed income and mixed mutual funds covered by Morningstar (2,733 funds with total net assets of US$6,319 billion) and fixed-income ETFs.
	Market share	• Around 100% of the fixed income and mixed fund sector.
	Data	• Commercial data (Morningstar).
	Reference date	• December 31, 2019.
2. Channels of risk propagation	Methodology	• CoVaR applied to fund flows and returns by fund category to identify most vulnerable funds and most contagious. • Diebold-Yilmaz methodology applied to funds to identify most vulnerable funds and most contagious. • Tail-dependence using copula.
	Time horizon	• Monthly data.
3. Tail shocks	Scenario analysis	• For Copula approach: expected net flows conditional on a fund category facing net flows worse than the 3% expected shortfall.
5. Regulatory standards and parameters	Regulatory/accounting standards	• N/A
6. Reporting format for results	Output presentation	• Representation of interconnectedness among funds by fund category. • Identification of fund categories most vulnerable to distress from other categories.

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Appendix V. Insurance Sector Stress Testing Matrix

Insurance Sector: Solvency Risk		
1. Institutional perimeter	Institutions included	• Macrofinancial scenario: 21 life insurance groups, 22 non-life insurance groups, 7 health insurance groups. • Low-for long: Life insurance sector. • Mass lapse event: 21 life insurance groups. • Natural disaster: 538 non-life insurers (solo), 44 small, regionally concentrated non-life insurers (solo). • Banking counterparty default: 21 life insurance groups, 22 non-life insurance groups, 7 health insurance groups.

	Market share	• Macrofinancial scenario (based on gross written premiums):
		  • Life: 70 percent.
		  • Non-life: 70 percent.
		  • Health: 45 percent.

	Data	• Regulatory reporting.
	Reference date	• December 31, 2018.
2. Channels of risk propagation	Methodology	• Investment assets: other-than-temporary impairments on securities after price shocks, increase in the default rate for corporate bonds and loan exposures. • Insurance liabilities: unaffected by change in interest rates as discount rates are based on historic cost accounting. • Sensitivity analysis: effect on statutory capital.
	Time horizon	• Instantaneous shock.
3. Tail shocks	Scenario analysis	• Adverse macrofinancial scenario: Equity prices -40.4 percent (unaffiliated) and -20.0 percent (affiliated); property held for sale -23.2 percent; impairment on fixed-income instruments between 3.0 percent (NAIC rating category 3) and 15.0 percent (NAIC rating category 6); corporate bond yield increase between 2.8 percentage points (NAIC rating category 3) and 7.0 percentage points (NAIC rating category 6); impairment on mortgages 2.0 percent (first lien) and 10.0 percent (other mortgages).
	Sensitivity analysis	• Low-for-long interest rate projections. • Mass lapse event, triggered by a +2.0 percentage points interest rate hike for U.S. Treasury bonds. • Natural disaster: 1-in-50, 1-in-100, 1-in-250, and 1-in-500 years hurricane. • Default of the largest banking counterparty.
4. Risks and buffers	Risks/factors assessed	• Market risks: interest rates, share prices, property prices, credit spreads. • Asset-liability risks. • Credit risks, incl. counterparty risks. • Natural catastrophe risks. • Summation of risks, no diversification effects.
	Buffers	• None.
	Behavioral adjustments	• None.
5. Regulatory standards and parameters	Regulatory/ accounting standards	• U.S. Risk-Based Capital (RBC). • U.S. GAAP.
6. Reporting format for results	Output presentation	• Macrofinancial scenario: Impact on statutory capital and contribution of individual shocks; dispersion measures. • Low-for-long: Projection of net investment spread (investment return minus guaranteed interest rate). • Mass lapse event: Cash outflow, waterfall of assets which need to be liquidated; dispersion measures. • Natural disaster: Impact on statutory capital and RBC coverage ratio, number of companies with an RBC shortfall; dispersion measures. • Banking counterparty default: Impact on statutory capital; dispersion measures.

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Appendix VI. Grouping of Banks in the Stress Test

Banks in the stress test are grouped into four different categories depending on business model and size of the balance sheet, namely: G-SIBs (excluding four G-SIBs, which are grouped as Trading Banks given their focus on trading-related activities, investment banking, and asset management services); trading banks; foreign-owned banks; and large domestically oriented banks (Non-GSIBs).

Name	Stress Testing Category	Assets (2020: Q1); in th. USD
JPMorgan Chase & Co.	G-SIB	3,139,431,000
Bank of America Corporation	G-SIB	2,619,954,000
Citigroup Inc.	G-SIB	2,219,770,000
Wells Fargo & Company	G-SIB	1,981,349,000
Goldman Sachs Group, Inc.	Trading bank	1,089,759,000
Morgan Stanley	Trading bank	947,795,000
U.S. Bancorp	Non-GSIB	542,909,000
Truist Financial	Non-GSIB	506,229,000
Bank of New York Mellon Corporation	Trading bank	468,155,000
TD Group US Holdings LLC	Foreign	447,268,871
PNC Financial Services Group, Inc.	Non-GSIB	445,567,546
Capital One Financial Corporation	Non-GSIB	396,878,031
State Street Corporation	Trading bank	362,528,000
HSBC North America Holdings Inc.	Foreign	297,535,664
BMO Financial Corp.	Foreign	187,756,342
American Express Company	Non-GSIB	186,054,000
Fifth Third Bancorp	Non-GSIB	185,391,070
BNP Paribas USA, Inc.	Foreign	183,085,293
Ally Financial Inc.	Non-GSIB	182,527,000
Barclays US LLC	Foreign	179,955,000
Citizens Financial Group, Inc.	Non-GSIB	176,981,456
MUFG Americas Holdings Corporation	Foreign	165,696,005
UBS Americas Holding LLC	Foreign	163,248,851
Northern Trust Corporation	Trading bank	161,709,179
KeyCorp	Non-GSIB	157,003,466
Santander Holdings USA, Inc.	Foreign	152,144,560
RBC US Group Holdings LLC	Foreign	137,944,290
Regions Financial Corporation	Non-GSIB	133,638,000
Credit Suisse Holdings (USA), Inc.	Foreign	131,778,058
M&T Bank Corporation	Non-GSIB	124,577,833
DB USA Corporation	Foreign	117,159,000
Huntington Bancshares Incorporated	Non-GSIB	113,897,248
Discover Financial Services	Non-GSIB	112,656,646
BBVA Compass Bancshares, Inc.	Foreign	94,325,559

Source: IMF staff; and S&P Market Intelligence

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FSAP Recommendation	Developments	Status
Macroprudential framework and policy		
Provide an explicit financial stability mandate to all FSOC member agencies	Several agencies continue to have no explicit legal mandate to support financial stability. As discussed in the 2015 FSAP, this can complicate their input to the Financial Stability Oversight Council (FSOC), and potentially undermines the response to the committee's recommendations and macroprudential coordination. While not all FSOC agencies within their existing authorities have an explicit legal mandate to support financial stability, they all continue to make progress toward financial reforms. Some FSOC agencies, however (including the U.S. federal banking agencies), have, as their responsibilities, key roles in maintaining financial stability.	Not implemented.
Include in FSOC Annual Report specific follow-up actions for each material threat identified	The FSOC's Annual Reports discuss in a detailed manner each material threat identified, provide updates on regulations and other measures proposed or implemented in response to each threat, and outline the research agenda. However, specific timelines and responsible agencies are not identified.	Partially implemented.
Publish the current U.S. macroprudential toolkit and prioritize further development	The macroprudential toolkit remains to be centrally published, and a prioritization to be made. The FSAP recommended further development and implementation of time-varying macroprudential tools, like the countercyclical capital buffer (CCyB). The OCC, FDIC, and Federal Reserve (FRB), have the authority under their respective regulations to determine whether or not to activate the CCyB (and to determine the appropriate level) for the banking organizations subject to the respective jurisdictions. Staff from the three agencies meet on a regular basis to discuss their views on CCyB implementation and have generally agreed to coordinate as appropriate. In September 2016, the FRB approved a final policy statement detailing the framework for setting the CCyB. The policy statement provides background on the range of financial-system vulnerabilities and other factors the FRB may take into account as it evaluates settings for the buffer, including but not limited to, leverage in the nonfinancial and financial sectors, maturity and liquidity transformation in the financial sector, and asset valuation pressures. Due to the constantly evolving nature of economic and financial risks, the FRB is likely to adapt the range of indicators and models over time. The FRB has re-assessed the level of the CCyB annually since adopting the policy statement and has begun issuing a semiannual report on financial stability conditions. Most recently, in March 2019, the FRB affirmed the amount of the CCyB at 0 percent.	Partially implemented.

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	The NAIC Financial Stability (EX) Task Force is working to enhance the macroprudential toolkit of state insurance regulators. The Macro Prudential Initiative (MPI) addresses four focus areas: developing a liquidity stress testing framework for material life insurance groups, including enhancing disclosures to better assess products with higher liquidity risk potential; capital stress testing to be addressed as part of the NAIC group capital calculation; reviewing existing recovery and resolution processes, and disclosures to identify any enhancement needs; and determining if there are material gaps in existing counterparty exposure disclosures.	
Expedite heightened prudential standards for designated nonbank systemically important financial institutions (SIFIs)	In 2015, the FRB adopted a comprehensive set of enhanced prudential standards (EPS) for General Electric Capital Corporation, Inc. (GECC), which was designated by the FSOC in July 2013 for Federal Reserve supervision. The EPS included capital and liquidity requirements, capital planning and stress testing requirements, risk management requirements, and restrictions on intercompany transactions between GECC and its parent. The FSOC rescinded the designations of GECC in June 2016; AIG in September 2017; and Prudential Financial, Inc. in October 2018. In March 2016, a federal district court rescinded FSOC's designation of MetLife, Inc. As a result, there are currently no companies designated by the FSOC for Federal Reserve supervision and enhanced prudential standards. On June 3, 2016, the FRB approved an advance notice of proposed rulemaking (ANPR) inviting comment on conceptual frameworks for capital standards that could apply to systemically important insurance companies and to insurance companies that own a bank or thrift. The standards would differ for each population of insurance firms supervised by the FRB. In parallel, the FRB approved a notice of proposed rulemaking to apply EPS for the systemically important insurance companies as designated by the FSOC. In line with the Dodd-Frank Act (DFA), these proposed standards would apply consistent liquidity, corporate governance, and risk management standards to the firms and require the firms to employ both a chief risk officer and chief actuary.	Partially implemented.
Improve data collection, and address impediments to inter-agency data sharing	The Office of Financial Research (OFR) *Interagency Data Inventory* (IDI), which catalogues the data that FSOC member agencies purchase or collect from the industry or derive from other data, had its annual update in March 2017. FSOC member agencies use the inventory for identifying data gaps and for improving research and analysis but, due to specific restrictions to data sharing, the listing of data in the inventory does not necessarily signify that all FSOC member agencies have access to all data sets. In support of FSOC, OFR facilitated a review of data sharing agreements to identify areas for standardization (see OFR 2016 Financial Stability Report). OFR, along with the FRB, the New York Federal Reserve, and the Securities and Exchange Commission (SEC) have completed pilot data collections about bilateral repurchase agreements (repos) and securities lending activity. The OFR has made the summary of	Partially implemented.

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	findings publicly available on its website.[1] Steady progress in data collection and sharing is being made, including areas previously identified as those where more work needs to be done: (i) the collection of data on securities lending, and bilateral repos is still at an early stage; and (ii) outstanding obstacles to interagency data sharing should be reduced, as recommended in the FSAP. Section 21(c)(7) of the Commodity Exchange Act directs swap data repositories to make swap data available to certain enumerated domestic authorities and any other entity the Commodity Futures Trading Commission (CFTC) determines to be appropriate, which may include certain types of foreign authorities. In 2011, the CFTC adopted rules implementing these statutory swap data access provisions by establishing processes by which various categories of entities could gain access to swap data held by swap data repositories. In June 2018, the CFTC amended the 2011 access requirements such that certain authorities may obtain swap data access more efficiently. The amendments removed statutorily mandated requirements that foreign and domestic regulators indemnify swap data repositories for any expenses arising from litigation relating to the information provided by the repositories. The amendments also set forth a process for the CFTC to deem other domestic and foreign regulators appropriate to receive access to swap data held by the repositories. In August 2016, the SEC adopted rules to provide authorities with conditional access to security-based swap data held by SEC-registered security-based swap data repositories. Authorities must agree to keep confidential the data they receive from the repository, and the rules adopted require a memorandum of understanding or other arrangement between the SEC and the data recipient addressing the confidentiality of the information made available.	
Regulation and supervision		
Give primacy to safety and soundness in the supervisory objectives of Federal Banking Agencies	No material change in the legal mandates.	Not implemented.
Strengthen the banking supervisory framework and limit structures for related-party lending and concentration risk; and	In August 2018, the Federal Reserve adopted a final rule to address *single-counterparty credit risk*. The rule applies single-counterparty credit limits to bank holding companies (BHCs) and foreign banking organizations with total consolidated assets of $250 billion or more, including any U.S. intermediate holding company (U.S. IHCs) of a foreign banking organization with $50 billion or more in total consolidated assets, and any BHC identified as a global systemically important BHC under the Federal Reserve's capital rules.	Partially implemented.

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update guidance for operational and interest rate risk	In late 2015, the agencies issued guidance on commercial real estate lending, which includes, among other things, a discussion of the importance of managing concentration risk. No meaningful progress on related-party transactions and guidance for operational and interest rate risk.	
Set up an independent insurance regulatory body with nationwide responsibilities and authority	The supervisory and regulatory architecture for insurance firms has not changed.	Not implemented.
Implement principle-based valuation standard for life insurers consistently across the states	All states are in the process of implementing principles-based reserving (PBR) for life insurance reserves with an optional three-year transition period starting on January 1, 2017 (only 37 life insurance companies took this option) before it became mandatory on January 1, 2020. PBR only applies to new business written so existing books of business will continue to use the previous valuation methodologies.	Partially implemented.
Develop and implement group supervision and group-level capital requirements for insurance companies	In 2016, the FRB developed consolidated reporting requirements and consulted on enhanced prudential standards for insurance companies designated by FSOC. The FRB has consulted twice on the development of capital standards for groups with insurance activities subject to its supervision. As there are no FSOC-designated insurance groups currently, only the consultation on the Building Block Approach for capital requirements for the insurance groups that own a bank or thrift remain relevant in 2019. State insurance regulators are working through the NAIC to develop a group capital calculation, which would be an additional analysis tool for regulators, but not a quantitative capital requirement. The proposed group capital calculation is currently being tested by over 30 insurance groups and 15 lead states. <u>Developments in insurance group regulation</u> All 50 states, the District of Columbia, and Puerto Rico have adopted the updated NAIC model holding company Act enhancing state insurance regulators' group supervisory authorities and the NAIC Own Risk and Solvency Assessment (ORSA) model Act. Twenty-nine states have adopted updates to the NAIC model holding company Act relating to powers of a group-wide supervisor (GWS) of an IAIG. It became part of the accreditation program for all states by January 1, 2020.	Partially implemented.

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	Twenty-seven states have adopted the NAIC corporate governance model Act, which became an accreditation requirement on January 1, 2020.	
Provide needed resources to the SEC and CFTC and enhance their funding stability	There has been no change to the funding systems of both agencies.	Not implemented
Increase examination coverage of asset managers	The SEC has increased its examination coverage of registered investment advisers, reaching a level of 17 percent in fiscal year 2018. However, further improvements are warranted.	Partially implemented
Introduce explicit requirements on risk management and internal controls for asset managers and commodity pool operators	New SEC rules took effect in 2018 requiring open-end funds to have liquidity risk management programs with certain mandatory elements. The CFTC has not introduced any changes to the framework for commodity pool operators.	Partially implemented.
Complete the assessment of equity market structure and address regulatory gaps	Since the 2015 FSAP, the SEC has issued several significant proposals related to equity market structure, including amendments to existing regulation to enhance operational transparency and regulatory oversight of ATSs. In addition, the SEC approved the consolidated audit trail, which would enable regulators to efficiently track all trading activity in the U.S. equity and options markets. SEC staff has also organized a series of roundtables devoted to specific equity market structure topics.	Implemented.
Stress testing		
Conduct liquidity stress testing for banks and nonbanks on a regular basis; run regular network analyses; and link liquidity, solvency, and network analyses	While the Comprehensive Capital Analysis and Review (CCAR) and DFA stress tests continue to take the form of supervisory solvency stress tests in which second-round effects are not explicitly incorporated, they are implicitly captured in a few ways. First, the macro scenarios are based on very severe recessions coupled with significant declines in asset prices. In the past, such recessions have been associated with very weak banking sectors, so the macro dynamics should reflect the amplification effects from the banking system. Second, the global market shock is based on the movements of asset prices in the second half of 2008, a period that saw the default of a SIFI and the distress of several systemically important institutions. Thus, market conditions should reflect the "second round" effects of the failure of a major	Partially implemented.

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	financial company. Third, in implementing the default of the largest counterparty element, participating banks are instructed to compute outcomes if the counterparty whose default would cause the largest losses (under the market conditions described in the market shock) was to default. While this does not capture additional second-round effects beyond those described above, it does guarantee that the first-round effects are as large as possible. Federal banking agencies finalized a rule implementing the *Liquidity Coverage Ratio* (LCR) in 2014 and proposed a *Net Stable Funding Ratio* (NSFR) in 2016. Per definition, the LCR is a short-term liquidity stress test, and banks are expected to pass the underlying stress scenario on a continuous basis. The proposed NSFR would establish a quantitative metric that measures the stability of a firm's funding profile over a one-year timeframe. However, stress testing exercises, like the DFA stress tests or the CCAR, focus on credit and market risk, not on funding and market liquidity risk. Authorities do not conduct, on a regular basis, liquidity stress tests on nonbanks. However, the SEC requires MMFs to conduct regular stress tests, including on their liquidity. In addition, certain of the largest broker-dealers are providing additional information regarding their liquidity risk so SEC staff can better monitor the firm's management of that risk. The SEC also adopted rules in October 2016 requiring open-end funds to have liquidity risk management programs with certain required elements (see further below). While most large U.S. life insurers perform their own internal liquidity stress testing work, a consistent regulatory liquidity stress test is currently under development by the NAIC. This requirement will exist for any insurance group or legal entity with U.S. results that trigger any of six thresholds (fixed and indexed annuities, funding agreements and GICs, derivatives, securities lending, repurchase agreements, and borrowed money). Once a group triggers the liquidity stress testing requirement, the liquidity stress test itself will be based upon internal company cash flows, will utilize consistent stress tests and "what if" modifications (currently being established), and be applied at the legal entity level (including the holding company) with results reported individually and as a group. The target date for the proposed liquidity stress testing design is August 2019. *Network analysis, and integration with liquidity and solvency stress tests.* The DFA stress tests and the CCAR do not integrate different risk classes beyond credit and market risk. The tests look at banks individually, with contagion and spillover risks entering implicitly though the macro dynamics in the current scenarios rather than explicitly being assessed in the tests. Publicly available information suggests there is no supervisory requirement to integrate in a single framework different risk factors. OFR has conducted research on network models within the context of stress testing and contagion.	

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	In March 2010, the U.S. federal banking agencies issued guidance titled "The Interagency Policy Statement on Funding and Liquidity Risk Management" (75 FR 13656 (March 22, 2010)) ("Liquidity Risk Policy Statement"). The Liquidity Risk Policy Statement incorporates elements of the BCBS's Principles for Sound Liquidity Risk Management and Supervision ("Basel Liquidity Principles") and is supplemented by other liquidity risk management principles previously issued by the U.S. federal banking agencies. The Liquidity Risk Policy Statement discusses examples for fundamental liquidity risk management practices that the U.S. federal banking agencies generally consider to be consistent with safety and soundness standards and other applicable laws and regulations, including a comprehensive management process for identifying, measuring, monitoring, and controlling liquidity risk. It also emphasizes the central role of corporate governance, cash-flow projections, stress testing, ample liquidity resources, and formal contingency funding plans as tools for effectively measuring and managing liquidity risk. In addition, in 2014, the Federal Reserve adopted Regulation YY (12 CFR part 252) to implement the enhanced prudential standards established under section 165 of the Dodd-Frank Wall Street Reform and Consumer Protection Act ("Dodd-Frank Act") (12 U.S.C. § 5365) for BHCs , including foreign-based BHCs, with total consolidated assets of $50 billion or more (covered companies). These enhanced prudential standards included requirements related to liquidity risk management and liquidity sufficiency. The Regulation YY liquidity requirements, which came into effect in 2015 for the relevant domestic BHCs and 2016 for the relevant foreign banking organizations, provide a regulatory framework for large banking institutions to establish and maintain robust liquidity risk management practices, perform internal stress tests for determining the adequacy of liquidity resources, and maintain a buffer of highly liquid assets to cover cash flow needs over a 30-day stress period, or the first 14 days of a 30-day stress period in the case of the collective U.S. branches and agencies of a foreign banking organization operating in the United States. As a result of statutory changes, the Board has proposed to change the threshold for Regulation YY to apply to BHCs with total assets of $100 billion in more (in addition, in the case of foreign banking organizations, the Board has proposed to raise the threshold to $100 billion or more in combined U.S. assets). A component of Regulation YY's liquidity stress testing requirement is evaluated annually. For example, in one-year supervisors may review foreign banking organizations' compliance with the requirement that they conduct stress testing with respect to their U.S. branches and agencies, and in the following year supervisors may examine compliance by BHCs. In addition, the Federal Reserve conducts an annual review of the liquidity stress testing practices, liquidity position, and liquidity risk management practices of systemically important banking organizations. Under this program, supervisors assess the adequacy of firms' liquidity positions relative to their unique risks and test the reliability of these firms' approaches to managing liquidity risk. The review provides a regular opportunity for supervisors to respond to evolving liquidity risks and firm practices over time. The supervisory review evaluates firms' liquidity positions both through a range of supervisory liquidity metrics and through analysis of firms' internal stress tests. The assessment includes an examination of the stress tests that each firm uses to make funding decisions and to	

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	determine its liquidity needs and an assessment of a range of liquidity risk management practices.	
Develop and perform regular insurance stress tests on a consolidated group-level basis	State insurance regulators assess the stress tests performed by insurance companies on a consolidated group-level basis through the Own Risk and Solvency Assessment (ORSA) under the Risk Management and Own Risk Assessment Model Act, which has been adopted by all states. The group capital calculation contemplates determining if stress testing should be included in the filing of that calculation.	Partially implemented.
Develop and perform regular liquidity stress tests for the asset management industry	The SEC requires MMFs to conduct regular stress tests, including on their liquidity. The SEC also requires that an open-end fund assess, manage, and periodically review (with such review occurring no less frequently than annually) its liquidity risk, based on a range of factors. However, the SEC does not perform stress tests itself.	Not implemented.
Market-based finance and systemic liquidity		
Change redemption structures for mutual funds (MFs) to lessen incentives to run; move all money market mutual funds (MMMFs) to variable net asset value (NAV) approaches	In September 2015, SEC proposed a rule for MFs and ETFs designed to enhance liquidity risk management, provide new disclosures regarding fund liquidity, and allow MFs to adopt swing pricing to pass on transaction costs to entering and exiting investors. However, to date no MF has adopted swing pricing. *MMFs and variable NAV:* Rules issued by the SEC that have been fully implemented require floating NAVs for institutional non-government MMFs. Retail and government MMFs are permitted to continue using an amortized cost method of pricing where constant NAVs are applied. For the latter group of MMFs, the rules provide new tools—liquidity fees and redemption gates—to address potential runs. In its 2018 annual report, FSOC recommended that the SEC continue to monitor the impact of its reforms in light of the approximately $1 trillion shift from non-government MMFs to government MMFs since the adoption of the reforms.	Partially implemented.
Complete tri-party repo (TPR) reforms and measures to reduce run-risk, including the possible use of central clearing platforms (CCPs)	The underlying infrastructure of the TPR market, a key stress point in the global financial crisis, has been improved. The amount of intra-day credit extended to collateral providers has been reduced by over 95 percent as a result of changes in practice and process made to adhere to the reform roadmap. Also, clearing banks are now limited to funding a maximum of 10 percent of a dealer's notional tri-party book through pre-committed lines and incur a capital charge from the credit extension. Risk of fire sales of collateral by a dealer losing access to repo or by a dealer's creditors: Although the risk of collateral fire-sales is reduced through post-crisis capital and liquidity regulations, it remains a significant risk that warrants attention.	Implemented.

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	Intra-day counterparty risk exposure in the tri-party repurchase (repo) market contracted significantly in recent years, but the potential for fire sales of collateral by creditors of a defaulted broker-dealer remains a significant risk. Additionally, data gaps continue to limit regulators' ability to monitor the aggregate repo market and identify interdependencies among firms and market participants.	
Enhance disclosures and regulatory reporting of securities lending	In early 2016, the OFR, the FRB, and the SEC completed a *joint securities lending data collection pilot*. The purpose of the pilot data collection was to collect information directly from seven securities lending agents that participated in the pilot project voluntarily. In April 2016, the FSOC expressed its view that, without comprehensive information on securities lending activities across the financial system, regulators cannot fully assess potential financial stability risk, and encouraged efforts to propose and adopt a rule for a permanent collection of data on securities lending relevant agencies continue to consult on these issues. In October 2016, the SEC adopted new reporting requirements for registered investment companies, which include information on their securities lending activities. Registered investment companies were required to comply with requirements to provide annual information regarding securities lending beginning on June 1, 2018.	Partially implemented.
Strengthen broker-dealer regulation, in particular liquidity and leverage regulations	The U.S. authorities are tackling financial leverage through regulating financial products as well as the types of market participants (of which some are not subject to direct regulation): Broker-dealer requirements, like margin rules for securities transactions, central clearing of derivatives (fostering product standardization and increasing liquidity), as well as newly introduced margin requirements for uncleared swaps constitute important examples of regulatory and supervisory efforts. In addition, certain of the largest broker-dealers are providing additional information regarding their liquidity risk so SEC staff can better monitor the firm's management of that risk. To reduce the financial stability risk potential of derivatives, U.S. bank swap dealers are now required to collect and post margin on (almost) all swaps that cannot be centrally cleared. The use of uncleared derivatives is thereby made less attractive, and the requirements will encourage the use of standard derivatives that go through central clearinghouses. This measure also helps ensure that a default of a major OTC derivatives market participant would not bring down the system. In October 2015, the FRB, Federal Deposit Insurance Corporation (FDIC), Office of the Comptroller of the Currency (OCC), Farm Credit Administration (FCA), and Federal Housing Finance Agency (FHFA) issued a final rule to establish capital and margin requirements for swap dealers, major swap participants, security-based swap dealers, and major security-based	Partially implemented.

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	swap participants regulated by one of the aforementioned agencies. The final rule phased in the variation margin requirements between September 1, 2016 and March 1, 2017. The initial margin requirements began on September 1, 2016 and phase in over four years. In January 2016, the CFTC issued its final rule on margin requirements for uncleared swaps. The CFTC final rule on cross-border application of margin requirements was published in May 2016. Implementation of the CFTC's final regulations on margin requirements for swap entities not regulated for this purpose by a U.S. prudential regulator was initiated for initial margin on a phase-in basis starting on September 1, 2016 and was effective for variation margin as of March 1, 2017. The CFTC amended its rules in November 2018 to harmonize with the requirements for swap entities regulated by the U.S. prudential regulators. In addition, the CFTC issued comparability determinations for margin requirements for uncleared swaps for Japan (September 2016, updated March 2019), the European Union (October 2017), and Australia (March 2019).	
Improve data availability across bilateral repo/tri-party repo and securities lending markets	Data on the tri-party and General Collateral Financing (GCF) repo markets are published regularly. In February 2019, the OFR adopted rules requiring daily reporting by covered central counterparties of centrally cleared repo transactions, comprising approximately one-quarter of all U.S. repo market transactions. In October 2016, the SEC adopted new reporting requirements for registered investment companies, which include information about their securities lending activities. Registered investment companies were required to comply with requirements to provide annual information regarding securities lending beginning on June 1, 2018. Pursuant to the FRB's supervisory authority, the Federal Reserve Bank of New York (FRBNY) collects trade-by-trade data on tri-party repo transactions on a daily basis from the Bank of New York Mellon. In February 2019, the OFR published a final rule that will require the Fixed Income Clearing Corporation (FICC) to report data on FICC-cleared repo transactions beginning in October 2019. The FRB will act as the OFR's collection agent, with required data to be submitted directly to the FRBNY. (Currently, the FRBNY relies on a voluntary agreement with an FICC affiliate to obtain data regarding bilateral repos and GCF repo transactions that are cleared by FICC.)	Partially implemented.
Liquidity backstops, crisis preparedness, and resolution		
Revamp the Primary Credit Facility as a monetary instrument	In 2016, the Federal Reserve considered the role of the Primary Credit Facility as part of an evaluation of its long-run operating framework. In particular, at the FOMC's November 2016 meeting Federal Reserve staff discussed considerations regarding potential choices of operating regimes and the issue of stigma associated with borrowing from the discount window. No changes to the Primary Credit Facility were made at that time.	Not implemented.

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	Subsequently, staff of the Federal Reserve System has continued to study the role of Primary Credit. This work has included an October 2017 conference on the stigma associated with use of the discount window.	
Enable the FRB to lend to solvent nonbanks that are designated as systemically important	In November 2015, the Federal Reserve approved a *final rule specifying its procedures for emergency lending* under Section 13(3) of the Federal Reserve Act. Since the passage of the DFA in 2010, the FRB's emergency lending activity has been limited to programs and facilities with "broad-based eligibility" that have been established with the approval of the Secretary of the Treasury. The rule provides greater clarity regarding the FRB's implementation of limitations to emergency lending, and other statutory requirements. The final rule defines "broad-based" to mean "a program or facility that is not designed for the purpose of aiding any number of failing firms and in which at least five entities would be eligible to participate." These additional limitations are consistent with and provide further support to the revisions made by the DFA that a program should not be for the purpose of aiding specific companies to avoid bankruptcy or resolution. Solvent nonbanks that have been designated as systemically important by the FSOC would be able to participate in these programs to the extent they satisfy the applicable facility eligibility requirements.	Partially implemented.
Assign formal crisis preparedness and management coordinating role to FSOC	The FSOC has not assumed a crisis preparedness and management role. The FSOC was an informal forum for emerging issues, such as, Brexit, Hurricane Sandy, and MF Global's bankruptcy.	Not implemented.
Extend the Orderly Liquidation Authority powers to cover systemically important insurance companies and U.S. branches of foreign-owned banks	The recommendation pertained to systemic insurance firms that would have to be resolved under state bankruptcy legislation, for example, insurers without a holding company. The DFA was not changed on this point. The U.S. authorities cooperate with foreign resolution authorities in CMGs and through firm-specific COAGs and interagency MOUs, but the DFA has not been changed to extend OLA powers to cover U.S. branches of foreign-owned banks.	Not implemented.
Adopt powers to support foreign resolution measures; extend preference to overseas depositors	Foreign resolution measures continue to rely on recognition by U.S. courts under the principle of comity. The standards for such recognition are unclear regarding entities that are explicitly excluded under Chapter 15 of the U.S. Bankruptcy Code, such as FBOs' U.S. branches and agencies. The FDIC's "dual payability" rule clarified—but has yet to be confirmed in court—that foreign branch deposits are treated as deposit liabilities under the FDI Act's depositor preference rule with equal ranking as domestic uninsured deposits but not insured deposits.	Not implemented.

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Finalize recovery and resolution plans for SIFIs, agree cooperation agreements with overseas authorities	RRP under the DFA for and by the largest and most complex financial companies has progressed. The U.S. authorities concluded resolution-related cooperation frameworks and information-sharing arrangements with foreign counterparts, including by participating in firm-specific CMGs and by concluding firm-specific COAGs with CMG members. The FDIC concluded bilateral Resolution Memoranda of Understanding with its counterparts in major jurisdictions. State insurance regulators through their work at the NAIC are reviewing the value of aspects of resolution planning for large insurance groups under its Macro Prudential Initiative (MPI). The goal of MPI is to consider some new or improved tools to (1) better monitor and respond to the impact of external financial and economic risks on the firms state insurance regulators supervise, including financial, reputational, litigation or regulatory risks for the firm; and (2) better monitor and respond to risks emanating from or amplified by insurers that might be transmitted externally, and which may result in significant impacts to the stability of broader financial markets. Moreover, state insurance regulators are authorized, under revisions to the NAIC model holding company act, to have the power to act as a group-wide supervisor (GWS) for identified IAIGs, and these powers enable the GWS to be able to order mitigation of material risks to the insurance operations of the group, which could if necessary include the power to require the development of resolution and/or recovery plans. The revisions to the NAIC Model Holding Company Act that provide for the powers to act as a GWS of an IAIG have been adopted in 29 states and will be required to be adopted in all accredited U.S. states and jurisdictions by January 1, 2020.	Partially implemented.
Financial market infrastructures (FMIs)		
Identify and manage system-wide risks related to interdependencies among FMIs, banks, and markets	U.S. authorities continue efforts to increase the resilience and recoverability of financial market infrastructures (FMIs), with particular emphasis on central counterparties (CCPs). U.S. authorities advanced domestic efforts and continued to participate in, and contribute to, numerous international work streams. Since 2015, the SEC adopted risk management standards for systemically important FMIs, while all authorities issued expectations for recovery and orderly wind-down planning. Authorities are examining the viability and comprehensiveness of these FMIs' recovery and orderly wind-down plans. The authorities also are actively engaging in resolution planning for systemic CCPs. The FDIC and the CFTC co-host crisis management group (CMGs) meetings for two U.S. CCPs-that are considered systemically important in more than one jurisdiction: the Chicago Mercantile Exchange (CME) and Ice Clear Credit, LLC.	Largely Implemented.

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	The CFTC conducted stress testing exercises of selected CCPs in 2016, 2017, and 2019. In September 2016, the CFTC issued final cybersecurity testing rules for FMIs and markets. In May 2018, FRB welcomed the release of the CPMI's strategy for *reducing the risk of wholesale payments fraud related to endpoint security* and reaffirmed its commitment to work collaboratively with domestic and international stakeholders to promote the safety and resilience of the wholesale payments ecosystem worldwide. FRB staff, in close collaboration with the Federal Reserve Banks, has been engaged in efforts domestically to advance the strategy in the United States and actively monitor progress. The U.S. authorities participated in the Study Group on Central Clearing Independencies (SGCCI), which was established by the Financial Stability Board (FSB), the International Organization of Securities Commissions (IOSCO), and the Basel Committee on Banking Supervision (BCBS) to identify, quantify, and analyze interdependencies between CCPs and major clearing members, and financial service providers. Results from the SGCCI's analysis were published in July 2017 and August of 2018. The U.S. authorities, as members of CPMI-IOSCO, participate in the drafting of reports, at both the consultation and final stage, for the CPMI-IOSCO's Framework for Supervisory Stress Testing of CCPs, CPMI-IOSCO's Resilience of Central Counterparties (CCPs): Further Guidance on the PFMI, and Recovery of FMIs. The final versions were published in July 2017 (Resilience of CCPs and Recovery of FMIs) and April 2018 (the Framework for Supervisory Stress Testing for CCPs). The CFTC co-chairs the CPMI-IOSCO Policy Standing Group. U.S. authorities also contributed to CPMI-IOSCO's report on "Guidance on cyber resilience for financial market infrastructures" published in June 2016. The U.S. authorities are participating in the FSB work streams on resolution of CCPs and the continuity of access to FMIs for members in resolution. The FDIC co-chairs the FSB work stream on CCP resolution, which published in July 2017 "Guidance on Central Counterparty Resolution and Resolution Planning."	
Offer FRB accounts to designated Financial Market Infrastructures (FMIs) to reduce dependencies on commercial bank services	By December 2017, requests from designated financial market infrastructures have been authorized by the Federal Reserve Banks of Chicago and New York. The following five U.S. FMIs have been designated as systemically important utilities and are authorized to open accounts, and have opened accounts, at the central bank: ICE Clear Credit, CME Inc., the Options Clearing Corporation, the National Securities Clearing Corporation, and the Fixed Income Clearing Corporation. The measure has been possible because these (nonbank) FMIs have been designated as systemically important financial market utilities and are therefore eligible for Federal Reserve accounts and services pursuant to section 806 of the Dodd-Frank Act.	Implemented.

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Housing finance		
Reinvigorate the momentum for comprehensive housing market reform	The U.S. housing market has not been reformed comprehensively. No legislative or executive action has been taken to reduce substantially the footprint of the GSEs. As conservator, however, the Federal Housing Finance Agency (FHFA) has required market-based credit risk transfers from the GSEs to the private sector at an increasing level since 2013. Between their initiation in 2013 and June 2018, the GSEs have transferred a portion of credit risk on approximately $2.5 trillion of unpaid principal balance (UPB) with a combined Risk in Force (RIF) of about $81 billion. The GSEs have also jointly developed a common securitization platform. FHFA issued a final rule on the uniform mortgage-backed security in February 2019 to align GSE policies and practices that affect cash flows of To-Be-Announced (TBA) eligible mortgage-backed securities. These requirements apply to both the GSEs' current offerings and to the new Uniform Mortgage-Backed Security (UMBS). These GSE reforms have been accomplished administratively and have not reformed the entire housing finance system, which would require legislative action. Since 2015, the FHFA has directed the Enterprises to fund the Housing Trust Fund and Capital Magnet Funds (as required by the 2008 Housing and Economic Recovery Act) by transferring a portion of total new acquisitions to these funds, which are administered by the Department of Housing and Urban Development and Treasury Department, respectively. FHFA has the discretion to suspend the GSE allocations to the affordable housing funds, including the Housing Trust Fund, if the allocations are contributing to the GSE's financial instability. The Senior Preferred Stock Purchase Agreements (PSPAs) between the Treasury and each GSE continue to provide financial strength for the GSEs. They ensure the ability of the GSEs to meet their financial obligations and are structured so that they will have minimal net worth as all profits above the capital reserve amount are transferred to Treasury each quarter. The capital reserve amount had been declining by $600 million per year and was scheduled to decline to zero by January 2018. However, on December 21, 2017, FHFA and the Department of the Treasury agreed to reinstate a $3 billion capital reserve amount for each GSE to prevent draws on the PSPA due to fluctuations in the GSEs' income due to the normal course of business. Despite the new capital reserve, the December 2017 tax cuts caused the GSEs to draw a combined total of $4 billion at the end of that quarter, reflecting value loss in deferred tax assets that followed the Tax Cuts and Jobs Act enactment. In June 2018, FHFA issued a proposed rule on GSE capital requirements. The rule would implement new risk-based capital requirements and two alternatives for a revised minimum leverage capital requirement for the GSEs. The requirements in this rule would continue to be suspended while the GSEs remain in conservatorship.	Not implemented.

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	In September 2019, the U.S. Treasury released the Housing Reform Plan which calls for a reduced role of the government in the U.S. housing finance system. The Department of Housing and Urban Development (HUD) put forth a concomitant plan focused on streamlining the Federal Housing Administration (FHA) and the Government National Mortgage Association (GNMA) and avoiding the duplication of government support in the housing market.	

Note: Based on IMF staff's assessment and inputs from authorities.

[1] For the summary of the bilateral repo data collection, see https://www.financialresearch.gov/data/repo-data-project/, for the summary of the securities lending data collection, see https://www.financialresearch.gov/data/securities-lending-data-collection-project/.

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Content of the New Requirements	Date	Proposal/ Final Rule
Economic Growth Regulatory Relief Consumer Protection Act • Raised the enhanced prudential threshold from US$50 billion or more in assets to US$250 billion. • Directed the U.S. FBAs to tailor supervision and regulation of large banking organizations with more than US$100 billion in assets. • Eliminates the supervisory stress tests for BHCs with less than US$100 billion in assets, requires periodic (rather than annual) supervisory stress test for firms in the US$100 billion to US$250 billion range, and removes the company-run stress tests requirements for banking organizations with less than US$250 billion in assets. • Includes a simplified regulatory regime for community banks that meet certain risk profile criteria (ability to opt for a capital requirement based on a simple leverage ratio), requires FBAs to amend the Supplementary Leverage Ratio (SLR) rule for custodial banks to exclude from the leverage exposure measure qualifying deposits at certain central banks. • Mandates FBAs to amend the LCR rule to classify all investment-grade, liquid, and readily marketable municipal securities as level 2B liquid assets. • Introduces Volcker Rule exemptions and a less restrictive definition of high volatility commercial real estate.	May 2018	Final
Recalibration of the enhanced SLR for G-SIBs • The proposal would replace the fixed leverage ratio buffer (2 percent) that applies uniformly to all G-SIBs holding companies with a buffer tailored to each G-SIB, set at 50 percent of the G-SIB risk-based surcharge.	April 2018	Proposed
Volcker Rule revisions • A three-tier compliance framework is introduced. Banks with moderate and limited trading assets and liabilities are exempted from a number of requirements (such as reporting, internal control, CEO attestation). If an instrument is held for longer than 60 days, banks can presume (subject to supervisory rebuttal) that the rule will not apply to such instruments.	August 2019	Final
Tailoring rules • Introduce four categories of regulatory standards for banks with over US$100 billion in total consolidated assets, with standards increasing in stringency (Category I standards being the most stringent and Category IV standards the least stringent).	October 2019	Final

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Simplification to the capital rules for non-advanced approaches banking organizations • It replaces the 10 percent of CET1 capital deduction threshold for each category (deferred tax assets, mortgage services rights, investments in unconsolidated financial institutions) with 25 percent of CET1 capital threshold. • It eliminates the aggregate 15 percent of CET1 threshold for the combined impact of the three categories of deduction items. • It allows banking organizations to include minority interest up to 10 percent of the parent banking organization's CET1 capital.	October 2019	Final
Stress testing rules • The Stress Capital Buffer would integrate the capital rule and the CCAR process and relax some assumptions. • Various changes to the perimeter and frequency of the CCAR introduced as mandated by the EGRRCP Act. • Removal of the qualitative objection.	March 2020 October 2018 April 2019	Final Final Final

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Appendix IX. Banking Regulation and Basel Standards

	Basel standards	U.S. standards				
		Category I (U.S. GSIBs)	Category II (*)	Category III (*)	Category IV (*)	Other firms
Capital rules						
GSIB surcharge	From 1% to 3.5%	From 1% to 5.5%	N/A			
DSIB surcharge	Principle-based approach	N/A	No surchage as no D-SIBs have been identified in the US		N/A	
Banks operate obove the minimum regulatory capital ratios (to reflect banks' risk profile and changes in economic conditions)	Pillar 2 (**)	Stressed risk-based capital requirements (**)				No Pillar 2 and no stressed risk-based capital requirements
Countercyclical capital buffer (CCyB)	From 0% to 2.5%	In line with Basel			No CCyB	
Higher leverage ratio requirements for GSIBs (eSLR in the US)	3% + leverage buffer (50% of the GSIB surcharge) Leverage buffer in the 0.5-1.75% range	3% + leverage buffer (50% of the US GSIB surcharge) Leverage buffer in the 0.5-2.75% range	N/A			
Leverage ratio (SLR in the US)	3%	N/A	3% (SLR is aligned with Basel)		No SLR	
Regulatory adjustments to CET1	- For DTAs, MSRs and investments in unconsolidated financial entities: limited recognition in capital capped at 10% of CET1 for each category - The amount of the three items that remains recognized cannot exceed 15% of CET1 - Limited recognition of minority interests	In line with Basel	In line with Basel	- Limited recognition capped at 25% of CET1 for each category - The amount of the three items that remains recognized after the application of all regulatory adjustments is not capped - All minority interests are eligible		
Impact of unrealized gains and losses	Unrealized gains and losses are included in regulatory capital	Unrealized gains and losses are included in regulatory capital	Unrealized gains and losses are included in regulatory capital	Firms have the possiblity to exclude gains and losses from regulatory capital (i.e., unrealized losses are not deducted from capital). This is less conservative under stressful conditions when firms are likely to accumulate underlying losses		
Calculation of RWAs						
Floor for firms using internal model approache	72.50%	100% (***)	100% (***)	N/A		
Operational risk	Standardized approach (Business Indicators)	AMA (****)	AMA (****)	No capital charge	No capital charge	No capital charge
Market risk	Framework applies to all banks regarless of the size of the trading book	Framework applies to banks with significant market risk exposures (with aggregated trading assets and liabilities of at least US$ 1 bn or 10% of total assets)				
CVA risk	Yes	Yes	Yes	No capital charge	No capital charge	No capital charge
Liquidity rules						
LCR	Full LCR requirements	Full LCR requirements	Full LCR requirements	Reduced LCR	No LCR	No LCR
NSFR	Full NSFR requirements	Full NSFR requirements if implemented (*****)	Full NSFR requirements if implemented (*****)	Reduced NSFR if implemented (*****)	No NSFR	No NSFR

(*) Category II firms: ≥ US$700 bn in total assets or ≥ in cross-Jurisdictional activity. Category III: US$250 bn total assets or US$75 bn ≥ in nonbank assets, short-term funding, or off-balance sheet exposure. Category IV: Other firms with US$100 to 250 bn in assets

(**) Comparing the Pillar 2 approach in the Basel framework and the CCAR process in the US is extremely difficult -if not impossible- given the conceptual differences. It is all about implementation.

(***) A prudent permanent capital floor on banks based on the standardized approach risk-based capital rules (100%) is implemented, but the U.S. standardized approach excludes capital charges for operational risk and for Credit Value Adjustment (CVA) risk

(****) The FBAs are considering introducing a standardized approach

(*****) The NSFR rule has not been finalized and timing is uncertain

More conservative than Basel standards	Less conservative than Basel standards

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United States: Financial System Stability Assessment

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UNITED STATES

FINANCIAL SYSTEM STABILITY ASSESSMENT

August 2020

This Financial System Stability Assessment paper on United States was prepared by a staff team of the International Monetary Fund. It is based on the information available at the time it was completed on July 31, 2020.

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INTERNATIONAL MONETARY FUND

UNITED STATES

FINANCIAL SYSTEM STABILITY ASSESSMENT

July 17, 2020

KEY ISSUES

Context: Much of the Financial Sector Assessment Program (FSAP) work was conducted prior to the COVID-19 pandemic. The lockdown of the economy has led to a massive growth shock. Following the precipitous fall, risk asset prices have rebounded, and financial conditions eased. The vulnerability analysis has been updated and largely captures this shock. Recommendations on strengthening policy and institutional frameworks remain pertinent. The approach to financial regulation and supervision was risk-focused given the high degree of compliance against international standards assessed during the 2015 FSAP.

Findings: The financial system entered the crisis with strong buffers, but the rise in corporate leverage and migration of risks to nonbank financial institutions compounded with ongoing economic disruption could result in a severe financial strain. Banks' capital depletion rates in the stress test are high, yet manageable, and limiting shareholder payouts would help conserve banks' capital. Most investment funds would be able to meet severe redemptions. Some life insurers face a significant capital reduction in the adverse scenario, but the valuation and capital framework largely mitigates the impact. The Federal Reserve's response to market dysfunction was timely and forceful helping to preserve financial stability. Relaxation of prudential requirements has led to fewer banks being subject to full Basel standards. There are few tools to deal with the ongoing migration of risks to nonbanks. Key insurance reforms remain outstanding. Recent changes require fewer banks to prepare recovery and resolution plans.

Policies: The development of macroprudential tools to deal with the growing risks in nonbanks is a priority. The overall stringency of prudential requirements for non-internationally active banks should be maintained. The Federal Reserve should take measures to durably bolster money market resilience and strengthen liquidity backstops. More comprehensive system-wide supervisory stress tests should be developed for central counterparties (CCP) and the consistency of risk management outcomes by CCPs should be strengthened. Group capital requirements should be developed for insurers. The Commodity Futures Trading Commission (CFTC) and the Securities and Exchange Commission (SEC) should be granted greater budgetary independence. The authorities should mitigate the impact of reduced firm-developed recovery and resolution plans through recovery plan requirements, their own resolution plans, and intensified crisis preparedness.

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Approved By
Aditya Narain and Nigel Chalk
Prepared By
Monetary and Capital Markets Department

This report is based on the work of the FSAP mission that visited the United States during October 22–November 8, 2019 and February 18–March 6, 2020. It has been factually updated to incorporate COVID-19-related events in March and April 2020. The FSAP findings were discussed with the authorities in May 2020.

- The team was led by Michaela Erbenová (Mission Chief) and included Peter Breuer and Darryl King (Deputy Mission Chiefs); Atilla Arda, Kelly Eckhold, Caio Ferreira, Tamás Gaidosch, Mindaugas Leika, Fabian Lipinski, Luc Riedweg, Dulani Seneviratne, Richard Stobo, Froukelien Wendt, and Peter Windsor (all MCM); Carlos Caceres (WHD); Steve Dawe, Kathleen Kao, and Nadine Schwarz (LEG); and Antoine Bouveret, Timo Broszeit, Rama Cont, Patrick Honohan, Klaus Löber, Jennifer Long, Ron Morrow, Lyndon Nelson, Stuart Wason, and Mark Zelmer (experts). Eva Yu (MCM) assisted research and analysis. Marina Agnese and Ramanjeet Singh (MCM) provided administrative support. Aditya Narain (MCM) provided oversight and joined selected meetings.

- The mission met with Under Secretary of the U.S. Department of the Treasury Brent McIntosh; Vice Chair for Supervision of the Board of Governors of the Federal Reserve System (FRB) Randal Quarles; Chairman and Chief Executive of the Commodity Futures Trading Commission (CFTC) Heath Tarbert; and a number of senior officials at the FRB, Consumer Financial Protection Bureau (CFPB), CFTC, Federal Deposit Insurance Corporation (FDIC), Federal Housing Finance Agency (FHFA), Securities and Exchange Commission (SEC), Office of the Comptroller of the Currency (OCC); Office of Financial Research (OFR), and other agencies at the federal and state level. The mission also met industry associations, banks, insurance companies, auditors, academics, market analysts, and fintech companies.

- FSAPs assess the stability of the financial system as a whole and not that of individual institutions. They are intended to help countries identify key sources of systemic risk in the financial sector and implement policies to enhance its resilience to shocks and contagion. Certain categories of risk affecting financial institutions, such as operational or legal risk, or risk related to fraud, are not covered in FSAPs.

- The United States is deemed by the Fund to have a systemically important financial sector according to Mandatory Financial Stability Assessments Under the Financial Sector Assessment Program—Update SM 11/18/2013, and the stability assessment under this FSAP is part of bilateral surveillance under Article IV of the Fund's Articles of Agreement.

- This report was prepared by Michaela Erbenová, Peter Breuer, and Darryl King, with contributions from the FSAP team. It is based on information available as of May 15, 2020.

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Glossary

ACA	Affordable Care Act
AML/CFT	Anti-Money Laundering/Combating the Financing of Terrorism
BCBS	Basel Committee on Banking Supervision
BCP	Basel Core Principles for Effective Banking Supervision
BHC	Bank Holding Company
BIS	Bank for International Settlements
BNYM	Bank of New York Mellon
BO	Beneficial Ownership
Bps	Basis points
CAR	Capital Adequacy Ratio
CARES Act	The Coronavirus Aid, Relief, and Economic Security Act
CCAR	Federal Reserve's Comprehensive Capital Analysis and Review
CCB	Capital Conservation Buffer
CCFs	Credit Conversion Factors
CCP	Central Counterparty
CCyB	Countercyclical Capital Buffer
CET1	Common Equity Tier 1 Capital
CFPB	Consumer Finance Protection Bureau
CFTC	Commodity Futures Trading Commission
C&I	Commercial and Industrial (loan)
CLASS	Capital and Loss Assessment under Stress Scenario
CLO	Collateralized Loan Obligation
CME	Chicago Mercantile Exchange
CMG	Crisis Management Group
CPMI	Committee on Payments and Market Infrastructures
CPSS	Committee on Payment and Settlement Systems
DFA	Dodd-Frank Wall Street Reform and Consumer Protection Act
DFAST	Dodd-Frank Act Stress Test
DIS	Deposit Insurance System
EBITDA	Earnings before interest, taxes, depreciation, and amortization
ELA	Emergency Liquidity Assistance
EM	Emerging Market (mutual fund type)
EPS	Enhanced Prudential Standards
ETF	Exchange Traded Fund
FATF	Financial Action Task Force
FCA	Farm Credit Administration
FDIC	Federal Deposit Insurance Corporation
Fed	The Federal Reserve System
FFIEC	Federal Financial Institutions Examination Council
FHFA	Federal Housing Finance Agency

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FHLB	Federal Home Loan Bank
FICC	Fixed Income Clearing Corporation
FinCEN	Financial Crimes Enforcement Network
FMI	Financial Market Infrastructure
FMU	Financial Market Utility
FRB	Board of Governors of the Federal Reserve System
FRBNY	Federal Reserve Bank of New York
FSAP	Financial Sector Assessment Program
FSB	Financial Stability Board
FSSA	Financial System Stability Analysis
FSOC	Financial Stability Oversight Council
FHLMC	Federal Home Loan Mortgage Corporation ("Freddie Mac")
FSOC	Financial Stability Oversight Council
GAAP	Generally Accepted Accounting Principles
GCC	Group Capital Calculation
GFSR	Global Financial Stability Report
GDP	Gross Domestic Product
GECC	General Electric Capital Corporation, Inc.
GFC	Global Financial Crisis
GNMA	Government National Mortgage Association ("Ginnie Mae")
GSE	Government-Sponsored Enterprise
G-SIB	Global Systemically Important Bank
GSS	Government Securities Settlement
HELOC	Home Equity Lines of Credit
HQLA	High-Quality Liquid Asset
HUD	Housing and Urban Development
HY	High Yield (mutual fund type)
ICC	Ice Clear Credit
ICPs	Insurance Core Principles
ICS	Insurance Capital Standard
IDI	Insured Depository Institution
IFS	International Financial Statistics
IG	Investment Grade (mutual fund type)
IHC	Intermediate Holding Company (of a foreign banking organization)
IOSCO	International Organization of Securities Commissions
IT	Information Technology
LAC	Loss-Absorbing Capacity
LCR	Liquidity Coverage Ratio
LIBOR	London Interbank Offered Rate
LLs	Leveraged Loans
M&A	Mergers and Acquisitions
MBS	Mortgage-Backed Securities

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MFs	Mutual Funds
MMF	Money Market Fund
MPI	Macroprudential Initiative
MWCB	Market-Wide Circuit Breaker
NAIC	National Association of Insurance Commissioners
NAV	Net Asset Value
NFA	National Futures Association
NMA	National Mortgage Association ("Fannie Mae")
OBFR	Overnight Bank Funding Rate
OCC	Office of Comptroller of the Currency
OFR	Office of Financial Research
OLA	Orderly Liquidation Authority
OMO	Open Market Operation
ORSA	Own Risk and Solvency Assessment
Non-GSIB	Non-Global Systemically Important Bank
OTC	Over-the-Counter (derivatives)
PBR	Principles-Based Reserving
PFMI	Principles for Financial Market Infrastructure
PMI	Private Mortgage Insurer
PMIERs	Private Mortgage Insurer Eligibility Requirements
PPNR	Pre-provision Net Revenue
PSPA	Preferred Stock Purchase Agreement
P&C	Property & Casualty (insurance firms)
QM	Qualified Mortgage
RAM	Risk Assessment Matrix
RBC	Risk-Based Capital
ROA	Return on Assets
ROE	Return on Equity
RRP	Recovery and Resolution Plan/Planning
RWA	Risk-Weighted Asset
SEC	Securities and Exchange Commission
SOFR	Secured Overnight Financing Rate
STA	Standardized Approach (to calculating risk weights
TN	Technical Note
T-bill	Treasury bill
UPB	Unpaid Principal Balance
VA	Virtual Asset
VASP	Virtual Asset Service Provider
VAWG	Valuation Analysis Working Group
WEO	World Economic Outlook

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EXECUTIVE SUMMARY

The longest expansion in the recorded U.S. history has come to an abrupt end. The economy will contract sharply in 2020 on the back of the COVID-19 outbreak and associated containment efforts, with significant lingering risks and a high degree of uncertainty. The economic rebound in 2021 is predicated critically on the pandemic fading and effective economic policy actions stemming widespread corporate bankruptcies, extended employment losses, and system-wide financial disruption. Banks have entered the crisis with strong buffers and households have deleveraged, but the rise in corporate leverage and migration of risks to nonbank financial institutions in recent years compounded with ongoing economic disruption could result in severe financial strain. The highly interconnected financial sector is also exposed to cybersecurity and operational risk events that could lead to distress in a major financial firm or market infrastructure.

The FSAP was conducted prior to the pandemic onset and has been factually updated to incorporate events that followed. Reflecting the post-mission developments, the economic growth projections have been significantly revised downward in the *June 2020 World Economic Outlook (WEO) Update*. The U.S. authorities implemented urgent measures to address health concerns, to safeguard economic and financial stability and to prevent adverse macrofinancial feedback loops. The assessment of the full impact of the shock and the effectiveness of mitigation policy measures would be premature. The FSAP's risk analysis nonetheless remains broadly relevant, with stress test scenarios aiming to capture wide uncertainty related to the time profile and other specifics of the COVID-19 shock. A combination of monetary, fiscal and financial sector policies may continue to be needed to support stability of the financial system and to preserve soundness of financial institutions, especially if economic activity remains paralyzed for longer than anticipated. The FSAP's recommendations on strengthening policy and institutional frameworks— including for regulation, supervision, contingency planning, and crisis preparedness and management—remain pertinent and should be considered once the crisis containment phase has concluded.

FSAP stress tests indicate that the financial system entered the crisis generally well-prepared to an array of severe shocks. Susceptibility of the U.S. banking system to inward spillovers remains limited, but it could become a source of contagion to foreign banking systems. Equity and bond market valuations appear stretched, while the assessment is hampered by the still unfolding events as markets remain vulnerable to new bouts of volatility. A marked rise in corporate stress would impact nonbank financial institutions, with a more moderate impact on banks. Given the sharp economic contraction, bank capital depletion rates are high in the baseline scenario yet remain manageable overall. With the uncertain duration of the shock, retaining earnings and limiting shareholder payouts would help preserve capital and limit recapitalization needs. Global systemically important banks' (G-SIBs') liquidity buffers are substantial, but high utilization of credit and liquidity facilities could lead to a liquidity shortfall at some banks. The financial stability risks stemming from the insurance sector appear contained for now. Some life insurers would face a significant capital reduction in the adverse scenario, but the valuation and capital framework largely mitigates the impact on statutory capital. Most investment funds would be able to withstand severe redemptions, though high yield and loan funds could face significant shortfalls.

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The FRB's response to the extreme market dysfunction was timely and forceful and has thus far helped preserve financial stability. Market resilience has been declining for some time and was severely tested in the March–April COVID-19 crisis period but was backstopped by a plethora of timely actions. Once the crisis abates, the FRB should take measures to durably bolster market resilience through permanent operational framework adjustments and by retaining some aspects of its crisis response that have improved access to its liquidity backstops—regular open market operations (OMOs) and encouragement to banks to explicitly allow for use of the Discount Window to monetize high-quality liquid assets (HQLAs) in their short-term liquidity planning. Other priorities include addressing the vulnerability from having a sole provider in the government securities settlement and tri-party repo markets, restoring the FRB's ability to provide liquidity backstops to systemically designated nonbanks, developing the capacity for foreign currency liquidity backstops for banks and designated central counterparties (CCPs), and setting firm targets backed by supervisory action to promote transition from the London Interbank Offered Rate (LIBOR).

The Financial Stability and Oversight Council (FSOC) plays the leading role in systemic and emerging risk identification, and a broader toolkit would help bolster the authorities' policy framework. Continuing full operational independence of all member agencies is critical, and providing them with explicit financial stability mandates would bolster the framework. The activities-based approach will help in addressing risks in nonbanks, but more clarity is needed on its implementation. The development of macroprudential tools for nonbanks is an important priority as is ensuring sufficient buffers are retained to accommodate macro-relevant vulnerabilities. Addressing remaining data gaps is key to enhancing the assessment of interconnections, vulnerabilities, and risks across the financial system. The FSOC and its member agencies should intensify crisis preparedness for decisive responses to contingencies.

Strong prudential regulation has contributed to a sound banking system, but certain requirements are being reduced at a time when financial stability risks are rising. For the U.S. G-SIBs, considered as internationally active banks by the authorities, capital and liquidity requirements meet and sometimes exceed the Basel standards. However, recent reforms emphasizing a tailored approach will require fewer banks (other than the G-SIBs) to be subject to the full set of Basel standards. Fewer banks are subject to annual supervisory stress tests while recent changes to the Comprehensive Capital Analysis and Review (CCAR) program and the implementation of the Stress Capital Buffer will likely lower capital requirements for some large banks. The 2018 statement on the role of supervisory guidance could create obstacles to the implementation of key supervisory expectations. Authorities should consider rewriting certain prudential guidance as regulation; and maintaining the overall stringency of prudential requirements for non-internationally active banks.

While much progress has been made since 2015, the size, complexity, and global importance of the U.S. capital markets call for continued reform and oversight strengthening. U.S. authorities have taken prompt action to maintain orderly functioning of securities and derivatives markets. Reform priorities include greater budgetary autonomy for the SEC and CFTC; completion of the work on market-wide circuit breakers; the deepening of joint work on new concerns, such as

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leveraged loans; and the monitoring of financial stability risks related to mutual funds (including through SEC-led stress testing). Legislative action to enable greater scrutiny of new registrants, reducing reliance of the National Futures Association (NFA) on self-certifications, and a strategic review of the SEC's oversight of exchanges are all also priorities for the agenda.

Key reforms in the regulation and supervision of insurance are under development or remain outstanding. These include greater independence for the state regulators, strengthening of risk-based supervision, consistency in liability valuation methodologies for life insurers, implementation of a total balance sheet approach to risk and solvency assessment, and progress on the group capital requirements. Strengthening the solvency regime for insurers is particularly important. Regulatory responses to natural catastrophe risks need to capture the increasing risk to policyholders and incentivize risk mitigation measures and closing protection gaps.

The increased reliance of the financial system on financial market infrastructures (FMIs) underlines the importance of FMI resilience for the United States and global financial stability. FMIs appeared so far sufficiently robust to surges in volumes and volatility in financial markets. The regulation, supervision, and oversight of systemically important U.S. FMIs is broadly adequate; but there is room to strengthen the consistency of outcomes of CCP risk management practices. As in other countries, new nonbank players are entering the payments space with innovative services. A review of regulatory requirements for payments may be warranted so as to allow for a proactive, comprehensive, and risk-based response to the potential systemic risks that these new providers may bring.

The authorities have mainstreamed consideration of cybersecurity and other aspects of technological resilience into both regulation and supervision. Public-private partnerships enable information sharing. Both industry and supervisors have programs in place to improve resilience.

Financial integrity has been strengthened since 2015 in relation to beneficial ownership identification and verification. Addressing high-risk sectors and misuse of legal entities remain priorities, including by requiring beneficial ownership information to be collected upon company formation and ensuring that investment advisers, lawyers, accountants, and company service providers are effectively regulated and supervised in line with risks.

Considerable progress has been made with the largest and most-complex financial companies' resilience, recoverability, and resolvability; but recent changes could lower their focus and resource allocation on these matters. The reduction in coverage and frequency of firm-developed recovery and resolution plans (RRPs) could weaken the impact these plans have made on financial companies' management. The Federal Banking Agencies (FBAs) should continue to actively mitigate this challenge through recovery plan requirements, their own annual resolution plans, and intensified crisis preparedness. Further refinements relating to cross-border resolution framework also deserve attention. CCP recovery and resolution planning should include more firms.

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Table 1. United States 2020 FSAP: Key Recommendations		
	Responsible Authority	Horizon[1]
Systemic Risk Oversight and Macroprudential Framework		
Provide an explicit financial stability mandate to all federal FSOC members.	Congress	MT
Prioritize the development of macroprudential tools to address risks and vulnerabilities in the nonbank sector.	FSOC	MT
Intensify efforts to close data gaps, including reporting disclosures of holdings of collateralized loan obligations (CLOs) and repo markets, to reinforce market discipline.	OFR	I
Banking Regulation and Supervision		
Review prudential requirements for non-internationally active banks (Category III and IV) and ensure they are and continue to be broadly consistent with the Basel capital framework and appropriate concentration limits; and consider extending the full liquidity coverage ratio (LCR) to them.	FBAs	ST
Streamline regulatory requirements and consider rewriting key prudential guidance as regulation.	FBAs	MT
Introduce heightened standards on the governance of large and complex bank holding companies (BHCs), enhance the related-party framework, introduce rules on concentration risk management, and include more quantitative standards regarding interest rate risk in the banking book.	FBAs	ST
Insurance Regulation and Supervision		
Increase independence of state insurance regulators, with appropriate accountability.	States	MT
Require all in-force life insurance business be moved to principles-based reserving (PBR) after a five-year transition period, adjust asset valuation approach to ensure consistency between assets and liabilities, and recalibrate risk-based capital (RBC) to the revised valuation approach.	NAIC and states	MT
Develop a consolidated group capital requirement similar to GAAP-Plus insurance capital standard (ICS) for internationally active groups and optionally for domestic groups in parallel with the development of aggregation approaches by the FRB and NAIC.	NAIC, FRB, and states	MT
Regulation, Supervision, and Oversight of FMIs		
Increase CFTC resources devoted to CCP supervision and strengthen rule-approval process to an affirmative approval with a public consultation.	CFTC	ST
Collaborate to analyze differences in outcomes of CCP risk management practices and adopt an appropriately consistent, conservative implementation of risk management standards across CCPs.	FRB, CFTC, SEC	ST
Develop and execute more comprehensive systemwide CCP supervisory stress tests.	FRB, CFTC, SEC	ST

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Table 1. United States 2020 FSAP: Key Recommendations (concluded)		
	Responsible Authority	Horizon[1]
Securities Regulation and Supervision		
Give CFTC and SEC greater independence to determine their own resources, with appropriate accountability.	Congress	ST
Assess financial stability risks related to mutual funds and stable net asset value (NAV) money market funds (MMFs), including through SEC-led liquidity stress testing.	SEC	I
Conclude implementation of new broker-dealer capital rules; finalization of market-wide circuit breakers, and delivery of the Consolidated Audit Trail.	SEC	ST
Increase scrutiny of new registrants and reduce reliance on self-attestations where applicable.	SEC, CFTC, NFA	I
AML/CFT		
Legislate to collect beneficial ownership information on formation of U.S. corporations, maintain it, and ensure timely access for authorities.	Congress	ST
Ensure that investment advisers, lawyers, accountants, and company service providers are effectively regulated and supervised for AML/CFT in line with risks.	Treasury	ST
Systemic Liquidity		
Promote the fungibility of Treasury Securities and Reserves by adjusting assumptions about firms' access to the Discount Window in liquidity metrics.	FRB	ST
Continue to operate regular fine-tuning OMOs.	FRB	I
Advance arrangements for providing liquidity to systemic nonbanks and CCPs under stress, and reconsider restrictions on bilateral emergency liquidity assistance (ELA) to designated systemically important nonbanks.	FRB, Treasury & Congress	ST
Develop robust and effective backup plans in the event the sole provider, Bank of New York Mellon (BNYM), is not able to settle and clear repo transactions.	FRB	MT
Enhance arrangements to provide liquidity support in foreign currencies to banks and designated systemically important CCPs.	FRB	MT
Crisis Preparedness and Management		
Intensify crisis preparedness.	FSOC, FBAs, UST	ST
Continue to use agency discretion actively to subject a wider array of firms to RRP.	FBAs	ST
Continue to undertake, at least yearly, Dodd-Frank Act (DFA) Title II plans, resolvability assessments, and crisis management group (CMG) discussions of RRPs and assessments.	FRB, FDIC	ST
Extend OLA powers to cover FBOs' U.S. branches; ensure equal depositor preference ranking for overseas branch deposits with domestic deposits; introduce powers to give prompt and predictable legal effect to foreign resolution measures.	Congress	MT

[1] I: Immediate; ST: short term= less than 1 year; MT: medium term= 1–5 years.

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MACROFINANCIAL SETTING

1. The FSAP takes place against the background of rising medium-term financial vulnerabilities and the COVID-19 pandemic. Following the longest expansion in its recorded history, the U.S. economy has decelerated sharply on the back of the pandemic outbreak. The containment measures introduced in March have brought large parts of the economy to a standstill, with growth in 2020 expected to decline by most since the Great Depression, followed by a partial recovery in 2021 (Table 2). The fiscal deficit is projected to exceed 20 percent of GDP, leading to a sharp increase in U.S. public debt, which was already on an unsustainable path before the crisis. Financial conditions tightened initially—reflecting a broad-based market correction driven by investors' assessment of the impact of the virus and the collapse of oil prices—but have recovered somewhat on the back of a quick policy action. Nonetheless, the sharp economic deterioration will have a long-lasting impact on the financial system. The economic outlook is subject to an unusually high degree of uncertainty.

2. The extended period of easy financial conditions until early 2020 has been accompanied by a buildup of medium-term vulnerabilities. Overall, vulnerabilities have grown relative to the 2015 FSAP (Figure 1). The continued low interest rate environment has pushed investors to take more risks in the search for yield. While banks and household balance sheets have strengthened, vulnerabilities have grown in nonfinancial corporates and in the nonbank financial system. At the same time, bank capital and liquidity requirements have been eased for a large part of banking sector following the *2018 Economic Growth, Regulatory Relief, and Consumer Protection Act* and subsequent regulatory measures, which could reduce banks' resilience in the downturn.

3. Corporate sector entered the current crisis episode with historically high debt relative to the size of the economy and leveraged finance growing rapidly. Nonfinancial business debt rose to almost 75 percent of GDP (about US$16 trillion) toward the end of 2019—slightly higher than at the onset of the Global Financial Crisis (GFC). The largest portion (US$10 trillion) relates to corporate sector debt, including corporate bonds and commercial paper (US$6.5 trillion, about 80 percent at investment grade); bank and leveraged loans (about US$1.5 trillion and US$1.2 trillion, respectively); and other debt (less than US$1 trillion). Increased financial risk taking and weakening underwriting standards have allowed less creditworthy firms to access capital markets and increase leverage (Figure 2). The leveraged loans[1] account for roughly 7 percent of total business sector debt (5 percent of GDP), comparable in size to the high-yield corporate bond debt market (Box 1). At the onset of the pandemic, these risks were mitigated by significant liquid assets on corporate balance sheets, and the fact that many firms have extended maturities, with most debt maturing after 2022, while the costs of financing have fallen.[2]

[1] Term loans to indebted and lower-rated corporates originated by bank syndicates and sold to institutional and other investors.

[2] See the Global Financial Stability Report (GFSR), Chapter 1, October 2019, https://www.imf.org/en/Publications/GFSR/Issues/2019/10/01/global-financial-stability-report-october-2019 .

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Figure 1. United States: Financial Vulnerabilities Radar Chart—COVID-19 Prologue

Source: IMF staff estimates.

Note: The chart is based on data available as of March 2020 and shows vulnerabilities in six sectors in the U.S. based on the pooled percentile rank as determined in the Indicator-Based Framework of the Global Financial Stability Report (see Online Annex April 2019). Vulnerabilities arise from leverage, liquidity, maturity, and currency mismatches and are shown relative to those of other 19 systemically important advanced economies and across time from 2000 onward.

4. Households have reduced their overall indebtedness post-GFC, but high unemployment could impair debt servicing capacity. Over the last decade, residential mortgage debt has decreased substantially across all income groups, with low delinquencies, falling debt servicing costs and extended maturities as households refinanced their mortgages (Figure 2). That said, the mortgage market is large, with outstanding mortgages exceeding US$10 trillion (roughly 50 percent of GDP, or two-thirds of total household debt), and a deterioration in credit quality could impact financial stability. The government continues to play a central role in housing through the government-sponsored enterprises (GSEs), most notably Federal National Mortgage Association ("Fannie Mae") and the Federal Home Loan Mortgage Corporation ("Freddie Mac"), which currently own or guarantee roughly half of outstanding mortgage debt and represent about 85 percent of the mortgage-backed securities (MBS) market. Student loans and some segments of consumer debt (e.g., auto loans) have been on the rise, albeit a large part of that growth accrues to households with prime credit scores. The COVID-19 outbreak has triggered unprecedented job losses. If persistent, high unemployment and falling income would put pressure on households debt servicing capacity.

5. The banking system entered the COVID-19 outbreak well-prepared, but additional challenges loom on the horizon. Banks accumulated considerable capital and liquidity buffers, maintained low levels of nonperforming loans and robust profitability (Table 3). Banks' exposures and funding remain to a large extent domestic. The share of stable funding increased reflecting growth of retail deposits and longer-term securities. The COVID-19 outbreak was followed by a significant immediate increase in provisioning, a decline in profitability, and use of accumulated buffers. The Federal Reserve System's (Fed) actions supported credit flow to the real economy (Figure 3). In the short term, loan losses are likely to grow while bank profitability will be reduced,

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leading to a further decline in capital buffers. In the medium to long term, the growing competition for deposits, fee revenues, and payment services from fintech companies will pose challenges to banks' business models and call for increased investments into information technology (IT).

6. The authorities acted decisively to counter the immediate effects of the pandemic and safeguard financial stability. Recent money market volatility has been forcefully responded to, and U.S. authorities have taken prompt action to maintain orderly function in the securities and derivatives markets. The comprehensive set of measures by the Fed included cutting the Fed funds rate to close to zero, ensuring an ample supply of reserves through scaling up term and overnight repurchase agreements, encouraging depository institutions to use the discount window, and plans to purchase unlimited amounts of Treasuries and MBS. The Fed also announced facilities to further support the flow of credit to corporates and to the broader economy. The Coronavirus Aid, Relief, and Economic Security (CARES) Act provided almost 10 percent of GDP in tax, spending, and liquidity support measures.[3] Subsequent appropriations have boosted this support to about 15 percent of GDP, including measures for small businesses and hospitals. Nonetheless, the impact of COVID-19 has been far-reaching, with more than 30 million new unemployment insurance claims filed in the first six weeks of containment measures and a range of indicators pointing to an unprecedented contraction in output in the second quarter.

7. While the collapse in economic activity appears to have bottomed-out in May–June, there are sizable risks ahead. The principal risk a resurgence in the number of COVID-19 cases, which—in turn—could necessitate a renewed partial shutdown of the economy. Additional headwinds could come from potential fracturing of a range of employee-employer relations that will take time to repair, corporate bankruptcies, global supply chains disruptions, and tightening financial conditions. Large negative growth, earnings surprises, or an abrupt reversal of the partial recovery in financial market conditions also represent material risks. The most vulnerable segments include U.S. firms with high leverage, in particular those in the energy sector, small businesses, and workers relying on hourly pay to meet basic needs. Bouts of sell-off in risk markets, increased volatility and flight to quality make judgments on risk premia and financial assets valuations uncertain at the time of the completion of this report. Market valuations appear stretched across equity and corporate bond markets.[4] Markets remain vulnerable to a decompression of risk and term premia, which could potentially close debt markets to new issuance, trigger deleveraging and create broader volatility. A combination of monetary, fiscal and financial sector policies may continue to be needed to support stability of the financial system and to preserve soundness of financial institutions, especially if economic activity remains paralyzed for longer than anticipated.

[3] Under the CARES Act, US$500 billion was appropriated to the Treasury for purposes of making loans, loan guarantees and other investments, including to support facilities established by the Federal Reserve under section 13(3) of the Federal Reserve Act. The CARES Act funds levered with Federal Reserve lending facilities may result in substantially greater lending capacity—more than US$4 trillion–than the appropriated funds alone under the CARES Act.

[4] See Global Financial Stability Update, June 2020.

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Figure 2. United States: Corporate Borrowing and Household Mortgages

Average Leverage and Coverage Ratios on New Issue Leveraged Loans
(Multiple)

Sources: Worldscope; IMF staff calculations.

Leveraged loan Issuance by Leverage Multiple
(In percent)

Sources: S&P Leveraged Commentary & Data ; IMF staff calculations.

Household and Not-For-Profits Debt
(In percent of GDP)

Sources: Federal Reserve Board; Bureau of Economic Analysis; and IMF staff estimations.

Household Debt Service Ratio
(In percent of disposable income)

Sources: Federal Reserve; Haver Analytics; Bureau of Economic Analysis; and IMF staff estimates.

Mortgage Debt Across Income Distribution
(In percent of gross income)

Sources: PSID; and IMF staff estimates.

Consumer Credit Debt Ratio
(In percent of disposable income)

Sources: FRBNY Consumer Credit Panel/Equifax; Haver Analytics; Bureau of Economic Analysis; and IMF staff estimates.

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Figure 3. United States: Asset Valuations

S&P-500 Equity Price Index
(December 2007 = 100)

Sources: Standard & Poor's; and IMF staff estimations.

CBOE Market Volatility Index: VIX

Sources: Thomson Reuters Datastream; and IMF staff estimates.

Cyclically Adjusted Price-to-Earnings Ratio
(In percent)

Sources: Standard & Poor's; and IMF staff estimations.

House-Price-to-Income Ratio
(In percent)

Sources: Standard & Poor's; Bureau of Economic Analysis; and IMF staff estimates.

RISKS AND VULNERABILITIES

A. What Are the Key Macrofinancial Risks?

8. The financial system faces domestic and external risks (Risk Assessment Matrix, Appendix I). The key external risks are tighter financial conditions, structurally weak growth in major advanced economies, and a significant slowdown in global growth—including, in the near-term, through a larger-than expected impact from the COVID-19 virus outbreak. On the domestic front, there is a risk of a sharper-than-expected and more-prolonged slowdown and a significant deterioration in corporate earnings, particularly if financial conditions tighten again for an extended period. A deterioration in market sentiment (e.g., prompted by a widening public health crisis, policy surprises, trade or geopolitical tensions) could trigger risk-off events. While these risks would

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typically be considered as independent of one another, they may overlap in the present environment, potentially setting the stage for a perfect storm. These risks are further analyzed using an array of quantitative approaches. Risks that are addressed qualitatively by the FSAP include a failure of large globally significant U.S. FMIs,[5] which could trigger a major market dislocation because of their quasi-monopoly position in the market. Increasing reliance on outsourcing, shared services, and cloud computing across interconnected platforms increases the risk that a cybersecurity event could have severe negative consequences for the provision of financial services. Other important risks are related to potential dislocations from the transition away from LIBOR.

9. Financial vulnerabilities in the corporate sector and among nonbank financial firms can amplify the impact of shocks.

- Corporate vulnerabilities are of concern due to high debt burdens and weakened underwriting standards. Following a shock to earnings or availability of new financing, highly leveraged corporates may experience significant stress, leading to higher credit spreads, potential downgrades, inability to refinance debt, and defaults. As corporates de-lever and reduce costs, lay-offs would accelerate, consumer confidence may decline, and the shock could impact other segments of the economy. Much of this risk is distributed in the form of leveraged loans, private loans and CLOs, including to overseas bank and domestic nonbank investors. Covenant protections for investors have weakened and the credit quality of new loans has been deteriorating. Important data gaps exist, particularly regarding direct and indirect exposures to leveraged and private loans across financial sub-sectors.

- Financial institutions could suffer via direct and indirect exposures to the highly leveraged corporate and COVID-19 affected household sectors, resulting in credit losses. Enhanced management discretion resulting from weaker covenant protections for leveraged loan investors could imply delays in corporate restructurings and a subsequent economic recovery. Funding liquidity stress, asset liquidations, and mark-to-market losses are to a large extent contained at this stage by the recent actions of the FRB and other central banks around the world.

- A long period of very low rates has contributed to a buildup of vulnerabilities among investment funds, pension funds, and life insurers. Low yields promote an increase in portfolio similarities among some types of investment funds, which may amplify market selloffs in stressed conditions. Pension funds may need to satisfy contingent calls arising from illiquid investments, which could constrain their traditional role of stabilizing markets during periods of stress. Low yields and guarantees are a risk for life insurers under a low-yield environment, with the former driving an increase in riskier investments by some insurers.

[5] The U.S. authorities use the term Financial Market Utility (FMU), defined in Title VII of the DFA as any person that manages or operates a multilateral system for the purpose of transferring, clearing, or settling payment, securities or other financial transactions among financial institutions or between financial institutions and the person. FMUs, which do not include trade repositories, are generally referred to as FMIs outside of the United States.

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10. The COVID-19 crisis added stress for an already leveraged corporate sector. Corporates face the effects of recent financial market volatility, oil price shock, tightening in financing conditions and, for many, a collapse in sales. Corporate short-term liquidity needs are large, notably for the energy sector; but most of these are concentrated in investment-grade companies whose debt markets are supported by the Federal Reserve liquidity facilities—including the so-called "fallen angels" that have recently lost their investment grade status. However, with the potential of a protracted economic slowdown and behavioral changes induced by evolving social-distancing norms, the long-term sustainability of certain business models could be challenged. Solvency risks could materialize, leading to large credit losses. Energy sector, entertainment and leisure services, retail, and durable-goods manufacturers appear to be among the most vulnerable.

11. Corporate sector stress tests suggest that potential losses could be significant (Box 1). Stress tests suggest that leveraged firms—those firms with a debt-to-EBITDA ratio higher than 5—are likely to experience relatively large solvency and funding pressures, representing about three-quarters of all firms with negative equity under the baseline scenario. In such a situation, and despite the relatively small size of the leveraged loan market, these firms would account for a large share of the potential losses (over 80 percent of the US$400 billion in debt-related losses). In a more severe scenario, which assumes a second wave of infections toward the end of 2020 (c.f., FSAP *Sensitivity Scenario 3* below), losses from corporate debt could reach US$675 billion (US$465 billion related to leveraged firms). Although the losses are sizeable on aggregate, banks have limited direct exposure to these products.[6] Indirect exposures and market dislocations combined with liquidity shortages could amplify the stress.

B. How Resilient is the Financial System?[7]

12. The United States has a highly diversified financial system, which is the largest and among the most developed in the world, with deep and liquid core funding markets (Figures 4–6). In 2019, total assets of financial institutions surpassed US$100 trillion (around five times the GDP), while outstanding debt securities and stock market capitalization were more than twice the size of GDP, each. With an average daily turnover value in 2018 of US$208 billion,[8] U.S. equity markets are substantially larger than those of any other jurisdiction. Of the US$3 trillion interest rate derivatives traded daily globally, US$1.2 trillion is traded in the United States, more than in any other jurisdiction.[9] The United States has the world's largest single-country insurance market, with 28 percent of global direct premiums written in 2018. Exposure of foreign financial institutions

[6] Banks hold slightly less than 20 percent of outstanding corporate bonds and loans, representing roughly one-tenth of their own assets.

[7] This Section covers events after the conclusion of the FSAP on-site visits in early March 2020. The characterizations of the programs are based on public announcements by U.S. government agencies and, like the scenarios and analysis discussed in this section, do not reflect the same depth of discussions and information-gathering as the rest of the document.

[8] World Federation of Exchanges Annual Statistics Guide 2018, equity tables 1.1 and 1.6.

[9] Bank for International Settlements, OTC single currency interest rate derivatives turnover by country and instrument in April 2016, "net-gross" basis, daily averages, at https://stats.bis.org/statx/srs/table/d12.5?o=8:TO1

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Box 1. Corporate Sector Vulnerabilities

Business sector debt is at record highs relative to GDP. Following short-lived deleveraging after the GFC, nonfinancial business debt has risen rapidly, and now stands close to US$16 trillion (roughly 75 percent of GDP). Most of this relative increase is due to the U.S. corporate sector—with overall indebtedness close US$10 trillion currently having grown at an annual average of 5.4 percent since 2010—and the remaining accrued to noncorporate businesses, whose debt levels have grown on average by 4.2 percent, in line with the nominal GDP, over the past decade. Corporate debt consists of corporate bonds and commercial paper (US$6.5 trillion)—of which roughly 80 percent is investment grade and 20 percent is high yield—bank loans (US$1.5 trillion), leveraged loans (about US$1.2 trillion), and other debt.

Source: FRB Financial Stability Report (November 2019); Financial Accounts of the United States; and IMF staff calculations.

Exposures are concentrated in the nonbank financial institutions. Mutual funds have the largest direct exposure to the corporate sector (US$13.5 trillion, representing over 80 percent of their assets). Life insurers and pension funds also hold relatively sizeable amounts of corporate securities. Banks' exposures are more limited, accounting for less than 10 percent of assets, a large part (about 60 percent) is in the form of loans. Corporate exposures of closed-end funds are small in dollar terms, but significant relative to assets.

Source: Financial Accounts of the United States; Haver Analytics; and IMF staff calculations.

Vulnerabilities in riskier debt markets increased, most notably in the leveraged loan market. Leveraged loans are generally syndicated loans provided to highly leveraged firms (i.e., with high debt-to-EBITDA multiples), or with low credit ratings, and are mainly used for mergers and acquisitions (M&A), leveraged buyouts, recapitalization, or debt refinancing. The leveraged loan market has seen double digit growth in recent years, accompanied by weakening underwriting standards. The share of the "covenant-lite" loans has grown substantially over time. Lowering financial maintenance covenants may reduce the probability of liquidation bankruptcy, but in turn could delay corporate restructuring and reduce the recovery rate in case of default.

Securitization of corporate leverage through products such as Collateralized Loan Obligations (CLOs) has grown rapidly. Most CLOs are issued offshore (e.g., the Cayman Islands), with those onshore issued mainly in Delaware. CLOs hold more than half (about US$700 billion) of the total outstanding leveraged loans. CLOs themselves are held by a wide range of investors including domestic and foreign banks (US$200 billion), insurers (US$135 billion), and exchange traded funds (ETFs) and mutual funds (US$130 billion).[1]

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Box 1. Corporate Sector Vulnerabilities (continued)

The U.S. banks have a multi-faceted exposure to this market. Bank exposures include retained portions in the loan book, credit lines and revolving lines of credit (revolvers), and warehousing some of the products (subject to "pipeline risk"). The largest U.S. banks hold mostly higher quality (AAA-rated) CLO tranches in their investment books. Lower-rated tranches are mainly held by both domestic and foreign asset managers, insurers, hedge funds, and structured credit funds.[2]

Maturity mismatches on investors balance sheet could pose challenges in a situation of stress. An advantage of the CLO structure is that it provides some stability to market liquidity pressures. CLOs usually have a relatively long (two year) "no-call" period, during which securities issued are non-callable. Moreover, CLOs are not required to mark-to-market their assets (except on any amount exceeding the 7.5 percent threshold on holdings of CCC-rated assets), and early investor redemptions are generally not allowed. These features make them less vulnerable to runs, and CLOs can thus act as potential stabilizers in the market. In contrast, institutions with daily redemptions could face significant liquidity pressures in times of stress, triggering asset liquidations and mark-to-market losses.

Stress testing suggests sizeable potential losses, particularly among leveraged firms. The sample covered about 2,000 U.S. nonfinancial firms active in the corporate bond and leveraged loan markets, with total debt outstanding of about US$9 trillion. The tests were designed to assess corporates' solvency and funding risks using the FSAP stress test scenarios over the period 2020–25[3] Leveraged corporates appear to be more vulnerable in terms of profitability in the stress scenario and exhibit larger funding needs, making them more susceptible to solvency and funding pressures. Given the COVID-19 outbreak, the largest losses are concentrated in 2020. In the baseline scenario (corresponding to the *June 2020 WEO Update* projections), almost 5½ percent of the firms in the sample could fall into negative equity in 2020, with the majority the leveraged segment (accounting for 73 percent of all firms with negative equity in the stress scenario). In this scenario, the aggregate amount of outstanding debt of firms potentially in distress is about US$400 billion. More strikingly, if a scenario entailing a second wave of COVID-19 infection were to materialize, about 11 percent of the corporates in our sample would fall into negative equity, accounting for about US$675 billion of outstanding debt, and with an initial equity value of US$256 billion. These potential losses are substantial, although they remain broadly covered by existing financial sector buffers, particularly in the case of banks which have a moderate direct. However, the growing size of these risky credit markets—particularly when adding the high yield and private debt markets to the leveraged loan market—combined with potential losses stemming from other sectors in a downturn (e.g., households, noncorporate businesses) calls for close monitoring.

Indirect losses and potential market dislocations from corporate stress could widen depending on market liquidity conditions, particularly industries affected by the COVID-19 outbreak and collapse in oil prices. In the short term, corporates will face a shock to their liquidity position both from the uncertain market appetite for new issuance—particularly for lower rated credits—and from an expected collapse in revenues. The energy sector will face significant near-term challenges: it accounts for 10 percent of investment grade loans and bonds (10 percent of the debt service due in the remainder of 2020) and 5 percent of non-investment-grade liabilities (11 percent of debt service), with total outstanding debt is US$580 billion. Over the medium term, if rising spreads and corporate downgrades translate into system-wide asset liquidations under stress, then price impacts of fire sales and mark-to-market losses could reverberate through the system, leading to indirect losses even for the banks. Conversely, the availability of "dry powder" (e.g., from private equity investors) or structures with liability "lock-in" features could dampen potential contagion.

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Box 1. Corporate Sector Vulnerabilities (concluded)

Note:: the FSAP baseline scenario corresponds to the *June 2020 WEO Update* projections.

Source: IMF staff calculations.

[1] See Financial Stability Board report on "*Vulnerabilities associated with leveraged loans and collateralized loan obligations*", published on December 19, 2019.

[2] See Federal Reserve Board's "*Financial Stability Report,*" May 2019 edition.

[3] See Caceres, C., Cerdeiro, D.A., Pan, D., and Tambunlertchai, S., 2020, *"Stress Testing U.S. Leveraged Corporates,"* IMF Working Paper, 20/XX (forthcoming), for a detailed description of the methodology.

to U.S. rate, credit, and equity market risk is substantial, acting as an amplification channel of adverse U.S. shocks.

13. Nonbanks play a vital role in financial intermediation. Domestic financial intermediation is diversified, and the system is highly interconnected. Mutual funds hold around a sixth of the U.S corporate bond market and serve as a key source of funding for U.S. corporates and a major destination for U.S. household savings. The banking sector accounts for about 20 percent of overall financial system assets and—notwithstanding the presence of eight G-SIBs—is less concentrated

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than in other advanced economies.[10] FMIs are highly concentrated and very interdependent; their global systemic importance has grown as a result of post-crisis internationally agreed reforms. Eight systemically important FMIs, each dominating a particular market, are globally critical for U.S. dollar clearing, the clearing and settlement of U.S. Treasuries, and clearing of the exchange-traded or over-the-counter (OTC) derivatives (Figure 7).

14. The rapid expansion of nonbank mortgage lenders might lead to rising risks (Box 2). These companies have become prominent in the origination and servicing of residential mortgages. They are highly leveraged and rely on short-term funding, often from banks, to finance their operations, including pipeline, day-to-day expenses, and backstops for borrowers' delinquencies. Balance sheet funding needs are limited, however, by the fact that nonbank mortgage lenders do not hold mortgages themselves. Their rapid growth, limited coverage within a federal regulatory perimeter, low transparency and disclosure requirements, multifaceted operations, and complex interlinkages with the rest of the housing finance market could lead to significant risk buildups with consequences for other financial institutions and GSEs. Adequate regulation and supervision of these nonbanks is important to support macrofinancial stability and to protect taxpayers

15. In 2019, the authorities announced recommendations for GSE reform that would limit taxpayer risk and allow for private competitors to develop.[11] The GSEs (under federal conservatorship since 2008) have fostered the widespread availability of the 30-year fixed-rate mortgages which improve access to credit and mitigate interest rate risks to households. The roadmaps include recapitalization and tailoring government support; more stringent capital and liquidity regulation; expansion of credit risk transfer to private investors; a resolution framework requiring GSEs to maintain a minimum amount of bail-in-able loss-absorbing capacity (LAC); scaling back GSEs non-core operations; and raising competition by allowing the FHFA to charter private competitors to the GSEs while eliminating GSEs' exemptions from certain CFPB requirements—most notably the Qualified Mortgage (QM) patch.[12] The authorities' plans articulate a reasonable approach broadly consistent with past staff advice. The implementation timeline remains unclear.

16. Reforms should seek to mitigate risks of mortgage and MBS market dislocations. At roughly US$8.5 trillion (with average daily-trading volume over US$200 billion), the Agency MBS market is one of the largest and most liquid fixed-income markets with important role in banks' liquidity risk management. A reduction in the GSE's footprint may reduce intermediation for various

[10] G-SIBs account for about 57 percent of total banking sector assets and about 11 percent of total financial sector assets.

[11] The Treasury Housing Reform Plan https://home.treasury.gov/news/press-releases/sm769 and the Department of Housing and Urban Development plan https://www.hud.gov/press/press_releases_media_advisories/HUD_No_19_135

[12] The CFPB QM rule provides a compliance standard for assessing a consumer's ability to repay a mortgage loan. Under the temporary QM patch, loans eligible to be purchased or guaranteed by GSEs receive a presumption of compliance as a Qualified Mortgage. These loans are not required to meet the CFPB's General QM standard, including the maximum 43 percent debt-to-income limit. The CFPB announced in July 2019 that the QM patch would expire in January 2021 or after a short extension. On June 22, 2020, the CFPB proposed two rules pursuant to this July 2019 advanced notice of proposed rulemaking.

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Figure 4. United States: Large and Diversified Financial Sector

The U.S. financial sector is the largest among peers…

Size of Financial Sector Assets
(As of end-2019 or latest available)

Sources: Flow of Funds, Haver Analytic.

…including for banks, though not when scaled by GDP.

Size of Banking Sector Assets
(As of end-2019 or latest available)

Sources: FSI database, Haver analytic.

Financial intermediation is dominated by nonbanks…

Share of Financial Sector Assets
(In percent of total)

Source: FRB, Flow of Funds; Haver Analytics.

…while total financial system assets have levelled off.

Financial System Size and Internationalization
(In percent of GDP)

Sources: FRB, Flow of Funds; BIS

Financial sector assets grew sharply by end-2019, while the share of financial assets held by the nonresidents remained stable.

Financial Sector Asset Growth and the Share Held by the Rest of the World
(In percent)

Sources: FRB, Flow of Funds; Haver Analytics.

Financial intermediation is highly diversified.

Financial Sector Composition[1/]
(In percent of total)

Source: FRB, Flow of Funds; Haver Analytics.
1/ Data as of 2019:Q4. MMF stands for money market funds.

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Figure 5. United States: Bank Funding, Shadow Banks, and Markets

Number of Commercial Banks—FDIC Insured

Sources: FDIC.

Banks by Asset Size

(left scale = unit; right scale = billions of US$)

Sources: Flow of Funds.

Wholesale Funding: Commercial and Savings Banks

(left scale = billions of US$; right scale = in percent)

Sources: FDIC.

Shadow Banking System

(In percent of GDP)

Sources: Flow of Funds.

Domestic Market Capitalization: Selected Exchanges

(US$ billions; end-2018)

Source: World Federation of Exchanges Annual Statistics Guide 2018.

Mutual Funds Assets under Management

(US$ billions)

Sources: Flow of Funds, Refinitiv Datastream.

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Figure 6. United States: Cross-Sectoral Interconnectedness

Sources: FRB, Flow of Funds, and IMF staff calculations.

Note: A claims (color A) on B. Size of the link reflects the relative significance of claims; therefore, each sector shows both assets and liabilities. The numeric values refer to values in trillions of U.S. dollars based on levels in U.S. flow of funds as of 2018:Q4. Numeric values in black-colored fonts correspond to assets of the respective sector, while numeric values in pink-colored fonts corresponds to the area with liabilities coming into the sector.

Figure 7. United States: FMI Landscape

Source: IMF staff estimates.

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Box 2. Nonbank Mortgage Lenders[1]

Nonbank mortgage companies originate over half of residential mortgages, up from a quarter in 2007, and provide about half of mortgage servicing.[2] Quicken Loans is the largest, having originated some 6 percent of total home loans in 2018, followed by United Shore Financial Services LLC and LoanDepot LLC, with about 2 percent market share.[3] This compares to Wells Fargo Bank with a 3.2 percent and JP Morgan Chase Bank 2.3 percent market shares, respectively.

Activities in a typical mortgage loan process

- ***Origination***. Nonbank originators rely on short-term credit lines from warehouse lenders to extend mortgages. Mortgage originators seek to sell the mortgages on a timely basis to repay the credit lines.

- ***Distribution.*** Most of the loans are ultimately sold as securities guaranteed by GSEs and by Ginnie Mae ("agency MBS"), as the market for private-label residential MBS dried up post-GFC. Loans underlying these securities have to meet standards set by the GSEs and federal agencies that back loans in the Ginnie Mae pool. Ginnie Mae guarantees are explicitly backed by the government.

Basic structure of the non-bank mortgage market

- ***Servicing***. Servicers collect payments and forward them to tax authorities, insurers, and investors. These payments have to be made even if the loans are delinquent ("advances").

Multifaceted risks

Liquidity stress for servicers is a key risk. As borrower delinquencies increase, nonbank servicers will have to make advanced payments. Their liquidity buffers thus fall and their borrowing needs rise when financial conditions are tightening. Ginnie Mae servicers appear most vulnerable, these loans tend to have worse credit quality than GSE loans, and Ginnie Mae servicers generally cannot use the "advances" as funding collateral.

The ongoing COVID-19 pandemic is a real-time liquidity stress test for mortgage servicers. Mortgage servicers had been operating with low delinquency rates prior to the pandemic (0.65 percent for GSE loans, 1.92 percent for VA loans, and 3.47 percent for FHA loans in 2019).[4] Mortgages in forbearance increased rapidly with the onset of COVID-19, implying that advance payments by servicers are multiple times their "normal" amounts. The sharp tightening in financing conditions in markets without official interventions makes it harder for servicers to obtain bridge financing. Even though the Federal Housing Finance Agency (FHFA) has subsequently allowed the GSEs to provide relief, servicers still generally need to make payments in the initial four months following the forbearance on a single-family mortgage. Whereas FHFA provided a degree of certainty to servicers as to the duration of the servicing advance requirement, , Ginnie Mae opted to provide direct liquidity assistance to its servicers.

Share of Mortgage Loans in Forbearance following the COVID-19 Outbreak

Source: Mortgage Banker Association's Forbearance and Call Volume Survey.

Other risks include solvency and loss of market depth. Changes to the GSE regime could impact market depth. A slowdown in securitization could make it difficult for originators to repay the credit lines. Originators could incur valuation losses on unsold loans, and servicers losses in servicing delinquent loans. With the COVID-19 outbreak, some

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Box 2. Nonbank Mortgage Lenders (concluded)

loans entered in forbearance before being sold to the GSEs. Even though GSEs made an exception to temporarily purchase such loans, a haircut of 5–7 percent to the loan value will be applied, representing a loss for originators.

Macrofinancial exposures and implications of disruptions to nonbank mortgage firms

- ***Warehouse creditors***. Warehouse creditors (mostly large banks) could incur losses if originators fail to pay back the credit lines. Such potential losses are likely limited, as credit lines are secured by mortgages with a haircut. Moreover, the system's aggregate exposure to warehouse credit is relatively limited.[5]

- ***MBS investors***. Even though investors in GSEs and Ginnie Mae securities are protected from losses, they could potentially be affected if mortgage servicers do not function properly. This is exacerbated by the concentration of the servicing market. Non-agency MBS investors bear the entire credit risk on their holdings of non-guaranteed mortgage loans, including those originated by nonbanks which tend to have lower credit quality than bank loans.

- ***Shareholders of nonbank businesses***. Nonbank mortgage companies are typically organized as monolines but some are affiliated with other financial institutions (e.g., private equity firms). Some real estate investment trusts (REITs) hold mortgage-servicing rights. While shareholders serve as potential source of liquidity, they could be negatively impacted by loses of associated mortgage companies.

Widespread disruptions to nonbank mortgage firms could adversely impact broader housing market. Lower credit availability will likely affect Ginnie Mae's borrowers the most—nonbanks are currently originating about 90 percent of Ginnie Mae loans, most of which are to borrowers with lower credit score and lower income. Although a number of mitigators exist (e.g. loan-loss mitigation procedures and improved risk assessment practices by GSEs which will also benefit Ginnie Mae given their shared nonbank counterparties), a "moral hazard" risk remains important. Research found that the transfer of credit risk through the originate-to-distribute channel resulted in originations of inferior-quality mortgages, although securitized-loan quality has improved following the introduction of the Dodd-Frank Act.[6] Higher GSE losses could pose challenges to the reform plans.

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[1] This discussion excludes insurers.

[2] See "*Reengineering Nonbank Supervision*." Chapter three: Overview of Nonbank Mortgage, The Conference of State Bank Supervisors, September 2019.

[3] See "*Data Point: 2018 Mortgage Market Activity and Trends*", The Consumer Financial Protection Bureau, 2019.

[4] See "*Global Markets Analysis Report, April 2020*" by Ginnie Mae.

[5] Data on aggregate exposure are not available. Assuming that mortgage loans usually sit on the credit line for about 15 days, a total mortgage origination by nonbanks of about US$500 billion per annum would be backed by credit lines of about US$20 billion.

[6] See Purnanandam, A., 2011, *"Originate-to-Distribute Model and the Sub-Prime Mortgage Crisis,"* The Review of Financial Studies, Volume 4, Issue 6, Oxford University Press, June 2011.

mortgage-related products, if not offset by increased private participation. The increase in interest spreads on long-term fixed-rate mortgages is often seen as one of the most important potential impacts. Changes to the GSEs' underwriting standards and rules may result in less access for lower-income borrowers. Requirement that the GSEs maintain a nationwide presence and preclusion from holding mortgages in their own portfolio beyond the level needed to facilitate their securitizations would lower the GSEs' profitability, making it potentially harder to attract private capital.

17. Changes to the GSE framework could impact Private Mortgage Insurers (PMIs) whose financial strength significantly improved post-GFC. GSEs are required by statute to obtain credit enhancement on all purchased mortgages with a loan-to-value ratio greater than 80 percent. More than 98 percent of this enhancement constitutes insurance with PMIs. In 2015, the GSEs put in place

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Private Mortgage Insurer Eligibility Requirements (PMIERs)—further updated in 2018—which provide a comprehensive set of operational and risk-based financial requirements. PMIs must always meet PMIERs to be eligible to write mortgage guaranty insurance for mortgages acquired by the GSEs. PMIERs financial requirements are considerably stronger than the current minimum capital requirements by the states. Revised state requirements for PMIs are under development. When capital requirements for the GSEs are developed, further modification of PMIERs financial requirements would be necessary to avoid capital arbitrage.

Risk Analysis Approaches

18. Financial system resilience was assessed by analyzing solvency of banks and insurers; liquidity of banks, mutual funds (MFs), and money market funds (MMFs) under stress; and system interconnectedness (Figure 8, Appendices II–V). The FSAP approach recognizes high complexity and strong cross-sectoral linkages in the U.S. financial system, the relatively large number of G-SIBs, and the large number and size of MFs and insurers. Emphasis was put on the impact of delayed recovery from the COVID-19 outbreak and potential impact of additional containment measures due to a potential second wave of the pandemics. Parts of the analysis (interconnectedness, MFs) were finalized before the COVID-19 outbreak and focused on asset fire-sales, e.g., due to materialized risks in the corporate sector.[13] The COVID-19 shock has introduced a considerable uncertainty about future economic developments and may lead to structural breaks in consumer and corporate behaviors. A number of indicators are pointing to a possibility of a stronger output contraction in 2020 and an elevated level of unemployment remaining for longer. The stress testing results should therefore be interpreted with caution.

Figure 8. United States: FSAP Systemic Risk Assessment Framework

Source: IMF staff analysis.

[13] Further description of the models, methodologies, and stress test scenarios in the Technical Note on *Risk Analysis and Stress Testing the Financial Sector*.

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Scenarios

19. The following scenarios have been used for the stress tests (Figure 9):

- The FSAP *Baseline scenario* follows the *June 2020 WEO Update* projections.[14] It entails a sharp contraction (mainly in 2020:Q2) owing to containment measures in response to the COVID-19 outbreak, and subdued activity and reduced demand in sectors affected by social-distancing norms. This is then followed by a tepid economic recovery as the economy starts to open again, but private sector balance sheet deterioration—with the unemployment rate peaking at 13½ percent in 2020:Q2—combined with long-lasting behavioral changes, keeping GDP below its pre-crisis (i.e., 2019:Q4) level through end-2022. Asset prices face a commensurate short-term fall, and then recover back to their previous levels within two-year horizon.

- Three alternative sensitivity scenarios are also considered, which assume different length of containment and de facto mobility measures:

  (i) *Sensitivity Scenario 1*: relative to the baseline, this scenario assumes that the reduced de facto mobility observed during the containment period lasts for the entire second quarter of 2020. Output losses during this period are assumed to be 25 percent (non-annualized) relative to pre-COVID levels. In other words, the level of economic output in 2020:Q2 is equivalent to 75 percent of the pre-shock quarterly output level. This is then followed by a slower economic recovery relative to the baseline, hysteresis losses are assumed to be commensurately larger. The fall in financial asset prices is proportionately adjusted to the severity of the output losses embedded in the scenario.

  (ii) *Sensitivity Scenario 2*: this scenario follows the same logic as *Sensitivity Scenario 1*, but the containment measures and reduced mobility are assumed to last for another quarter. In other words, output levels in both 2020:Q2 and 2020:Q3 are only 75 percent of the pre-crisis level. This would lead to larger employment, income, and business losses, thus also translating into larger and longer-lasting economic "scarring" relative to the previous two scenarios.

  (iii) *Sensitivity Scenario 3*: initially, this scenario follows the same pattern as *Sensitivity Scenario 1*, but assumes another wave of increased infections followed by a new containment period in the first quarter of 2021. This leads to a "W-shaped" path of the level of output, triggering more economic and balance sheet losses for longer. Consequently, economic activity recovers even slower in this scenario in subsequent years.

20. Compared to historical patterns observed in previous economic crises, the economic losses in the FSAP scenarios are unprecedented, reflecting the unprecedented nature of the ongoing pandemic. The sharp real GDP contraction in 2020:Q2 in the *June 2020 WEO Update* is equivalent to 12 times the historical standard deviation of the quarterly GDP growth series recorded

[14] https://www.imf.org/en/Publications/WEO/Issues/2020/06/24/WEOUpdateJune2020 .

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since the end of WWII. This same variable's path corresponds to 17 standard deviations in the case of the adverse scenarios. The FSAP stress test scenarios of financial variables are adjusted proportionately to the severity of the output losses. This includes large shocks to corporate risk premia, stock market prices, and real estate prices (which tend to exhibit a more delayed response).

Figure 9. United States: Stress Test Scenarios

Delayed recovery leads to subdued activity ....

Real GDP Levels
(Index: 2019Q4=100)

... and more persistent unemployment

Unemployment Rate
(In percent)

House prices fall...

House Price Index
(Index; 2019Q4=100)

...following a contraction in the stock market

Stock Market Index
(Index; 2019Q4=100)

Risk premiums go up, especially for lower rated corporates....

BBB Corporate Spread
(In percent)

...despite policy rates expected to remain low for longer

Slope of the Yield Curve
(In percentage points; 10-year minus 3-month yield)

Sources: FRB, CCAR scenarios; Haver Analytics; IMF staff estimates.

Note: The FSAP Baseline Scenario refers to the *June 2020 WEO Update* projections.

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Banking Sector Resilience

21. The banking system entered COVID-19 crisis with sizeable capital buffers, though future capital depletion is subject to multiple sources of uncertainty, including duration and intensity of COVID-19 containment measures. Solid buffers allowed banks to extend credit lines to cash strapped corporates and households. Were the macroeconomic forecasts produced before the COVID-19 outbreak to materialize, banks would maintain high capital buffers and profitability. The uncertainty around the duration of the crisis required simulation of several adverse scenarios—complementing the already severe baseline—and utilization of ad hoc assumptions to analyze sensitivity of capital positions to different duration of containment, assumptions about payouts to shareholders, dynamics of non-interest expenses, and credit portfolio growth. The stress tests, however, were not able to fully incorporate the impact of various fiscal measures in the CARES package and the temporary postponement of loan repayments granted to banks' borrowers.

22. The FSAP corporate stress analysis and market data informed calibration of corporate and commercial real estate (CRE) loss rates. The corporate and commercial real estate loan portfolios were hit by an unprecedented shock of the containment measures, with expected losses far exceeding observed banks' loss rates during previous cyclical downturns. Further, historic commercial and industrial (C&I) loan loss data may not reflect the structural break related to the rapid growth of leveraged loans with few covenants in recent years. Thus, C&I loan losses follow the path derived from the above corporate sector stress test results. The potential loss rate from the C&I loans under the *Baseline scenario* reaches 11.2 percent and is four times higher than the rate observed during the GFC; losses under the *Adverse Sensitivity Scenario 1* reach 14.9 percent and are five times higher than those observed during the GFC. Projections of CRE loan losses are based on market sources, with the COVID-19 impact up to three times larger than the CRE loan losses in 2008–09.[15]

23. To gauge the sensitivity of the results to behavioral assumptions, the stress test considered two options for shareholder payouts. The main set of simulations involved an assumption that banks would continue shareholder payouts at historic average rates (i.e., at approximately 40 percent of net earnings, excluding share buybacks) and will reduce other expenses, while balance sheets will grow at the rate of up to 4 percent per year reflecting lower demand for credit compared to average growth rates of 7.5 percent recently. An alternative set of simulations assumed that banks would temporarily reduce shareholder payouts to zero for the duration of the crisis. Based on these assumptions and the four scenarios, eight simulations were performed in total.[16]

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[15] See Moody's report: *"Coronavirus (COVID-19): Credit Risk Impact on Commercial Real Estate Loan Portfolios."* https://www.moodysanalytics.com/-/media/article/2020/covid19-credit-risk-impact-cre.pdf

[16] The bank solvency stress test uses public data and the Capital and Loss Assessment under Stress Scenario (CLASS) top-down model developed by the Federal Reserve Bank of New York and augmented by the FSAP team.

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24. Capital depletion rates are high in the *Baseline scenario* yet remain manageable (Figure 10, Appendix VI provides sample grouping). The impact of COVID-19 plays out mainly via two channels: (i) immediate increase in credit losses, especially exposures to credit cards (losses of up to 3 percent of risk-weighted assets (RWAs)) and C&I loans (losses of up to 1.8 percent of RWAs); and (ii) growth of RWAs due to a utilization of credit and funding lines leading to an additional depletion of CET1 of up to 1 percentage point[17] Net interest income offsets the majority of losses, but declining margins resulting from low policy rates reduce pre-provision net revenue.[18] Policy rates have a small additional positive effect on funding costs but a significant negative one on loan interest rates. Cumulative five-year gross interest income goes down from 15.5 percent to 12.2 percent of total assets when compared to the pre-crisis level. This leads to a 360-basis point annual capital uplift from net interest income compared to 420 basis points (bps) estimated before the COVID-19 outbreak. If shareholder payouts remain at a historic level, up to four banks in the sample (none of which is one of the eight G-SIBs) would need additional capital to meet the 4.5 CET1 hurdle requirement within the three-year horizon, with aggregate recapitalization needs amounting to 0.4 percent of GDP. No G-SIB would fall below the 4.5 CET1 hurdle also over the five-year horizon, while a total of five non-GSIBs would require additional capital of about 0.8 percent of GDP in aggregate. If shareholder payouts were zero for the stress test horizon, only four non-GSIBs would need additional capital with the recapitalization needs falling to 0.6 percent of GDP over the five-year horizon.

25. Banks with a high share of retail funding, diversified asset portfolios, and high initial CET1 capital buffers are more resilient. G-SIBs[19] with diversified business lines fare well, with trading banks[20] experiencing a limited impact on their balance sheets, mainly due to prompt actions from the FRB setting up the lending facilities to stabilize market liquidity. Non-GSIBs[21] and some foreign-owned banks with considerable exposure to C&I loans, lower capital buffers, and large shareholder payout ratios are relatively more vulnerable to shocks. Non-GSIBs are primarily exposed to losses from unsecured lending to households (e.g., credit cards), secured loans (e.g., residential mortgages), and C&I loans, as well as commercial real estate lending. Some smaller non-GSIBs have high exposure to consumer lending, such as credit cards. Moreover, banks differ in terms of exposures to various sub-segments of consumer credit, with some banks having targeted lower-income households, which were particularly strongly hit by the crisis.

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[17] Assuming a system-wide expected utilization of 20 percent and a credit conversion factor of 50 percent.

[18] Non-interest expenses show high historic volatility stemming from large one-off litigation costs or operational risk events, adding to the overall model estimations uncertainty. These have been capped in the stress testing model.

[19] For the stress test purposes, G-SIB group includes four universal banks designated as G-SIB (Bank of America Corporation, Citigroup Inc., J.P. Morgan Chase & Co, and Wells Fargo & Company) and excludes the other four G-SIBs, which fall under the trading banks category due to the underlying business model.

[20] Trading banks group includes banks with a high share of trading-related income and trading assets, *inter alia* also four G-SIBs (Bank of New York Mellon, Goldman Sachs Group, Inc., Morgan Stanley, and State Street Corporation).

[21] This group includes large banks with consolidated total assets above US$100 billion, excluding U.S. G-SIBs and Intermediate Holding Companies. See Appendix VI.

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Figure 10. United States: Bank Solvency Stress Testing Results—IMF Baseline Scenario

Banks started with strong capital position to support further growth of balance sheets, but declining interest margins coupled with high credit losses could lead to four non-GSIBs falling below minimum requirements...

CET1 Ratio in Baseline Scenario

...G-SIBs have enough buffers to continue expanding loans yet the shareholder payouts at the current rates would reduce buffers going forward...

CET1-Ratio in Baseline Scenario- GSIBs

...as do trading banks, which have low exposure to consumer loans.

CET1 Ratio in Baseline Scenario - Trading Banks

Foreign banks fare relatively well, though some with significant retail exposures face a challenge...

CET1 Ratio in Baseline Scenario- Foreign Banks

...as do non-GSIBs, which started with lower levels of capital and profitability and have less diversified credit portfolios.

CET1 Ratio in Baseline Scenario- Non-GSIBs

Non interest expenses may be further optimized: cost optimization, lower shareholder payouts would help in preserving capital base.

Contributions to CET1 Base

(In billions of U.S. Dollars)

Sources: IMF staff estimates.

Note: See Appendix VI for bank grouping. The box plots illustrate the interquartile range through the orange rectangular shaped objects, while the wiskers denote upper and lower bounds (latter is set to zero). The Baseline Scenario assumes shareholder payouts at 40 percent.

26. A more prolonged economic disruption would lead to a further depletion of banks' capital buffers, yet no G-SIB falls below the minimum required CET1 level within the three years (Figure 11). Focusing on the three-year period, up to six banks (all of them non-GSIBs) would need additional capital in the *Adverse Sensitivity Scenario 1*, though capital gap would be small and amounts to 0.5 percent of GDP.

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Figure 11. United States: Bank Solvency Stress Testing Results—Adverse Sensitivity Scenario 1

Most of the banks would stay above 4.5 percent CET1 minimum within the first year of the scenario.

CET1 Ratio in Sensitivity Scenario 1

G-SIBS show greatest resilience due to the diversified nature of their business models and high initial capital buffers…

CET1-Ratio in Sensitivity Scenario 1- GSIBs

…while banks focused on market trading are hit less because of higher relative exposore to market and counterparty risks, which are not assumed to materialize due to monetary and market support measures.

CET1 Ratio in Sensitivity Scenario 1 - Trading Banks

Some foreign banks would need additional capital buffers, especially those exposed to consumer lending segment…

CET1 Ratio in Sensitivity Scenario 1 - Foreign Banks

…as would Non-GSIBs, especially those with lower initial capital bufers and higher expsoure to consumer and C&I loans

CET1 Ratio in Sensitivity Scenario 1- Non-GSIBs

Overall, credit cards, C&I loans are the largest contributors to credit risk…

Loan Losses
(In billions of US dollars)

Sources: IMF staff estimates.

Note: See Appendix VI for bank grouping. The box plots illustrate the interquartile range through the orange rectangular shaped objects, while the wiskers denote upper and lower bounds (latter is set to zero).

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27. Sensitivity analysis using different assumptions about duration of the current crisis and a hypothetical second infection wave indicates a range of impact on banks' capital positions. An additional quarter of lockdown in *Sensitivity Scenario 2* results in a system wide CET1 ratio falling on average by additional 90 bps (2022:Q2); up to eight non-GSIBs would need additional capital with the overall capital shortfall against the 4.5 percent CET1 hurdle of about 0.6 percent of GDP. In case of a second wave of infections and subsequent reactivation of full containment measures under *Sensitivity Scenario 3*, the CET1 declines by additional 450 bps in the third year compared to the *Baseline*. Overall, this would lead to 10 non-GSIBs failing to meet minimum CET1 hurdle within the first three years of the crisis with the aggregate capital shortfall of about 0.8 percent of GDP. The recapitalization needs would be on average 0.1 percentage point lower in the scenarios that assume that shareholder payouts are zero during the simulated crisis period.

28. Even under the adverse scenarios most of the banks earn enough interest income to offset credit risk-related losses, and non-interest expenses drive the overall impact on capitalization (Figure 12). U.S. banks have a track record of reducing operational expenses quickly by closing branches and reducing workforce and staff compensation. However, were the longer duration of stress to materialize, further growth of the loan portfolio in the adverse scenarios would require a higher share of earnings to be retained. This would also help banks to maintain staffing ensuring robust business continuity. In particular, by keeping shareholder payouts at zero for the duration of the crisis, banks would save an average of 60 bps of CET1 by 2022:Q2 in the *Baseline Scenario*.

Figure 12. United States: Solvency Stress Testing Results—Sensitivity to Assumptions about Shareholder Payouts

Systemwide CET1 ratio would remain above the 4.5 percent CET1 minimum within the stress test horizon…

CET1 Ratio—With Historic Level of Payouts
(In percent of risk-weighted assets)

…and retaining all earnings would help to conserve additional capital in case of an extended duration of the current pandemics.

CET1 Ratio—Without Payouts
(In percent of risk- weighted assets)

Source: IMF staff estimates
Note: In panel 1, payouts include forecasted dividend payouts but exclude share buybacks.

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29. Most of the banks would be able to maintain leverage ratios above the minimum requirement (Figure 13). Some trading banks designated as G-SIBs would face a challenge in maintaining a 6 percent supplementary leverage ratio without reducing the dividend payout ratio or asset growth.[22] Foreign banks and some non-GSIBs, which are not subject to the supplementary leveraged ratio rule, would need additional capital to remain within the minimum Tier 1 leverage ratio of 4 percent.

Figure 13. United States: Bank Solvency Stress Testing Results—Leverage Ratio

Sources: IMF staff estimates.

Note:The box plots illustrate the interquartile range through the orange rectangular-shaped objects, while the wiskers denote upper and lower bounds (latter is set to zero).

30. The potential impact of competition from fintech companies is relatively small for now (Figure 14). Applying assumptions derived from industry surveys and rating company reports, a sensitivity test leads to a 10-basis point decline in potential CET1 ratio.[23] The growing competition for deposits, fee revenues, and payment services from fintech companies will pose risks to banks' business models in the medium term, unless banks increase their spending on IT and innovative technologies. Non-GSIBs are the most vulnerable given their market share in deposits. The analysis

[22] The analysis did not take into account the temporary rule announced in April, which excludes U.S. Treasury securities and deposits at Federal Reserve Banks from the calculation of the supplementary leverage ratio and will be in effect until March 31, 2021. See https://www.federalreserve.gov/newsevents/pressreleases/bcreg20200401a.htm.

[23] See *Technical Note on Risk Analysis and Stress Testing the Financial Sector* for details on assumptions and methodology. The sensitivity analysis was performed using 2019:Q3 data.

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was conducted before COVID-19, and the impact of COVID-19 on digitalization of retail banking and pressures for cost cutting via closure of physical branches may accelerate further.

Figure 14. United States: Sensitivity Analysis—Impact of Fintech on Banks

Sources: IMF staff estimates.

Note: The box plots in the right panel illustrate the interquartile range through the red rectangular-shaped objects, while the wiskers denote upper and lower bounds. The horizontal black bars in the middle of the interquartile range denote the median.

31. Based on public disclosures, banks' liquidity risks appeared moderate at the crisis onset (Figure 15). The banks in the sample obtain more than half of their funding from domestic deposits. The COVID-19 crisis and market liquidity support by the FRB led to a significant (US$1 trillion) increase in bank deposits by households and corporates in 2020:Q1. Some foreign banks do depend on repo markets for their short-term funding and are thus more exposed to wholesale funding shocks. All banks held enough high-quality liquid assets (HQLA) to fund projected cash outflows for 30 days: average Liquidity Coverage Ratio (LCR) was 133 in 2019:Q3. Their total contractual 30-day funding gap was relatively modest, and mostly driven by off-balance sheet financing commitments. On-balance sheet inflows and outflows over a 30-day period constituted on average around half of banks' balance sheets. Off-balance sheet credit and liquidity facilities constituted another 25 percent of total assets. Most of these commitments are credit lines to corporations (revolvers) and households (credit cards, mortgages), and loans to other financial institutions—including mutual, investment, and hedge funds.

32. An increased utilization of credit and liquidity facilities could lead to a significant shortage of liquidity and a substantial decline in CET1 ratios (Figure 16). As evidenced in previous crises and during the COVID-19 stress period, nonfinancial corporates and households increase their utilization of bank facilities. If drawdowns exceeded 30 percent, many banks (including G-SIBs) would need additional liquidity to provide funding to distressed corporates and other

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Figure 15. United States: Bank Structural Liquidity Ratios

Domestic deposits are the largest funding source for banks.

The median LCR ratio has increased since 2018 and all banks have buffers above 100 percent…

*Data for 8 banks **Data for 17 banks; 2019 and onwards: data for 33 banks

…although non-GSIBs' LCR ratio is higher due to a 70 percent cap on outflows….

…and the highest average share of deposit funding among the peer groups of banks.

System-wide liquidity risk expsoure is modest: 30-day funding gap is close to 35 percent of total assets…

…with off-balance sheet funding and liquidity facilities being the key contributing factors among unsecured liabilities in the 30-day time horizon.

Sources: IMF staff estimates using public LCR and FR 9Y disclosure data.

Note: The box plots illustrate the interquartile range through the gray rectangular-shaped objects, while the wiskers denote upper and lower bounds. The yellow dots denote the mean.

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institutions in times of wholesale funding stress or adverse market conditions market.[24] Depending on the share of committed and uncommitted credit lines, assumed credit conversion factors—additional depletion of CET1 ratios due to the increase in RWAs—would be from 20 bps (minimum of 5 percent drawdown) to 250 bps if banks were to allow full drawdown of the lines. Failure to grant credit lines would lead to various non-linear feedback effects within the financial sector and further defaults of cash-strapped corporates. While post COVID-19 Fed actions helped to shore up liquidity, it is important that banks maintain high enough liquidity buffers and predictable access to central bank liquidity facilities going forward.

Figure 16. United States: Bank Liquidity Stress Testing Results

System-wide liquidity needs are small in case of increase in drawdowns on revolvers of up to 30 percent of utilization rates....

...with some non-GSIBS driving the overall impact due to assumptions about low expected drawdowns.

Sources: IMF staff estimates using public LCR and FR 9Y disclosure data.

Note: The box plots illustrate the interquartile range through the gray rectangular-shaped objects, while the wiskers denote upper and lower bounds. The yellow dots denote the mean.

33. Additional cash flow-based stress tests assessed funding and market liquidity risks in the network of U.S. G-SIBs.[25] The test focused on two scenarios: (i) the LCR-based shock scenario, which used LCR stress parameters but assumed more severe outflow rates on contingent liquidity items, such as credit and liquidity facilities, derivatives, and loss of rehypothecation rights; and (ii) the LCR-based shock scenario coupled with the assumption of a closure of repo markets (i.e., repos with MBS, agency and corporate securities not possible) and outflow rates on selected cash flow items the same as in scenario (i).

34. G-SIBs appear to have enough liquidity to withstand a severe LCR-like liquidity shock coupled with additional contingent liquidity and committed line outflows over a 1-, 5-, and 30-day horizon. Compared to the results of the analysis above conducted for 35 banks using public

[24] The test assumed that banks' inflows/outflows follow LCR rates, except for higher (standardized for all banks) utilization rates for credit and liquidity facilities. The full amount of HQLA without haircut is used to cover the gap. The test does not distinguish between committed/uncommitted lines.

[25] The analysis was performed by the FRB staff using IMF scenarios and models in March 2020, and it does not reflect the views of the U.S. regulators.

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LCR data (where a number of non-GSIBs were illiquid), the G-SIBs do not have a gap after HQLA asset sales and do not need to repo assets. The liquidity gap and impact on CET1 is thus zero across all scenarios and maturity horizons. There is also no further transmission of funding risk in the network due to counterparty exposures among the G-SIBs.

35. Closure of the repo market for non-Treasury securities would lead to a small and short-lived cash flow gap in several G-SIBs, but the system-wide impact from asset fire-sales is small. Unless daily asset trading volume exceeds five times the historic average, an immediate closure of the non-Treasury repo markets affects banks during the one-day to five-day horizons (Figure 17). The worst observed cash flow gap (before a bank needs to repo treasury securities) would be from 0.09 percent of total assets (one day) to 0.27 percent (one week). This gap is fully covered by other inflows on the 30-day horizon (i.e., no shortage of liquidity is observed). If affected banks liquidate assets in stressed markets, this would lead to an insignificant 9 bps decline of CET1 on average (because the assets liquidated are Treasury securities). No G-SIB would become technically illiquid and there would be no additional losses due to interconnectedness among G-SIBs. It is worth noting that in case of a complete closure of repo markets (i.e., including Treasury securities), affected banks would face higher asset liquidation needs, although the probability of such a scenario is very low. Withdrawal of funding from Federal Home Loan Banks (FHLB)—an important source of HQLA—would not lead to a cashflow gap.

36. Closure of repo markets may lead to illiquidity of a G-SIB when this severe shock is combined with an increased utilization of credit and liquidity facilities by other financial institutions or corporates. The stress test found one G-SIB illiquid, albeit under an assumption of very high outflow rates from the credit and liquidity facilities (40 percent and above) and only under a 30-day test horizon. Overall, the impact of an asset fire-sale, including repricing of remaining assets on affected G-SIBs balance sheets, is small with a similar decline in CET1 capital by 9 bps as in the previous case, and funding gap of only 7 bps of total assets in the worst-case scenario.

Mutual Fund Resilience

37. Given the market footprint of MFs, asset sales by managers could have a sizeable impact on market prices, thereby transmitting shocks to the financial system. FSAP liquidity tests examined funds' ability to meet severe-but-plausible redemption shocks and the extent to which funds can transmit shocks through asset sales. Using commercially available fund-level data on all U.S. fixed income and mixed MFs (2,734 funds with total net assets of US$6.4 trillion), potentially vulnerable funds were identified on the basis of historical redemption data and their ability to meet redemption shocks with highly liquid assets using assumptions about investor and manager behavior, and excluding managers' use of liquidity management tools. In this context, the price impact of asset sales under different liquidation strategies was considered. A sensitivity analysis of a small set of funds (10) with large derivatives exposures to foreign exchange and shocks to term premium was also conducted. Further, the potential for funds to transmit shocks in distress, including through fire sales that would affect other parts of the financial system, was assessed.

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Figure 17. United States: Liquidity and Asset Fire-Sales Scenario for U.S. G-SIBs

Impact of the closure of the repo market is small, and on its own will not lead to illiquidity of banks (one-week horizon is shown), especially if they can sell multiple amounts of liquid securities (five times average daily trading volume in the figure below means that the gap becomes zero).

Under the 30-day scenario, all G-SIBs would retain positive cash flow gap if outflow shock on credit facilities would remain below 40 percent.

CET1 capital impairment solely due to liquidation losses is around 4.5 basis points (bps)...

...while mark-to-market losses are around the same level, yielding a combined CET1 impact of 9 bps.

Sources: IMF calculations performed by the FRB staff in March 2020 based on FRB supervisory data.

38. While nearly all funds would be able to withstand severe redemptions in the FSAP stress test, high yield and loan MFs would face significant shortfalls. More than 90 percent of funds (measured by assets under management) would have enough highly liquid assets to meet investors' redemptions. However, funds exposed to high yield and leveraged loans would need to sell less-liquid securities in their portfolio (assuming that they do not use any liquidity risk management tools), potentially giving rise to fire-sale dynamics (Figure 18). These results remain valid whether shocks are calibrated based on historical data at the fund category level (homogeneity) or at the individual fund level (heterogeneity). Two behavioral scenarios of the asset

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sales were analyzed. Under the slicing approach—where funds sell securities in proportion of their weights in the portfolio—the price impact from MF sales ranges from 50 to 200 bps in normal times and between 150 and 700 bps during stress periods. In addition, funds with large exposures to derivatives could face significant liquidity demand stemming from variation margin. The illustrative analysis shows that a 1 percent depreciation of the U.S. dollar and a 50-basis point increase in the interest rates would prompt margin calls on the derivatives portfolio ranging between 3 and 10 percent of the net asset value (NAV).

39. When certain fund categories are in distress, other fund categories may be in distress at the same time. Such categories include investment-grade corporate, multi-strategy bond funds and to a lesser extent municipal bond funds, mixed funds and global funds (Figure 18). Emerging market bond funds may be likely to experience large outflows when other fund categories are in distress. Fund categories which are most exposed to liquidity risk under the FSAP analysis include high yield (HY), emerging market (EM), and loan funds are not systemic in the sense that when they are in distress other fund categories do not experience large outflows. This is partly due to substitution effects, whereby in periods of stress investors may move out of the HY, EM, and loan funds (which are a smaller share of the market) into safer government or investment-grade (IG) corporate bond funds.

Money Market Fund Resilience

40. As part of the 2014 MMF reform rules, the SEC requires MMFs to perform regular stress tests. MMFs using stable NAV must be able to maintain a mark-to-market NAV within 0.5 cent of US$1.00, i.e., the shadow NAV must not fluctuate by more than 0.5 percent.

41. Stress tests by the FSAP indicate that all MMFs using stable NAV would be able to withstand large interest rate and credit spread shocks. A sample of 208 MMFs, covering 95 percent of the universe were subject to 100-bps interest rate and credit spread shocks. Results show that the NAV of MMFs would not fluctuate more than 0.16 percent for the interest rate shock (well within the 0.5 percent allowable range) and no more than 0.27 percent for a combined 100-bps interest rate and spread shock. Very large shocks would be required for MMFs to “break the buck” (more than 350 bps). The stress tests did not asses the liquidity of MMFs, which do not use stable NAV (Institutional Prime MMFs). During the beginning of the COVID-19 outbreak in March 2020, Institutional Prime MMFs experienced very large outflows from investors (Figure 19). At the same time, Prime MMFs faced challenges in selling their assets due to strains in the short-term money markets. As a result of those combined asset and liability shocks, some Prime MMFs required sponsor support in March. Two sponsors purchased assets from the MMFs to ensure compliance with their daily and weekly liquidity requirements while allowing investors to redeem their shares. Following the FRB support to the commercial paper market and to MMFs, stress receded and prime MMFs saw inflows starting early April.

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Figure 18. United States: Mutual Funds Stress Tests Results

MFs have enough highly liquid assets, except HY and Loan funds.

Share of Funds with a Liquidity Shortfall

Note: Share of funds (by category) whose Redemption Coverage Ratio (highly liquid assets to redemption) is below one .
Sources: Morningstar, IMF staff.

Asset sales by MFs can have a sizeable impact on the market.

Price Impact of Asset Sales on Underlying Market

Note: Price impact of asset sales by liquidation strategy, in bps. The chart shows the impact of sales for each category of funds on its underlying market (EM bond fund sales impact on EM bond market etc.)
Sources: Morningstar, IMF staff.

Liquidity demands for MFs using derivatives can be large.

Variation Margins
(In percent of cash and cash equivalents)

Note: Variation margins in % of cash and cash equivalents as reported in B.2.f.
Sources: SEC form N-PORT IMF staff.

When IG and mixed MFs are in distress, other fund categories are also affected, while EM funds are particularly vulnerable.

Potential Flow Spillovers among Fund Categories

Note: Expected net flows conditional on distress in %.
Sources: Morningstar, IMF staff.
Negative values indicate outflows.

Insurance Sector Resilience

42. The FSAP used a broad range of scenario analyses, sensitivity tests, and exposure analyses to quantify insurance sector risks. The scenario for the top-down stress test built on the narrative and severity of the banking sector stress test, focusing more on market shocks, assumed to occur instantaneously. Additional sensitivity analyses included (i) prolonged low interest rates, (ii) higher lapse rates with liquidity outflows, (iii) the default of the largest banking counterparty, and (iv) a stock-take on carbon-intense assets. Publicly available data of 50 insurance groups and more granular investment data provided by the NAIC were used for the analysis.[26] The COVID-19 pandemic will impact the insurance industry primarily through the impact on investments and to a lesser extent through changing claims patterns (Box 3). At the time of this report finalization, these

[26] The test covered 21 life, 22 property & casualty, and 7 health insurers and was finalized in March 2020. Shocks were slightly adjusted to make them more operational for the insurance stress test and recalibrated to be meaningfully applicable at end-2018 when equity markets were temporarily depressed.

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do not invalidate stress testing conclusions. The stress test, however, does not include a scenario with major rating downgrades in the financial and corporate sector, which would increase insurers' capital requirements, especially when assets lose IG rating.

Figure 19. United States: Money Market Funds—Flows and Fed Facilities

Inflows into government MMFs were large after the shock...

Note: Net assets of Prime and Government and Treasury MMFs, in USD bn.

...and the Fed facilities served as an important market backstop.

Note: Holdings of Prime MMFs and MMFs repo with the Federal Reserve, in USD bn.

Source: SEC MMF Statistics, Form N-MFP Data, filings through April 13, 2020.

43. In the adverse scenario, some life insurers would face a significant statutory capital reduction in the adverse scenario, but the current valuation and capital framework largely mitigates the impact (Figure 20). The aggregated loss in capital of US$226 billion equates to a 31 percent reduction (3.9 percent of consolidated balance sheet assets), mostly driven by shocks to non-IG corporate bonds, stocks, and other investment assets. In the life sector, aggregated capital declines by US$74.3 billion (-35.7 percent), in P&C by US$149.8 billion (-32 percent), and in the health sector by only US$1.4 billion (-2.8 percent). Unlike in a fully market-consistent valuation, sizable parts of the balance sheet are not sensitive to market price fluctuations. The absence of a consolidated group capital framework complicates estimating the stress impact. Nonetheless, as solvency ratios of U.S. solo companies tended to be well above regulatory thresholds, it can be expected that even in this adverse scenario the vast majority would still continue to meet capital requirements based on the current calibration of risk-based solvency regime.[27]

A few life insurers would need to liquidate sizable parts of their bond portfolio to meet cash outflows after a large increase of lapse rates. Assuming a sharp interest rate hike, policyholders would be incentivized to terminate those policies that can be terminated at book value or those with

[27] At end-2018, about 94 percent of U.S. life insurers (at the solo level) had an RBC coverage of more than 200 percent, i.e., they could withstand a 50 percent decline of capital without violating the regulatory threshold. Those life insurers which had a decline of more than 50 percent of their available capital in the FSAP stress test reported an RBC coverage (at the level of the largest solo entity) well above 300 percent.

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Box 3. COVID-19 Impact on the Insurance Industry

The insurance sector is affected by the pandemic mainly through higher claims, operational challenges, and lower investment returns. Claims will be made under various types of household and commercial insurance. Revenues are expected to decline, at least temporarily, as the demand for insurance coverage declines. Changes in operating conditions and new processes to facilitate remote interactions with clients and business partners increase costs. The risk of fraudulent claims increases when economic conditions deteriorate. All insurers face investment losses as a result of stock market declines, bond defaults, and spread increases; while lower interest rates weigh heavily on life insurers with return guarantees. Equity exposures are material, but a substantial share of market-value changes is directly passed on to policyholders through investment-linked products. As the duration of the liabilities is generally longer than the assets, reinvestment risk has increased. Bond downgrades to non-investment grade would have substantial impact due to the requirement for capitalization of higher risk exposures. Finally, insurers are generally more liquid than their liabilities require, but some may face liquidity pressures if product cancellations and surrenders increase sharply while new business and renewals decline.

Life insurance

Beneficiaries on life insurance policies with a death coverage will submit claims on those policies, while annuity providers might experience reduced payouts given higher mortality rates. Excess mortality is covered by reinsurance to a large degree, mostly with reinsurers outside the United States.[1] One global reinsurer has indicated that its exposure to COVID-19 life and health insurance claims, even under a very severe 1-in-200 years scenario, is similar in scope to a medium-sized natural catastrophe. Mortality increases might appear to be an immediate financial gain for annuity providers, but many of these products have guarantees that effectively reduced any perceived benefit for the insurer. Lower investment returns are a significant negative for life insurers, both in terms of reinvestment risks and the difficulty to earn a guaranteed rate of return.

Health insurance

Health insurers face higher costs and claims as policyholders may require testing, more medical care, and hospitalizations. An increase in unemployment will affect the level of uninsured health expenses. Under the Affordable Care Act (ACA), consumers who lose their coverage or become eligible for subsidies due to loss of income are able to enroll in coverage on the ACA Exchange and most state-based Exchanges have created special enrollment periods to facilitate coverage. COVID-19 testing, hospitalizations, and premium grace periods have impacted insurer costs and incomes. At the same time, delays in other, non-emergency care have significantly reduced insurer spending in the first part of 2020, and many are looking at, and some have announced, premium holidays.

The Families First Act and the CARES Act, complementing the ACA, require insurers to waive all cost-sharing, including deductibles, for medical services provided to people with any type of private health coverage related to medically necessary COVID-19 testing and associated visits. In addition, any preventive services, which include any future vaccine, must be covered by the principle of no cost-sharing. The new Act also enables states to provide free coverage for coronavirus testing for uninsured residents. However, the Act does not impose any federal requirement to waive cost-sharing for COVID-19 related medical treatments, and thus individuals may be subjected to significant out-of-pocket costs.

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Box 3. COVID-19 Impact on the Insurance Industry (concluded)

Property & casualty (P&C) insurance

Most business interruption clauses included in commercial property insurance policies are only triggered in case of physical damage to the property of the policyholder due to a covered peril. There are differing views on whether the contamination of a property by a virus would be considered physical damage. Policies that more generally provide coverage for business interruption due to physical damage or loss of use may be more likely to be determined to provide coverage of pandemic-related business interruption losses. Many commercial policies apply exclusions that could apply to a viral contamination such as COVID-19. For example, the standard Insurance Services Office commercial property policy used in the United States applies an exclusion for "loss or damage caused by or resulting from any virus, bacterium, or other microorganism that induces or is capable of inducing physical distress, illness, or disease." Yet it is unclear how many commercial policies do have such a clear inclusion or exclusion.

Major legal and regulatory risks may emerge. For example, in New Jersey, a legislative proposal has been put forward to require that all commercial property policies providing coverage for business interruption or loss of use of property also provide coverage for interruption resulting from COVID-19. As proposed, insurers that incur claims as a result of this legislation could seek reimbursement from the Commissioner of Banking and Insurance, who would then recover those costs from all insurers writing business in New Jersey. While this legislation is on hold at the time of this report's finalization, similar legislation has been introduced in Ohio and Massachusetts. At the federal level, a group of members of the House of Representatives has requested insurers to consider retroactively covering financial losses from COVID-19 under business-interruption coverage provided in commercial policies, suggesting that containment measures should be considered as civil authority orders that trigger coverage. The NAIC has written to Congress noting that such a measure would result in substantial solvency risks for P&C insurers and significantly undermine the ability of insurers to pay other types of claims.[2]

Travel insurance is affected through coverage of medical treatments and trip cancellation. The overall industry exposure to trip cancellation claims is not significant relative to other lines of business. Some insurers have changed the terms of travel insurance policies or stopped selling new travel insurance policies. For existing policies, medical treatment during travel would be covered in most cases, unless a travel advisory was in place. Insurance coverage for trip cancellation will usually only reimburse expenses after all attempts for refunds have been exhausted and only when there are no official advisories against travel at the time of booking.

Claims can arise from liability insurance, including workers compensation. Employees may claim compensation for lost wages and medical expenses if they believe they were infected at workplace, which could invoke coverage under workers compensation insurance. They could also make claims for distress, bodily injury, discrimination, or financial losses due to isolation that could potentially be covered by employment practices liability insurance. For businesses whose premises are accessible to the public or to their customers, claims could be made in case of infections provided a proof of negligence regarding the spread of the virus is obtained.

Motor insurance is contributing to an overall resilience of the P&C sector. Individual traffic has declined as a result of public health measures and lower economic activity results in reduced commercial road use. In the longer term, however, it is likely that renewals will reset, and underwritten volumes will shrink.

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[1] The market for life reinsurance is highly concentrated both globally and in the United States, with the largest five reinsurers having a market share of about 90 percent in the United States—of these five companies, four are part of European groups, and one is a domestic group. See Munich Re, 2018 Life Reinsurance Survey Results.

[2] See https://content.naic.org/article/statement_naic_statement_congressional_action_relating_covid_19.htm.

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a flat surrender charge.[28] About one-third of the life insurers would be able to meet the outflow simply by selling parts of their (highly liquid) U.S. Treasury bonds. Up to six companies would ultimately also have to liquidate corporate bonds, which might be subject to temporarily restricted liquidity, allowing large-scale sales only at a discount. The total amount of U.S. Treasury bond sales in the four scenarios ranges from US$23–33 billion, while for U.S. GSEs and corporate bonds the ranges are US$13–15 billion and from US$4–11 billion, respectively.

44. With continued low interest rates, net investment spreads in the life sector are expected to decline further (Figure 21 panel 1). Average credited rates would decline, as new business would be issued with lower contractually guaranteed interest rates. Projecting investment yields assumes that the recent downward trend will flatten out in the future, when fixed-income instruments with higher coupons would have already expired. With about 7 percent of bond investments to be rolled over every year, the net portfolio yield still declines, likely at a slightly higher pace than the guaranteed interest rate. By 2021, the net investment spread could therefore drop below 1 percent, adding further pressure on life insurers' profitability.

45. If the largest banking counterparty defaults, the vast majority of insurers would experience a limited capital impact (Figure 21 panel 2). The median life company would lose 1.2 percent of its capital, and half of the sector's firms range between 0.8 percent and 1.8 percent. In the P&C and health sector, concentration towards the largest banking counterparty is even lower, but outliers exist, in particular when an insurer holds a participation in a large bank.

46. Large, diversified P&C insurers are relatively resilient to natural disasters, even of a larger scale, but smaller and more concentrated P&C companies would be severely affected by major hurricanes (Figures 21, panels 3 and 4). A single event, expected to occur every 50 years, reduces capital of large firms by 8.1 percent—including reinsurance recoverables, the reduction is only 3.9 percent. For hurricanes with an occurrence expected every 500 years, capital (after reinsurance) declines by 8.6 percent, and drops below the regulatory minimum for 18 out of 538 insurers. Smaller local insurers rely more on reinsurance for less severe hurricanes than larger firms, mitigating the impact significantly. However, excessive costs seem to prevent small firms from buying the same level of reinsurance coverage for more remote events. In a 1-in-500 years event, their aggregated capital declines by 164 percent—14 companies would record a capital shortfall. The impact on policyholders is however mitigated through various protection schemes.

47. Carbon-intense assets in a narrow sense do not represent a major asset class. Narrowly focusing on oil, gas, and mining companies, the exposure amounts to 3.5 percent of all corporate bond holdings and 1.6 percent of the equity portfolio. Together, the identified investments account for 1.1 percent of the sample's total balance sheet assets. Notwithstanding these small direct-exposure amounts, transition risks could also arise for other exposures, e.g., transport or heavy industries, which were not included in this analysis. Similar to other countries, mortgage loan or MBS collateral in areas becoming more frequently hit by windstorms, floods, or wildfires could be

[28] The upward interest rate shock is one of possible triggers for increased lapses. Similarly, higher lapse rates might be observed in a recession when household income and wealth declines as it happened in 2009.

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repriced by investors, acknowledging underlying long-term physical risks. The same might apply to debt issued by municipalities and utility providers in affected regions.

Figure 20. United States: Insurance Stress Test Results

Statutory capital of the median life company declines by 32 percent, and by 19 percent for the median non-life insurer.

Reduction in Statutory Capital
(In percent)

Health insurers are barely affected by market shocks, while results in the other sectors are very heterogenous.

Reduction in Statutory Capital
(In percent)

In the life sector, the shock to other investment assets (Schedule BA) contributes most to the overall reduction in capital, while in the non-life sector, lower stock prices are more relevant (though aggregates are driven by very few larger companies while many non-life companies hold only few stocks).

Aggregated Contribution of Individual Shocks
(In percent)

Source: IMF staff calculations based on NAIC data.

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Figure 21. United States: Insurance—Sensitivity Analyses

(a) Net investment spreads have been rather steadily declining since 2007 and will, assuming persistent low rates, continue to weigh on profitability.

Net Investment Spread
(Net portfolio yield over guaranteed rate)

(b) For the vast majority of insurers, the default of the largest banking counterparty has only a minor direct impact on capital, but outliers exist.

Reduction in Statutory Capital
(In percent)

(c) Claims stemming from a 1-in-500 years hurricane would reduce capital of large and diversified insurers by 9 percent (net, after reinsurance)...

Impact on available capital:
Large, diversified insurers
(In percent)

...while (d) for small and concentrated insurers, the same event would trigger claims equating 164 percent of statutory capital.

Impact on available capital:
Small, concentrated insurers
(In percent)

Source: IMF staff calculations based on NAIC data.

C. What Are the Financial Stability Implications of Interconnectedness?

Domestic Interconnectedness

48. The high degree of interconnectedness implies a considerable potential for shocks to reverberate through the financial system. Both banks and nonbanks have sizeable direct exposures to households and corporates (Figure 22). Nonbanks intermediate twice as much credit to

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the real economy than depository institutions. Intra-financial system interconnectedness is also significant with linkages between banks and nonbanks, amounting to over 30 percent of their assets. In addition, these sectors are indirectly interconnected through common exposures to asset classes such as corporate bonds, equities, agency, and Treasury securities markets.[29] Common exposure to asset classes could amplify risk transmission. Moreover, the banking sector has off-balance sheet exposures similar in size to the overall balance sheet. Unused commitments such as credit lines amount to about 40 percent of the aggregate balance sheet of the bank sample. In case of severe corporate stress, these may be drawn down, exacerbating other simultaneous pressures.[30]

Figure 22. United States: Macrofinancial Linkages

Source: U.S. Flow of Funds; IMF staff analyses.

Note: Node size reflects the intra-sectoral flow of funds. Edge color denotes assets of the sector with the same colored node vis-à-vis the other sector (i.e., liabilities and equities of the other sector)

49. Direct funding and credit contagion among G-SIBs is small, however, and a failure of one G-SIB would not lead to direct default of another one. The interconnectedness modelling exercise performed by the FRB staff using IMF scenarios and models assessed the propagation of idiosyncratic and systemic shocks through the network of U.S. G-SIBs, linking solvency and liquidity risks (Figure 23). The analysis considered unsecured, secured (repos/reverse repos, swaps, etc.), and contingent (derivatives, CDS contracts) exposures among the six largest G-SIBs. While the closure of

[29] For example, banks, insurers, pension funds, money market and mutual funds hold about US$4–7 trillion in debt securities each.

[30] Revolver drawdowns reported in 8-k filings between March to mid-April 2020 surpassed US$200 billion.

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non-Treasury repo markets coupled with severe scenario parameters would lead to one G-SIB becoming illiquid over 30-day horizon, even in this extreme case the asset fire-sale impact on remaining banks in the network is rather limited: the decline in CET1 would be 25 bps, depending on asset liquidation strategies banks would choose (Figure 24).[31]

Figure 23. United States: Enhanced Interconnectedness Analysis—Solvency and Liquidity Risk Linkages

Source: IMF staff analysis.

Note: The analysis is based on two stages. First stage—funding liquidity risk based on cash flow data (paragraphs 25–28 of this report); second stage—network contagion model. The first stage simulates conditions under which a bank would be illiquid or insolvent under severe yet plausible funding shocks; in the second stage a bank which fails the first stage (illiquid because of revaluation of its assets using fire-sale prices) does not meet its contractual obligations to the other banks in the network.

50. Complementary analysis of a corporate sector shock shows that it would reverberate through the financial system with non-negligible impact, particularly for nonbanks. The shock was calibrated based on the FSAP corporate stress tests, and the linkages were analyzed using balance sheet data. Although significant, potential losses appear to be manageable for the banking system, in large part owing to banks' limited direct exposure to the corporate sector. For the short-term market sentiment shock lasting for one month, liquidation losses for mutual funds amount to about US$0.9 billion (about 1 percent of the original value of the total assets sold). For banks, the resulting mark-to-market losses are close to US$10.8 billion (roughly equivalent to 0.06 percent of assets). This would reduce banks CET1 ratio by about 0.1 percentage points. In the case of insurance

[31] The test used two strategies: waterfall when banks liquidate most liquid assets first, and slicing when banks liquidate proportional amount of each type of security.

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Figure 24. Liquidity and Asset Sales Scenario Propagation in the U.S. G-SIBs Network

The impact of asset sales on CET1 would be 9 basis points (bps) for affected banks if they use proportional liquidation approach to sales (slicing)...

...the network contagion and fire-sales impact would be higher under waterfall liquidation strategy (i.e., liquidate most liquid assets first), albeit no bank would be insolvent and final impact would be 25 bps of CET1 loss.

Sources: IMF calculations performed by the FRB in March 2020 based on FRB supervisory data.

companies, these may roughly translate into losses at about 1 percent of insurance sector total assets. In case of a systemic credit risk-related stress (which leads to an increase of default rates of leveraged corporates of up to 6 percent), banks would face US$230 billion losses on commercial and industrial loans and CLO holdings (assuming that banks would be providing at least part of their US$760 billion committed lines to corporates). Ten non-GSIBs would fall below the CET1 hurdle rate of 4.5 percent. Insurance sector will be hit by about US$300 billion in losses, at the same time they do not have to mark these to market given the existing regulatory treatment.

Cross-Border Interconnectedness

51. Although U.S. banks hold nearly a quarter of their claims against foreign borrowers, they are a larger source of outward spillovers than the rest of the world is for inward spillovers to them.[32] Under the very conservative but illustrative assumption that all claims are unsecured and the loss-given default is at 100 percent, comparable foreign shocks would result in U.S. bank losses amounting to 2–8 percent of system-wide capital, while foreign banking systems would suffer losses of 10–40 percent of capital (Figure 25).[33] Contagion from the U.S. to foreign

[32] These conclusions are based on an analysis using the model in Espinosa-Vega, M. A., and Sole, J., 2010, "Cross-Border Financial Surveillance: A Network Perspective," IMF Working Paper 10/105, International Monetary Fund.

[33] The analysis covered (1) exposures capturing the role of financial intermediation by financial centers; (2) exposures in the presence of foreign subsidiaries and branches, for instance, owing to dollar funding activities by foreign banks; and (3) consolidated exposures capturing claims and liabilities of domestically incorporated banks. Under a different assumption where the loss-given default is 50 percent, the inward spillovers to the U.S. banking system is between 1–3 percent, while the contagion into other banking systems is 5–15 percent of initial regulatory capital.

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banking systems is partially driven by the fact that nearly half of global cross-border claims are denominated in U.S. dollars. In systemic stress episodes with fragilities in dollar funding markets, lending in U.S. dollars by foreign banks could become a shock-propagation mechanism. A market-based spillover analysis based on equity return movements confirms that U.S. G-SIBs are the largest potential source of spillovers to large global financial sector entities, followed by the foreign G-SIBs.[34]

Figure 25. Average Spillovers between U.S. Banking System and Foreign Banking Systems

(In percent of initial capital of spillover recipient)

Sources: BIS; IMF, IFS; IMF staff estimates.

Note: Consolidated data covers exposures between U.S.-owned banks and foreign-owned banks excluding intra-group positions. Unconsolidated nationality basis data covers exposures between U.S.-owned banks and foreign-owned banks including intra-group positions. Unconsolidated residency basis data covers exposures between U.S.-domiciled banks and foreign-domiciled banks including intra-group positions.

D. Funding Market Fragility: Are there Systemic Liquidity Concerns?

52. While usually highly liquid, indicators of money market resilience showed signs of decline from 2017, with shocks causing sharp spikes in rates in September 2019 and March 2020. Financial institutions mainly use the very large and generally resilient repo market rather than other money market segments, such as the much smaller Fed funds market, for liquidity management and funding (Figure 26, top-left panel). The Fed's balance sheet normalization during 2015–19 reduced the supply of Fed reserves (Figure 26, top-right panel) and started to more obviously impact money markets from early 2017.[35] The level and volatility of short-term interest rates drifted up relative to the Fed's target range and become more sensitive to changes in reserve

[34] The analysis is based on Diebold, F.X. and Yilmaz, K., 2014, "On the Network Topology of Variance Decompositions: Measuring the Connectedness of Financial Firms," Journal of Econometrics, 182, pp. 119–134.

[35] The FRB announced plans to implement monetary policy with an ample supply of reserves, without conducting regular OMOs. See https://www.federalreserve.gov/monetarypolicy/policy-normalization.htm. From mid-2017, the FRB began tapering its reinvestments in maturing securities and, in March 2019, it announced that the reduction in the balance sheet would be completed in September 2019.

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Figure 26. United States: Systemic Liquidity Developments

Repo markets are the center of money market activity…

Traded volumes in key money market segments (2019 daily average, USD billions)

Sources: Federal Reserve Bank of New York, SIFMA

…markets tightened as the Fed balance sheet reduced.

SOFR, GCF Repo, Fed Funds Rates (Percent, USD billions)

Sources: Federal Reserve Bank of New York, DTCC

The liquidity demand curve has steepened.

Fed Funds Effective less IOER vs. Reserve Balances (Percent, USD millions)

Sources: Federal Reserve Bank of New York, IMF Staff calculations

The Fed's response to extreme volatility was forceful…

Federal Reserve treasury bill holdings and repos outstanding
(USD bilions)

Sources: Federal Reserve Bank of New York, IMF Staff calculations

…and extremely effective in quelling pressures.

5. Distribution of intraday repo market trading versus approximate volumes traded above the Federal funds target range
(Percent, USD billions)

Sources: Federal Reserve Bank of New York, IMF Staff calculations

Market reliance on LIBOR is very high.

Volumes of Instruments Tied to USD LIBOR (USD trillions, end 2016)

Sources: ARRC Second Report, 2018

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supply (Figure 26, middle-right panel). Interest rates spiked sharply in September 2019, and even more significant disruption occurred in March 2020 as the COVID-19 crisis unfolded.

53. Since late 2019, the Fed shifted to actively managing reserves, scaling up liquidity provision which effectively quelled market pressures. The Fed shifted quickly from passive to active liquidity management and boosted reserves from September 2019 (Figure 26, top-right panel), while regular Open Market Operations (OMOs) resumed after a long hiatus (Figure 26, middle-right panel). Major disruption following the COVID-19 outbreak prompted a broad and far-reaching Fed response that eventually settled markets.[36]

54. The period of decreased reserve availability exposed structural money market rigidities. Quantitative easing and associated ample reserves underpinned money market liquidity post-GFC with banks opting to comply with tighter liquidity regulation through higher levels of reserves, while also substantially upgrading liquidity risk management frameworks. Banks have become more conservative and reluctant to rely on the Fed's liquidity backstops in their liquidity planning and are working harder to optimize balance sheets to boost returns. These desirable changes came hand in hand with increased cost of intermediation, reduced incentives for banks to take advantage of arbitrage opportunities and decreased bank flexibility when shocks hit markets. Market resilience has thus declined. Separating individual contributions to this complex nexus of factors is difficult, but available estimates suggest that a steady state G-SIB demand for reserves is now significant.[37]

55. The Fed could help rebuild market resilience by adjusting its ample reserves operational framework and improving access to liquidity backstops once the crisis abates:

- *Regular OMOs should continue and the operating target should be adjusted to help provide greater liquidity certainty*. This could help reduce the demand for reserves and flatten the slope of the demand curve while still retaining ample reserves. Adjusting the operating target to encompass repo rates would help reduce uncertainty on the FRB's reaction function when pressures build. The ample reserves framework supports the resiliency of the money markets and should be retained.

- *Banking regulators should encourage banks to explicitly allow for use of the Discount Window in their short-term liquidity planning to monetize U.S. Treasury securities*. Banks could be given guidance to incorporate Discount Window use for monetizing U.S. Treasury securities holdings

[36] Crisis Preparedness and Management, Section C below, provides more detail on the COVID-19 response.

[37] For example, see Bush et al. (2019) https://libertystreeteconomics.newyorkfed.org/2019/02/stressed-outflows-and-the-supply-of-central-bank-reserves.html, which estimated Day 1 stressed liquidity outflows of the U.S. G-SIBs to be in the order of US$587–934 billion—much of which would need to be covered by cash holdings given the challenges of liquidating a large volume of other HQLA within one day.

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in their liquidity planning.[38] This approach is consistent with international standards[39] and that taken by other major central banks (e.g., the Bank of England[40] and the Bank of Canada). It would encourage G-SIBs to include in their liquidity plans access to the Fed's liquidity facilities for meeting regulatory requirements for intra-day liquidity needs or during resolution, thereby reducing incentives for cash hoarding and increasing incentives for large banks to make liquidity available to the wider nonbank market.

- *Adjusting the price of primary credit or implementing a standing repo facility could help reduce Discount Window stigma and boost market resilience*. Continuing to offer Primary Credit at a price closer to normal market rates than prior to March 2020 may help reduce Discount Window stigma. Alternatively, a standing repo facility, similar to the Primary Dealer Credit Facility, but perhaps limited to Treasury securities, could be considered if there is ongoing reluctance to access Primary Credit. There are, however, a number of significant design challenges with such a facility, with difficult trade-offs in terms of counterparty access and pricing versus stigma and moral hazard risks to negotiate.

56. The authorities should work with market participants to mitigate the risks stemming from concentration of repo settlement (Box 4). The concentration of repo settlements with Bank of New York Mellon (BNYM) is a vulnerability. Both the cleared and tri-party repo market depends on the BNYM to settle transactions as does the Fed when it conducts repo OMOs.

57. Reliance of banks on funding from Federal Home Loan Banks (FHLBs) increases interconnectedness. FHLBs play an important intermediation and funding role in the money markets as funding from FHLBs remains relatively generously treated in the LCR.[41] Treating funding from FHLBs similarly to that from other unsecured borrowers in the Fed funds market would help reduce concentration risks on FHLBs and enhance the resilience of markets in situations where FHLBs themselves run into liquidity problems.

58. The Alternative Reference Rates Committee (ARRC) and the authorities have made excellent progress in transitioning away from LIBOR but more needs to be done. The U.S. authorities have been heavily engaged with the ARRC in promoting the transition away from LIBOR by end-2021.[42] Most of the nominal LIBOR-related exposures are in the derivatives markets where

[38] Vice Chair Quarles, in a personal February 2020 speech discussed this type of policy option—see https://www.federalreserve.gov/newsevents/speech/quarles20200206a.htm,

[39] See FSB "Guiding principles on the temporary funding needed to support the orderly resolution of a global systemically important bank" (2016) at https://www.fsb.org/2016/08/guiding-principles-on-the-temporary-funding-needed-to-support-the-orderly-resolution-of-a-global-systemically-important-bank-g-sib/ for a discussion of options.

[40] See https://www.bankofengland.co.uk/-/media/boe/files/prudential-regulation/consultation-paper/2019/cp2719.pdf.

[41] The treatment of FHLBs in the LCR rule has been assessed by the Basel Committee in 2017 as part of the Regulatory Consistency Assessment Programme. See https://www.bis.org/bcbs/publ/d409.htm.

[42] The ARRC is private sector-led, convened by the Federal Reserve Board and Federal Reserve Bank of New York (FRBNY), with the SEC and CFTC among the public-sector ex-officio members. For information on the ARRC and its work program see https://www.newyorkfed.org/arrc.

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Box 4. United States: Bank of New York Mellon (BNYM)—A Uniquely Important Financial Institution

The BNYM plays a unique role in the government securities clearing, global collateral management and tri-party repo market. As a G-SIB with global operations, it has a diversified portfolio of fee-generating investment services and investment management businesses, total assets of US$381 billion, US$1.9 trillion under management, and US$37.1 trillion of client assets under custody at end-2019. The withdrawal of JP Morgan Chase for government securities settlement (GSS) in 2016 left BNYM as the sole provider of GSS and tri-party repo services. The BNYM acts as a custodian, settles repos and government securities, and takes care of back-office functions. The FRBNY is reliant on the BNYM for the conduct of OMO repos. The BNYM plays a key settlement role for FICC-sponsored repo transactions and is a major sponsor itself.

The FRB has crafted a hybrid approach to the supervision of BNYM. Co-location of the critical infrastructure role in one group with an entity that also provides commercial banking services raises specific issues from both a supervisory and resolution planning standpoint. The BNYM's U.S. government securities settlement and tri-party repo services are comparable in importance to the FMIs that have been designated as systemically important by the FSOC.[1] As one of eight U.S.-based G-SIBs, the BNYM is subject to heightened capital and liquidity requirements, dedicated on-site supervision, and recovery and resolution planning requirements to ensure the continuity of critical services. In addition, it is subject to some components of the PFMI, notably for governance and operational reliability.

Given its sole provider status in a high volume and high value market, ensuring continuity of operations is a key focus of the bank's planning and of its supervisor's concerns. The BNYM has invested heavily in IT infrastructure in recent years to build in resilience and redundancy, as well as a geographic dispersion of its activities across several sites of concurrent operations. Regular testing and various outage contingencies are part of the setup. The FRB conducts logistical planning in a range of contingencies with the objective of keeping the functions going in the event of disruptions of service or failure. While separability is required for BNYM's GSS operations (which are part of a separate legal entity with own governance structure), actual separation could prove very protracted and challenging. The BNYM would also be eligible for guarantees and liquidity support under the Dodd-Frank Wall Street Reform and Consumer Protection Act (DFA) Title II in resolution. There is, however, no alternative to the BNYM in the event it ceases operations or exits the market, and it would be left to the FRBNY to manage the GSS system. In other major jurisdictions, either the central bank or privately operated central securities depositories play this role.

The authorities should work with market participants to establish backups to preserve GSS and repo market functioning in the unlikely event that the BNYM runs into problems. While the current approach provides for a thorough set of prudential safeguards to reduce the likelihood of such an event materializing, the FRB is encouraged to enhance its comfort by conducting a full assessment of the PFMI to further identify specific clearing and settlement risks, for example, with regard to the potential risk of unwinding, delivery-versus-payment mechanisms, and access criteria. The FRB should undertake a simulation exercise to test a response to a tail risk of a protracted BNYM operational outage or reduction in BNYM capacity.

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[1] See speech by J.H. Powell, "The Evolving Structure of the U.S. Treasury Market: Second Annual Conference of the Federal Reserve Bank of New York," October 24, 2016, https://www.federalreserve.gov/newsevents/speech/powell20161024.htm.

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significant progress has occurred and where new markets that reference the Secured Overnight Financing Rate (SOFR) are developing fast. Less progress is evident in the smaller but still material corporate securities and loan markets accessed by a wide variety of users where some more significant changes in the structure of instruments are required. Market participants need to continue work on transition as quickly as possible. The authorities should remain focused on ensuring regulated firms manage and disclose LIBOR-related risks effectively, and increasingly set harder targets with deadlines for when firms start transitioning from doing business based on LIBOR to SOFR or other reference rate-based products.

FINANCIAL SECTOR OVERSIGHT

59. The supervisory and regulatory framework is sound overall, but remaining gaps relative to international standards need to be addressed. The U.S. framework was found to have a high degree of compliance with international standards in the 2015 FSAP, however, a number of the recommendations remain outstanding (Appendix VII).[43] In addition to full adherence to international standards, the FSAP considers that additional strengthening in some areas may be warranted given the system structure and evolution of new risks.

A. What Are the Regulatory Challenges in a Changing Financial System?

60. The U.S. regulatory and supervisory architecture is complex, putting a premium on coordination and cooperation across agencies (Figure 27). In banking, the Federal Financial Institutions Examination Council (FFIEC) provides an effective coordinating mechanism with joint issuance of Notices of Proposed Rulemaking by banking agencies enhancing consistency in approach and messaging. Across the securities and derivatives markets, there is no formal coordination mechanism between the CFTC and the SEC, although Memoranda of Understanding (MOUs) are in place for data sharing and there is frequent informal coordination. The FSOC provides an effective mechanism for coordination across all financial sector agencies.

61. The rapidly changing financial landscape poses additional challenges. Technological and financial innovation is lowering barriers to entry and allowing firms that may sit outside of the regulatory perimeter to provide financial services: (i) financial innovations have resulted in mortgage activity migrating out of banks; (ii) virtual assets (VAs) and virtual asset service providers (VASPs) offer services, which may be very similar to those of traditional securities intermediaries or other financial institutions (issuance, operation of a trading platform, custody) but without being subject to the same standards and obligations; and (iii) providers of critical payment services either fall outside direct supervision or are only partially supervised through third-party service provider regimes whereby risks by the third parties are expected to be managed by the banks.

[43] The 2015 FSAP produced Detailed Assessment Reports on banking, insurance, and securities, as well as a pilot review of the compliance with the Key Attributes for Effective Resolution with respect to the banking and insurance sectors. Given that the main standards and their assessment methodologies have not changed, this FSAP covered financial sector oversight in a targeted manner focusing on macrofinancially relevant themes.

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Figure 27. United States: Complex Regulatory Architecture

Source: A Financial System that Creates Economic Opportunities: Banks and Credit Unions, Report to President Donald J. Trump by the United States Treasury, June 2017, page 29 at https://www.treasury.gov/press-center/press-releases/Documents/A%20Financial%20System.pdf.

Note: The figure depicts the primary regulators in the U.S. financial regulatory structure and their primary oversight responsibilities. A list of acronyms is available on page iv. There are additional agencies involved in regulating the financial markets and there may be other possible regulatory connections than those depicted. See Government Accountability Office Report on Financial Regulation: Complex and Fragmented Structure Could Be Streamlined to Improve Effectiveness, GAO-16-175, February 2016, at: https://www.gao.gov/assets/680/675400.pdf.

62. National charters and FSOC designation may be avenues for ensuring the regulatory perimeter is appropriately defined. The OCC proposed in 2016 a special purpose national bank charter, which could attract firms like marketplace lenders or payment companies because the national charter could reduce compliance costs by consolidating supervision under one primary national regulatory structure. The FSOC has the power to designate activities and entities as systemically important and recommend heightened prudential standards as it deems appropriate. It also is tasked with identifying gaps in the regulatory framework; however, its ability to act is limited where there is no primary regulator.

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B. Are Systemic Risks Adequately Identified and Can They be Mitigated?

Institutional Arrangements for Systemic Risk Oversight

63. The FSOC provides the framework for systemic risk oversight, and a forum for the U.S. regulators to collectively identify risks and encourage individual agencies to respond. It was established in 2010 with three primary purposes: to identify risks to U.S. financial stability; to promote market discipline by eliminating expectations that the government will shield shareholders and counterparties from losses; and to respond to emerging threats to financial stability. It provides a systematic approach for the effective identification of vulnerabilities working primarily through enhancing coordination of the work of the 15 member agencies, of which 10 are voting members.

64. While buy-in to the process is strong, many member agencies do not have a clearly defined financial stability objective. Continuing full operational independence of member agencies is critical to discharging their mandates but creates challenges for the operation of the FSOC. Supplementing FSOC members' mandates and mission statements with a more explicit financial stability mandate would help address these challenges without undermining the FSOC authority, increase the focus on financial stability issues, and incentivize actions to address systemic financial stability risks. Such objective in the mandate would largely relate to issues within an agency's sphere that could potentially spill over to the wider financial sector.

65. Financial stability communication centers on the FSOC Annual Report with reports from other agencies adding breadth to the discussion.[44] The FSOC's report largely covers structural vulnerabilities with many carried over from previous years reflecting the long-lived nature of financial stability risks (e.g., in 2019, cybersecurity risk and CCP risk management). The Office of Financial Research (OFR) continues to publish its high-quality annual report, and the FRB issued the first of its semi-annual Financial Stability Reports (FSR) in November 2018. The FSR covers mainly cyclical issues (asset valuations, borrowing by businesses and households, financial sector leverage, and funding) and complements well the work of the FSOC, while also contributing to the determination of the scenarios used in its stress tests and helping inform the setting of the countercyclical capital buffer (CCyB).

66. Strengthening FSOC communication to better link actions with identified vulnerabilities would improve effectiveness. Regulatory changes made by member agencies are listed in the Annual Report but are not linked back to identified vulnerabilities, and in many cases are unrelated to any listed vulnerability. Consideration could be given to releasing more detailed minutes of FSOC meetings (for the meetings that are not open to the public) recognizing the trade-off between the benefits of enhanced transparency and the need to protect supervisory and other market-sensitive data from disclosure in order to prevent destabilizing market speculation that could occur if that information were to be disclosed. To improve traceability, and with it

[44] For example: FDIC Risk Review—https://www.fdic.gov/bank/analytical/risk-review/index.html, and the OCC's Semiannual Risk Perspective—https://www.occ.treas.gov/publications-and-resources/publications/semiannual-risk-perspective/index-semiannual-risk-perspective.html.

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transparency, specific actions being considered by member agencies to mitigate identified potential systemic risks should be identified, where possible. Subsequently, actions taken should be linked back to identified vulnerabilities.

67. The OFR has undergone a significant restructuring. The OFR's mandate is to support the FSOC through data collection, research, and measuring and monitoring risks. It plays a vital role in connecting the dots across the system and undertaking analyses of systemic issues. Staffing had fallen significantly since 2017 although there is stated aim now to rebuild staff levels.

68. Addressing remaining data gaps is key to enhancing the assessment of interconnections, vulnerabilities, and systemic risks. Progress has been made in addressing some of the data gaps and inter-agency data-sharing shortcomings identified in previous FSAPs. This includes the completion of the pilot on data collections on bilateral repurchase agreements and securities lending activity as well as adoption of SEC rules to provide regulators with conditional access to security-based swap data held by SEC-registered repositories. However, important data gaps remain. Data gathering on bilateral repos, tri-party repos, securities lending, and asset management is at early stages. The Trade Reporting and Compliance Engine (TRACE) pilot for data reporting on Treasury securities should be a permanent feature of the system. Finally, to build a clear view of interconnections, data on interbank exposures should be expanded from the six U.S. G-SIBs to a fuller sample of banks and a better picture is needed of the holdings of CLOs, institutions' direct and indirect exposures to leveraged and private loans, and the various channels that connect nonbanks with the rest of the system.

The Toolkit

69. Tools to address potential systemic risks are distributed across FSOC members, who are collectively accountable for identifying and responding to threats to financial stability.[45] The toolkit mainly consists of agencies exercising their own powers vis-à-vis the entities they oversee to either mitigate potential systemic risks or strengthen the resilience of the financial system against systemic risk events. Tools that reside with the FSOC consist of its authority to issue recommendations for new or heightened regulatory standards to financial regulators; designate nonbank financial companies for consolidated supervision and enhanced prudential standards; and designate financial market utilities as well as systemic payment, clearing, and settlement systems as systemically important, subjecting them to enhanced standards. The United States, however, stands out among its peers as not having any borrower-based tools in the housing sector.[46]

70. Tools to deal with structural vulnerabilities in the banking system are generally sufficient, while coverage of the CCyB should be extended to improve effectiveness. Tools to enhance the structural resilience of the banking system include the G-SIB capital surcharge as well

[45] IMF Macroprudential Policy Survey: https://www.elibrary-areaer.imf.org/Macroprudential/Pages/Reports.aspx.

[46] Specific market structure in the United States makes international comparisons difficult. Of the US$11 trillion in residential mortgages, only US$3.6 trillion (33 percent) is held by banks, representing 20 percent of banking sector assets. Over one-half of the mortgages are originated by nonbank mortgage companies (see Box 2).

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as enhanced capital and liquidity standards for large non-GSIBs, and the recently introduced Stress Capital Buffer, which also potentially has a cyclical element. The CCyB is applicable to Category I–III banks and has not been activated since introduction in 2010. The FRB's implementation framework recognizes that while empirical models that capture a manageable set of quantitative indicators (e.g., combinations of credit-to-GDP to trends in residential and commercial real estate) can be useful input into the setting of the CCyB, no fixed set of indicators can adequately capture all the financial sector vulnerabilities.[47] In this context, it will also consider whether activating the CCyB could lead to migration of credit activity to banks that are not subject to the CCyB, or to nonbanks. For this reason, the FRB should consider expanding CCyB to Category IV banks, which would increase the coverage from about 70 percent of banking sector assets to 80 percent.

71. In late 2019, the FSOC adopted final interpretive guidance describing the activities-based approach to identify and address potential risks to U.S. financial stability. As part of the activities-based approach, the FSOC will examine a diverse range of financial products, activities, or practices that could pose potential risks to financial stability. The FSOC intends to allow relevant financial regulatory agencies, which generally possess greater information and expertise with respect to company, product, and market risks, to address potential risks. If the FSOC believes that these actions are inadequate to address an identified risk, it can publicly issue recommendations to agencies under the DFA s120. In cases where a regulator would not be expected to conduct a cost-benefit analysis, the FSOC itself will—prior to making a final recommendation under s120—conduct such an analysis. Finally, if the FSOC's engagement with regulators under the activities-based approach does not adequately address a potential threat identified, it may evaluate nonbank financial companies for an entity-specific determination under DFA s113. The FSOC will perform a cost-benefit analysis prior to making any such determination.

72. Effective implementation of the activities-based approach will be challenging. To foster confidence, the FSOC should communicate as much detail as possible about the process. Potential challenges to effective implementation include the following:

- While the requirement of a cost-benefit analysis is appropriate, in practice it may be very difficult to conduct with precision given that a probability of a risk being realized must be assigned; and
- The entity designation process must be timely, meaning that on the occasion where it is deemed necessary to designate an entity, such designation must occur within a timeframe that mitigates the financial stability risks. In this regard, there must be due recognition given to speed with which financial risks can build up in complex financial institutions.

73. The FSOC should encourage its members to prioritize the development of tools to address risks and vulnerabilities in the nonbank sector. The most pressing case is to develop

[47] Federal Register 09/16/2016: Regulatory Capital Rules: The Federal Reserve Board's Framework for Implementing the U.S. Basel III Countercyclical Capital Buffer.

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tools to address the systemic risks arising from very high leverage in nonfinancial corporates (as highlighted in the vulnerabilities analysis). Further, the following measures should be considered:

- **Tools to address the build-up of risks in housing financing will be needed.** As the Treasury and FHFA are examining options for ending the GSEs conservatorship, the CFPB is deliberating changes to the qualified mortgages (QM) definition.[48] This provides an opportunity to assess the interaction of the GSE capital regime and other potential liquidity sources for the housing market, mortgage underwriting and insurance standards, and lending restrictions aimed at ensuring borrowers' ability to repay their mortgage loan. Consideration should be given to how best to integrate and calibrate a full range of macroprudential tools (e.g., debt service ratio and other borrower-based standards, or CCyB-type capital requirements) to improve financial system resilience.

- **Changes should be considered to mitigate liquidity risks in fund management.** The SEC should consider requiring mutual funds to perform liquidity stress tests as part of their liquidity risk management program. Mandatory liquidity buffers for mutual funds exposed to liquidity risk should also be considered.

- **Analysis of insurance sector risks should be expanded and deepened.** While the NAIC's framework for monitoring individual asset-side risks is quite advanced, scenario-based solvency and liquidity stress testing would add value. State supervisors and the NAIC should continue to closely monitor reinvestment risks and search-for-yield behavior in a low interest rate environment, together with insurers' risk management capabilities when investing in higher risk assets. They should also analyze exposures of primary insurers to natural disasters and reinsurance capacity, including catastrophe or guarantee funds in the analysis for relevant states.

C. How Safe are Financial Market Infrastructures?

74. Given the global systemic importance of some of the U.S. FMIs, it is imperative that their regulation and supervision are effective. Eight firms designated by the FSOC as systemically important Financial Market Utilities (FMUs) are regulated, supervised, and overseen by the FRB, SEC, or CFTC (depending on their activities). The DFA authorized the FRB to promote uniform standards for the management of risks by systemically important FMUs. The increased global reliance on central counterparties (CCPs), following mandatory clearing requirements, underlines the crucial role of regulatory oversight and internal risk governance to ensure their resilience and adequate risk management.

[48] The DFA (s1411 and s1412) requires that, for residential mortgages, creditors must make a determination that the consumer has a reasonable ability to repay the loan. Congress established a presumption of compliance for "QMs," which are mortgages that meet criteria as defined in CFPB rules. The category of General QM Loans prohibits negative amortization, interest-only payments, terms greater than 30 years and balloon payments. The total points and fees paid for origination must not exceed a certain percentage of the loan amount and the consumer's ratio of debt service to income cannot exceed 43 percent. A separate category of QM Loans that are eligible to be purchased or guaranteed by either GSE has the aforementioned requirements, except the debt-to-income limit.

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75. While regulation and supervision have strengthened since 2015, further improvements to CFTC supervision are needed. Important milestones since the last FSAP are the adoption of SEC rules for CCPs and Central Securities Depositories, and the CFTC stress tests for CCPs. The regulation, supervision, and oversight of systemically important U.S. FMIs are generally adequate and effective, but the CFTC's rule approval process and its resources need strengthening. CFTC staffing increased since the 2015 FSAP, but the increase has not kept up with additional responsibilities, which likely hampers the CFTC's effectiveness. The FRB (and, under delegated authority, the individual Federal Reserve Banks), the CFTC, and the SEC actively cooperate—a prerequisite for effective supervision in the U.S. regulatory landscape—but supervisory crisis management arrangements for FMIs could be strengthened.

76. Authorities have implemented the relevant international standards, the Principles for Financial Market Infrastructures (PFMI),[49] through dedicated regulations; but consistency of outcomes could be further enhanced. FMIs appeared so far sufficiently robust to manage surges in volumes and volatility in financial markets during the crisis. The analysis of the credit and liquidity risk management frameworks of four selected CCPs shows that they are broadly sound.[50] However, in analyzing the outcomes of certain risk management measures, the mission found that in some cases the outcome of the implementation of PFMI risk management standards by the CCPs was uneven, specifically regarding the independence of the risk management function, the conservativeness of the Margin Period of Risk (MPOR), and the implementation of intra-day margining rules. It is recommended that the FRB, CFTC, and SEC collaborate to analyze these differences and adopt an appropriately consistent, conservative implementation of the PFMI where financial stability or market efficiency could be negatively impacted. More comprehensive supervisory stress tests for CCPs may contribute to this objective by helping authorities to understand where risks could materialize during a stress event.

77. A review of the regulatory and supervisory framework for the payments ecosystem may be warranted to comprehensively address relevant risks. As in other countries, new players are entering the payments space offering innovative services. The current regulatory framework forms a complex pattern and as a result, money transmitters are subject to diverging sets of rules and multiple and overlapping examinations depending on the location and nature of their activities. Banks are expected to manage all risks raised by third-party relationships, including those related to payments. Risks posed by other providers of potentially critical payment services (e.g., card payment schemes, electronic wallet providers, payment gateways, aggregators, or platform providers), such as operational risks, either fall outside direct supervision or are supervised only partially through third-party service provider regimes. The current regulatory framework may not be future-proof so as to ensure risk sensitivity, comprehensiveness, and consistency of requirements for the possible emergence of new payment service providers, irrespective of their status as bank, money

[49] The PFMI were issued by the CPMI (then CPSS) and IOSCO in 2012 and are the internationally agreed standards for FMIs, including CCPs, https://www.bis.org/cpmi/publ/d101.htm.

[50] The analysis focused on CCPs critical for the respective markets they serve in the United States: ICE Clear Credit for credit default swaps; the Options Clearing Corporation for U.S. equity and index options; the Chicago Mercantile Exchange for futures and commodity derivatives (CME Base) and interest rate swaps (CME IRS); and the FICC for U.S. government securities.

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transmitter, or nonbank. The FSOC has recognized the need to evaluate potential risks to payment system integrity and operational risk, among other, as well as appropriate approaches to reduce regulatory fragmentation, while supporting innovation.

D. Is Oversight of Markets Commensurate with the Changing Financial Intermediation?

78. The SEC and CFTC took prompt action to address disruption to securities and derivatives markets arising from the COVID-19 pandemic through the issuance of orders, no-action relief, and guidance.[51] The SEC's actions included an order designed to facilitate open-end funds' (other than MMFs) borrowing from an affiliated person and using inter-fund lending arrangements in the face of severe redemption pressures, thereby preventing fire sales of assets. The CFTC issued no-action letters providing temporary, targeted relief to futures commission merchants, introducing brokers, swap dealers, retail foreign exchange dealers, floor brokers, and other market participants covering, inter alia, regulations requiring recording of oral communications related to voice trading and other telephonic communications, as well as audit trail and related requirements. In addition, circuit breakers that triggered temporary trading halts on several occasions in March 2020 promoted orderly trading during the periods of most extreme volatility.[52]

79. The size, complexity, and importance of U.S. capital markets call for continued reform in oversight. Measures taken since the 2015 FSAP include an increase in the coverage of examination of investment advisers, mutual fund liquidity management reforms, and changes to reduce the potential for—and impact of—disruption in equity trading. There is, however, a continued need for the SEC and CFTC to have more budgetary independence, and autonomy over their resource allocation, with appropriate accountability for the deployment of the sums raised through their industry fees. Other priorities include deepening of joint work on topics of common interest (e.g., leveraged loans). New registrants should be subject to increased scrutiny and the National Futures Association's (NFA's) reliance on self-certifications should be reduced.

80. There is scope to strengthen the regulation and supervision of the fund management sector. The SEC has introduced important reforms since the 2015 FSAP but areas for improvement remain, including in the coverage of investment adviser inspections, rules on funds' use of derivatives, and an assessment of the impact and effectiveness of the mutual fund liquidity management reforms aimed at reducing liquidity vulnerabilities. The CFTC has not implemented the still relevant recommendations of the 2015 FSAP, which include requirements for commodity pool

[51] The analysis set out in this section focuses on the medium-term challenges and policy priorities for regulation and supervision of securities markets in the United States and does not cover the COVID-19 outbreak or the related policy response, which has since become the overarching near-term priority. The FSAP recommendations are meant to be considered once the impact of the pandemic on the economy and the securities sector becomes clearer.

[52] The current framework for Market-Wide Circuit Breaker (MWCB) was introduced as a multi-year pilot and takes the form of temporary rules.

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operators to implement internal controls and risk management, and addressing the way investors are to be treated if they are adversely affected by pricing errors in a commodity pool. With respect to MMFs, the reforms introduced in 2010 and 2014 are now fully implemented and represent important additional safeguards. However, with about 87 percent of MMF assets having a stable NAV, close monitoring by SEC is essential, including stress testing and contingency planning for a stress situation where the NAV of one or more of these funds falls below US$1.00.[53]

81. Welcome progress has been made on equity market structure and the regulation of trading; however, more remains to be done. The United States and other jurisdictions have made progress in implementing internationally agreed reforms to OTC derivatives ("swaps" and "security-based swaps") markets. In addition to changes in market structure, including an increased proportion of trading concentrated in closing auctions, these markets are faced with threats of wider significance such as to technological and cybersecurity-related resilience. It is important to finalize arrangements for market-wide circuit-breakers (MWCB) for trading in all equities and options markets,[54] implement the new capital rules for broker-dealers, and deliver the long-planned Consolidated Audit Trail. The SEC should also focus on off-exchange trading given that over a third of equity trading is executed outside exchanges, including 20 percent that takes place outside national securities exchanges or regulated alternative trading systems, and there is the potential for this proportion to grow. The SEC should also carry out a strategic review of its supervision and oversight of exchanges to ensure that there is sufficient focus on material areas of risk.

82. The CFTC and SEC should closely collaborate to complete implementation of the post-crisis reforms to OTC derivatives markets and make targeted adjustments to current arrangements. While data suggest that changes have been successful in incentivizing central clearing, the authorities need to finalize a regime for security-based swaps and to address barriers to increased trading on swap execution facilities and the resultant liquidity fragmentation.

83. Service providers conducting activities involving VAs that constitute securities are subject to AML/CFT regulation and supervision by the SEC. To the extent that a VA is considered an investment contract, and therefore a security under the Howey test, or another type of security, the SEC has regulatory and enforcement authority over the safekeeping and administration of the VA or the provision of financial services relating to the offer, sale, or issuance of the VA. In addition, enforcement action has been taken in circumstances involving alleged violations of the federal securities laws where a VA is a security. However, a notable gap in the current framework relates to the spot market for VAs that are commodities that are not securities. While the CFTC has exclusive jurisdiction over derivatives on commodities that are not securities, it has only general anti-fraud

[53] The majority of MMFs with a stable NAV are government MMFs.

[54] In this regard, the United States faces particular challenges compared to other jurisdictions due to the complexity of coordination across all relevant trading venues, which arises from the mandatory routing of orders in National Market System stocks through the National Market System (the national system for trading equities).

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and anti-manipulation powers in relation to the spot market for the underlying commodity itself.[55] As a result, no federal agency is directly overseeing the spot market for Bitcoin[56]—by far the largest VA by market capitalization. Market participants are also closely monitoring regulatory enforcement action as a means of better understanding the agencies' approach to perimeter issues (Box 5).

E. Have Bank Regulatory Standards Been Weakened?

84. The FSAP's targeted review of the key aspects of the banking regulatory framework focused on the recent tailoring of regulatory requirements and stress tests. The 2015 assessment of compliance with the Basel Core Principles for Effective Banking Supervision (BCPs) found a high degree of compliance. The mission leveraged that assessment by reviewing the main supervisory and regulatory developments since 2015 and assessing the progress achieved in addressing recommendations to ensure the completion of key elements of Basel III. The FSAP team has not covered in detail the impact of COVID-19 outbreak on banks and has not discussed with authorities the related policy response. The FSAP recommendations are meant to be considered once the impact of the pandemic on the economy and the banking sector becomes clearer.

85. The U.S. should implement remaining aspects of the BCPs, some of which persist from the previous assessment and require further attention. The authorities should finalize heightened standards on governance for large and complex bank holding companies, enhance the related-party framework, introduce rules on concentration risk management, and include more quantitative standards on interest rate risk in the banking book. Remaining weaknesses in relation to beneficial ownership identification and verification also need to be addressed. Finally, the authorities should also review the regulatory framework (aiming to streamline and simplify requirements) and consider rewriting certain prudential guidance as regulation.

The overall stringency of prudential regulation has been reduced while medium-term financial stability risks are rising. The scope of application of the recent tailoring reforms is wide ranging, and all the recent adjustments have been made in the same direction, i.e., to lessen requirements (Appendix VIII). Regulatory changes will reduce the number of banks that must comply with the full set of Basel standards and will no longer require non-internationally active banks to comply with the full set of the Basel standard (Appendix IX). Furthermore, fewer banks are subject to annual supervisory stress tests and recent changes to the CCAR program, which appears to be the binding capital constraint for most banks, as well as the implementation of the Stress Capital Buffer will likely result in meaningfully lower capital requirements for several large banks, and possibly also for the G-SIBs in the current stage of the economic cycle.

[55] Unless the transaction is done on a leveraged, margin, or financed basis.

[56] With the exception of FinCEN for AML/CFT purposes.

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Box 5. Regulation and Oversight of Virtual Assets (VAs)

The VA sector in the United States is currently small as a proportion of the overall financial system but has grown rapidly in recent years.[1] VAs can fall into a range of categories depending on their specific features including securities, commodities, derivatives and currencies. The universe of virtual asset service providers (VASPs), meanwhile, spans small start-ups that are providing financial services for the first time through to major financial institutions.[2] Key activities that carried out by VASPs include issuance (typically through initial coin offerings (ICOs)), transfer of VAs from one party to another, exchange between different VAs and with fiat currency, custody, and operation of trading platforms.

There is no bespoke U.S. regulatory framework for VAs and VASPs. Depending on the features of a particular VA, and the nature and geographical reach of the activity being performed in relation to it, regulatory oversight may lie with the SEC, the CFTC, Financial Crimes Enforcement Network (FinCEN), or one of the state regulators. This leads to fragmentation, both in relation to the rules that apply and the agency that applies them. Individual agencies have taken steps to clarify in which circumstances a VA falls under its oversight. In April 2019, SEC staff issued a "Framework for "Investment Contract" Analysis of Digital Assets;" however, this does not have the status of a formal rule or agency guidance. Entities considering whether their VA activities would constitute a violation of the federal requirements can seek clarification from SEC or CFTC staff, as applicable (for example, by requesting a "no-action letter"). Market participants are also closely monitoring regulatory enforcement action and speeches by individual Commissioners as a means of better understanding the agencies' approach to perimeter issues.

One notable gap in the current framework relates to the spot market for VAs that are commodities and not securities. While the CFTC has exclusive jurisdiction over derivatives on commodities, it has only general anti-fraud and anti-manipulation authority in relation to the spot market for the underlying commodity itself (unless a transaction is done on a leveraged, margin, or financed basis), meaning that it can only act after the fact. As a result, no federal agency is directly overseeing the spot market for Bitcoin,[3] which is by far the largest VA by market capitalization. This gap raises questions on the risks of derivatives on VAs that are commodities and creates general customer protection risks.

VAs may be marketed to investors as an entirely new asset class while in fact sharing key characteristics of securities, commodities, or even certain types of investment fund. The appearance of innovation creates asituation in which less sophisticated investors may be misled and subject to fraud. Both the SEC and CFTC have made substantial efforts to inform investors about VAs and the risks inherent to them. A notable initiative undertaken by the SEC was the so-called Howeycoin, in which investors were presented with marketing material for an apparent ICO promising high returns on investment. Any attempt by an investor to buy the coins led them to the SEC's dedicated investor education website, which explained that Howeycoins were fake and that investors should be wary of such scams. The initiative triggered widespread coverage in local and national media. More generally, both agencies have set up dedicated internal units to work on VAs and VASPs (as part of the broader fintech sector) and brought in staff with specialist expertise.

Risks to financial stability from VAs appear low at present given the small size of the sector. However, there is currently a lack of reliable, comprehensive data on VAs, rendering a definitive assessment of the potential systemic relevance of the sector more challenging. Agencies have generally not put in place specific reporting requirements for VA-related activity and rely instead on individual engagement with regulated entities and input from third-party data providers. The FRB, for example, conducts a bi-annual survey of the banks it supervises to determine the exposures they have to VAs. The lack of dedicated reporting may be explained in part by VASPs operating in non-compliance with registration and reporting requirements, but may also be due to issues of categorization and fragmentation, given that there are so many different types of VA and determining the responsible regulatory agency may not be straightforward. Under the current regulatory architecture, it is more feasible to expect individual agencies to introduce their own reporting requirements. Also, the spot market for commodities that are not securities currently is not overseen by the SEC or CFTC.

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Box 5. Regulation and Oversight of Virtual Assets (VAs) (concluded)

The complexity of the framework underlines the importance of cooperation between agencies both at the federal and state levels. The SROs, FINRA and NFA, have a key role to play in ensuring consistent application of the framework. It will also be important for the Conference of State Banking Supervisors to continue its efforts to ensure consistency of approaches across the state banking regulators, including finalization and adoption of the model law for money services businesses.

AML/CFT

The U.S. framework is largely compliant with the new AML/CFT standard relating to VAs and VASPs. The United States was one of the first countries to address the ML/TF risks related to VAs prior to the 2018 issuance of the new FATF standard. In February 2020, the FATF concluded that, overall, the authorities had a good understanding of the risks associated with VA activities and that the regulatory framework captured the majority of VA activities as most VASPs in the U.S. fall within one of the categories of financial institutions under the purview of FinCEN, the SEC, or the CFTC. The U.S. also has had several successful enforcement actions targeting the illicit use financial institutions to understand and mitigate the risk associated with VAs were not explicit and the threshold for mandatory customer due diligence of VAs.

Further efforts are nevertheless needed to continue the momentum. While acknowledging the comprehensiveness of the U.S. framework, the FATF noted minor deficiencies (requirements for (CDD) measures for occasional transactions involving VAs was too high) and questioned whether AML/CFT oversight over VASPs was fully in line with the risk profile of the industry. The impact of these shortcomings in practice appears, however, to be very low given the robustness of the existing AML/CFT framework. The authorities continue to study the virtual landscape and consider ways to improve the regulatory framework. In this context, the United States should address remaining minor deficiencies by (i) lowering the threshold for CDD measures for occasional transactions to US$1,000 or lower; and (ii) explicitly requiring financial institutions to identify, understand, and address risks related to VAs.

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[1] A VA as defined by the Financial Action Task Force (FATF) is a digital representation of value that can be digitally traded, or transferred, and can be used for payment or investment purposes.

[2] VASP as defined by the FATF is any natural or legal person who as a business conducts one or more of the following activities or operations for or on behalf of another natural or legal person: (i) exchange between virtual assets and fiat currencies; (ii) exchange between one or more forms of virtual assets; (iii) transfer of virtual assets; (iv) safekeeping and/or administration of virtual assets or instruments enabling control over virtual assets; and (v) participation in and provision of financial services related to an issuer's offer and/or sale of a virtual asset.

[3] With the exception of FinCEN for AML/CFT purposes.

87. Authorities are encouraged to maintain the overall stringency of prudential requirements for non-internationally active banks. The U.S. authorities have maintained the broad compliance with Basel III of the regulation applicable to banks that are considered internationally active (i.e., the eight U.S. G-SIBs in Category I and one bank in Category II). The other banks, including large banks classified in Categories III and IV, are no longer required to comply with the full set of Basel capital and liquidity standards. As required under the BCPs, non-internationally active banks should be required to comply with capital requirements that are broadly consistent with the Basel capital framework and appropriate large exposure limits. Authorities should consider moving capital standards for non-internationally active banks closer to those required for internationally active banks. Authorities may also want to consider extending the full LCR requirements to all non-internationally active banks in Categories III and IV. In addition, considering the increase in financial stability risks, it is important to continue thoroughly scrutinizing banks'

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ability to absorb shocks, including by maintaining the frequency of stress tests for Category IV banks.

88. A number of measures to address the impact of the COVID-19 pandemic on the banking sector have been taken swiftly and effectively by the U.S. authorities. They aim to support the provision of credit to the real economy while mitigating potentially negative impacts to financial stability and maintaining banks' operational resilience. The FBAs have encouraged banks to work constructively and prudently with borrowers affected by COVID-19 crisis and issued statements supporting banks that choose to use their capital and liquidity buffers to lend to households and corporates. The FRB has also allowed bank holding companies subject to the supplementary leverage ratio (SLR) to exclude Treasuries and deposits held at Federal Reserve Banks from the SLR calculation. Additionally, supervisory priorities have been adjusted to minimize burden on banks, scale back non-essential activities and focus on monitoring efforts. Lastly, accounting and prudential changes to minimize the immediate impact of forthcoming loan losses on the regulatory capital have been introduced in law and regulation. Most of these measures are temporary and include a phase-out period. Going forward, it will be important to ensure compliance with international standards where exceptions have been temporarily introduced.

89. The U.S. regulatory capital stress test program is rigorous and comprehensive. The FBAs are encouraged to continue exploring second-round effects, possibly by integrating capital and liquidity stress tests. They may also wish to consider leveraging the stress test framework to probe the prudential implications of longer-term structural issues in the banking industry. Removing the CCAR qualitative objection places added pressure on bank supervision.

90. Maintaining high-quality bank supervision remains essential. The FBAs have been very successful in fulfilling their mandate and enhancing the resilience of the banking sector. However, to effectively face new challenges arising from regulatory changes, rapid technological transformation of financial services, renewed industry pressure against supervisory actions and vulnerabilities that continue to build in a maturing credit cycle, it is key to maintain the intensity of supervisory scrutiny and being agile in responding to new threats to financial stability. As supervisory stress tests have become less frequent and capital and liquidity requirements less stringent for some non-GSIBs, supervision needs to remain intrusive and continue enhancing its effectiveness to ensure that banks remain appropriately governed and incentivized to manage their risks to remain financially resilient.

F. Has Insurance Regulation and Supervision Been Strengthened to Address the Rising Risks?

91. State insurance regulators took numerous actions in response to the COVID-19 crisis, including facilitating late payment of premiums by policyholders while maintaining coverage and banning health insurers from imposing cost sharing for COVID-19 tests. State insurance regulators also heightened the monitoring of insurers. The recommendations are meant to be considered once

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the impact of the pandemic on the insurance sector becomes clearer and when extraordinary measures can be eased.

92. The targeted review of the state-based insurance regulation and supervision found that supervisory independence remains to be addressed. Supervisory independence—perceived or actual—is likely to be undermined by the appointment of insurance commissioners and their senior staff by state governors in several states or the direct election of the commissioners in others. There are also concerns about state governments' control of supervisors' budgets and constraints on staff remuneration. Reforms of the appointment and dismissal of commissioners are recommended as well as a more flexible remuneration to attract and retain sufficiently qualified staff. All cost recovery assessments should be passed to the insurance regulators for their budgetary independence. Financial stability should be included as a core objective of all state insurance regulators' mandates.

93. Reserving and asset valuation for life insurance should be strengthened expeditiously. Principles-Based Reserving (PBR) was made mandatory only for new life insurance business from January 2020, leading to a very slow evolution of reserving which it will be impossible to match with the asset valuation methodology. All reserves should be moved to a consistent PBR basis after a five-year transition period, the asset valuation approach should be adjusted to ensure consistency between assets and liabilities with risk-based capital (RBC) recalibrated accordingly.

94. Further steps are needed to strengthen risk-based supervision and implement a group capital requirement. Off-site analysis and examinations should be better integrated to enhance regulators understanding of firms' risk culture, governance, and the quality of risk management. More frequent, focused, and thematic examinations should replace the current five-year examination cycles. Both the FRB and the NAIC are developing aggregation approaches to group capital, which contrasts with the more usual consolidated approaches implemented in other jurisdictions. These two U.S. aggregation approaches may diverge in certain technical areas while aiming for comparable outcomes over time. The U.S. authorities should develop the GAAP Plus version of the Insurance Capital Standard (at least for Internationally Active Insurance Groups) with a view to implementation in parallel with their own aggregation approaches.[57]

95. Regulatory responses to the increasing risk and severity of natural catastrophes need to be strategically focused on the medium to long term; ensuring that risks are appropriately priced to increase resilience through incentivizing mitigation:

- The regulatory response in California to exceptional losses from wildfires in 2017–18 has focused on protecting policyholders from significantly increased rates while ensuring continuity in the availability of insurance in the short term. The authorities and industry need to collaborate and develop a medium- to long-term plan incorporating risk-based pricing to incentivize insurers to remain in the market, while allowing time for development of standard mitigation measures, and

[57] In November 2019, the IAIS agreed to consider the comparability of the Aggregation Method and the IAIS ICS reference method. The outcome of this assessment is not available at the time of the report finalization.

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for policyholders to adjust to higher premiums as necessary. Long-term solutions require policies among multiple agencies to reduce the risks loss from wildfires.

- After hurricane-related crises (1990s and 2000s), the Florida homeowners insurance market eventually stabilized, and the state settled on a system of regulation that appears to be working and may provide some lessons for other states that are facing increasing catastrophe losses.
- There are likely to be significant protection gaps[58] arising from flood risks that need to be first assessed, and then addressed. While addressing the protection gap is difficult, the authorities are urged to consider a range of possible solutions to closing the gap in the medium to long term.

96. The NAIC and state insurance regulators need to quickly finalize post-crisis reforms to requirements for PMIs. The binding financial requirements for PMIs are PMIERs imposed by the GSEs rather than minimum capital requirements of state regulators.[59] The NAIC and state regulators are working on a risk-based capital requirement that includes a countercyclical factor to capture risks from rising house prices compared to incomes. This should be quickly finalized including regulatory intervention levels.

G. How is Cybersecurity Risk Being Incorporated in Financial Oversight?

97. Cybersecurity risk preparedness is a top concern for both the financial sector intermediaries and their supervisors. Cybersecurity recommendations featured prominently in the 2017–19 FSOC annual reports, and FSOC members are increasingly focusing on the cyber resilience of the institutions that they supervise. These issues carry even more relevance in the environment imposed by COVID-19 mitigation measures. Key components of the U.S. financial sector are considered critical infrastructure, and its cybersecurity is a matter of national security. A National Infrastructure Protection Plan (NIPP) sets out the general framework for strengthening the resilience of the critical infrastructure.[60] The Treasury is designated as the financial sector-specific agency responsible for a sector-specific protection plan, which—together with the NIPP—provides a mechanism for coordination between the public and the private sector. Most relevant response and recovery plans are at the individual institutions' level.

98. Regular security testing is an established practice. Banking regulators generally do not mandate but rather include the use of security tests in their broader guidance. In addition, industry-wide tabletop cybersecurity exercises with the participation of systemic financial institutions and FMIs, industry associations and government stakeholders are conducted regularly, coordinated by the Treasury. A key result of the sectoral exercises was the establishment of a last resort

[58] The protection gap is the difference between total asset losses in a possible catastrophic event and the possible insured asset losses.

[59] For the discussion of PMIERs see paragraph 18.

[60] See https://www.cisa.gov/national-infrastructure-protection-plan.

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standardized and highly secure financial data restoration facility that makes it possible to restore bank account information after catastrophic failures of participants' critical systems.

99. FBAs run risk-based, mature, policy-driven, and highly formalized cybersecurity supervisory processes. Notwithstanding the complex institutional structure, cybersecurity expectations and supervisory practices have a strong common base. Banking regulators all use the FFIEC principles, standards, and tools as the foundation of their cybersecurity supervisory activities. Cybersecurity regulation and guidance are sufficiently principles-based to facilitate risk-based supervision well-integrated into the overall supervisory cycle, and to maintain relevance despite the changing threat landscape. The Cybersecurity Information Sharing Act provides sound legal basis for information sharing, and established fora and protocols are part of a national framework. Public-private partnerships are key enablers of voluntary information sharing between the industry and government agencies.

100. The CFTC and SEC have mainstreamed consideration of cybersecurity, business continuity, and other aspects of technological resilience into both regulation and supervision. This has included sharing of key findings from examinations for the benefit of other registrants, enabling a wider dissemination of lessons learned and good practices. Both agencies have regulatory requirements that take industry best practices into consideration, which allows them to remain relevant as tools, technologies, and the associated standards evolve.

101. The FBA's supervisory remit over third parties that provide core information technology services to their regulated firms is well established. To further enhance third-party service provider information security, in its 2019 Annual Report the FSOC recommended Congress pass legislation providing this authority to additional agencies, including the National Credit Union Administration.

H. Is the Financial Integrity Framework Effective?

102. Financial integrity has been strengthened since the last FSAP in relation to beneficial ownership (BO) identification and verification for some covered financial institutions'[61] customers; addressing high risk sectors and misuse of legal entities remain priorities.[62] In 2016, the U.S. AML/CFT framework was assessed as very effective[63] in most areas, but fundamentally

[61] Banks, brokers, or dealers in securities, mutual funds, and future commission merchants and introducing brokers in commodities.

[62] Beneficial ownership means the natural person(s) who ultimately owns or controls a customer and/or the natural person on whose behalf a transaction is being conducted. It also includes those persons who exercise ultimate effective control over a legal person or arrangement. Reference to "ultimately owns or controls" and "ultimate effective control" refer to situations in which ownership/control is exercised through a chain of ownership or by means of control other than direct control.

[63] Under the common AML/CFT assessment methodology, a High level of Effectiveness (HE) is the highest rating a country can achieve. A Substantial level of Effectiveness (SE) is the second top rating—it entails that the country has reached a specific outcome to a large extent and that moderate improvements are needed. The other two ratings are a Moderate (ME) and Low (LE) levels of Effectiveness, in which major and fundamental improvements are needed, respectively. The U.S ratings were four HE, four SE, two ME, and one LE, one of the better results from the latest round of assessments.

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weak for mitigating risks of misuse of legal persons.[64] There were also major weaknesses in AML/CFT obligations for investment advisers, lawyers, accountants, and company service providers, and for identifying and verifying BO for covered FIs' customers and politically exposed persons. The authorities recognize that these weaknesses facilitate the misuse of legal persons and increase ML risks for high-end real estate.[65] They have imposed a new BO rule which requires all covered FIs, including smaller institutions, to collect and verify BO information for companies and some trusts that are customers, although minor deficiencies remain.[66] It is too early to tell if this materially improves timely access to BO information about all entities. The other major weaknesses remain unaddressed. The United States should rapidly fix those weaknesses, including by requiring BO information to be collected upon company formation rather than when companies enter into customer relationships with covered FIs. U.S. compliance with new FATF requirements on virtual asset service providers is discussed in Box 5.

CRISIS PREPAREDNESS AND MANAGEMENT

A. Bank Resolution and Deposit Insurance

103. Recovery and Resolution Planning (RRP) for and by the largest and most complex bank holding companies (BHCs) under the DFA is the centerpiece of orderly resolution. After a decade of resolution planning, the development of the U.S. resolution regime is more advanced than in other major jurisdictions and has improved firms' capabilities to recover from financial distress and to be resolved in an orderly way under court-governed bankruptcy procedures. The initial requirement to submit annual comprehensive resolution plans under DFA Title I has had far-reaching effects. Firms have reconfigured their financial, legal, and operational structures, underpinned by strengthened governance arrangements; they increasingly assess business decisions through a "resolution lens," ensuring that acquisitions and new activities do not adversely affect resolvability. BHCs' Title I resolution planning has helped the FBAs to better prepare for administrative resolution under the DFA Title II orderly liquidation authority (OLA).

104. Deposit insurance by the Federal Deposit Insurance Corporation (FDIC) is an effective tool to limit the damage caused by the failure of insured depository institutions (IDIs). For failed IDIs, the FDIC's preferred resolution method is a purchase and assumption (P&A) transaction, which is a time-tested and cost-effective resolution method. Supported by effective recordkeeping by IDIs for timely deposit insurance determination, P&A transactions have provided access to insured—and often also uninsured—deposits typically within one business day. This was also the

[64] The assessment was conducted jointly by the Financial Action Task Force (FATF) and the Asia/Pacific Group on Money Laundering (APG, the FATF-style regional body for the Asia/Pacific)) as the United States is a member of both.

[65] See: https://home.treasury.gov/system/files/136/National-Strategy-to-Counter-Illicit-Financev2.pdf.

[66] The FATF upgraded the U.S. technical compliance with customer due diligence requirements from partially to largely compliant, see: http://www.fatf-gafi.org/media/fatf/documents/reports/fur/Follow-Up-Report-United-States-March-2020.pdf.

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case during the GFC. Since 2012, to support its preparedness, the FDIC requires large IDIs to submit annual resolution plans under the Federal Deposit Insurance Act (FDI Act).

105. Requirements for financial companies' DFA Title I resolution plans have been reduced since the previous FSAP. The Economic Growth, Regulatory Relief, and Consumer Protection Act of 2018 (EGRRCPA) increased the thresholds established under the DFA for mandatory Title I plans from US$50 billion to US$250 billion, while giving the FRB discretion—which it has exercised—to apply the requirement to BHCs with assets between US$100 billion and US$250 billion. Under rule changes in 2019 by the FRB and the FDIC, the 74 financial companies subject to DFA Title I resolution plans—including the eight U.S. G-SIBs and several large regional U.S. BHCs and FBOs—follow longer two-or three-year cycles (depending on their size and complexity), alternating full and targeted plans, or even less extensive reduced plans.[67] BHCs with assets under US$100 billion are not required to submit resolution plans.

106. Recovery plan requirements have also been reduced. Dovetailing these changes, in 2019, the OCC increased the threshold for its recovery planning guidelines from US$50 billion to US$250 billion, reducing the number of national banks to which the guidelines apply from 25 to 8. The FRB's recovery planning requirements continue to apply to only the eight U.S. G-SIBs (including the BHC parents of four banks subject to OCC guidelines). For other financial institutions, regular supervision includes overseeing aspects of recovery capabilities; for example, through contingency planning and capital management requirements, without additional or enhanced requirements.

107. Exercising their discretion actively, the FBAs should continue to keep a wider array of firms focused on improving critical capabilities for resiliency, recoverability, and resolvability. The FBAs retain discretion to prescribe more comprehensive and frequent RRP, and to apply these to BHCs with assets above US$100 billion. The FDIC should continue to review these firms' resolvability at least annually and promptly discuss the plans and resolvability assessments in crisis management groups (CMGs). All BHCs and IDIs that are subject to resolution plan requirements should also be subject to recovery plan requirements; other firms should adopt credible, enhanced contingency funding plans—emulating recovery plans—subject to the FBAs' critical supervisory assessment. Any increase of the threshold (from the current US$50 billion) for IDI resolution plans should be very limited. Ensuring the credibility of recovery plans—as is now being done for resolution plans—and the complementarity between recovery and resolution plans is an important priority.

108. Loss-absorbing capacity (LAC) additional to regular capital requirements should be considered for some non-GSIB U.S. financial companies. So far, the U.S. authorities have focused on G-SIBs' LAC. However, the simultaneous failure of smaller or less complex companies could also impact financial stability. This risk could be mitigated, and resolvability improved, by requiring some non-GSIB financial companies—prioritizing those that are subject to resolution planning or have a large regional presence—to hold LAC additional to regular capital requirements, in the form of

[67] Firms are still required to report material changes as they occur, and the FBAs can request that firms focus on specific topics, as needed, allowing targeted reviews of core elements of resolvability.

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subordinated debt or otherwise. This is consistent with the Key Attributes, and it is the practice in other major jurisdictions such as the European Union and the United Kingdom.

109. Further refinements relating to cross-border resolution also deserve attention, as the 2015 FSAP pointed out. OLA powers do not cover FBOs' U.S. branches. While judicial recognition of a foreign resolution action may be possible under the doctrine of comity, a specific statutory mechanism to recognize and support foreign resolution actions does not exist. The depositor preference rule discriminates based on the jurisdiction where deposits are payable.

B. CCP Recovery and Resolution Planning

110. Important progress has been achieved in recent years on recovery planning for CCPs; resolution for CCPs is still work in progress. Since the 2015 FSAP, CCPs have developed recovery plans as required by new and dedicated requirements, with guidance from primary regulators. The FDIC is developing resolution strategies for select CCPs in cooperation with relevant domestic and foreign supervisors, for example—but not only—through so-called CCP CMGs for the CME and ICC. Coordination of the FDIC with domestic regulators is a good and necessary development and should continue, for example, to broaden resolution planning to other CCPs than the ones currently selected; to further develop a policy approach on the interaction between recovery and resolution; and to participate in CCP supervisory stress tests.

C. Liquidity Backstops

111. The Fed rolled out a comprehensive set of liquidity support measures from March 2020 to combat widespread market dysfunction and to enhance monetary policy transmission. The sequence of measures combined significant monetary policy easing, outright long-term asset purchases, expansion of standard repo OMOs, enhancement of the Primary Credit Facility, elimination of reserve requirements, globally coordinated U.S. dollar liquidity provision through an expanded FX swap line network and introduction of a panoply of crisis liquidity support measures using section 13-3 of the FRA (Figure 28).[68] The initial policy response targeted extreme dysfunction in money and securities markets and included coordinated global central bank action to help stabilize FX swap markets. Many of the support measures were a reactivation of GFC-era liquidity facilities with the support of the Treasury to help manage the elevated risks.

112. The FRB's actions were effective in bringing markets under control. Much of the impact in March was an announcement effect as few of the newly announced facilities were immediately operational, implying high credibility of the FRB's timely measures. Money market volatility came down relatively quickly, and repo and Fed funds rates moved back within the Fed funds target

[68] The authorities also implemented complementary regulatory changes which reduced bank balance sheet constraints—for example, adjustments to the Liquidity Coverage Ratio Rule published on May 6, 2020 that require banking organizations to neutralize the effect under the LCR rule of participating in some Fed emergency programs; https://www.federalregister.gov/documents/2020/05/06/2020-09716/liquidity-coverage-ratio-rule-treatment-of-certain-emergency-facilities.

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range. Commercial paper and other securities markets took longer to respond reflecting the significant uncertainty about corporate credit quality and the underlying business environment.

Figure 28. United States: Measures in Response to COVID-19 Crisis as of end-March 2020

Source: IMF staff analysis.

Note: The figure includes actions taken up to end March 2020. In April 2020, the Federal Reserve introduced new facilities to provide liquidity to provide liquidity to businesses via the Paycheck Protection and Main Street Lending Programs. The figure does not show other measures in the area of bank regulation and guidance that were also taken in March 2020 to increase the efficacy of these programs.

Depository Institutions

113. The Fed has a broad and scalable toolkit to backstop liquidity pressures at depository institutions. The Discount Window covers all depository institutions in a variety of circumstances and has wide collateral eligibility. The Discount Window has two main parts: the Primary Credit Facility, which provides collateralized liquidity to well-capitalized depository institutions on a no-questions-asked basis; and the Secondary Credit Facility, which provides liquidity to less well-capitalized depository institutions to assist them quickly returning to the market for funding as well as facilitating an orderly resolution, if required. Significant collateral is pre-positioned at the Fed. The term auction facility is fully developed and provides a scalable tool to provide term funding.

114. Stigma is a longstanding challenge to the effectiveness of the Discount Window. Large banks are usually unwilling to use the Discount Window, which partially reflects perceptions that even the Primary Credit Facility is not merely for helping meet normal day-to-day needs and its use is indicative of more serious problems. Stigma is less evident in banking systems where standing facilities are more frequently used in business-as-usual situations. Encouraging banks to incorporate Discount Window use in their liquidity planning and making Discount Window credit available at a cost closer to normal bank funding rates might improve its effectiveness.

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Nonbanks

115. The DFA narrowed the FRB's powers to lend to systemically important nonbanks, leaving an important gap in the toolkit. The DFA restricted the FRB's powers in that lending to nonbanks under section 13(3) of the Federal Reserve Act is now only possible in exigent circumstances as part of a broad-based program available to at least five nonbanks approved by the Treasury Secretary.[69] Bilateral liquidity support to individual systemically important nonbanks (for example, of the nature of the GFC lending to American International Group and Bear Stearns) is no longer feasible. Restoring such powers is desirable.

Central Counterparties

116. The DFA provided the FRB with the power to provide liquidity support under Title VIII of the DFA to FSOC-designated FMUs. This is desirable given the prominent role these firms play in the management of liquidity and risk in the financial markets. The DFA appropriately sets a high bar for lending to FMUs, which puts appropriate pressure on FMUs and their regulators to ensure that robust liquidity management processes and buffers are in place that reduce the need for official sector support.

117. Early warning processes are well established but preparedness for liquidity support to CCPs could be improved. Regulators have well-developed oversight arrangements that provide timely and granular information on the liquidity situation of CCPs. While CCP supervisors have taken steps to ensure that CCP liquidity will be adequate in stressed market conditions, very extreme circumstances could still conceivably challenge the stressed liquidity plans. The FRB should enhance arrangements to provide liquidity support in a very extreme and likely fast-moving situation.

Market-Wide Liquidity Support

118. Preparedness to provide liquidity support to key securities markets and to quickly implement broad-based liquidity support programs to nonbanks could be further upgraded. The U.S. financial system depends heavily on securities markets for funding and risk management. The Fed deployed programs to support key securities markets in both the GFC and the recent COVID-19 crisis period, which emphasizes the importance of these tools. Preparedness would be enhanced if the FRB developed a more formal framework and associated operational modalities, to determine where and how to quickly provide support to key securities markets.

Foreign Exchange Liquidity Support

119. The capacity for the FRB to provide liquidity support in foreign currencies deserves further attention. The system of standing central bank FX swap lines provides a potentially useful

[69] See https://www.federalreserve.gov/aboutthefed/section13.htm.

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source to finance FX liquidity provision. It is recommended that the FRB develops its FX liquidity support protocols to both banks and CCPs.

D. Collective Crisis Preparedness and Management

120. The FSOC should more actively facilitate and engage in preparedness for a banking sector crisis. So far, the FSOC has focused less on how interagency cooperation would function in contingencies where risk reduction has not succeeded. The FSOC should devote greater attention to ensuring that the FBAs and the Treasury have comprehensive and complementary organization-wide crisis preparedness plans. The FSOC should also prepare the modalities for crisis cooperation, particularly where crisis responses require far more than individual agencies' regular planning. This applies to, for example, national financial crisis communications, and in the rare possibility of a DFA Title II resolution without prior Title I planning. The FBAs should also prepare mitigating actions for a case in which several (larger) institutions will need to simultaneously activate their recovery or contingency funding plans. Considering the increased role of the Treasury Secretary in activating important crisis response tools (some of them still untested), it is critical to decisive crisis action that the modalities for the interactions between the Treasury and the FBAs be operationalized, documented, and regularly reviewed and tested. The FSOC should prioritize this work.

121. Building on the extensive preparation for the resolution of individual large banks, the authorities should consider how a future systemic financial crisis extending beyond the banking sector would best be handled. It is widely acknowledged that the ingenuity and shared vision of the several agencies and of the Treasury during the GFC facilitated what was sufficiently decisive action at most of the key decision points. A next crisis might have its origin and important parts of its transmission in new types of failure and in new types of financial or nonfinancial firms. Needed action might, sooner or later, involve agencies other than the FBAs. Although the FRB would surely still play a leading part, it might have to interact with unfamiliar counterparts and with its freedom of action constrained.

122. The FSOC's crisis preparedness work must cover the entire financial system and include all its member agencies. The FSOC has a broad membership and its mandate covers both the identification of financial stability risks and the response to emerging financial stability threats; it is primarily a forum for coordination between operationally autonomous agencies and has limited decision-making powers. This design puts a premium on advance collective crisis preparation to ensure decisive and coordinated responses from the entire FSOC community. The FSOC should devote greater attention to preparing the modalities for crisis coordination that could be activated at the time of a next financial crisis. Such modalities would not substitute for the member agencies' statutory responsibilities, which they should continue to exercise autonomously. Similar to the preparedness for a banking sector crisis as discussed above, the FSOC should ensure that all member agencies and U.S. Treasury have comprehensive and complementary organization-wide crisis preparedness plans to support the FSOC mandate, ensuring collective and decisive responses to contingencies.

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Table 2. United States: Selected Economic Indicators, 2018–25

(In percentage change from previous period, unless otherwise indicated)

	2018	2019	Projections 2020	2021	2022	2023	2024	2025
National production and income								
Real GDP	3	2	-7	4	3	2	2	2
Real GDP (q4/q4)	3	2	-7	5	3	2	2	2
Net exports 1/	0	0	0	0	0	0	0	0
Total domestic demand	3	2	-6	4	3	2	2	2
Final domestic demand	3	2	-6	4	3	2	2	2
Private final consumption	3	3	-8	5	4	2	2	2
Public consumption expenditure	2	2	2	2	1	1	1	1
Gross fixed domestic investment	4	2	-5	1	3	3	3	3
Private fixed investment	5	1	-7	1	4	3	3	3
Public fixed investment	2	4	3	3	2	2	2	1
Change in private inventories 1/	0	0	-1	0	0	0	0	0
Nominal GDP	5	4	-5	6	5	4	4	4
Personal saving rate (% of disposable income)	8	8	16	11	8	8	8	8
Private investment rate (% of GDP)	18	17	17	16	16	17	17	17
Unemployment and potential output								
Unemployment rate	4	4	9	8	6	5	4	4
Labor force participation rate	63	63	62	62	63	62	62	62
Potential GDP	2	2	-1	1	2	2	2	2
Output gap (% of potential GDP)	0	1	-5	-2	-1	0	0	0
Inflation								
CPI inflation (q4/q4)	2	2	1	2	2	2	2	2
Core CPI Inflation (q4/q4)	2	2	1	2	2	2	2	2
PCE Inflation (q4/q4)	2	1	1	2	2	2	2	2
GDP deflator	2	2	1	2	2	2	2	2
Government finances								
Federal balance (% of GDP) 2/	-4	-5	-18	-10	-5	-5	-5	-5
Federal debt held by the public (% of GDP)	77	79	100	107	107	107	107	108
General government budget balance (% of GDP) 2/	-6	-6	-23	-12	-7	-7	-6	-6
General government gross debt (% of GDP)	107	109	138	142	143	144	145	147
Interest rates (percent; period average)								
Merchandise trade balance (billions of dollars)	-880	-864	-796	-824	-861	-893	-919	-947
Merchandise trade balance (billions of dollars)	-880	-864	-796	-824	-861	-893	-919	-947
Merchandise trade balance (billions of dollars)	-880	-864	-796	-824	-861	-893	-919	-947
Balance of payments								
Current account balance (billions of dollars)	-450	-480	-436	-447	-478	-496	-500	-510
Merchandise trade balance (billions of dollars)	-880	-864	-796	-824	-861	-893	-919	-947
Current account balance (% of GDP)	-2.2	-2.2	-2.2	-2.1	-2.1	-2.1	-2.0	-2.0
Merchandise trade balance (% of GDP)	-4.3	-4.0	-3.9	-3.8	-3.8	-3.8	-3.7	-3.7
Export volume (NIPA basis, goods)	4.3	0.2	-11.2	6.3	5.5	4.6	2.9	2.3
Import volume (NIPA basis, goods)	5.0	0.3	-9.2	6.9	4.6	3.7	2.4	2.1
Net international investment position (% of GDP)	-47.0	-51.6	-61.2	-59.8	-58.8	-58.5	-58.3	-58.2
Saving and investment (% of GDP)								
Gross national saving	18.4	18.1	17.9	17.4	17.4	17.6	17.8	18.0
General government	-3.3	-3.8	-15.1	-9.1	-4.9	-4.0	-3.9	-3.9
Private	21.8	21.9	32.9	26.5	22.3	21.5	21.7	21.9
Personal	5.9	6.1	13.1	8.7	6.4	5.9	5.9	5.9
Business	15.9	15.8	19.8	17.7	15.9	15.7	15.9	16.0
Gross domestic investment	21.0	20.9	20.7	20.1	20.1	20.2	20.4	20.6
Private	17.6	17.5	16.9	16.4	16.4	16.6	16.7	16.9
Fixed investment	17.4	17.2	17.1	16.6	16.6	16.8	17.0	17.1
Inventories	0.3	0.3	-0.3	-0.2	-0.2	-0.2	-0.2	-0.2
Public	3.3	3.4	3.8	3.7	3.7	3.7	3.7	3.7

Sources: BEA; BLS; FRB; Haver Analytics; and IMF staff estimates.

1/ Contribution to real GDP growth, percentage points.
2/ Includes staff's adjustments for one-off items, including costs of financial sector support.

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Table 3. United States: Core Financial Soundness Indicators for Deposit Takers, 2011–19

(In percent unless stated otherwise, end-of-period)

	2011	2012	2013	2014	2015	2016	2017	2018	2019
Regulatory capital to risk-weighted assets	14.7	14.5	14.4	14.4	14.1	14.2	14.5	14.8	14.7
Regulatory tier 1 capital to risk-weighted assets	12.6	12.7	12.8	13.1	13.1	13.2	13.5	13.8	13.8
Non-performing loans net of provisions to capital	17.6	15.7	11.7	8.8	7.2	6.6	5.7	4.7	4.3
Non-performing loans to total gross loans	3.8	3.3	2.5	1.9	1.5	1.3	1.1	0.9	0.9
Sectoral distribution of total loans: residents	95.6	95.5	95.2	95.6	95.8	96.1	96.0	96.3	96.3
Sectoral distribution of total loans: deposit-takers	6.0	6.0	5.0	4.1	3.6	3.8	3.9	5.5	4.8
Sectoral distribution of total loans: other financial corporations	3.8	4.4	5.2	6.2	6.7	6.7	6.9	7.3	7.7
Sectoral distribution of total loans: general government	0.9	1.1	1.2	1.3	1.4	1.5	1.6	1.5	1.4
Sectoral distribution of total loans: nonfinancial corporations	31.8	32.1	33.3	34.2	35.0	35.5	35.4	35.3	35.5
Sectoral distribution of total loans: other domestic sectors	53.1	51.9	50.5	49.8	49.1	48.5	48.2	46.7	46.8
Sectoral distribution of total loans: nonresidents	4.4	4.5	4.8	4.4	4.2	3.9	4.0	3.7	3.7
Return on assets	0.3	0.3	0.4	0.3	0.4	0.4	0.3	0.4	0.4
Return on equity	2.3	2.7	3.3	2.8	3.0	3.2	2.9	3.4	3.5
Interest margin to gross income	65.2	60.8	63.5	63.7	63.4	65.1	67.0	68.3	66.2
Non-interest expenses to gross income	64.5	63.6	61.7	64.7	60.7	59.6	61.6	58.4	57.3
Liquid assets to total assets (liquid asset ratio)	12.7	13.4	14.5	14.5	13.2	12.8	13.2	12.7	11.7
Liquid assets to short term liabilities	66.1	74.1	88.3	90.0	91.2	98.2	97.7	89.3	80.6

Source: IMF, Financial Soundness Indicators and IMF staff calculations.

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Appendix I. FSAP Risk Assessment Matrix

Nature of Risk	Overall Level of Concern	
	Medium-term Likelihood of Realization	**Expected Impact if Risk Materializes**
Prolonged COVID-19 outbreak	**High**	**High**
	Longer containment and uncertainties about the intensity and the duration of the COVID-19 outbreak reduce supply, as well as domestic and external demand. Deteriorating economic fundamentals and the associated decline in risk appetite would result in a second wave of financial tightening, and in debt service and refinancing difficulties for corporates and households.	A sharp recession would have a negative impact on both the U.S. and the global economy. Rising unemployment and bankruptcies would impact banks' NPLs and increase credit risks, translating into financial institutions' losses and forcing them to cut credit, with further adverse implications for growth.
Sharp rise in risk premia	**High**	**High**
	An abrupt deterioration in market sentiment (e.g., prompted by policy surprises, pandemic, trade or geopolitical tensions) could trigger risk-off events such as recognition of underpriced risk. Financial asset prices could fall sharply, and credit spreads widen given the bulk of securities in the lowest investment-grade rating.	Liquidity could dry up in some funding and securities markets (e.g., leveraged loan market) reducing intermediation impacting banks and NBFIs. Higher risk premia cause higher debt service and refinancing risks; stress on leveraged corporates, and to a lesser extent households, disruptive corrections to stretched asset valuations—all depressing growth.
Cyber-attacks	**Low**	**High**
	Cyber-attack on the interconnected financial system reliant on a broadening array of interconnected platforms could trigger systemic financial instability or widely disrupt socio-economic activities.	Shock to critical infrastructure causes delay, denial, disruption, breakdown or loss of services, affecting many institutions that rely on the attacked hub. This could also lead to a loss of confidence in the functioning of the financial system.
Distress of a major CCP or other financial infrastructure	**Low**	**High**
	Regulation and oversight of systemically important U.S. FMIs are generally adequate and effective. However, outcomes of the implementation of the relevant internationally agreed risk management requirements by CCPs are uneven in certain areas in select CCPs, which may potentially exacerbate financial stability risks.	The high interconnectedness and concentrated nature of major FMIs, interdependencies with the largest banks and quasi-monopolies for clearing specific asset classes could trigger a systemic event both domestically and globally.
Inadequate preparations for LIBOR transition	**Medium**	**Medium**
	While progress has been made in moving to a new benchmark, there are still significant risks that public and private entities may not be ready for the transition by the end of 2021.	With more than US$200 trillion of LIBOR-based contracts, problems in transitioning to a new benchmark could cause very significant disruption in financial markets.

Note: The Risk Assessment Matrix shows events that could materially alter the baseline path (the scenario most likely to materialize in the view of IMF staff). It reflects views of the FSAP team on the sources of financial stability risks surrounding the baseline, relative likelihood of their realization sometime in the next three years, and the overall level of concern.

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Appendix II. Banking Sector Stress Testing Matrix

A. Banking Sector: Solvency Test			
Domain		**Framework**	
		TD by FRB	**TD by FSAP Team**
1. Institutional perimeter	Institutions included	18 BHCs classified as large and complex were assessed during the 2019 DFAST/CCAR exercise (8 G-SIBs, 4 other domestic BHCs, 6 IHCs) based on conservative scenarios.	34 largest BHCs/IHCs. The criteria used to determine the institutional perimeter include: (1) FRB stress test sample of banks used in the 2018 DFAST/CCAR exercise; (2) firms' balance sheet size at or above US$100 billion (including one bank which assets are close to US$100 billion).
	Market share	About 65 percent of total banking sector assets in the United States.	About 78 percent of total banking sector assets in the United States.
	Data	Effective date: December 2018. Data: Mostly based on confidential FR Y-14A/M/Q reports and publicly available FR Y-9C report Scope of consolidation: Consolidated group basis.	Effective date: March 2020. Data: Based on publicly available FR Y-9C report accessed via S&P Market Intelligence platform, and supplemented by other data sources including Bloomberg, Dealogic, Haver Analytics, Moody's KMV, International Financial Statistics (IFS), IMF Global Assumptions (GAS), and IMF WEO. Scope of consolidation: Consolidated group basis.
	Stress testing process	The path of any additional macroeconomic or financial variable is derived in a way which is consistent with the scenario using FRB own models.	The FSAP team conducted its own TD stress test using *June 2020 WEO Update* forecast paths (baseline) and forecast paths generated by IMF's Global Macrofinancial Model (adverse) for all material geographies of included banks. The path of any additional macroeconomic or financial variable required by the IMF models is derived in a way which is consistent with the scenario (e.g., real estate prices, credit growth, equity prices, corporate bond yields, term spreads, etc.).

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A. Banking Sector: Solvency Test			
Domain		Framework	
		TD by FRB	TD by FSAP Team
2. Channels of risk propagation	Methodology	FRB uses its own satellite models for: credit risk projections, bank interest rates and net interest margins, market risk, and banks' fee & commission income. FRB projects PPNR components using supervisory models that take the FRB's scenarios and firm-provided data as inputs. The FRB projects the paths of these variables as a function of aggregate macroeconomic variables included in the CCAR scenarios. FRB calculates projected pre-tax net income by combining projections of revenue, expenses, loan-loss provisions, and other losses.	FSAP team projected pre-tax net income at bank level by combining projections of PPNR components and loan loss provisions derived based on forecasted charge-offs and recoveries (57 separate specifications). The model's core set of regressions are used to forecast financial ratios related to pre-provision net revenue (PPNR), returns on AFS securities, and provisions conditional on macroeconomic conditions, lagged value of the ratio, and firm-level controls. FSAP team forecasted 26 PPNR-related ratios separately (8 interest income ratios, 7 interest expense ratios, 8 non-interest income ratios, and 3 non-interest expense ratios). The macroeconomic variables for these specifications are chosen based on the economic intuition rather than merely relying on the statistical significance. Bank-level controls such as various loan shares also enter the PPNR specifications to account for heterogeneity such as various business models these BHCs have. FSAP team forecasted charge-offs and recoveries ratios separately for 15 ratios (30 ratios in total) at industry-level as presented in the schematic below. The autoregressive nature of the specifications implies that the projected ratios will converge to their long-run steady state value. Solvency-funding cost interaction: bank-specific funding costs (interest expenses) conditional on stressed capital position.
3. Tail shocks	Scenario analysis	FRB scenarios is based on FRB policy statement and includes inter alia severe tail shocks such as increase in the level of unemployment by at least 4 p.p. up to a level not less than 10 percent. This corresponds to 1-in-100 years scenario.	The adverse scenario features a severe recession that occurs concurrently with significant financial market stress and a sharp housing and equity market correction and is characterized by a slow recovery. The main triggers are a deterioration of U.S. corporate debt markets and simultaneous downturns in Europe and China. The scenario is to a large extent similar to FRB's

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A. Banking Sector: Solvency Test			
Domain		**Framework**	
		TD by FRB	**TD by FSAP Team**
			severely adverse scenario in terms of severity (less than 1 percent probability of occurrence).
	Sensitivity analysis	• Default of the largest counterparties	• Fintech impact on income and IT expenses. • Market shock on corporate loans, including CLOs/LLs. • Decreased reliance on FHLB funding.
4. Risks and buffers	Positions/risk factors assessed	Credit risk Estimated according to the FRBs stress testing framework. Framework is based upon accounting classification of assets. CLOs and securitization exposures are included. Off-balance sheet exposures using baseline and stressed Credit Conversion Factors (CCFs) are included. Traded risks Mark-to-market valuation of securities (from shocks to interest rates and credit spreads). For banks with large trading books, trading book exposures are shocked through a set of Global Market Shocks (GMS) with losses recognized in the first quarter of the planning period. In addition, DFAST applies a largest counterparty default shock (LCPD) to the trading firms and two other firms with substantial process and/or custodial operations. Both GMS and LCPD are add-ons to the macroeconomic scenarios. All sovereign issuers relevant for banks are included. Market stress from shocks to risk-free interest rates, exchange rates, credit spreads, commodities, and equity prices. Profit loss recognition. Losses/gains are recognized in the same quarter that a shock hit. .	Credit risks: Estimated based on 15 charge-off and recoveries specifications for: first lien and junior lien residential mortgages, home equity lines of credit (HELOC), construction loans, multifamily and non-residential commercial mortgages, credit cards, other consumer loans, commercia and industrial (C&I) loans, loans to foreign governments, loans to depository institutions, agriculture loans, other residential real estate loans, and all other loans. Traded risks: Realized gains on AFS securities is estimated separately following the original CLASS model. Realized AFS gains and losses reflect a combination of asset price shocks, credit events, behavioral decisions about asset sales, and accounting judgment. Due to lack of access to detailed risk information such as mark-to-market losses at loan-level, this model may be more effective in forecasting variables for diversified firms. Market stress from shocks to risk-free interest rates, credit spreads, and equity prices are also incorporated into the framework through the FSAP macro scenario.

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A. Banking Sector: Solvency Test			
Domain		Framework	
		TD by FRB	TD by FSAP Team
		Evolution of RWAs. RWAs for credit risk evolve according to STA approach as well as balance sheet growth requirements embedded into scenario. Net trading income from equity positions, debt instruments, and trading derivatives. Interest income declines by the amount of lost income from defaulted loans. Interest income from non-defaulting loans is estimated according to satellite models. Interest expenses increase due to rising funding costs linked to the macroeconomic scenario with empirically estimated pass-through, and add-on funding stress from a market event with no pass-through to lending rates. Net fee and commission income and other income evolve with macroeconomic conditions and banks' balance sheets. No change in business models (no rebalancing of portfolio). Balance sheets growth over the stress horizon. Starting in DFAST 2020, projections are based on the assumption that firms' balance sheets remain unchanged throughout the projection period. Also, in March 2020, the FRB amended its stress testing requirements to assume that a firm maintains a constant level of assets over the projection horizon and to assume that a firm will not pay any common dividends or make any issuance of common or preferred stock. Tax Rate The effective corporate income tax rate. Regulatory impact Stress tests results are compared against regulatory minima of CET1 and leverage ratios. G-SIB buffer is included into 4.5 percent CET1 minima and can be depleted. No conversion of additional Tier 1 capital	Profit loss recognition. Losses/gains are recognized in the same quarter that a shock hit. Balance sheet and RWA projections Growth path of assets over the stress testing horizon is used to forecast the balance sheet variables and RWAs. The FSAP team first uses a simple approach of using the long-run historical asset growth, supplemented by additional approaches for robustness. The latter include: (1) assuming a zero growth in balance sheet in the stress testing horizon; (2) forecasting balance sheet growth to reflect dynamics of the nominal GDP path in the scenario. Tax rate: Assumed at 21 percent in the forecasting horizon Regulatory impact Stress test results will be compared against a hurdle rate of 4.5. In addition to the hurdle rate, these BHCs are also subjected to a capital conservation buffer (CCB also includes the G-SIBs surcharge in the case of G-SIBs).

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A. Banking Sector: Solvency Test			
Domain		**Framework**	
		TD by FRB	**TD by FSAP Team**
		is assumed during the stress horizon. If banks' capital ratio falls below regulatory minimum during the stress test horizon, banks are not able to return funds to shareholders (dividend payments as well as share buybacks).	
	Behavioral adjustments	Dynamic Balance Sheet: In line with 2019 FRB methodology. Dividend Policy: Payout ratio set by 2019 FRB methodology.	Dynamic Balance Sheet: Balance sheet size is assumed to grow at historical industry growth rate Dividend Policy: Payout ratio projected based on a partial adjustment model with a payout rate of 45 percent for a portion of the net income. The specification is as follows: (0.9*(previous period's dividends) +((1-0.9) *(0.45*net income)).
5. Regulatory and market-based standards and parameters	Calibration of risk parameters	Parameter definition Net charge off ratios for credit risk (accounting definition)	Parameter definition Accounting portfolios.
	Regulatory standards	Capital definition according to national implementation of Basel principles, including CET1, Tier 1, leverage ratio and total CAR. Capital components that are no longer eligible for additional Tier 1 and Tier 2 capital components follow Basel III transitional path.	
6. Reporting format for results	Output presentation	Bank-by-bank: • Minimum CET1, Tier 1, CAR, and leverage ratio • Composition of P&L • Capital ratios • Profitability metrics: ROE; ROA; NII.	Contribution of key drivers to aggregate CET1 capital ratios Number of banks and share of total assets below hurdle rates. Capital shortfall in terms of nominal GDP. System-wide and by groups of banks: • CET1, Tier 1, CAR, and leverage ratio • Distribution of capital ratios (box plots) • Profitability metrics: ROE; ROA; NII

B. Banking Sector: Liquidity Test		
Domain		**Framework**
		TD by FSAP Team
1. Institutional Perimeter	Institutions included	33 banks on the consolidated basis

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	Market share	Over 80 percent of total banking sector assets
	Output presentation	Public data: LCR disclosure templates containing cash flow data for 30 days period. Consolidated basis. Banks grouped by business model Baseline date: December 31, 2019
B. Banking Sector: Liquidity Test		
Domain		**Framework**
		TD by FSAP Team
2. Channels of risk propagation	Methodology	Cash flow-based analysis using contractual LCR cash flow data aggregated for all currencies with assumptions about combined interaction of funding and market liquidity and different degrees of central bank support. Integrated Solvency-Liquidity-Network contagion framework with sequential recalculation of key solvency, liquidity and risk parameters to incorporate feedback loops due to asset fire-sales.
	Feedback loops and links with solvency analysis	Solvency-Funding cost loop (price effect). Higher funding costs for those banks which experience significant decline in solvency ratios. CCP loop. Stress in collateral market (e.g., MBS, corporate securities downgrade etc.) leads to additional flows of collateral.
3. Sensitivity analysis	Perimeter and type of analysis	LCR distribution and volatility across banks
4. Tail Shocks	Size of the shock	Baseline: business as usual (as reported by banks under normal market conditions). Behavioral assumptions: all maturing liabilities are rolled-over. Collateral freeze scenario (e.g., due to cyber-risk related event at CCP) 1 day, 5 days and 1-month intermediate/severe market stress scenario: higher run-off rates on unsecured wholesale funding, and undrawn committed credit/liquidity lines on top of the mild stress scenario;
5. Regulatory and Market-Based Standards and Parameters	Regulatory standards	Threshold for cash flow-based analysis: net cumulative funding gap falls below 0.
6. Reporting Format for Results	Output presentation	Number of banks with negative net cumulated funding gaps; Aggregate negative cumulated counterbalancing capacity.

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Appendix III. Interconnectedness Stress Testing Matrix

A. Banking Sector Domestic Interconnectedness: Exposure Based		
1. Institutional Perimeter	Institutions included	• Six domestic G-SIBs.
	Market share	• About 50 percent of the banking sector.
	Data and baseline date	• Confidential bilateral exposure data collected by the FRB for the BIS G-SIB hub and confidential liquidity data from FR 2052a. Given the confidentiality of the data used for this exercise, FRB staff implemented the analysis for the FSAP team. Data cutoff as of end-December 2019.
2. Channels of Risk Propagation	Methodology	• First stage (Liquidity Shock) ○ Calibration of net outflows shock and comparison to the counter-balancing capacity. ○ Liquidity channel-related contagion to the other entities occur due to the price impact of asset sales. ○ Loss in capital due to liquidity channel-related losses (liquidation losses plus marked-to-market losses). These capital levels are carried forward to the second stage as the starting capital levels. • Second stage (Credit Shock and Risk Transfers) ○ Based on a modified version of Espinosa-Vega and Sole (2010) with 7 exposure categories separately.
3. Tail shocks	Size of the shock	• Redemption shocks/run-off factors in the first stage are scenario-based, calibrated based on historical evidence. • Loss given default rates (LGDs) in the second stage vary by exposure category.
4. Reporting Format for Results	Output presentation	• Capital shortfall in percent of initial capital before stage 1 in the network (without identifying individual banks by name); • Capital shortfall, system wide (with max values).
B. Banking Sector Cross-Border Interconnectedness: Exposure Based		
1. Institutional Perimeter	Institutions included	• 22 large banking systems (both nationality/consolidated and locational residency basis).
	Market share	• Includes exposures of internationally active banks in these banking systems.
	Data and baseline date	• Based on publicly available and confidential BIS consolidated and locational data. Data cutoff end-September 2019.

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2. Channels of Risk Propagation	Methodology	• Balance-sheet based; network contagion based on Espinosa-Vega and Sole (2010).
3. Tail shocks	Size of the shock	• Pure contagion: default of banking systems, 50–100 percent loss given default, 50 percent funding roll-over ratio.
4. Reporting Format for Results	Output presentation	• Capital shortfall, system wide on consolidated basis (i.e., based on nationality); • Capital shortfall, system wide on residency basis.
C. Domestic and Cross-Border Interconnectedness: Market Based		
1. Institutional Perimeter	Institutions included	• 120 depository institutions and 87 other financial entities in 23 countries. Out of the 207 total entities, 47 are U.S. entities.
	Market share	• All listed financial sector entities with consolidated assets above US$100 billion.
	Data and baseline date	• Equity prices from Thompson Reuters DataStream (daily). Data cutoff as of end-December 2019.
2. Channels of Risk Propagation	Methodology	• Market-based model: Diebold and Yilmaz's (2014) generalized forecast error variance decomposition approach. The analysis is conducted using either daily or weekly data. For daily data, following standard practice, two-day average is used to accommodate time differences across markets.
3. Tail shocks	Size of the shock	• Size of the correlation coefficient. We further refined it by incorporating the asset size of these entities (i.e., asset-weighted coefficients).
4. Reporting Format for Results	Output presentation	• Heatmap of average co-movement between banks/nonbanks in the US/Rest of the world. • Network maps with co-movement between entities.

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Appendix IV. Mutual Fund Stress Testing Matrix

Mutual Fund Sector: Liquidity Risk		
1. Institutional perimeter	Institutions included	• All fixed income and mixed mutual funds covered by Morningstar (2,733 funds with total net assets of US$6,319 billion).
	Market share	• Around 100 % of the fixed income and mixed fund sector.
	Data	• Commercial data (Morningstar).
	Reference date	• December 31, 2019.
2. Channels of risk propagation	Methodology	• Calibration of redemption shock and comparison to level of highly liquid assets. • Price impact due to asset sales. • Second-round effects based on flow-performance relationship.
	Time horizon	• Instantaneous shock.
3. Tail shocks	Scenario analysis	• Adverse scenario: same as the banking sector scenario but converted to monthly frequency. • Pure redemption shock: outflows based on historical distribution: 3% expected shortfall (average of 3% worst net flows).
4. Risks and buffers	Risks/factors assessed	• Market risk: interest rates, share prices, credit spreads. • Liquidity risk: severe redemption shock.
	Buffers	• Level of highly liquid assets.
	Behavioral adjustments	• Choice of liquidation strategy used: slicing (prorated), waterfall (most liquid assets first), and mixed approach (cash then slicing). • Liquidity Management Tools are not taken into account.
5. Regulatory standards and parameters	Regulatory/accounting standards	• N/A
6. Reporting format for results	Output presentation	• Number of funds with a redemption coverage ratio below one (ratio of highly liquid assets to redemptions). • Price impact of asset sales. • Redemptions due to second-round effects.
Mutual Fund Sector: Vulnerability analysis and contagion		
1. Institutional perimeter	Institutions included	• All fixed income and mixed mutual funds covered by Morningstar (2,733 funds with total net assets of US$6,319 billion) and fixed-income ETFs.
	Market share	• Around 100% of the fixed income and mixed fund sector.
	Data	• Commercial data (Morningstar).
	Reference date	• December 31, 2019.
2. Channels of risk propagation	Methodology	• CoVaR applied to fund flows and returns by fund category to identify most vulnerable funds and most contagious. • Diebold-Yilmaz methodology applied to funds to identify most vulnerable funds and most contagious. • Tail-dependence using copula.
	Time horizon	• Monthly data.
3. Tail shocks	Scenario analysis	• For Copula approach: expected net flows conditional on a fund category facing net flows worse than the 3% expected shortfall.
5. Regulatory standards and parameters	Regulatory/accounting standards	• N/A
6. Reporting format for results	Output presentation	• Representation of interconnectedness among funds by fund category. • Identification of fund categories most vulnerable to distress from other categories.

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Appendix V. Insurance Sector Stress Testing Matrix

Insurance Sector: Solvency Risk		
1. Institutional perimeter	Institutions included	• Macrofinancial scenario: 21 life insurance groups, 22 non-life insurance groups, 7 health insurance groups. • Low-for long: Life insurance sector. • Mass lapse event: 21 life insurance groups. • Natural disaster: 538 non-life insurers (solo), 44 small, regionally concentrated non-life insurers (solo). • Banking counterparty default: 21 life insurance groups, 22 non-life insurance groups, 7 health insurance groups.

	Market share	• Macrofinancial scenario (based on gross written premiums):
		  • Life: 70 percent.
		  • Non-life: 70 percent.
		  • Health: 45 percent.

	Data	• Regulatory reporting.
	Reference date	• December 31, 2018.
2. Channels of risk propagation	Methodology	• Investment assets: other-than-temporary impairments on securities after price shocks, increase in the default rate for corporate bonds and loan exposures. • Insurance liabilities: unaffected by change in interest rates as discount rates are based on historic cost accounting. • Sensitivity analysis: effect on statutory capital.
	Time horizon	• Instantaneous shock.
3. Tail shocks	Scenario analysis	• Adverse macrofinancial scenario: Equity prices -40.4 percent (unaffiliated) and -20.0 percent (affiliated); property held for sale -23.2 percent; impairment on fixed-income instruments between 3.0 percent (NAIC rating category 3) and 15.0 percent (NAIC rating category 6); corporate bond yield increase between 2.8 percentage points (NAIC rating category 3) and 7.0 percentage points (NAIC rating category 6); impairment on mortgages 2.0 percent (first lien) and 10.0 percent (other mortgages).
	Sensitivity analysis	• Low-for-long interest rate projections. • Mass lapse event, triggered by a +2.0 percentage points interest rate hike for U.S. Treasury bonds. • Natural disaster: 1-in-50, 1-in-100, 1-in-250, and 1-in-500 years hurricane. • Default of the largest banking counterparty.
4. Risks and buffers	Risks/factors assessed	• Market risks: interest rates, share prices, property prices, credit spreads. • Asset-liability risks. • Credit risks, incl. counterparty risks. • Natural catastrophe risks. • Summation of risks, no diversification effects.
	Buffers	• None.
	Behavioral adjustments	• None.
5. Regulatory standards and parameters	Regulatory/ accounting standards	• U.S. Risk-Based Capital (RBC). • U.S. GAAP.
6. Reporting format for results	Output presentation	• Macrofinancial scenario: Impact on statutory capital and contribution of individual shocks; dispersion measures. • Low-for-long: Projection of net investment spread (investment return minus guaranteed interest rate). • Mass lapse event: Cash outflow, waterfall of assets which need to be liquidated; dispersion measures. • Natural disaster: Impact on statutory capital and RBC coverage ratio, number of companies with an RBC shortfall; dispersion measures. • Banking counterparty default: Impact on statutory capital; dispersion measures.

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Appendix VI. Grouping of Banks in the Stress Test

Banks in the stress test are grouped into four different categories depending on business model and size of the balance sheet, namely: G-SIBs (excluding four G-SIBs, which are grouped as Trading Banks given their focus on trading-related activities, investment banking, and asset management services); trading banks; foreign-owned banks; and large domestically oriented banks (Non-GSIBs).

Name	Stress Testing Category	Assets (2020: Q1); in th. USD
JPMorgan Chase & Co.	G-SIB	3,139,431,000
Bank of America Corporation	G-SIB	2,619,954,000
Citigroup Inc.	G-SIB	2,219,770,000
Wells Fargo & Company	G-SIB	1,981,349,000
Goldman Sachs Group, Inc.	Trading bank	1,089,759,000
Morgan Stanley	Trading bank	947,795,000
U.S. Bancorp	Non-GSIB	542,909,000
Truist Financial	Non-GSIB	506,229,000
Bank of New York Mellon Corporation	Trading bank	468,155,000
TD Group US Holdings LLC	Foreign	447,268,871
PNC Financial Services Group, Inc.	Non-GSIB	445,567,546
Capital One Financial Corporation	Non-GSIB	396,878,031
State Street Corporation	Trading bank	362,528,000
HSBC North America Holdings Inc.	Foreign	297,535,664
BMO Financial Corp.	Foreign	187,756,342
American Express Company	Non-GSIB	186,054,000
Fifth Third Bancorp	Non-GSIB	185,391,070
BNP Paribas USA, Inc.	Foreign	183,085,293
Ally Financial Inc.	Non-GSIB	182,527,000
Barclays US LLC	Foreign	179,955,000
Citizens Financial Group, Inc.	Non-GSIB	176,981,456
MUFG Americas Holdings Corporation	Foreign	165,696,005
UBS Americas Holding LLC	Foreign	163,248,851
Northern Trust Corporation	Trading bank	161,709,179
KeyCorp	Non-GSIB	157,003,466
Santander Holdings USA, Inc.	Foreign	152,144,560
RBC US Group Holdings LLC	Foreign	137,944,290
Regions Financial Corporation	Non-GSIB	133,638,000
Credit Suisse Holdings (USA), Inc.	Foreign	131,778,058
M&T Bank Corporation	Non-GSIB	124,577,833
DB USA Corporation	Foreign	117,159,000
Huntington Bancshares Incorporated	Non-GSIB	113,897,248
Discover Financial Services	Non-GSIB	112,656,646
BBVA Compass Bancshares, Inc.	Foreign	94,325,559

Source: IMF staff; and S&P Market Intelligence

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FSAP Recommendation	Developments	Status
Macroprudential framework and policy		
Provide an explicit financial stability mandate to all FSOC member agencies	Several agencies continue to have no explicit legal mandate to support financial stability. As discussed in the 2015 FSAP, this can complicate their input to the Financial Stability Oversight Council (FSOC), and potentially undermines the response to the committee's recommendations and macroprudential coordination. While not all FSOC agencies within their existing authorities have an explicit legal mandate to support financial stability, they all continue to make progress toward financial reforms. Some FSOC agencies, however (including the U.S. federal banking agencies), have, as their responsibilities, key roles in maintaining financial stability.	Not implemented.
Include in FSOC Annual Report specific follow-up actions for each material threat identified	The FSOC's Annual Reports discuss in a detailed manner each material threat identified, provide updates on regulations and other measures proposed or implemented in response to each threat, and outline the research agenda. However, specific timelines and responsible agencies are not identified.	Partially implemented.
Publish the current U.S. macroprudential toolkit and prioritize further development	The macroprudential toolkit remains to be centrally published, and a prioritization to be made. The FSAP recommended further development and implementation of time-varying macroprudential tools, like the countercyclical capital buffer (CCyB). The OCC, FDIC, and Federal Reserve (FRB), have the authority under their respective regulations to determine whether or not to activate the CCyB (and to determine the appropriate level) for the banking organizations subject to the respective jurisdictions. Staff from the three agencies meet on a regular basis to discuss their views on CCyB implementation and have generally agreed to coordinate as appropriate. In September 2016, the FRB approved a final policy statement detailing the framework for setting the CCyB. The policy statement provides background on the range of financial-system vulnerabilities and other factors the FRB may take into account as it evaluates settings for the buffer, including but not limited to, leverage in the nonfinancial and financial sectors, maturity and liquidity transformation in the financial sector, and asset valuation pressures. Due to the constantly evolving nature of economic and financial risks, the FRB is likely to adapt the range of indicators and models over time. The FRB has re-assessed the level of the CCyB annually since adopting the policy statement and has begun issuing a semiannual report on financial stability conditions. Most recently, in March 2019, the FRB affirmed the amount of the CCyB at 0 percent.	Partially implemented.

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	The NAIC Financial Stability (EX) Task Force is working to enhance the macroprudential toolkit of state insurance regulators. The Macro Prudential Initiative (MPI) addresses four focus areas: developing a liquidity stress testing framework for material life insurance groups, including enhancing disclosures to better assess products with higher liquidity risk potential; capital stress testing to be addressed as part of the NAIC group capital calculation; reviewing existing recovery and resolution processes, and disclosures to identify any enhancement needs; and determining if there are material gaps in existing counterparty exposure disclosures.	
Expedite heightened prudential standards for designated nonbank systemically important financial institutions (SIFIs)	In 2015, the FRB adopted a comprehensive set of enhanced prudential standards (EPS) for General Electric Capital Corporation, Inc. (GECC), which was designated by the FSOC in July 2013 for Federal Reserve supervision. The EPS included capital and liquidity requirements, capital planning and stress testing requirements, risk management requirements, and restrictions on intercompany transactions between GECC and its parent. The FSOC rescinded the designations of GECC in June 2016; AIG in September 2017; and Prudential Financial, Inc. in October 2018. In March 2016, a federal district court rescinded FSOC's designation of MetLife, Inc. As a result, there are currently no companies designated by the FSOC for Federal Reserve supervision and enhanced prudential standards. On June 3, 2016, the FRB approved an advance notice of proposed rulemaking (ANPR) inviting comment on conceptual frameworks for capital standards that could apply to systemically important insurance companies and to insurance companies that own a bank or thrift. The standards would differ for each population of insurance firms supervised by the FRB. In parallel, the FRB approved a notice of proposed rulemaking to apply EPS for the systemically important insurance companies as designated by the FSOC. In line with the Dodd-Frank Act (DFA), these proposed standards would apply consistent liquidity, corporate governance, and risk management standards to the firms and require the firms to employ both a chief risk officer and chief actuary.	Partially implemented.
Improve data collection, and address impediments to inter-agency data sharing	The Office of Financial Research (OFR) *Interagency Data Inventory* (IDI), which catalogues the data that FSOC member agencies purchase or collect from the industry or derive from other data, had its annual update in March 2017. FSOC member agencies use the inventory for identifying data gaps and for improving research and analysis but, due to specific restrictions to data sharing, the listing of data in the inventory does not necessarily signify that all FSOC member agencies have access to all data sets. In support of FSOC, OFR facilitated a review of data sharing agreements to identify areas for standardization (see OFR 2016 Financial Stability Report). OFR, along with the FRB, the New York Federal Reserve, and the Securities and Exchange Commission (SEC) have completed pilot data collections about bilateral repurchase agreements (repos) and securities lending activity. The OFR has made the summary of	Partially implemented.

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	findings publicly available on its website.[1] Steady progress in data collection and sharing is being made, including areas previously identified as those where more work needs to be done: (i) the collection of data on securities lending, and bilateral repos is still at an early stage; and (ii) outstanding obstacles to interagency data sharing should be reduced, as recommended in the FSAP. Section 21(c)(7) of the Commodity Exchange Act directs swap data repositories to make swap data available to certain enumerated domestic authorities and any other entity the Commodity Futures Trading Commission (CFTC) determines to be appropriate, which may include certain types of foreign authorities. In 2011, the CFTC adopted rules implementing these statutory swap data access provisions by establishing processes by which various categories of entities could gain access to swap data held by swap data repositories. In June 2018, the CFTC amended the 2011 access requirements such that certain authorities may obtain swap data access more efficiently. The amendments removed statutorily mandated requirements that foreign and domestic regulators indemnify swap data repositories for any expenses arising from litigation relating to the information provided by the repositories. The amendments also set forth a process for the CFTC to deem other domestic and foreign regulators appropriate to receive access to swap data held by the repositories. In August 2016, the SEC adopted rules to provide authorities with conditional access to security-based swap data held by SEC-registered security-based swap data repositories. Authorities must agree to keep confidential the data they receive from the repository, and the rules adopted require a memorandum of understanding or other arrangement between the SEC and the data recipient addressing the confidentiality of the information made available.	
Regulation and supervision		
Give primacy to safety and soundness in the supervisory objectives of Federal Banking Agencies	No material change in the legal mandates.	Not implemented.
Strengthen the banking supervisory framework and limit structures for related-party lending and concentration risk; and	In August 2018, the Federal Reserve adopted a final rule to address *single-counterparty credit risk*. The rule applies single-counterparty credit limits to bank holding companies (BHCs) and foreign banking organizations with total consolidated assets of $250 billion or more, including any U.S. intermediate holding company (U.S. IHCs) of a foreign banking organization with $50 billion or more in total consolidated assets, and any BHC identified as a global systemically important BHC under the Federal Reserve's capital rules.	Partially implemented.

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update guidance for operational and interest rate risk	In late 2015, the agencies issued guidance on commercial real estate lending, which includes, among other things, a discussion of the importance of managing concentration risk. No meaningful progress on related-party transactions and guidance for operational and interest rate risk.	
Set up an independent insurance regulatory body with nationwide responsibilities and authority	The supervisory and regulatory architecture for insurance firms has not changed.	Not implemented.
Implement principle-based valuation standard for life insurers consistently across the states	All states are in the process of implementing principles-based reserving (PBR) for life insurance reserves with an optional three-year transition period starting on January 1, 2017 (only 37 life insurance companies took this option) before it became mandatory on January 1, 2020. PBR only applies to new business written so existing books of business will continue to use the previous valuation methodologies.	Partially implemented.
Develop and implement group supervision and group-level capital requirements for insurance companies	In 2016, the FRB developed consolidated reporting requirements and consulted on enhanced prudential standards for insurance companies designated by FSOC. The FRB has consulted twice on the development of capital standards for groups with insurance activities subject to its supervision. As there are no FSOC-designated insurance groups currently, only the consultation on the Building Block Approach for capital requirements for the insurance groups that own a bank or thrift remain relevant in 2019. State insurance regulators are working through the NAIC to develop a group capital calculation, which would be an additional analysis tool for regulators, but not a quantitative capital requirement. The proposed group capital calculation is currently being tested by over 30 insurance groups and 15 lead states. <u>Developments in insurance group regulation</u> All 50 states, the District of Columbia, and Puerto Rico have adopted the updated NAIC model holding company Act enhancing state insurance regulators' group supervisory authorities and the NAIC Own Risk and Solvency Assessment (ORSA) model Act. Twenty-nine states have adopted updates to the NAIC model holding company Act relating to powers of a group-wide supervisor (GWS) of an IAIG. It became part of the accreditation program for all states by January 1, 2020.	Partially implemented.

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	Twenty-seven states have adopted the NAIC corporate governance model Act, which became an accreditation requirement on January 1, 2020.	
Provide needed resources to the SEC and CFTC and enhance their funding stability	There has been no change to the funding systems of both agencies.	Not implemented
Increase examination coverage of asset managers	The SEC has increased its examination coverage of registered investment advisers, reaching a level of 17 percent in fiscal year 2018. However, further improvements are warranted.	Partially implemented
Introduce explicit requirements on risk management and internal controls for asset managers and commodity pool operators	New SEC rules took effect in 2018 requiring open-end funds to have liquidity risk management programs with certain mandatory elements. The CFTC has not introduced any changes to the framework for commodity pool operators.	Partially implemented.
Complete the assessment of equity market structure and address regulatory gaps	Since the 2015 FSAP, the SEC has issued several significant proposals related to equity market structure, including amendments to existing regulation to enhance operational transparency and regulatory oversight of ATSs. In addition, the SEC approved the consolidated audit trail, which would enable regulators to efficiently track all trading activity in the U.S. equity and options markets. SEC staff has also organized a series of roundtables devoted to specific equity market structure topics.	Implemented.
Stress testing		
Conduct liquidity stress testing for banks and nonbanks on a regular basis; run regular network analyses; and link liquidity, solvency, and network analyses	While the Comprehensive Capital Analysis and Review (CCAR) and DFA stress tests continue to take the form of supervisory solvency stress tests in which second-round effects are not explicitly incorporated, they are implicitly captured in a few ways. First, the macro scenarios are based on very severe recessions coupled with significant declines in asset prices. In the past, such recessions have been associated with very weak banking sectors, so the macro dynamics should reflect the amplification effects from the banking system. Second, the global market shock is based on the movements of asset prices in the second half of 2008, a period that saw the default of a SIFI and the distress of several systemically important institutions. Thus, market conditions should reflect the "second round" effects of the failure of a major	Partially implemented.

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	financial company. Third, in implementing the default of the largest counterparty element, participating banks are instructed to compute outcomes if the counterparty whose default would cause the largest losses (under the market conditions described in the market shock) was to default. While this does not capture additional second-round effects beyond those described above, it does guarantee that the first-round effects are as large as possible. Federal banking agencies finalized a rule implementing the *Liquidity Coverage Ratio* (LCR) in 2014 and proposed a *Net Stable Funding Ratio* (NSFR) in 2016. Per definition, the LCR is a short-term liquidity stress test, and banks are expected to pass the underlying stress scenario on a continuous basis. The proposed NSFR would establish a quantitative metric that measures the stability of a firm's funding profile over a one-year timeframe. However, stress testing exercises, like the DFA stress tests or the CCAR, focus on credit and market risk, not on funding and market liquidity risk. Authorities do not conduct, on a regular basis, liquidity stress tests on nonbanks. However, the SEC requires MMFs to conduct regular stress tests, including on their liquidity. In addition, certain of the largest broker-dealers are providing additional information regarding their liquidity risk so SEC staff can better monitor the firm's management of that risk. The SEC also adopted rules in October 2016 requiring open-end funds to have liquidity risk management programs with certain required elements (see further below). While most large U.S. life insurers perform their own internal liquidity stress testing work, a consistent regulatory liquidity stress test is currently under development by the NAIC. This requirement will exist for any insurance group or legal entity with U.S. results that trigger any of six thresholds (fixed and indexed annuities, funding agreements and GICs, derivatives, securities lending, repurchase agreements, and borrowed money). Once a group triggers the liquidity stress testing requirement, the liquidity stress test itself will be based upon internal company cash flows, will utilize consistent stress tests and "what if" modifications (currently being established), and be applied at the legal entity level (including the holding company) with results reported individually and as a group. The target date for the proposed liquidity stress testing design is August 2019. *Network analysis, and integration with liquidity and solvency stress tests.* The DFA stress tests and the CCAR do not integrate different risk classes beyond credit and market risk. The tests look at banks individually, with contagion and spillover risks entering implicitly though the macro dynamics in the current scenarios rather than explicitly being assessed in the tests. Publicly available information suggests there is no supervisory requirement to integrate in a single framework different risk factors. OFR has conducted research on network models within the context of stress testing and contagion.	

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	In March 2010, the U.S. federal banking agencies issued guidance titled "The Interagency Policy Statement on Funding and Liquidity Risk Management" (75 FR 13656 (March 22, 2010)) ("Liquidity Risk Policy Statement"). The Liquidity Risk Policy Statement incorporates elements of the BCBS's Principles for Sound Liquidity Risk Management and Supervision ("Basel Liquidity Principles") and is supplemented by other liquidity risk management principles previously issued by the U.S. federal banking agencies. The Liquidity Risk Policy Statement discusses examples for fundamental liquidity risk management practices that the U.S. federal banking agencies generally consider to be consistent with safety and soundness standards and other applicable laws and regulations, including a comprehensive management process for identifying, measuring, monitoring, and controlling liquidity risk. It also emphasizes the central role of corporate governance, cash-flow projections, stress testing, ample liquidity resources, and formal contingency funding plans as tools for effectively measuring and managing liquidity risk. In addition, in 2014, the Federal Reserve adopted Regulation YY (12 CFR part 252) to implement the enhanced prudential standards established under section 165 of the Dodd-Frank Wall Street Reform and Consumer Protection Act ("Dodd-Frank Act") (12 U.S.C. § 5365) for BHCs , including foreign-based BHCs, with total consolidated assets of $50 billion or more (covered companies). These enhanced prudential standards included requirements related to liquidity risk management and liquidity sufficiency. The Regulation YY liquidity requirements, which came into effect in 2015 for the relevant domestic BHCs and 2016 for the relevant foreign banking organizations, provide a regulatory framework for large banking institutions to establish and maintain robust liquidity risk management practices, perform internal stress tests for determining the adequacy of liquidity resources, and maintain a buffer of highly liquid assets to cover cash flow needs over a 30-day stress period, or the first 14 days of a 30-day stress period in the case of the collective U.S. branches and agencies of a foreign banking organization operating in the United States. As a result of statutory changes, the Board has proposed to change the threshold for Regulation YY to apply to BHCs with total assets of $100 billion in more (in addition, in the case of foreign banking organizations, the Board has proposed to raise the threshold to $100 billion or more in combined U.S. assets). A component of Regulation YY's liquidity stress testing requirement is evaluated annually. For example, in one-year supervisors may review foreign banking organizations' compliance with the requirement that they conduct stress testing with respect to their U.S. branches and agencies, and in the following year supervisors may examine compliance by BHCs. In addition, the Federal Reserve conducts an annual review of the liquidity stress testing practices, liquidity position, and liquidity risk management practices of systemically important banking organizations. Under this program, supervisors assess the adequacy of firms' liquidity positions relative to their unique risks and test the reliability of these firms' approaches to managing liquidity risk. The review provides a regular opportunity for supervisors to respond to evolving liquidity risks and firm practices over time. The supervisory review evaluates firms' liquidity positions both through a range of supervisory liquidity metrics and through analysis of firms' internal stress tests. The assessment includes an examination of the stress tests that each firm uses to make funding decisions and to	

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	determine its liquidity needs and an assessment of a range of liquidity risk management practices.	
Develop and perform regular insurance stress tests on a consolidated group-level basis	State insurance regulators assess the stress tests performed by insurance companies on a consolidated group-level basis through the Own Risk and Solvency Assessment (ORSA) under the Risk Management and Own Risk Assessment Model Act, which has been adopted by all states. The group capital calculation contemplates determining if stress testing should be included in the filing of that calculation.	Partially implemented.
Develop and perform regular liquidity stress tests for the asset management industry	The SEC requires MMFs to conduct regular stress tests, including on their liquidity. The SEC also requires that an open-end fund assess, manage, and periodically review (with such review occurring no less frequently than annually) its liquidity risk, based on a range of factors. However, the SEC does not perform stress tests itself.	Not implemented.
Market-based finance and systemic liquidity		
Change redemption structures for mutual funds (MFs) to lessen incentives to run; move all money market mutual funds (MMMFs) to variable net asset value (NAV) approaches	In September 2015, SEC proposed a rule for MFs and ETFs designed to enhance liquidity risk management, provide new disclosures regarding fund liquidity, and allow MFs to adopt swing pricing to pass on transaction costs to entering and exiting investors. However, to date no MF has adopted swing pricing. *MMFs and variable NAV:* Rules issued by the SEC that have been fully implemented require floating NAVs for institutional non-government MMFs. Retail and government MMFs are permitted to continue using an amortized cost method of pricing where constant NAVs are applied. For the latter group of MMFs, the rules provide new tools—liquidity fees and redemption gates—to address potential runs. In its 2018 annual report, FSOC recommended that the SEC continue to monitor the impact of its reforms in light of the approximately $1 trillion shift from non-government MMFs to government MMFs since the adoption of the reforms.	Partially implemented.
Complete tri-party repo (TPR) reforms and measures to reduce run-risk, including the possible use of central clearing platforms (CCPs)	The underlying infrastructure of the TPR market, a key stress point in the global financial crisis, has been improved. The amount of intra-day credit extended to collateral providers has been reduced by over 95 percent as a result of changes in practice and process made to adhere to the reform roadmap. Also, clearing banks are now limited to funding a maximum of 10 percent of a dealer's notional tri-party book through pre-committed lines and incur a capital charge from the credit extension. Risk of fire sales of collateral by a dealer losing access to repo or by a dealer's creditors: Although the risk of collateral fire-sales is reduced through post-crisis capital and liquidity regulations, it remains a significant risk that warrants attention.	Implemented.

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	Intra-day counterparty risk exposure in the tri-party repurchase (repo) market contracted significantly in recent years, but the potential for fire sales of collateral by creditors of a defaulted broker-dealer remains a significant risk. Additionally, data gaps continue to limit regulators' ability to monitor the aggregate repo market and identify interdependencies among firms and market participants.	
Enhance disclosures and regulatory reporting of securities lending	In early 2016, the OFR, the FRB, and the SEC completed a *joint securities lending data collection pilot*. The purpose of the pilot data collection was to collect information directly from seven securities lending agents that participated in the pilot project voluntarily. In April 2016, the FSOC expressed its view that, without comprehensive information on securities lending activities across the financial system, regulators cannot fully assess potential financial stability risk, and encouraged efforts to propose and adopt a rule for a permanent collection of data on securities lending relevant agencies continue to consult on these issues. In October 2016, the SEC adopted new reporting requirements for registered investment companies, which include information on their securities lending activities. Registered investment companies were required to comply with requirements to provide annual information regarding securities lending beginning on June 1, 2018.	Partially implemented.
Strengthen broker-dealer regulation, in particular liquidity and leverage regulations	The U.S. authorities are tackling financial leverage through regulating financial products as well as the types of market participants (of which some are not subject to direct regulation): Broker-dealer requirements, like margin rules for securities transactions, central clearing of derivatives (fostering product standardization and increasing liquidity), as well as newly introduced margin requirements for uncleared swaps constitute important examples of regulatory and supervisory efforts. In addition, certain of the largest broker-dealers are providing additional information regarding their liquidity risk so SEC staff can better monitor the firm's management of that risk. To reduce the financial stability risk potential of derivatives, U.S. bank swap dealers are now required to collect and post margin on (almost) all swaps that cannot be centrally cleared. The use of uncleared derivatives is thereby made less attractive, and the requirements will encourage the use of standard derivatives that go through central clearinghouses. This measure also helps ensure that a default of a major OTC derivatives market participant would not bring down the system. In October 2015, the FRB, Federal Deposit Insurance Corporation (FDIC), Office of the Comptroller of the Currency (OCC), Farm Credit Administration (FCA), and Federal Housing Finance Agency (FHFA) issued a final rule to establish capital and margin requirements for swap dealers, major swap participants, security-based swap dealers, and major security-based	Partially implemented.

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	swap participants regulated by one of the aforementioned agencies. The final rule phased in the variation margin requirements between September 1, 2016 and March 1, 2017. The initial margin requirements began on September 1, 2016 and phase in over four years. In January 2016, the CFTC issued its final rule on margin requirements for uncleared swaps. The CFTC final rule on cross-border application of margin requirements was published in May 2016. Implementation of the CFTC's final regulations on margin requirements for swap entities not regulated for this purpose by a U.S. prudential regulator was initiated for initial margin on a phase-in basis starting on September 1, 2016 and was effective for variation margin as of March 1, 2017. The CFTC amended its rules in November 2018 to harmonize with the requirements for swap entities regulated by the U.S. prudential regulators. In addition, the CFTC issued comparability determinations for margin requirements for uncleared swaps for Japan (September 2016, updated March 2019), the European Union (October 2017), and Australia (March 2019).	
Improve data availability across bilateral repo/tri-party repo and securities lending markets	Data on the tri-party and General Collateral Financing (GCF) repo markets are published regularly. In February 2019, the OFR adopted rules requiring daily reporting by covered central counterparties of centrally cleared repo transactions, comprising approximately one-quarter of all U.S. repo market transactions. In October 2016, the SEC adopted new reporting requirements for registered investment companies, which include information about their securities lending activities. Registered investment companies were required to comply with requirements to provide annual information regarding securities lending beginning on June 1, 2018. Pursuant to the FRB's supervisory authority, the Federal Reserve Bank of New York (FRBNY) collects trade-by-trade data on tri-party repo transactions on a daily basis from the Bank of New York Mellon. In February 2019, the OFR published a final rule that will require the Fixed Income Clearing Corporation (FICC) to report data on FICC-cleared repo transactions beginning in October 2019. The FRB will act as the OFR's collection agent, with required data to be submitted directly to the FRBNY. (Currently, the FRBNY relies on a voluntary agreement with an FICC affiliate to obtain data regarding bilateral repos and GCF repo transactions that are cleared by FICC.)	Partially implemented.
Liquidity backstops, crisis preparedness, and resolution		
Revamp the Primary Credit Facility as a monetary instrument	In 2016, the Federal Reserve considered the role of the Primary Credit Facility as part of an evaluation of its long-run operating framework. In particular, at the FOMC's November 2016 meeting Federal Reserve staff discussed considerations regarding potential choices of operating regimes and the issue of stigma associated with borrowing from the discount window. No changes to the Primary Credit Facility were made at that time.	Not implemented.

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	Subsequently, staff of the Federal Reserve System has continued to study the role of Primary Credit. This work has included an October 2017 conference on the stigma associated with use of the discount window.	
Enable the FRB to lend to solvent nonbanks that are designated as systemically important	In November 2015, the Federal Reserve approved a *final rule specifying its procedures for emergency lending* under Section 13(3) of the Federal Reserve Act. Since the passage of the DFA in 2010, the FRB's emergency lending activity has been limited to programs and facilities with "broad-based eligibility" that have been established with the approval of the Secretary of the Treasury. The rule provides greater clarity regarding the FRB's implementation of limitations to emergency lending, and other statutory requirements. The final rule defines "broad-based" to mean "a program or facility that is not designed for the purpose of aiding any number of failing firms and in which at least five entities would be eligible to participate." These additional limitations are consistent with and provide further support to the revisions made by the DFA that a program should not be for the purpose of aiding specific companies to avoid bankruptcy or resolution. Solvent nonbanks that have been designated as systemically important by the FSOC would be able to participate in these programs to the extent they satisfy the applicable facility eligibility requirements.	Partially implemented.
Assign formal crisis preparedness and management coordinating role to FSOC	The FSOC has not assumed a crisis preparedness and management role. The FSOC was an informal forum for emerging issues, such as, Brexit, Hurricane Sandy, and MF Global's bankruptcy.	Not implemented.
Extend the Orderly Liquidation Authority powers to cover systemically important insurance companies and U.S. branches of foreign-owned banks	The recommendation pertained to systemic insurance firms that would have to be resolved under state bankruptcy legislation, for example, insurers without a holding company. The DFA was not changed on this point. The U.S. authorities cooperate with foreign resolution authorities in CMGs and through firm-specific COAGs and interagency MOUs, but the DFA has not been changed to extend OLA powers to cover U.S. branches of foreign-owned banks.	Not implemented.
Adopt powers to support foreign resolution measures; extend preference to overseas depositors	Foreign resolution measures continue to rely on recognition by U.S. courts under the principle of comity. The standards for such recognition are unclear regarding entities that are explicitly excluded under Chapter 15 of the U.S. Bankruptcy Code, such as FBOs' U.S. branches and agencies. The FDIC's "dual payability" rule clarified—but has yet to be confirmed in court—that foreign branch deposits are treated as deposit liabilities under the FDI Act's depositor preference rule with equal ranking as domestic uninsured deposits but not insured deposits.	Not implemented.

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Finalize recovery and resolution plans for SIFIs, agree cooperation agreements with overseas authorities	RRP under the DFA for and by the largest and most complex financial companies has progressed. The U.S. authorities concluded resolution-related cooperation frameworks and information-sharing arrangements with foreign counterparts, including by participating in firm-specific CMGs and by concluding firm-specific COAGs with CMG members. The FDIC concluded bilateral Resolution Memoranda of Understanding with its counterparts in major jurisdictions. State insurance regulators through their work at the NAIC are reviewing the value of aspects of resolution planning for large insurance groups under its Macro Prudential Initiative (MPI). The goal of MPI is to consider some new or improved tools to (1) better monitor and respond to the impact of external financial and economic risks on the firms state insurance regulators supervise, including financial, reputational, litigation or regulatory risks for the firm; and (2) better monitor and respond to risks emanating from or amplified by insurers that might be transmitted externally, and which may result in significant impacts to the stability of broader financial markets. Moreover, state insurance regulators are authorized, under revisions to the NAIC model holding company act, to have the power to act as a group-wide supervisor (GWS) for identified IAIGs, and these powers enable the GWS to be able to order mitigation of material risks to the insurance operations of the group, which could if necessary include the power to require the development of resolution and/or recovery plans. The revisions to the NAIC Model Holding Company Act that provide for the powers to act as a GWS of an IAIG have been adopted in 29 states and will be required to be adopted in all accredited U.S. states and jurisdictions by January 1, 2020.	Partially implemented.
Financial market infrastructures (FMIs)		
Identify and manage system-wide risks related to interdependencies among FMIs, banks, and markets	U.S. authorities continue efforts to increase the resilience and recoverability of financial market infrastructures (FMIs), with particular emphasis on central counterparties (CCPs). U.S. authorities advanced domestic efforts and continued to participate in, and contribute to, numerous international work streams. Since 2015, the SEC adopted risk management standards for systemically important FMIs, while all authorities issued expectations for recovery and orderly wind-down planning. Authorities are examining the viability and comprehensiveness of these FMIs' recovery and orderly wind-down plans. The authorities also are actively engaging in resolution planning for systemic CCPs. The FDIC and the CFTC co-host crisis management group (CMGs) meetings for two U.S. CCPs-that are considered systemically important in more than one jurisdiction: the Chicago Mercantile Exchange (CME) and Ice Clear Credit, LLC.	Largely Implemented.

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	The CFTC conducted stress testing exercises of selected CCPs in 2016, 2017, and 2019. In September 2016, the CFTC issued final cybersecurity testing rules for FMIs and markets. In May 2018, FRB welcomed the release of the CPMI's strategy for *reducing the risk of wholesale payments fraud related to endpoint security* and reaffirmed its commitment to work collaboratively with domestic and international stakeholders to promote the safety and resilience of the wholesale payments ecosystem worldwide. FRB staff, in close collaboration with the Federal Reserve Banks, has been engaged in efforts domestically to advance the strategy in the United States and actively monitor progress. The U.S. authorities participated in the Study Group on Central Clearing Independencies (SGCCI), which was established by the Financial Stability Board (FSB), the International Organization of Securities Commissions (IOSCO), and the Basel Committee on Banking Supervision (BCBS) to identify, quantify, and analyze interdependencies between CCPs and major clearing members, and financial service providers. Results from the SGCCI's analysis were published in July 2017 and August of 2018. The U.S. authorities, as members of CPMI-IOSCO, participate in the drafting of reports, at both the consultation and final stage, for the CPMI-IOSCO's Framework for Supervisory Stress Testing of CCPs, CPMI-IOSCO's Resilience of Central Counterparties (CCPs): Further Guidance on the PFMI, and Recovery of FMIs. The final versions were published in July 2017 (Resilience of CCPs and Recovery of FMIs) and April 2018 (the Framework for Supervisory Stress Testing for CCPs). The CFTC co-chairs the CPMI-IOSCO Policy Standing Group. U.S. authorities also contributed to CPMI-IOSCO's report on "Guidance on cyber resilience for financial market infrastructures" published in June 2016. The U.S. authorities are participating in the FSB work streams on resolution of CCPs and the continuity of access to FMIs for members in resolution. The FDIC co-chairs the FSB work stream on CCP resolution, which published in July 2017 "Guidance on Central Counterparty Resolution and Resolution Planning."	
Offer FRB accounts to designated Financial Market Infrastructures (FMIs) to reduce dependencies on commercial bank services	By December 2017, requests from designated financial market infrastructures have been authorized by the Federal Reserve Banks of Chicago and New York. The following five U.S. FMIs have been designated as systemically important utilities and are authorized to open accounts, and have opened accounts, at the central bank: ICE Clear Credit, CME Inc., the Options Clearing Corporation, the National Securities Clearing Corporation, and the Fixed Income Clearing Corporation. The measure has been possible because these (nonbank) FMIs have been designated as systemically important financial market utilities and are therefore eligible for Federal Reserve accounts and services pursuant to section 806 of the Dodd-Frank Act.	Implemented.

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Housing finance		
Reinvigorate the momentum for comprehensive housing market reform	The U.S. housing market has not been reformed comprehensively. No legislative or executive action has been taken to reduce substantially the footprint of the GSEs. As conservator, however, the Federal Housing Finance Agency (FHFA) has required market-based credit risk transfers from the GSEs to the private sector at an increasing level since 2013. Between their initiation in 2013 and June 2018, the GSEs have transferred a portion of credit risk on approximately $2.5 trillion of unpaid principal balance (UPB) with a combined Risk in Force (RIF) of about $81 billion. The GSEs have also jointly developed a common securitization platform. FHFA issued a final rule on the uniform mortgage-backed security in February 2019 to align GSE policies and practices that affect cash flows of To-Be-Announced (TBA) eligible mortgage-backed securities. These requirements apply to both the GSEs' current offerings and to the new Uniform Mortgage-Backed Security (UMBS). These GSE reforms have been accomplished administratively and have not reformed the entire housing finance system, which would require legislative action. Since 2015, the FHFA has directed the Enterprises to fund the Housing Trust Fund and Capital Magnet Funds (as required by the 2008 Housing and Economic Recovery Act) by transferring a portion of total new acquisitions to these funds, which are administered by the Department of Housing and Urban Development and Treasury Department, respectively. FHFA has the discretion to suspend the GSE allocations to the affordable housing funds, including the Housing Trust Fund, if the allocations are contributing to the GSE's financial instability. The Senior Preferred Stock Purchase Agreements (PSPAs) between the Treasury and each GSE continue to provide financial strength for the GSEs. They ensure the ability of the GSEs to meet their financial obligations and are structured so that they will have minimal net worth as all profits above the capital reserve amount are transferred to Treasury each quarter. The capital reserve amount had been declining by $600 million per year and was scheduled to decline to zero by January 2018. However, on December 21, 2017, FHFA and the Department of the Treasury agreed to reinstate a $3 billion capital reserve amount for each GSE to prevent draws on the PSPA due to fluctuations in the GSEs' income due to the normal course of business. Despite the new capital reserve, the December 2017 tax cuts caused the GSEs to draw a combined total of $4 billion at the end of that quarter, reflecting value loss in deferred tax assets that followed the Tax Cuts and Jobs Act enactment. In June 2018, FHFA issued a proposed rule on GSE capital requirements. The rule would implement new risk-based capital requirements and two alternatives for a revised minimum leverage capital requirement for the GSEs. The requirements in this rule would continue to be suspended while the GSEs remain in conservatorship.	Not implemented.

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	In September 2019, the U.S. Treasury released the Housing Reform Plan which calls for a reduced role of the government in the U.S. housing finance system. The Department of Housing and Urban Development (HUD) put forth a concomitant plan focused on streamlining the Federal Housing Administration (FHA) and the Government National Mortgage Association (GNMA) and avoiding the duplication of government support in the housing market.	

Note: Based on IMF staff's assessment and inputs from authorities.

[1] For the summary of the bilateral repo data collection, see https://www.financialresearch.gov/data/repo-data-project/, for the summary of the securities lending data collection, see https://www.financialresearch.gov/data/securities-lending-data-collection-project/.

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Content of the New Requirements	Date	Proposal/ Final Rule
Economic Growth Regulatory Relief Consumer Protection Act • Raised the enhanced prudential threshold from US$50 billion or more in assets to US$250 billion. • Directed the U.S. FBAs to tailor supervision and regulation of large banking organizations with more than US$100 billion in assets. • Eliminates the supervisory stress tests for BHCs with less than US$100 billion in assets, requires periodic (rather than annual) supervisory stress test for firms in the US$100 billion to US$250 billion range, and removes the company-run stress tests requirements for banking organizations with less than US$250 billion in assets. • Includes a simplified regulatory regime for community banks that meet certain risk profile criteria (ability to opt for a capital requirement based on a simple leverage ratio), requires FBAs to amend the Supplementary Leverage Ratio (SLR) rule for custodial banks to exclude from the leverage exposure measure qualifying deposits at certain central banks. • Mandates FBAs to amend the LCR rule to classify all investment-grade, liquid, and readily marketable municipal securities as level 2B liquid assets. • Introduces Volcker Rule exemptions and a less restrictive definition of high volatility commercial real estate.	May 2018	Final
Recalibration of the enhanced SLR for G-SIBs • The proposal would replace the fixed leverage ratio buffer (2 percent) that applies uniformly to all G-SIBs holding companies with a buffer tailored to each G-SIB, set at 50 percent of the G-SIB risk-based surcharge.	April 2018	Proposed
Volcker Rule revisions • A three-tier compliance framework is introduced. Banks with moderate and limited trading assets and liabilities are exempted from a number of requirements (such as reporting, internal control, CEO attestation). If an instrument is held for longer than 60 days, banks can presume (subject to supervisory rebuttal) that the rule will not apply to such instruments.	August 2019	Final
Tailoring rules • Introduce four categories of regulatory standards for banks with over US$100 billion in total consolidated assets, with standards increasing in stringency (Category I standards being the most stringent and Category IV standards the least stringent).	October 2019	Final

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Simplification to the capital rules for non-advanced approaches banking organizations • It replaces the 10 percent of CET1 capital deduction threshold for each category (deferred tax assets, mortgage services rights, investments in unconsolidated financial institutions) with 25 percent of CET1 capital threshold. • It eliminates the aggregate 15 percent of CET1 threshold for the combined impact of the three categories of deduction items. • It allows banking organizations to include minority interest up to 10 percent of the parent banking organization's CET1 capital.	October 2019	Final
Stress testing rules • The Stress Capital Buffer would integrate the capital rule and the CCAR process and relax some assumptions. • Various changes to the perimeter and frequency of the CCAR introduced as mandated by the EGRRCP Act. • Removal of the qualitative objection.	March 2020 October 2018 April 2019	Final Final Final

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Appendix IX. Banking Regulation and Basel Standards

	Basel standards	U.S. standards				
		Category I (U.S. GSIBs)	Category II (*)	Category III (*)	Category IV (*)	Other firms
Capital rules						
GSIB surcharge	From 1% to 3.5%	From 1% to 5.5%	N/A			
DSIB surcharge	Principle-based approach	N/A	No surchage as no D-SIBs have been identified in the US		N/A	
Banks operate obove the minimum regulatory capital ratios (to reflect banks' risk profile and changes in economic conditions)	Pillar 2 (**)	Stressed risk-based capital requirements (**)				No Pillar 2 and no stressed risk-based capital requirements
Countercyclical capital buffer (CCyB)	From 0% to 2.5%	In line with Basel			No CCyB	
Higher leverage ratio requirements for GSIBs (eSLR in the US)	3% + leverage buffer (50% of the GSIB surcharge) Leverage buffer in the 0.5-1.75% range	3% + leverage buffer (50% of the US GSIB surcharge) Leverage buffer in the 0.5-2.75% range	N/A			
Leverage ratio (SLR in the US)	3%	N/A	3% (SLR is aligned with Basel)		No SLR	
Regulatory adjustments to CET1	- For DTAs, MSRs and investments in unconsolidated financial entities: limited recognition in capital capped at 10% of CET1 for each category - The amount of the three items that remains recognized cannot exceed 15% of CET1 - Limited recognition of minority interests	In line with Basel	In line with Basel	- Limited recognition capped at 25% of CET1 for each category - The amount of the three items that remains recognized after the application of all regulatory adjustments is not capped - All minority interests are eligible		
Impact of unrealized gains and losses	Unrealized gains and losses are included in regulatory capital	Unrealized gains and losses are included in regulatory capital	Unrealized gains and losses are included in regulatory capital	Firms have the possiblity to exclude gains and losses from regulatory capital (i.e., unrealized losses are not deducted from capital). This is less conservative under stressful conditions when firms are likely to accumulate underlying losses		
Calculation of RWAs						
Floor for firms using internal model approache	72.50%	100% (***)	100% (***)	N/A		
Operational risk	Standardized approach (Business Indicators)	AMA (****)	AMA (****)	No capital charge	No capital charge	No capital charge
Market risk	Framework applies to all banks regarless of the size of the trading book	Framework applies to banks with significant market risk exposures (with aggregated trading assets and liabilities of at least US$ 1 bn or 10% of total assets)				
CVA risk	Yes	Yes	Yes	No capital charge	No capital charge	No capital charge
Liquidity rules						
LCR	Full LCR requirements	Full LCR requirements	Full LCR requirements	Reduced LCR	No LCR	No LCR
NSFR	Full NSFR requirements	Full NSFR requirements if implemented (*****)	Full NSFR requirements if implemented (*****)	Reduced NSFR if implemented (*****)	No NSFR	No NSFR

(*) Category II firms: ≥ US$700 bn in total assets or ≥ in cross-Jurisdictional activity. Category III: US$250 bn total assets or US$75 bn ≥ in nonbank assets, short-term funding, or off-balance sheet exposure. Category IV: Other firms with US$100 to 250 bn in assets

(**) Comparing the Pillar 2 approach in the Basel framework and the CCAR process in the US is extremely difficult -if not impossible- given the conceptual differences. It is all about implementation.

(***) A prudent permanent capital floor on banks based on the standardized approach risk-based capital rules (100%) is implemented, but the U.S. standardized approach excludes capital charges for operational risk and for Credit Value Adjustment (CVA) risk

(****) The FBAs are considering introducing a standardized approach

(*****) The NSFR rule has not been finalized and timing is uncertain

More conservative than Basel standards	Less conservative than Basel standards

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UNITED STATES

FINANCIAL SECTOR ASSESSMENT PROGRAM

August 2020

TECHNICAL NOTE—FINANCIAL CRISIS PREPAREDNESS AND DEPOSIT INSURANCE

This Technical Note on Financial Crisis Preparedness and Deposit Insurance for the United States FSAP was prepared by a staff team of the International Monetary Fund as background documentation for the periodic consultation with the member country. It is based on the information available at the time it was completed in July 17, 2020.

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FINANCIAL SECTOR ASSESSMENT PROGRAM

July 27, 2020

TECHNICAL NOTE

FINANCIAL CRISIS PREPAREDNESS AND DEPOSIT INSURANCE

Prepared By
Monetary and Capital Markets Department

This Technical Note was prepared for the IMF Financial Sector Assessment Program (FSAP) mission in the United States held during February–March 2020. It was led by Ms. Michaela Erbenová. It contains technical analysis and detailed information underpinning the FSAP's findings and recommendations. Further information on the FSAP can be found at http://www.imf.org/external/np/fsap/fssa.aspx

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Glossary

BAU	Business-as-Usual
BHC	Bank Holding Company
CARES Act	Coronavirus Aid, Relief, and Economic Security Act
CAS	Claims Administration System
CIGFO	Council of Inspectors General on Financial Oversight
CISR	Division of Complex Institution Supervision and Resolution
CMG	Crisis Management Group
COAG	Cooperation Agreement
CP	Core Principles for Effective Deposit Insurance Systems
DFA	Dodd-Frank Wall Street Reform and Consumer Protection Act
DIF	Deposit Insurance Fund
DIS	Deposit Insurance System
EGRRCPA	Economic Growth, Regulatory Relief and Consumer Protection Act
EPS	Enhanced Prudential Standards
FBO	Foreign Banking Organization
FDI Act	Federal Deposit Insurance Act
FDIC	Federal Deposit Insurance Corporation
FIO	Federal Insurance Office
FRB	Board of Governors of the Federal Reserve System
FSAP	Financial Sector Assessment Program
FSB	Financial Stability Board
FSSA	Financial System Stability Assessment
GFC	Global Financial Crisis
GSIB	Global Systemically Important Bank
IBA	International Banking Act
IDI	Insured Depository Institution
IHC	Intermediate Holding Company
KA	Key Attributes of Effective Resolution Regimes for Financial Institutions
LAC	Loss-Absorbing Capacity
LISCC	Large Institution Supervision Coordinating Committee
MOU	Memorandum of Understanding
NCUA	National Credit Union Administration
NCUSIF	National Credit Union Share Insurance Fund
OCC	Office of the Comptroller of the Currency
OIG	Office of Inspector General
P&A	Purchase and Assumption
RRP	Recovery and Resolution Plan / Planning
RWA	Risk-Weighted Asset
SEC	Securities and Exchange Commission
SPOE	Single Point of Entry
TLAC	Total Loss-Absorbing Capacity
UST	U.S. Department of the Treasury

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EXECUTIVE SUMMARY

The U.S. authorities should preserve the considerable progress in the resiliency, recoverability, and resolvability of financial companies and insured depository institutions (IDIs), and intensify financial crisis preparedness efforts. After a decade of resolution planning, the development of the U.S. resolution regime is more advanced than in other major economies. This regime, together with the strong track record of the deposit insurance system (DIS) for banks and the federal banking agencies' (FBAs) preparation for resolution, provide a strong foundation for crisis preparedness. Bank holding companies (BHCs) have integrated recovery and resolution planning (RRP) into business-as-usual (BAU) activities, increasing their resiliency; this process has deepened the FBAs' understanding of the BHCs' business models and RRP capabilities. The FBAs should continue their own annual resolution planning and mitigate the recent changes that reduced the BHCs' RRP. These efforts should be complemented by further interagency crisis preparedness, including particularly with the U.S. Department of the Treasury (UST), given its essential role in critical aspects of crisis responses. Finally, further refinements relating to cross-border resolution also deserve attention.

RRP for and by the largest and most complex BHCs under the Dodd-Frank Wall Street Reform and Consumer Protection Act (DFA) is the centerpiece of orderly resolution. RRP has improved these BHCs' capabilities to recover from financial distress and to be resolved in an orderly manner under court-governed bankruptcy procedures. When such a resolution would adversely affect the U.S. economy, the orderly liquidation authority (OLA) vested in the Federal Deposit Insurance Corporation (FDIC) is available. The initial requirement to submit annual comprehensive resolution plans has had far-reaching effects. The largest and most complex BHCs have reconfigured financial, legal, and operational structures, underpinned by strengthened governance arrangements. These BHCs increasingly assess business decisions through a "resolution lens," ensuring that acquisitions and new activities do not adversely affect resolvability. BHCs' resolution planning under DFA Title I has helped the FBAs better prepare for administrative resolution under DFA Title II. Whereas resolution under the U.S. Bankruptcy Code must be carried out without extraordinary government support, the orderly liquidation fund (OLF) is an important temporary public backstop under OLA.

Deposit insurance by the FDIC is an effective tool to limit the damage caused by IDI failures. For failed IDIs, the FDIC's preferred resolution method is a purchase and assumption (P&A) transaction, which is a time-tested and cost-effective resolution method. Supported by effective recordkeeping by IDIs for timely deposit insurance determination, P&A transactions have provided access to insured—and often also uninsured—deposits within, typically, one business day. This was also the case during the global financial crisis (GFC), when the FDIC managed 489 IDI failures. To support its preparedness, since 2012 the FDIC requires large IDIs to submit annual resolution plans under the Federal Deposit Insurance Act (FDI Act). By 2009Q3, the FDIC-administered deposit insurance fund (DIF) was fully depleted; by 2018Q3, the DIF completed a multi-year restoration plan. At end-2019, the DIF balance stood at US$110 billion and the reserve ratio at 1.41 percent of insured deposits, the highest level since 1999, and well above its statutory minimum level. The DIF also has over US$200 billion in public backstops and the ability to collect prepaid premiums.

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Requirements for financial companies' RRP were reduced since the previous FSAP. The Economic Growth, Regulatory Relief and Consumer Protection Act of 2018 (EGRRCPA) increased the thresholds established under the DFA for mandatory Title I plans from US$50 billion to US$250 billion, while giving the Board of Governors of the Federal Reserve System (FRB) discretion—which it has exercised—to apply the requirement to BHCs with assets between US$100 billion and US$250 billion. Under rule changes in 2019 by the FRB and the FDIC, the 74 financial companies subject to resolution planning—including the 8 U.S. global systemically important banks (GSIBs) and several large regional U.S. BHCs and foreign banking organizations (FBOs)— follow longer two- or three-year cycles (depending on their size and complexity), alternating full and targeted plans, or even less extensive reduced plans. Dovetailing these changes, the Office of the Comptroller of the Currency (OCC) increased the threshold for its recovery planning guidelines, reducing the number of national banks to which the guidelines apply from 25 to 8. The FRB's recovery planning requirements continue to apply to only the eight U.S. GSIBs (including the BHC parents of four banks subject to OCC guidelines). For other national banks, elements of formal recovery planning are part of regular risk management supervision, without additional or enhanced requirements.

Exercising their discretion actively, the FBAs should continue to keep a wider array of firms focused on improving critical capabilities for resiliency, recoverability, and resolvability. The FBAs retain discretion to prescribe more comprehensive and frequent RRP, and to apply these to financial companies with assets above US$100 billion. They should continue to exercise this discretion actively, including with targeted plan requirements to keep a wider array of financial companies focused on improving critical capabilities for resiliency, recoverability, and resolvability. The FDIC should continue to review the resolvability of financial companies under its DFA Title II resolution planning annually, or sooner in case of material changes, and promptly discuss the plans and resolvability assessments in crisis management groups (CMGs). All BHCs and IDIs that are subject to resolution plan requirements should also be subject to recovery plan requirements; other firms should adopt credible, enhanced contingency funding plans—emulating recovery plans—subject to the FBAs' critical supervisory assessment. Any increase of the threshold (from US$50 billion) for IDI resolution plans should be very limited. Ensuring the credibility of recovery plans—as is now being done for resolution plans—and the complementarity between recovery and resolution plans is an important priority.

Loss-absorbing capacity (LAC) additional to regular capital requirements should be considered for some non-GSIB U.S. financial companies. So far, the United States has focused on total loss-absorbing capacity (TLAC) for GSIBs. However, the simultaneous failure of smaller or less complex financial companies could also impact financial stability, at least at the regional level. The large number of failures during the GFC (with heavy DIF losses) illustrates that this is a practical reality. In a Title II resolution, OLF funds deployed to provide liquidity cannot be used for capital and would need to be repaid. Such considerations suggest that there could be benefits in some non-GSIB U.S. financial companies holding LAC additional to regular capital requirements, in the form of subordinated debt or otherwise. This would improve resolvability and reduce the DIF's exposure.

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Further refinements relating to cross-border resolution also deserve attention. Alignment of the U.S. resolution regime with international standards on cross-border cooperation should be further strengthened, as the 2015 FSAP pointed out. OLA powers do not cover FBOs' U.S. branches. While judicial recognition of a foreign resolution action may be possible under the doctrine of comity, a specific statutory mechanism in the United States to recognize and support foreign resolution actions does not exist. This is particularly problematic for FBOs, including foreign GSIBs, with U.S. branches and agencies. The depositor preference rule discriminates based on the jurisdiction where deposits are payable: at best, deposits in U.S. banks' foreign branches are on par with uninsured U.S. deposits. Finally, as in many jurisdictions, there remains the prospect of ring-fencing the assets of U.S. branches of foreign institutions, to preserve such assets to the primary satisfaction of U.S. creditors, which may undermine cross-border cooperation.

The Financial Stability Oversight Council (FSOC) should more actively engage in and oversee crisis preparedness work. So far, the FSOC has focused less on how interagency cooperation would function in contingencies where risk reduction has not succeeded, and a full-blown crisis has materialized. The FSOC should devote greater attention to ensuring that the FBAs and the UST have comprehensive and complementary crisis preparedness plans, supported by robust governance frameworks within the agencies. The FSOC should also prepare the modalities for crisis cooperation, particularly where crisis responses would require far more than individual agencies' regular planning. This applies to, for example, national financial crisis management communications, and in the rare possibility of a DFA Title II resolution without prior Title I planning. The FBAs should also prepare mitigating actions for a case in which several (larger) institutions will need to simultaneously activate their recovery or contingency funding plans. It is critical to crisis preparedness and decisive action in crisis, that the modalities for the interactions between the UST and the FBAs be operationalized, documented, and regularly reviewed and tested. The FSOC should prioritize this work.

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Table 1. United States: Recommendations on Crisis Preparedness and Deposit Insurance

Recommendations and Responsible Authorities	Timing[1]	Priority[2]
Intensify interagency preparedness for crisis responses that would require far more than individual agencies' regular planning, such as national crisis communications, and a DFA Title II resolution without prior Title I planning (FSOC, FBAs; ¶49).	I	H
Operationalize, document, and regularly review and test the modalities for the interactions between the UST and the FBAs under the DFA and the FDI Act (FSOC, FBAs; ¶49).	I	H
Plan to mitigate simultaneous recovery and contingency funding actions by several firms (FSOC, FBAs; ¶49).	I	H
Continue to actively use agency discretion to subject a wider array of firms to recovery and resolution planning (FBAs; ¶29).	I	H
Continue to use (targeted) DFA Title I plan requirements to strengthen firms' resiliency, recoverability, and resolvability between full plan submissions (FBAs; ¶28).	I	H
Continue to undertake DFA Title II planning and resolvability assessments at least once a year and discuss RRPs and assessments for each firm at least once a year in CMGs (FRB, FDIC; ¶28).	I	H
Adopt policies and instructions for FBA staff to identify, as part of regular work, material changes and loss of integration between RRP and firms' BAU (FBAs; ¶28).	I	H
Implement all FDIC OIG recommendations in its 2020 'crisis readiness report' (FDIC; ¶46, Box 6).	ST	H
Extend OLA powers to FBOs' U.S. branches (U.S. Congress; ¶35).	MT	H
Introduce specific statutory provisions to give prompt and predictable legal effect in the U.S. to foreign resolution measures (U.S. Congress; ¶36–40).	MT	H
Ensure equal depositor preference ranking for overseas branch deposits with domestic deposits (U.S. Congress, FDIC; ¶41).	MT	H
Continue to ensure that staffing levels and expertise are commensurate with the agencies' mandates, and that decisive surge staffing, with adequate training, is possible in times of distress in the financial system (FDIC, FRB; ¶20, ¶45).	I	M
Restrict (a) crossholdings of TLAC instruments between financial firms, and (b) holdings by retail investors, to reduce contagion risks (FBAs; ¶32).	ST	M
Identify the disclosure requirements that may warrant waivers for an effective DFA Title II resolution; adopt supporting regulations (FBAs; Appendix I, item 8).	ST	M
Enhance the early intervention framework with policy limits for, e.g., concentration and interest rate risks (FBAs; ¶21).	MT	M
Adopt policies and methodologies to determine which non-GSIBs' resolvability can be enhanced with LAC additional to regular capital requirements (FBAs; ¶33).	MT	M
Assess the effectiveness of public awareness outreach on deposit insurance by undertaking a survey, focusing on, for example, complex trust account holders and depositors with low financial and limited language skills (FDIC; ¶42).	MT	M
Reform the deposit insurance system for credit unions by removing the cap, targeting a significantly higher level of paid-in funds, and making membership mandatory for all credit unions (U.S. Congress; ¶44).	MT	L
Amend the DFA and the FDI Act to further ensure consistency with the Key Attributes (U.S. Congress; ¶6–7, Appendix I, items 4, 7, 10–12, 17).	MT	L

[1] I: immediate (<1 year); ST: short term (1–2 years); MT: medium term (3–5 years).
[2] H: High; M: Medium; L: Low.

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BACKGROUND

A. Scope of the Review

1. This note sets out the analysis and detailed recommendations of the 2020 FSAP pertaining to financial crisis preparedness and deposit insurance in the United States.[1] The note summarizes the FSAP findings, including the mission undertaken in February–March 2020, during which time meetings were held with officials and senior staff of the FDIC, OCC, FRB, UST, the National Credit Union Administration (NCUA), and the U.S. Government Accountability Office; the mission also met with private-sector stakeholders, including banks, trade associations, and audit and law firms. The note considers developments since the 2015 FSAP, and is based on the regime in place and the practices employed as of March 10, 2020. The FSAP thanks the authorities for the constructive dialogue and the many insights that they shared.

2. The note focuses on large financial companies and IDIs, and the largest credit unions. Separate FSAP notes discuss other financial institutions (including insurers, securities firms, and financial market infrastructures) and liquidity issues in resolution.

3. The FSAP analyzed the U.S. financial crisis preparedness and deposit insurance arrangements,[2] **considering the U.S. financial sector landscape, U.S.-specific challenges, international standards, and emerging best practices**. While the note does not formally assess compliance with any standard,[3] in particular two international standards informed the analysis: the Key Attributes of Effective Resolution Regimes for Financial Institutions (KAs);[4] and the Core Principles for Effective Deposit Insurance Systems (CPs); and their assessment methodologies.[5]

4. The international standards identify several preconditions for effective resolution and deposit insurance that are covered by other FSAP workstreams: (1) a well-established framework for financial stability, surveillance, and policy formulation; and (2) an effective system of supervision, regulation, and oversight of banks. The standards also call for a robust accounting, auditing, and disclosure regime, and a well-developed legal framework and judicial system; the 2015 FSAP judged the U.S. arrangements favorably on these two preconditions and no update was done in 2020.

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[1] Authors: Atilla Arda (Senior Financial Sector Expert, IMF, Monetary and Capital Markets Department); and Patrick Honohan (external IMF expert; former governor of the Central Bank of Ireland).

[2] The FSAP did not assess the pertinent agencies' business continuity planning, that aims to ensure the continuity of their operations, staff, and facilities when these are affected by external events.

[3] The 2015 FSAP assessed the United States against the final 2014 Key Attributes, using the October 2014 draft Assessment Methodology that was finalized in 2016 with only a few material changes. This note supplements and complements the 2015 report (IMF Country Report No. 15/171).

[4] Most of the Key Attributes apply to resolution regimes for any financial institution that could be systemically significant or critical if it fails, and not only to GSIBs—see, for example, Chapter IV of the KA Assessment Methodology for the Banking Sector).

[5] Consistent with the methodologies, the team did not have access to confidential firm-specific RRPs and, accordingly, the team made no judgment on individual firms' resolvability.

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B. Developments Since the 2015 FSAP

5. The 2015 FSAP pointed to some gaps in the U.S. bank resolution regime vis-à-vis the international standards. The FSAP made recommendations, particularly on (1) the regime's coverage of foreign banks' U.S. branches; (2) cross-border cooperation, including prompt effect in the United States for foreign resolution decisions, the effects of U.S. resolution decisions on financial stability abroad, and depositor preference for overseas deposits; and (3) removing impediments to resolution and triggering resolution at a sufficiently early stage. The 2015 FSAP recommended to reforming the DIS for credit unions, to expedite the timetable for the long-term DIF target, and that the FSOC assume responsibility for crisis preparedness and management cooperation.

6. The authorities have addressed several of the 2015 FSAP recommendations (Appendix 1). A few recommendations were (partially) overtaken by clarifications in the final KA Assessment Methodology and subsequent guidance from the Financial Stability Board (FSB). The authorities noted that several recommendations addressed primarily the FDI Act, whereas they consider the DFA to be the primary way that the United States adheres to the KA requirements. The authorities also argued that they materially comply with most of the other outstanding recommendations. While the FSAP team is receptive to the latter argument, it continues to believe that there is merit in codifying good practice in statute; the FSAP team also notes that, in many instances, the KA explicitly require statutory provisions and not only KA-compliant practice.

7. The FSAP takes a holistic view on the several statutes underpinning the U.S. bank resolution regime. The DFA is particularly relevant for certain large BHCs; the FDI Act for IDIs; the International Banking Act (IBA) for federally licensed U.S. branches of FBOs; and state banking laws for state-licensed branches. The DFA and the FDI Act are the main pillars of the resolution regime. The DFA resolution approach to BHCs benefits from the FDIC's decades-long experience with resolving IDIs under the FDI Act. IDI resolution under the FDI Act is the only statutory basis for IDI resolution and complements—and is a useful backstop to—BHC resolution under the DFA in case the latter is not feasible.[6] When the opportunity presents itself, Congress should bring both the FDI Act and the DFA into closer alignment with the Key Attributes.

8. While the authorities have shown an impressive ability to resolve IDIs without cost to the U.S. taxpayer, no financial company has been resolved yet under the DFA. In the last 20 years, 558 FDIC-insured IDIs failed, 489 of which were during the GFC; in 2018 no IDI failed—a first since 2006 (Figure 1). Since the enactment of the DFA, 270 IDIs failed. None of these failures was resolved at the BHC level under OLA, which to date has not yet been tested; these IDIs were resolved under the FDI Act.

[6] "The [IDI] Rule is intended to complement the resolution plan requirements of the Dodd-Frank Act." (Federal Register. Vol. 77, No. 14 p. 3076, January 23, 2012) This was recently reiterated in Federal Register, Vol. 84, No. 77 p. 16623, April 22, 2019. See also Federal Register. Vol. 75, No. 94 p. 27466, May 17, 2010, discussing the G20 Leaders' call at the 2009 Pittsburgh Summit for "firm-specific contingency and resolution plans" (for which the FSB developed the Key Attributes), noting that the IDI Rule "supports and complements" and "enhances and complements" these international initiatives and efforts.

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Figure 1. United States: U.S. Bank Failures 2001–2020

Source: https://www.fdic.gov/bank/historical/bank/

9. The FSAP risk analysis identified pockets of vulnerabilities in the banking sector, particularly among U.S. non-GSIBs. While the banking system has solid capital buffers to withstand the simulated shocks in an adverse scenario, capital depletion would be relatively high in such scenario, and several banks' capital would fall below the minimum level for Common Equity Tier 1 Capital (4.5 percent)—or even fall below 2 percent. Especially U.S. non-GSIBs with lower initial capital buffers and higher loan exposures would need additional capital buffers.

10. The 2018 EGRRCPA was the first major revision of the DFA, reducing its scope and application. Importantly, this regulatory relief effort raised the asset threshold for the mandatory DFA title I resolution plan requirement from US$50 billion to US$250 billion, while giving the FRB discretion—which it has exercised—to apply the requirement to BHCs with assets between US$100 billion and US$250 billion. Related FBA actions exempted some BHCs and FBOs from this resolution plan requirement, while regulatory capital and liquidity requirements and stress testing were also being scaled down.[7] In response to the COVID-19 pandemic, the Coronavirus Aid, Relief, and Economic Security Act (CARES Act) was enacted. The Act includes the U.S. Congress' approval for the FDIC to create a widely available program guaranteeing the obligations of solvent IDIs, BHCs, and any affiliates thereof. The FDIC has not exercised this authority, and any program and related guarantee under the CARES Act is required to expire by end-2020. To reduce delays due to political processes, Congress should remove the approval requirement or extend the deadline for the current preauthorization until the economic implications of the COVID-19 pandemic have been mitigated.

[7] For an in-depth discussion, see the FSAP technical note on banking supervision and regulation.

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Box 1. U.S. RRP and TLAC Thresholds

US GSIBs: JPMorgan Chase;[1] Citigroup;[2] Bank of America;[3] Goldman Sachs;[3] Wells Fargo;[3] Bank of New York Mellon;[4] Morgan Stanley;[4] State Street[4]	• DFA Title 1 Resolution Plan Requirement 2-Year Cycle Alternating Full/Targeted Plans • DFA Title 2 Resolution Plan by FDIC • FRB Recovery Plan Requirement • TLAC Requirement
US non-GSIB Holding Companies: Capital One; Northern Trust; PNC Financial; U.S. Bancorp *Foreign GSIB US Holding Companies*: HSBC;[2] Barclays;[3] Deutsche Bank;[3] MUFG;[3] Credit Suisse;[4] Mizuho;[4] Royal Bank of Canada;[4] Toronto-Dominion;[4] UBS[4]	• DFA Title 1 Resolution Plan Requirement 3-Year Cycle Alternating Full/Targeted Plans • DFA Title 2 Resolution Plan by FDIC • TLAC Requirement for U.S. IHCs of foreign GSIBs[5]
53 FBOs with global assets ≥$250 billion	• DFA Title 1 Resolution Plan Requirement 3-Year Cycle Reduced Plans • DFA Title 2 Resolution Plan by FDIC • FDIC IDI Rule Resolution Plan Requirement • TLAC Requirement for U.S. IHCs of foreign GSIBs[5]
US/FBO IDIs with assets ≥$250 billion: JPMorgan Chase Bank; Bank of America; Wells Fargo Bank; Citibank; US Bank; PNC Bank Capital One; TD Bank	• FDIC IDI Rule Resolution Plan Requirement • OCC Recovery Plan Requirement
Other IDIs with assets ≥ $50 billion	• FDIC IDI Rule Resolution Plan Requirement • Regular prudential risk management requirements—no enhanced recovery planning requirements

Source: IMF Staff
[1] FSB GSIB Bucket 4
[2] FSB GSIB Bucket 3
[3] FSB GSIB Bucket 2
[4] GSIB Bucket 1
[5]FBOs with U.S. non-branch assets of US$50 billion or more must establish a U.S. IHC.

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11. The FBAs have amended their rules and guidance to reflect the EGRRCPA changes, reducing RRP by BHCs. A joint FRB-FDIC final rule in 2019 specified DFA Title I resolution plan requirements under the EGRRCPA (Box 1): the 8 U.S. GSIBs must submit resolution plans every 2 years, alternating full and less extensive targeted plans[8]; 13 larger U.S. BHCs and FBOs will follow a 3-year cycle, alternating full and targeted plans; and 53 FBOs with over US$250 billion global assets must submit reduced plans every 3 years. Financial companies with assets under US$100 billion are not required to submit resolution plans. Dovetailing these changes, per 2019, the OCC increased the assets threshold for its recovery planning guidelines from US$50 billion to US$250 billion, reducing the number of national banks to which these guidelines apply from 25 to 8. The FRB's recovery planning requirements continue to apply to only the eight GSIBs (including the BHC parents of four banks subject to OCC guidelines). For other financial institutions, regular supervision includes overseeing aspects of recovery capabilities; for example, through contingency planning and capital management requirements, without additional or enhanced, formal "recovery planning" requirements.

12. Crisis preparedness continues to be a high priority challenge for the U.S. authorities. Since the GFC, the Council of Inspectors General on Financial Oversight (CIGFO),[9] has been identifying readiness for financial crises among the top challenges for financial regulatory organizations.[10] Similarly, the FDIC Office of Inspector General (OIG) has "crisis readiness" among the FDIC's top challenges. In October 2018, the FDIC OIG announced that it was undertaking an overall assessment of the FDIC's crisis readiness planning efforts,[11] including its crisis readiness plans, its tools and mechanisms to implement the plans, roles and responsibilities, crisis response training, and actions to evaluate and improve readiness.[12] The FDIC OIG assessment was finalized during the FSAP and informed the FSAP assessment—see paragraph 46 below.[13]

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[8] Targeted plans will focus on the most material topics identified by the FDIC and the FRB, including capital and liquidity, and any material changes to the firm that have occurred since the last plan submission. The agencies also retain authority to require interim updates between plans, if they believe additional information is necessary. The full plans will also cover, for example, interconnectedness and interdependencies, management information systems, and corporate governance for resolution planning—targeted and reduced plans will not include these critical components of resolution planning. BHCs continue to be required to provide a "notice of extraordinary events" within 45 days of any "material merger, acquisition of assets or similar transaction" (12 CFR 381.4(d)(4)).

[9] The DFA established the CIGFO to oversee the FSOC and comprises the Inspector Generals of nine financial regulatory agencies, including the FBAs, and the UST.

[10] Most recently in, "Top Management and Performance Challenges Facing Financial Regulatory Organizations," CIGFO, July 2019. The CIGFO uses the term "crisis readiness" instead of "crisis preparedness."

[11] In September 2018, the Group of Thirty observed, "Of greatest concern, some of the tools available to fight extreme crises, when and if they recur, have been weakened, especially in the United States." See "Managing the Next Financial Crisis—An Assessment of Emergency Arrangements in the Major Economies," G30, September 2018.

[12] "Semiannual Report to the Congress," FDIC OIG, October 2018.

[13] FDIC OIG is now assessing the FDIC's enterprise risk management framework, aiming to ensure that the FDIC has increased awareness of emerging and key risks and an opportunity to address them proactively. Considering "the ongoing coronavirus pandemic and resulting strains on the global financial system," three U.S. Congress oversight committees urged the FDIC "to act immediately to establish robust crisis readiness," and requested a briefing on

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DOMESTIC ORGANIZATION

A. Oversight Architecture

13. Three FBAs are responsible for dealing with (potentially) failing banks. Each U.S. bank, whether chartered under federal or state law, is subject to regulation and supervision, including prompt corrective action (PCA) and recovery planning, by a primary federal banking supervisor.[14]

- ***FDIC***: state-chartered banks and savings associations that are not members of the Federal Reserve System. The FDIC administers the DIF and has backup supervisory authority for all IDIs.
- ***FRB***: state-chartered banks that are members of the Federal Reserve System; BHCs, and savings and loan holding companies; and U.S. operations of FBOs, including state-licensed branches.
- ***OCC***: national banks, federal savings associations, and federally licensed branches of FBOs.

14. The DFA strengthened the UST's role in responding to distress in the financial system (Box 2). The Treasury Secretary's agreement is required for triggering Title II resolution, using OLA powers and OLF funding, establishing an FDIC guarantee program for IDI obligations, and giving FRB liquidity support to nonbanks. Under the FDI Act, the Secretary decides on backstopping the DIF and invoking the systemic risk exception to the least-cost test for FDIC resolution measures.

B. Domestic Cooperation

15. The FBAs work closely on supervision and on guidance and rules for, and assessment of, DFA Title I resolution plans. They have enhanced coordination and established formal and informal mechanisms for information sharing and supervisory cooperation.[15] Particularly, the FRB and the FDIC work closely on joint rule making for DFA Title I resolution plans. Staff of the FRB and the FDIC also coordinate recommendations to their respective Boards on the feedback letters in response to firms' DFA Title I resolution plans. This promotes common positions on whether the firms' plans have shortcomings or deficiencies. The FDIC has sole authority on DFA Title II resolution planning, albeit with input from the FRB and the OCC.

16. The so-called "three keys process" for triggering OLA under DFA Title II requires close interagency cooperation. The use of these powers requires a recommendation of two-thirds of the members of both the FRB and the FDIC Board,[16] and agreement of the Treasury Secretary, in

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steps the FDIC is taking to "prepare for the potential impact of the coronavirus crisis on FDIC's critical role" (letter dated April 13, 2020).

[14] Most domestic banks have several federal supervisors. For example, an insured national bank owned by a BHC is subject to supervision by the OCC, the FRB, and the FDIC.

[15] For an in-depth discussion, see the FSAP technical note on banking supervision and regulation.

[16] Depending on the type of financial company or its largest domestic subsidiary, a recommendation from the Securities and Exchange Commission (SEC) or the Federal Insurance Office (FIO) is needed instead of the FDIC.

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consultation with the U.S. President.[17] All authorities involved in this process regularly refresh and confirm their responsibilities and pursue readiness to execute their responsibilities. This engagement includes interagency operational exercises, meetings, and teach-ins.

17. Resolution under the FDI Act too requires close cooperation between the FDIC and the other federal or state supervisors, depending on where or in what manner a bank is chartered. The cooperation starts during regular supervision, including on recovery planning, and intensifies as a bank deteriorates, which may require recovery and resolution action. Close cooperation between the FDIC and the other supervisors is critical for advance resolution preparation by the FDIC, and coordination of charter withdrawal by the chartering authority and resolution action by the FDIC.

Box 2. The U.S. Treasury Secretary's Role in Selected FDIC Crisis Responses[1]

Orderly Liquidation Authority
The Treasury Secretary decides to make OLA available to the FDIC, in consultation with the U.S. President, and on a recommendation of two-thirds of the members of both the FRB and the FDIC Board (or, in certain cases, the SEC or FIO).

Orderly Liquidation Fund
The Treasury Secretary (1) decides whether to acquire any FDIC obligations issued under the OLF, and (2), jointly with the FDIC and in consultation with the FSOC, sets the maximum amount for these OLF obligations. The Secretary's agreement is needed for the OLF policies, procedures, terms, and conditions.

FDIC Guarantees for Banks' Obligations
The Treasury Secretary

- approves the determination of a liquidity event, based on a recommendation—at the Secretary's request—by two-thirds of the members of both the FRB and the FDIC Board;
- approves the policies, procedures, terms, and conditions of any program; and
- decides on the amount of outstanding guaranteed debt, in consultation with the U.S. President, and on a recommendation—at the Secretary's request—of two-thirds of the members of both the FRB and the FDIC Board.

The FDIC may issue guarantees after approval by both chambers of the U.S. Congress upon a request from the U.S. President, giving the President and Congress a veto.

Systemic Risk Exception to the FDIC's Least-Cost Test
The Treasury Secretary decides, in consultation with the U.S. President, and on a recommendation of two-thirds of the members of both the FRB and the FDIC Board.

Backstop for DIF
The Treasury Secretary approves lending to the FDIC up to the statutory limit, subject to terms agreed to by the Secretary and the FDIC Board after congressional consultations on repayments, schedules, and special assessments on banks.

[1] This box does not cover, for example, UST and FRB lending, guarantees, and asset purchases.

[17] Those decisions are subject to immediate, though limited, judicial review.

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18. The FSOC is a formal forum for the leadership of the FBAs and the UST to coordinate their analysis and activities. The DFA created the FSOC as a collaborative body under UST chairmanship, with collective responsibility for identifying systemic risks and responding to emerging threats to financial stability.[18] The FSOC aims to deliver on this mandate, including by facilitating regulatory coordination and information collection and sharing. A small staff of 14 supports the FSOC. Of its five committees, the "regulation and resolution" committee supports the FSOC on resolution plan requirements and OLA rules and regulations. For example, the committee has discussed joint FRB and FDIC feedback on DFA Title I plans, and RRP rule and guidance changes.

C. Staffing

19. Mid-2019, the FDIC centralized its supervision and resolution activities for the largest and most complex IDIs. The new Division of Complex Institution Supervision and Resolution (CISR) is responsible for IDIs with assets greater than US$100 billion, for which the FDIC is not the primary federal regulator.[19] CISR plans and will execute resolution for these IDIs—and for other firms, if so decided by the FSOC. As the FDIC is not the primary federal regulator for these institutions, potential policy conflicts between its supervisory and resolution responsibilities are expected to be minimal. CISR is budgeted to have 275 staff members,[20] which it has filled mostly with staff from the Division of Risk Management Supervision, the Division of Resolutions and Receiverships, and the former Office of Complex Financial Institutions.

20. Some FBAs are facing staffing challenges. In 2019, the CIGFO highlighted staffing challenges,[21] reiterating its 2018 findings, particularly at the FRB and the FDIC. Because of regular staff attrition, both at expert and management levels, in combination with the low number of bank failures in recent years, staff with first-hand experience in bank resolution, let alone a financial crisis, is diminishing.[22,23] In February 2020,[24] the FDIC OIG warned that "the FDIC faces significant risks

[18] For an in-depth discussion, see the FSAP technical note on systemic risk oversight and systemic liquidity.

[19] The Division of Risk Management Supervision continues to be responsible for firms—including some large and complex firms—for which the FDIC is the primary federal regulator.

[20] CISR comprises three branches: Risk Assessment (assessing banks' DFA Title I plans); Resolution Readiness (ensuring the FDIC is ready for DFA Title II and FDI Act work); and Policy and Data Analytics.

[21] "Top Management and Performance Challenges Facing Financial Regulatory Organizations," CIGFO, July 2019. The potential retirement of experienced staff is a challenge for the entire federal government. In its March 2019 report, "Substantial Efforts Needed to Achieve Greater Progress on High-Risk Areas," the U.S. Government Accountability Office recognized strategic human capital management as a continuing government-wide area of high risk.

[22] The financial sector is facing the same challenge. In the words of Bank of America chief, Brian Moynihan: "One of the big questions for our industry is we now have a substantial amount of our employee base that weren't here [for the GFC]. And so you have to think about how do you get those teammates to understand all of what happened [during the GFC]." 'Focused on Remembering the Financial Crisis,' Financial Times, January 19, 2020.

[23] While the FRB centrally manages resolution planning, over 50 staff in the Federal Reserve System are actively involved in resolution plan reviews across the large bank portfolio.

[24] "Top Management and Performance Challenges Facing the Federal Deposit Insurance Corporation," FDIC OIG, February 2020.

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regarding retirement eligibility in key Divisions involved in crises readiness efforts [and] a significant number of employees responsible for ensuring the safety and soundness of institutions and protecting consumers are also eligible to retire." The OIG noted particularly the retirement eligibility by 2024 of two-thirds of FDIC staff responsible for resolutions and receiverships, including ensuring prompt deposit payouts, and 35 percent of the CISR Division. In response to the OIG 'crisis readiness report' (paragraph 46 below) and the FDIC's 'GFC response report' (footnote 70 below), in March 2020, the FDIC announced a buyout and early-retirement offer to 20 percent of its staff.[25] With this offer, the FDIC aims to increase its agility and effectiveness, and to ensure that it can appropriately adapt the skills, tools, and leadership necessary to fulfill mission-critical readiness. The authorities should continue to ensure that staffing levels and expertise are commensurate with their mandates.

FIRMS' RESILIENCY

A. Early Intervention

21. The early intervention framework should be enhanced. Responding to the savings and loan crisis in the 1980s and 1990s, the PCA framework was introduced in 1991 to help prevent DIF losses by prescribing mandatory, and increasingly intrusive, supervisory action by FBAs when a bank's capital falls below certain thresholds; the framework also includes earlier discretionary actions. The low capital thresholds at first adopted for the PCA did not trigger sufficiently early intervention. During the fast-moving GFC, the PCA did not prevent the DIF from large losses, with the Fund's total assets falling from US$52.4 billion at end-2007 to minus US$20.9 billion less than two years later.[26] Since then, the FBAs have increased the PCA capital thresholds and re-emphasized forward-looking supervisory guidance.[27] Complementing the PCA framework's capital thresholds with mandatory policy action in response to other dimensions of bank soundness, such as concentration and interest rate risks, could further enhance the effectiveness of the early intervention framework.[28]

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[25] "FDIC to offer buyouts, early retirements for 20% of its workforce," Federal News Network, March 5, 2020. Due to the COVID-19 pandemic, this program has been suspended until further notice.

[26] In its June 2011 report, "Modified Prompt Corrective Action Framework Would Improve Effectiveness," the U.S. Government Accountability Office concluded that the PCA framework "did not prevent widespread losses to the DIF—a key goal of PCA," and found that "PCA's triggers limit its ability to promptly address bank problems, and although regulators had discretion to address problems sooner, they did not consistently do so." See also, Balla, Mazur, Prescott, and Walter, "A Comparison of Small Bank Failures and FDIC Losses in the 1986–92 and 2007–13 Banking Crises," Federal Reserve Bank of Cleveland, Working Paper no. 17-19, November 2017.

[27] "Risk-Focused, Forward-Looking Safety and Soundness Supervision," FDIC Financial Institution Letter FIL-47-2019, August 27, 2019. This update to the FDIC Risk Management Manual of Examination Policies was a response to the FDIC-OIG evaluation report on 'Forward-Looking Supervision' in August 2018. The OIG concluded that while "examiners substantially achieved the intended outcomes of the Forward-Looking Supervision approach…the FDIC did not have a comprehensive policy guidance document on Forward-Looking Supervision. The OIG recommended that the FDIC adopt supporting guidance "to institutionalize the Forward-Looking Supervision approach and to help to ensure its application regardless of economic conditions and FDIC management prerogatives."

[28] See further, the FSAP technical note on banking supervision and regulation.

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B. Recovery and Resolution Planning

22. While supervision does not aim to prevent bank failures altogether, supervisory oversight aims to reduce the probability and the impact of bank failures.[29] Accordingly, Basel Core Principle 15 prescribes that banks have comprehensive management processes for their capital and liquidity risk, supported by contingency arrangements, including robust and credible recovery plans.[30] KA11.1 elaborates on the matter by prescribing recovery (and resolution) planning for, at a minimum, domestically incorporated firms that could be systemically significant or critical if they fail. KA11.5 complements this by prescribing that all firms subject to RRP maintain a recovery plan.

23. Each FBA has its own recovery planning framework (Box 1).

- ***FDIC***: elements of a formal recovery are part of regular supervisory risk management requirements, without enhanced recovery planning requirements, and IDIs with assets over US$50 billion are subject to IDI Rule resolution planning.

- ***FRB***:[31] recovery planning guidance applies to the eight GSIBs and not to the three other financial companies in the portfolio of the FRB's Large Institution Supervision Coordinating Committee (LISCC),[32] nor other large banking organizations (assets over US$100 billion) or large FBOs (U.S. assets over US$50 billion), all of which are subject to DFA Title I resolution planning and enhanced prudential standards (EPS).

- ***OCC***:[33] recovery planning guidance applies to eight national banks with assets over US$250 billion, which are all subject to IDI Rule resolution planning and subsidiaries of holding companies: four U.S. GSIBs, one foreign GSIB, and three other U.S. BHCs—the latter are not subject to FRB recovery planning.[34]

24. Three resolution planning requirements are in place (Box 1).[35]

- *DFA Title I (165(d) Rule)*[36]—Certain BHCs must submit plans, commonly known as "living wills," to the FRB and the FDIC, describing in detail the firms' strategy for rapid and orderly resolution

[29] "Core Principles for Effective Banking Supervision," Basel Committee on Banking Supervision, December 2019 (Basel Core Principles), Section 01.20.

[30] Section 01.20 of the Basel Core Principles distinguishes between "contingency funding plans" and "recovery plans."

[31] "Heightened Supervisory Expectations for Recovery and Resolution Preparedness for Certain Large Bank Holding Companies," FRB, SR 14-1

[32] These are the U.S. operations of three foreign GSIBs: Barclays; Credit Suisse Group; and Deutsche Bank. Early March 2020, UBS was moved from the LISCC to the Large and Foreign Banking Organizations portfolio—see footnote 44.

[33] "Recovery Planning Guidelines: Final Revised Guidelines," OCC Bulletin 2018-47, December 27, 2018.

[34] Wells Fargo Bank; Citibank; Bank of America; JP Morgan Chase; TD Bank; Capital One; U.S. Bancorp; PNC Bank.

[35] The public sections of resolution plans can be found here: https://www.fdic.gov/regulations/reform/resplans/

[36] https://www.federalreserve.gov/supervisionreg/resolution-plans.htm

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under the U.S. Bankruptcy Code, which is a court-governed process. These plans aim to reduce the likelihood that a BHC's financial distress or failure has systemic effects.

- *DFA Title II (OLA)*—This is an administrative procedure under FDIC receivership. The FDIC uses firms' DFA Title I plans to develop its own DFA Title II plans in case financial stability considerations do not allow for a resolution under the U.S. Bankruptcy Code.[37]

- *IDI Rule*[38]—The Rule requires IDIs with US$50 billion or more in total assets to periodically submit resolution plans that should enable the FDIC, as receiver under the FDI Act, to resolve an IDI in the event of its failure in a manner that ensures that depositors receive access to their insured deposits within one business day (or two business days of the failure occurs on a day other than a Friday), maximizes the net present value return from the sale or disposition of its assets, and minimizes the amount of any loss realized by the creditors in the resolution.[39]

25. The DFA Title I plan process has evolved to demonstrate BHCs' capabilities. To enhance their plans' credibility, firms have reconfigured financial, legal, and operational structures, underpinned by strengthened governance arrangements. Especially the largest and most complex BHCs increasingly assess strategic and business decisions through a "resolution lens," ensuring that acquisitions and new activities do not adversely affect resolvability. Through the agencies' capabilities testing, firms seek to demonstrate their capabilities to support their orderly resolution under the U.S. Bankruptcy Code. Firms' resolution planning under Title I has helped the FBAs to better understand banks' business models and RRP capabilities, allowing the FDIC to prepare for administrative resolution under DFA Title II when the U.S. Bankruptcy Code approach is not feasible.

26. Recently, the coverage and frequency of BHCs' DFA Title I and recovery plans were reduced. A combination of DFA amendments through the EGRRCPA, and the FBA's subsequent rule and guidance changes,[40] reduced the number of firms subject to recovery and DFA Title I resolution

[37] There are parallels with arrangements in other key jurisdictions. A similar regime exists in Switzerland, where firms' own "emergency plans" inform the resolution authority's "resolution plans." In the United Kingdom, the resolution plans are developed by the Bank of England based on banks' 'resolution packs' containing information on their financial, legal, and operational structures, and the critical functions they provide. In the European Union, the Single Resolution Board prepares resolution plans based on information and analysis submitted by the banks for this purpose about their structure, and critical functions or interconnections, the resolution strategy's operational consequences, and the processes and arrangements for effectively providing information in resolution.

[38] https://www.fdic.gov/regulations/laws/rules/2000-7800.html#fdic2000part360.10.

[39] The IDI Rule was proposed in 2010 (before the DFA was enacted) and came into effect in 2012 in response to the G20 Leaders' call at the 2009 Pittsburgh Summit for "firm-specific contingency and resolution plans." See footnote 6.

[40] https://www.fdic.gov/news/board/2019/2019-10-15-notice-dis-b-fr.pdf.

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plan requirements, and the content and frequency of the latter.[41] While not required by the EGRRCPA, in April 2019 the FDIC announced that it is considering an IDI Rule change.[42]

27. The KAs prescribe annual RRP for any firm that could have an impact on financial stability in the event of its failure. The KA require resolution authorities to undertake RRP updates, resolvability assessments, and evaluations of resolution strategies' feasibility and credibility, at least annually, and sooner in the event of material changes (KAs 10.1, 11.3, 11.10); top officials of home and host resolution authorities review annually firm-specific resolution strategies and operational resolution plans (KA11.11); RRP covers, at a minimum, firms that could be systemically significant or critical if they fail (KAs 11.1, 11.2); and recovery planning for all firms subject to resolution planning (KA11.5), implying the same coverage for recovery and resolution plans.

28. The FBAs should ensure that firms' focus on resiliency does not weaken, and that DFA Title II resolution planning by the FDIC remains KA-consistent. The authorities are determined to monitor and enhance resolvability on an ongoing basis. While there are practical reasons for lengthening the BHCs' DFA Title I planning cycle, there is a risk that leaving as much as six years between full plan submissions could lower financial companies' focus and resource allocation, weakening the impact of resolution plan requirements under DFA Title I. The targeted plans between full plan submissions (every four or six years) should be used to preserve firms' resiliency. The FBAs should adopt policies and instructions for their staff on identifying, as part of their regular oversight, material changes and loss of integration between RRP and firms' BAU activities. IDI resolution planning under the FDI Act is a critical backstop. Any increase of the IDI Rule threshold (from the current US$50 billion) should be very limited. The FDIC should continue to undertake DFA Title II planning and resolvability assessments at least once a year or sooner in case of material changes. CMGs for U.S. GSIBs should continue to discuss at least annually, firms' recovery plans, resolution strategy, Title I and II plans, and supporting resolvability assessments.

29. The authorities should subject a wider array of firms to RRP planning requirements. The FBAs retain discretion to prescribe more comprehensive and frequent RRP, and to apply these to BHCs with assets above US$100 billion.[43,44] They should continue to exercise this discretion

[41] Firms are still required to report material changes as they occur, and the FBAs can request that firms focus on specific topics, as needed, allowing targeted reviews of core elements of resolvability. See footnote 8 above for more detail. The authorities suggest that the new rules reflect the maturation in both he FBAs' and firms' consideration of certain resolution planning issues, allowing the FBAs to focus on core elements of resolvability and firms' capabilities.

[42] https://www.fdic.gov/news/news/press/2019/pr19034.html

[43] The FRB generally has discretion to apply any or all EPS to firms with total consolidated assets between US$100 billion and US$250 billion. The FRB would need to determine that the EPS are appropriate to prevent or mitigate risks to U.S. financial stability or to promote a firm's safety and soundness, considering risk factors that the FRB deems appropriate. The OCC can apply its recovery plan requirement to national banks with total consolidated assets below US$250 billion, if it determines that a bank is highly complex or otherwise presents a heightened risk.

[44] On March 6, 2020, the FRB and FDIC invited the public to comment on proposed changes to the DFA Title I resolution plan guidance for large FBOs. As of the date of the proposal, the firms that meet the proposed criteria are the U.S. operations of Barclays, Credit Suisse, and Deutsche Bank; UBS does no longer meet the criteria.

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actively, and require, for example, recovery plans from all financial institutions subject to EPS and resolution planning under both the DFA and the FDI Act. All BHCs and IDIs that are subject to resolution plan requirements should also be subject to recovery plan requirements (KA11); other firms, including firms with assets under US$100 billion, should adopt credible, enhanced contingency funding plans—emulating recovery plans—subject to the FBAs' critical supervisory assessment. Ensuring the credibility of recovery plans—as is now being done for resolution plans—and the complementarity between recovery and resolution plans is an important priority.

C. Loss-Absorbing Capacity

30. As per January 2019, all covered BHCs and intermediate holding companies (IHCs) comply with the 2016 U.S. regime for external TLAC.[45] The U.S. TLAC rule (Box 3) establishes minimum requirements for (i) the external TLAC amount that each U.S. top-tier BHC (covered BHC) identified as a U.S. GSIB must issue; and (ii) the internal TLAC amount that must be issued by each top-tier U.S. IHC (covered IHC) of a foreign GSIB with at least US$50 billion in U.S. non-branch assets. The external TLAC requirement applies uniformly to each U.S. GSIB's covered BHC, consistent with a groupwide SPOE resolution strategy.

Box 3. U.S. Regime for Total Loss-Absorbing Capacity

Under the U.S. TLAC rules, all covered BHCs[1] are subject to an external TLAC requirement of 18 percent of risk-weighted assets and 7.5 percent of total leverage exposures (in each case, not including applicable U.S. Basel III regulatory capital buffers, which must be met in addition to the minimum TLAC amount). The U.S. TLAC rules do not provide an alternative calibration for the external TLAC requirement.

The U.S. TLAC rules do not impose any requirements on the allocation of internal loss absorbency among the subsidiaries of covered BHCs and IHCs, but expressly left open the possibility for a future proposal. However, U.S. banks have pre-positioned liquidity and capital in certain subsidiaries based on estimates, for the Resolution Liquidity Execution Need, Resolution Liquidity Adequacy and Positioning, Resolution Capital Adequacy and Positioning; and Resolution Capital Execution Need.

The U.S. TLAC rules also established "clean holding company requirements" that restrict a covered BHC or covered IHC from issuing certain liabilities and entering certain arrangements in order to, among other things, preserve the structural subordination of a covered holding company's liabilities to the liabilities of its subsidiaries in a parent company-focused resolution (i.e., a global or local SPOE resolution).

[1] Covered IHCs with foreign parents that have identified a single-point-of-entry (SPOE) resolution strategy for the group resolution ("non-resolution covered IHC") would have a lower minimum TLAC requirement (16 percent of RWAs) and may issue only internal TLAC to their foreign parent (or another foreign affiliate). Alternatively, resolution covered IHCs with foreign parents that have identified a multiple-point-of-entry resolution strategy for the group resolution are subject to a higher minimum TLAC requirement (18 percent of RWAs) and may satisfy their internal TLAC requirement with a combination of internal and external TLAC instruments.

[45] https://www.federalreserve.gov/newsevents/pressreleases/files/bcreg20161215a1.pdf

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31. The authorities are considering calibrating internal TLAC toward the lower end of the FSB-prescribed 75–90 percent range. In its July 2019 review of TLAC implementation,[46] the FSB observed that the United States fixed internal TLAC by regulation, thus constraining flexibility to calibrate internal TLAC based on CMG discussions and the findings of the FSB resolvability assessment process findings. For most covered IHCs, the risk-weighted assets (RWA) component of the minimum internal TLAC requirement is calibrated at 16 percent RWA (16/18 percent = 88.9 percent internal).[47] Consequently, the U.S. internal TLAC calibration is on the high-end of the 75 percent–90 percent range. Interagency discussions to calibrate the requirement closer to 75 percent are ongoing. The calibration should balance home and host interests and support the group's resolution strategy.

32. The FBAs are working on rules for TLAC disclosures and crossholdings among financial institutions. In April 2019, the FBAs started the public consultation on these two issues,[48] which were highlighted in the aforementioned July 2019 FSB review report as the only two outstanding issues where the United States needed to make further progress. Under the proposed rules, certain banking organizations would need to deduct (from regulatory capital) some investments in unsecured debt securities—irrespective whether they qualify as TLAC—issued by U.S. and foreign GSIBs. The proposed deduction would be implemented by revising the existing deduction framework for certain investments in regulatory capital instruments under U.S. Basel III capital rules. While the authorities have not undertaken a comprehensive TLAC holding survey—and they do not consider this a priority—they expect that the new rule would help ensure that the largest U.S. banking firms will hold no more than a de minimis amount of TLAC instruments issued by GSIBs. Based on SEC disclosures and third-party information, the authorities estimate that the majority of TLAC holdings are non-retail holdings, including high-wealth clients. The authorities should ensure that restrictions on crossholdings between financial companies and on retail holdings adequately reduce contagion risk. The proposals would also require that BHCs and IHCs disclose information long-term debt and TLAC instruments to demonstrate compliance with the U.S. TLAC rules.

33. LAC additional to regular capital requirements should be considered for some non-GSIB U.S. financial companies. So far, the United States has focused on GSIBs' TLAC. However, the simultaneous failure of smaller or less complex financial companies could also impact financial stability, at least at the regional level. The large number of failures during the GFC (with heavy DIF losses) illustrate that this is a practical reality. In a DFA Title II resolution, OLF funds deployed to provide liquidity cannot be used for capital and would need to be repaid. Such considerations suggest that there could be benefits in some non-GSIB U.S. financial companies—

[46] "Review of the Technical Implementation of the Total Loss-Absorbing Capacity (TLAC) Standard," FSB, July 2, 2019.

[47] More specifically, if the covered IHC's foreign parent has adopted a group-wide SPOE resolution strategy, then the covered IHC would be required to maintain minimum internal TLAC not less than the greater of 16 percent RWA, 6 percent total leverage exposures, and 8 percent U.S. tier 1 leverage ratio. Alternatively, if the covered IHC's foreign parent has adopted a group-wide multiple-point-of-entry resolution strategy, then the covered IHC would be required to maintain minimum internal TLAC not less than the greater of 18 percent RWA, 6.75 percent total leverage exposures, and 9 percent U.S. tier 1 leverage ratio.

[48] https://www.federalreserve.gov/newsevents/pressreleases/bcreg20190402a.htm

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prioritizing firms that are subject to resolution planning or have a large regional presence—holding LAC additional to regular capital requirements, in the form of subordinated debt or otherwise. This is the practice in other major jurisdictions, such as the European Union and the United Kingdom; it is consistent with KA10 and KA11, would improve resolvability, and reduce the DIF's exposure. The authorities should adopt policies and methodologies to determine which financial companies' resolvability would benefit from enhanced LAC.

GLOBAL COOPERATION

34. The United States has taken a leadership role in developing and applying international standards on resolution planning and deposit insurance. Using the FDIC's decades-long experience, the United States has played an important role in developing and advocating international standards and good practices for bank resolution and deposit insurance. Particularly the FDIC's international outreach is worth noting with its seminars, technical assistance and training programs, and advocacy for self-assessments on the Core Principles for Effective Deposit Insurance Systems. The FRB and the FDIC jointly chair the CMGs for the eight U.S. GSIBs; as the United States hosts many foreign GSIBs, the agencies participate in the workings of several other CMGs. The FDIC actively reaches out to host jurisdictions where U.S. GSIBs and other internationally active U.S. banks have a systemic presence.[49] These exchanges are supported by Memoranda of Understanding (MOUs) or similar arrangements. The FDIC also engages on request in high-level discussions with non-CMG hosts on resolution strategies, and challenges and opportunities for cooperation. These engagements are broadly in line with pertinent FSB guidance.[50]

A. FBO Branches at Home

35. Extending OLA powers to cover U.S. branches of FBOs could help protect U.S. financial stability. The resolution of FBO branches is subject to the FDI Act for federally and state-licensed federally insured branches, the IBA for uninsured federally licensed branches, and state banking laws for uninsured state-licensed branches (Box 4).[51] Of these regimes, the FDI Act is most closely aligned with the Key Attributes; the DFA is silent on FBO branches. KA 1.1(iii) explicitly requires that the resolution regime cover foreign branches unless certain exceptions apply under EN(1)(e)—the United States does not meet these exceptions.[52] Such coverage would also ensure consistency with

[49] See "Cross-border resolution cooperation and information-sharing: an overview of home and host authority experience," BIS, January 2020.

[50] "Guidance on Cooperation and Information Sharing with Host Authorities of Jurisdictions where a G-SIFI has a Systemic Presence that are Not Represented on its CMG," FSB, November 2015.

[51] In her October 10, 2019, statement, Fed Governor Lael Brainard noted that during the GFC, some foreign branches were among the most active users of discount window borrowing when wholesale funding markets were stressed. She also noted that branch assets have grown as a percentage of foreign bank activities in the United States since the DFA introduced the IHC requirements for FBOs.

[52] EN(1)(e) stipulates that the resolution "regime is not required to apply to domestic branches of foreign banks in cases where resolution of such branches falls within a regime [that] requires the host resolution authorities to recognize or grant automatic mutual recognition of a resolution of the financial institution and all its branches carried out by the home resolution authority."

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EC 7.5, prescribing that the resolution regime enable the resolution authority to take resolution action against FBO branches to support a foreign resolution or where the home authority is not acting, or is acting in a manner that does not take sufficient account of the need to preserve financial stability in the host jurisdiction. Importantly, where the SPOE resolution strategy for the foreign parent of an FBO branch would not be feasible, U.S. authorities will need to take resolution action. To ensure that all financial firms that could be systemic or critical at the time of failure can be resolved consistent with the KA, the DFA should be amended, as recommended by the 2015 FSAP, to subject FBO branches to a Title II regime similar to that for other "covered financial companies."

Box 4. Resolution Regimes for U.S. Branches of Foreign Banks

At end-June 2019, 173 FBO branches held total U.S. assets of about US$2.3 trillion, of which about US$1.8 trillion was held by state-licensed branches. The two largest federally licensed branches had assets of about US$134 and US$123 billion. The six largest state-licensed branches were New York licensed; the three largest branches held assets ranging from US$101 billion to US$175 billion.

Since December 19, 1991, foreign firms cannot establish insured branches in the United States. Certain insured branches operating on that date were grandfathered, 10 of which are still in business. At end-June 2019, the largest two of the six insured state-licensed branches had assets over US$10 billion each; the largest of the four insured federally licensed branches had assets of about US$51 billion.

Insured FBO branches. Statute requires that the OCC and state supervisors appoint the FDIC as receiver. The FDI Act would govern the FDIC's receivership.

Uninsured federally licensed FBO branches. Under the IBA, the OCC appoints a receiver—not necessarily the FDIC—who takes possession of the foreign bank's assets in the United States The receiver has the same authorities exercised by receivers of failed national banks under the National Banking Act (12 U.S.C. § 3102 (i) and (j)), which are limited to winding up the business and the distribution of assets to creditors (12 U.S.C. § 197).

Uninsured state-licensed FBO branches. These branches are subject to state liquidation regimes.[1] In the State of New York, the Superintendent of Financial Services must first satisfy the claims of creditors who had transactions with the branch. Court authorization is required to transfer liquidation proceeds to parent FBO. The Superintendent, or any receiver or liquidator appointed by the Superintendent, may without court approval, sell assets of the branch, other than real estate, with a value of up to US$50,000. Statute is silent on consent for transfers that may be required under contract law and on the regime governing the transfer of liabilities. Common law would, however, generally require the obligee's consent. Upon a court challenge, the Superintendent's decision to take possession of the failed branch can be stayed. The New York Banking Law does not provide for a temporary stay of counterparties' early termination rights. In practice, such a stay is often provided by contract.

[1] Where an FBO has one or more state-licensed branches or agencies, and one or more federally licensed branches or agencies, and the OCC appoints a receiver for the federal branch or agency, the receiver takes possession of all the U.S. property and assets of such FBO—not only the federal branch's property and assets (12 U.S.C. 3102(j)).

B. Foreign Resolution Decisions

36. International standards prescribe speedy, transparent, and predictable procedures to give effect to foreign resolution measures. The KA Preamble, item (vi), explicitly expresses these

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three related expectations for effective resolution regimes and orderly resolution. The FSB Principles for Cross-border Effectiveness of Resolution Actions ('Cross-Border Principles'),[53] paragraph 5 explicitly stipulates that national authorities should ensure that the procedures for giving effect to foreign resolution actions with a recognition process or supportive measures can be carried out with the necessary "speed and predictability;" paragraph 7 stresses the importance of "legal certainty and predictability." The KA Assessment Methodology (EN7(e)) clarifies that KA7.5 (on giving effect to foreign resolution measures) pertains to "statutory," as opposed to "contractual" approaches,[54] and may, "in addition to primary legislation," comprise also legal precedent; EN7(f) notes that the objectives of KA7.5 could be achieved through administrative or judicial processes, or a combination thereof, provided that these processes are "established ex ante" and ensure speedy measures.[55] EN7(e) clarifies that "recognition and supportive measures complement each other and in practice, both may be required to achieve the desired outcome," adding that the "combination of recognition and support measures available in a jurisdiction should enable the resolution authority, supervisory authority, or court in the jurisdiction under review to give effect to [foreign] resolution measures."

37. The U.S. regime for recognition and support for foreign resolution measures comprises mainly court-based processes and supervisory measures. The U.S. authorities do not consider DFA, Title II, to be the avenue through which recognition or supportive measures generally would be effectuated in the United States. Chapter 15 of the U.S. Bankruptcy Code is the primary legal basis for recognition of foreign insolvency proceedings[56] for FBOs, including GSIBs, with any U.S. branches or agencies, the general doctrine of comity offers a legal avenue to seek recognition instead. The authorities expect that supportive measures would most likely take the form of supervisory measures or forbearance from taking supervisory action.

38. The DFA and the FDI Act lack a specific mechanism that would give prompt and predictable legal effect to foreign resolution measures by way of recognition or support. Neither law provides for recognition. Under the DFA—but not the FDI Act—the FDIC, as receiver for a failed BHC, is required to "coordinate" with foreign financial authorities. However, any possible support under the DFA for foreign resolution decisions is only available after activating Title II and the FDIC being appointed as receiver for the failed BHC, which requires political decision-making and could delay support measures. Any support for foreign resolution decisions based on the DFA is

[53] FSB, November 3, 2015: https://www.fsb.org/wp-content/uploads/Principles-for-Cross-border-Effectiveness-of-Resolution-Actions.pdf

[54] International standards do not consider contractual approaches as a substitute for judicial and administrative approaches. The Cross-Border Principles note that contractual recognition approaches offer a workable solution "until comprehensive statutory regimes for giving cross-border effect to resolution action are adopted" and are a way to "fill the gap until statutory approaches have been fully implemented and to complement such approaches by reinforcing the legal certainty and predictability of cross-border recognition under statutory frameworks."

[55] The KA, its Methodology, and the Cross-Border Principles stress that where courts are involved in the recognition process, jurisdictions must ensure that the effective implementation of resolution measures is not compromised. Interestingly, Annex I of the Cross-Border Principles highlights three national examples of statutory recognition frameworks (Singapore, Switzerland, European Union), all of which use an administrative recognition approach.

[56] Chapter 15 (2005) incorporates the UNCITRAL Model Law on Cross-Border Insolvency into U.S. law.

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further constrained by the objectives of Title II, concerning only the stability of the U.S. financial system, excluding consideration for financial stability in foreign jurisdictions. In any case, the DFA does not apply to U.S. branches of FBOs, further limiting its application.

39. Chapter 15 of the U.S. Bankruptcy Code and the doctrine of comity do not meet the expectations set by KA7.5. Chapter 15 does not explicitly refer to foreign resolution decisions, and, importantly, it excludes FBOs, including GSIBs, with any U.S. branch or agency from its scope of coverage.[57] While U.S. courts could recognize a foreign proceeding pursuant to the doctrine of comity, the standards for such recognition are unclear regarding entities that are explicitly excluded under Chapter 15, and, importantly, the doctrine's effectiveness in the resolution of a large and complex financial company is untested. Arguably, FBOs, including GSIBs, with U.S. branches and agencies cannot rely on Chapter 15;[58] and the effectiveness of comity in resolution cases is unclear.

40. Statutory changes are needed to ensure giving prompt and predictable legal effect in the U.S. to foreign resolution measures through an administrative and/or judicial framework. Anticipating the complexities of cross-border resolution, international standards advocate a comprehensive and complementary regime for recognition and support, with supervisory and resolution measures, and administrative and judicial processes, all laid down in primary legislation and supported by other components of the legal framework, such as, legal precedent. Considering the constraints and limitations of the U.S. recognition and support regime, statutory changes are required to ensure prompt and predictable legal effect in the U.S. for foreign resolution measures. Introducing express provisions on support measures—and possibly also recognition processes—in both the DFA and the FDIC Act would help; so would extending OLA powers to cover U.S. branches of FBOs. Bringing FBOs with U.S. branches or agencies within the scope of the U.S. Bankruptcy Code, and introducing therein express provisions on the recognition of foreign resolution decisions, would further improve the current recognition and support regime.

C. Depositor Preference Abroad

41. The 2015 FSAP recommended that the depositor preference rule be extended to depositors of U.S. branches abroad, irrespective of where the deposits are payable. In 2013, the FDIC clarified,[59] in line with a 1994 advisory opinion by the then Acting General Counsel,[60] that the term "deposit liability," as used for the purposes of the depositor preference regime, includes a foreign branch deposit only if it is a "dually payable deposit"; i.e. payable at both the foreign branch

[57] 11 USC. § 109 (b) and 11 USC. § 1501(c)(1).

[58] See Paul L. Lee, Cross-Border Resolution of Banking Groups: International Initiatives and U.S. Perspectives - Part III, 10 PRATT'S J. BANKR. L. 291, 335 (2014), p. 297. Others have suggested amending Chapter 15 to increase the certainty that U.S. courts will recognize foreign resolution decisions. See "Too Big to Fail: The Path to a Solution—A Report of the Failure Resolution Task Force of the Financial Regulatory Reform Initiative of the Bipartisan Policy Center," May 2013, supported by five industry associations in a comment letter to the FDIC (February 18, 2014).

[59] https://www.fdic.gov/news/news/press/2013/pr13081a.pdf.

[60] FDIC Advisory Opinion 94-1, Letter of Acting General Counsel Douglas H. Jones (Feb. 28, 1994).

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and at a U.S. office of the failed IDI.[61] Deposits that are dually payable enjoy depositor preference, though only as an uninsured deposit. Consequently, national depositor preference in the United States discriminates based on the jurisdiction where deposits are payable. This is inconsistent with KA7.4.[62] Moreover, the FDIC's clarification has not been tested in courts. Greater certainty for such depositors could reduce the U.S. banking system's exposure to contagion from a loss of depositor confidence at U.S. banks' branches abroad.[63] This issue can be resolved with a statutory provision giving equal ranking to foreign branch deposits and domestic deposits.[64]

DEPOSIT INSURANCE

A. Bank Deposits: Access in a Day Ensured

42. Operational effectiveness of the U.S. DIS remained impressive during the 2008–2013 surge in failures. For failed IDIs, the FDIC's preferred resolution method is a P&A transaction.[65] The P&A transaction is a time-tested and cost-effective resolution method. Supported by effective recordkeeping by IDIs for timely deposit insurance determination (Box 5), P&A transactions have provided access to insured—and often also uninsured—deposits within typically one business day.[66] This was also the case during the GFC, when the FDIC managed 489 IDI failures. The ability to ensure access to deposits in practice within one business day maintained the FDIC's high standing for depositor protection. Inquiries by the public and anecdotal evidence from a recent IDI failure demonstrate that a public awareness survey, focusing on, for example, complex trust account holders and depositors with low financial and limited language skills would be useful.

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[61] The rule's main purpose was to clarify the treatment of deposits in foreign branches of U.S. chartered IDIs. By modifying 12 C.F.R. § 330.3 (e), the FDIC clarified that it does not insure such deposits, even when they are payable at an office within the United States. The clarification on the treatment of foreign branch deposits for the purposes of the deposit preference rule was not made in the final rule, but rather in the explanatory text accompanying the revised regulations on deposit insurance. See Federal Register, 78 F. R. 56583 (September 13, 2013).

[62] KA7.4 prescribes that national laws and regulations should not discriminate against creditors on the basis of, i.a., the location of their claim or the jurisdiction where it is payable. See also Paul L. Lee, Cross-Border Resolution of Banking Groups: International Initiatives and U.S. Perspectives—Part IV, 11 Pratt's J. Bankr. L. 59 (2015), p. 78: "The FDIA depositor preference provision, as construed by the FDIC, is in direct conflict with Key Attribute 7.4."

[63] See also a joint paper by the law firms Sullivan & Cromwell, Cleary Gottlieb, and Davis Polk on January 2, 2013, observing that "the subordination of foreign branch deposits also increases the liquidity risk for banks, and could even precipitate a bank failure, as subordinated foreign branch depositors have a strong incentive to flee."

[64] As an interim step, the FDIC could issue a formal interpretation or regulation defining the term "deposit liability" as including foreign branch deposits; the joint paper referenced in the previous footnote deemed this "the most legally sustainable interpretation."

[65] See the FDIC Resolutions Handbook for a description of some P&A variations, including Basic P&A, Whole Bank P&A, P&A with Optional Shared Loss, and Bridge Bank P&A. If needed, P&A is executed in combination with a temporary bridge bank. The bridge bank option is rarely used but remains an important resolution tool, particularly for large financial companies and in system-wide crises, to provide time for arranging a permanent transaction and for prospective purchasers to assess the failed bank's condition in order to submit their offers. For use of P&A transactions and payouts since 1934, see the 'Bank Failures and Assistance Data' section on the FDIC website: https://banks.data.fdic.gov/explore/failures.

[66] P&A transactions require several months of preparation by the FDIC—prior to the so-called "resolution weekend"—including marketing the troubled IDI to healthy IDIs and due diligence by prospective bidders.

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Box 5. FDIC Recordkeeping Rules for IDIs

The FDIC uses the claims administration system (CAS) to identify insured and uninsured deposits in failing and failed IDIs. This mission-critical system helps the FDIC to make prompt and accurate payments, and to estimate the amount of uninsured deposits in determining the least costly resolution option. FDIC rules and procedures complement CAS enhancement efforts and mitigate limitations in CAS capability.[1] Particularly two rules address IDIs that are so large as to potentially exceed the capacity of the CAS:

- Recordkeeping for Timely Deposit Insurance Determination Rule (12 C.F.R. Part 370). As of end-2019, 30 IDIs (at end-2019) are either subject to or voluntarily comply with this Rule. These IDIs have either more than 2 million deposit accounts for two consecutive quarters or are affiliated with a qualifying IDI and have chosen to opt into the Rule.[2] These IDIs do not have to follow the following Rule.
- Large - Bank Deposit Insurance Determination Modernization Rule (12 C.F.R. §360.9). As of May 1, 2020, this Rule applies to 148 IDIs with more than US$2 billion in deposits and at least either 250,000 deposit accounts or US$20 billion in total assets for two consecutive quarters.

The remaining more than 3,000 IDIs are subject to a standard data request. FDIC staff works with these IDIs to ensure technical compliance and proper processing of the data. The IDIs' systems and data are subject to regular FDIC testing and audits to ensure accuracy and compliance.

[1] For an in-depth discussion and assessment of the CAS capacity, timeliness, and accuracy, see "Claims Administration System Functionality," FDIC OIG, March 2018.

[2] Of these 30 IDIs, 14 have over 5 million deposit accounts each.

43. The DIF is above its statutory minimum level (1.35 percent) and is progressing toward its long-term target (2 percent). By 2009Q3, the FDIC-administered DIF was fully depleted; by 2018Q3, the DIF completed a multi-year restoration plan. At end-2019, the DIF balance stood at US$110 billion and the reserve ratio at 1.41 percent of insured deposits, the highest level since 1999, and well above the 1.35 percent minimum level set by the DFA. The DIF also has over US$200 billion in public backstops and the ability to collect prepaid premiums from IDIs.[67] As part of a comprehensive fund management plan, the FDIC determined that a 2-percent long-term target is the minimum level needed to withstand future crises of the magnitude of past crises. Extrapolating its performance over the last six years, the FSAP team estimates that the DIF could meet this target in about six years, but this is unlikely due to a number of one-time factors over the last 5–6 years, including one-time assessment surcharges, a higher assessment rate schedule than currently in place, and low bank failure rates.

B. Credit Union Deposits: Flexibility Needed

44. Funding rules for the credit union DIS should be reformed to ensure a higher level of paid-in funds for all credit unions. Despite challenges faced during the GFC when it had to borrow from the UST to prevent its funds from full depletion, the National Credit Union Share Insurance Fund (NCUSIF) was not reformed after the GFC. At end-2019, the NCUA insured around

[67] The backstops include US$100 billion from the UST, which requires consultation with committees of each chamber of the U.S. Congress on the terms for repayment schemes and any special assessments on banks that are needed.

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US$1.2 trillion in deposits for over 120 million depositors. The NCUSIF balance stood at US$16.7 billion at that time. Its largest member had over US$112 billion in assets at end-2019—up from around US$50 billion in 2015; the second largest members had over US$41 billion in assets at end-2019. The NCUSIF funding structure is highly procyclical. The first 1 percent of the NCUSIF balance is not paid-in but booked as deposits from credit union members, which become impaired on credit union balance sheets when the NCUSIF balance falls below 1 percent. In times of stress, this could become a channel for potential contagion. Furthermore, the NCUSIF remains capped at 1.5 percent, and, as a result, only 0.5 percent could at most be paid in. As recommended by the 2015 FSAP, this regime needs legislative reform, including mandatory membership for all credit unions (to ensure consistency with principle 8 of the Core Principles for Effective Deposit Insurance Systems),[68] targeting a much higher level of paid-in funds not constrained by a cap.

CONTINGENCY PLANNING

45. Since the 2015 FSAP, the authorities have continued their financial crisis preparedness efforts. They have undertaken tabletop and playbook exercises at principals' level, including with authorities from the European Union and the United Kingdom. Failed bank reviews and material loss reviews by their OIGs provide the FBAs ongoing learning.[69] The FDIC has undertaken several staff-level exercises, including, for example, on bridge banks, large bank failures, and mid-day liquidity failures. The FDIC is using the lessons learned from these exercises to improve its crisis readiness, including for communications strategies and logistics. In response to the challenges in surge staffing at the start of the GFC, the FDIC developed a surge staffing plan for its Division of Resolutions and Receiverships,[70] and it has an alumni network to quickly employ a qualified pool of former staff who can be placed into duty with minimal training. The FDIC regularly recruits former bankers who could staff bridge and failing banks; it also continues to improve access to contracting resources in support of an increase in resolution activity (for examples, lawyers and auditors).

[68] While all federally chartered credit unions are required to be insured by the NCUSIF (12 U.S.C. § 1781(a)), 10 states allow their state-chartered credit union to obtain primary deposit insurance from a private company.

[69] These reviews are published on the website of each FBA's OIG.

[70] The FDIC's own comprehensive analysis of the GFC concluded that "the FDIC "was shorthanded during the early phase of the crisis," consequently "from 2008 to 2010 some scarce [FDIC] resources were necessarily diverted from resolution activities to infrastructure development," including hiring staff, opening new offices, and developing and updating contracts and information technology systems, and "only a few" of the 1,900 staff contracted between mid-2008 and end-2010 "were veterans of the bank and thrift crisis of 1980 through 1994." See "Crisis and Response: An FDIC History, 2008–2013," FDIC, November 2017." In its 2020 'crisis readiness' assessment, the FDIC OIG found that the FDIC lacks an agency-wide surge staffing plan.

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Box 6. Planned FDIC Action to Improve Crisis Preparedness

FDIC OIG Recommendation	FDIC Planned Corrective Action
Establish and implement a policy providing senior management's crisis readiness directives.	The FDIC will develop a corporate-wide crisis readiness directive that establishes policy for crisis planning and readiness, defines roles and responsibilities, and sets expectations for basic information that readiness plans should address.
Establish a committee to guide and oversee FDIC crisis readiness planning.	The FDIC will assign responsibility to its Operating Committee for overseeing crisis readiness planning efforts. This designation and responsibility will be addressed in the crisis readiness policy.
Establish and implement procedures supporting an agency-wide process for crisis readiness planning.	The FDIC will develop a crisis readiness procedures document that expands on the crisis readiness policy. The procedures will discuss the FDIC's methods of response, communicate roles and responsibilities, define general expectations for readiness plan content and testing, and raise FDIC employee awareness of crisis planning and response processes.
Establish and implement an agency-wide all-hazards readiness plan that identifies and integrates FDIC readiness activities common to all crises impacting insured depository institutions.[1]	The FDIC will engage a crisis readiness consulting firm to obtain advice and recommendations on improving the agency's crisis planning framework and maturing the existing crisis readiness program. Based on this feedback and advice, the FDIC will develop and implement agency-wide readiness plan(s) appropriate for the FDIC's mission and responsibilities.
Establish and implement agency-wide hazard-specific readiness plans, as needed, to identify and integrate FDIC readiness plans and activities unique to specific hazards impacting insured depository institutions.	Based on discussions with subject matter experts and crisis readiness consultants, the FDIC will develop criteria for determining when agency-wide hazard-specific plans are needed. The FDIC will document that criteria in the crisis readiness procedures. The FDIC will then apply that criteria to existing readiness plans and expand plans meeting the criteria to be agency-wide.
Establish and implement a process for ensuring periodic training of responsible personnel on their task-related responsibilities in executing readiness plans.	The crisis readiness policy and procedures will require that readiness plans explicitly state whether staff require any specialized training or skills in order to execute the readiness plan. Further, the FDIC will look for additional opportunities to train staff to conduct operations in a stressful environment.
Establish and implement a process for regularly documenting readiness plan exercise results and related recommendations, and retain that documentation for use in readiness improvement activities.	The FDIC will address expectations for documenting the results of readiness plan exercises and significant follow-on recommendations in the crisis readiness procedures. Documentation will be retained consistent with the FDIC's record retention policy

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Box 6. Planned FDIC Action to Improve Crisis Preparedness (Concluded)

Establish and implement a monitoring process for lessons learned that prioritizes and tracks recommendations to improve readiness activities.	The FDIC will establish, in the crisis readiness procedures, criteria for which priority recommendations resulting from plan exercises should be tracked.
Establish and implement a process to ensure that the FDIC reviews and updates readiness plans on a recurring basis.	The FDIC will develop a process for ensuring that plans remain current. The FDIC envisions having division and office directors periodically certify to the Operating Committee that plans are up-to-date or have been revised. The crisis readiness procedures will address this expectation.
Establish and maintain a central repository of up-to-date readiness plans.	The FDIC will ensure that readiness plans remain up-to-date and are readily available. The FDIC plans to further explore how best to maintain readiness plans with the crisis readiness consultant, including whether a central repository represents the most effective operational response. The FDIC will address expectations for keeping readiness plans up-to-date and readily available in the crisis readiness procedures.
Establish and implement a process to assess and report regularly on the state of the FDIC's Agency-wide readiness to address crises impacting IDIs.	The FDIC will develop a process for periodically assessing and reporting on the state of the FDIC's agency-wide readiness. The FDIC will address this recommendation through the periodic certification and reporting process to the Operating Committee and consideration of action items and recommendations resulting from plan testing. Reporting expectations will be addressed in the crisis readiness procedures.

[1] According to the FDIC OIG report, the term "all-hazards" concerns "all conditions that have the potential to cause injury, illness, or death; damage to or loss of equipment, infrastructure services, or property; or alternatively cause social, economic, or environmental damage." An all-hazards plan "should identify the necessary critical common functions and tasks, and individuals responsible for accomplishing them, regardless of the crisis scenario…while supplemental plans describe any unique requirements for specific hazard scenarios, as necessary based on risk."

46. Despite the FDIC's progress, the FDIC OIG found several critical shortcomings in the FDIC governance framework for crisis readiness.[71] Notably, the FDIC OIG found that "FDIC personnel could not identify any other crisis readiness planning procedures" than a 2015 document titled "Draft Procedure for Identification and Planning for External Risk Events," which the FDIC never finalized and had not updated since 2015; the OIG concluded that the FDIC does not "have

[71] "The FDIC's Readiness for Crises," FDIC OIG, April 2020. The OIG assessment was informed by guidance from the Department of Homeland Security and the Federal Emergency Management Agency on planning for crisis events; The OIG identified seven elements of a crisis readiness framework that are relevant to the FDIC. The OIG did not assess the FDIC's business continuity planning nor its resolution planning for individual firms.

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documented procedures to provide for a consistent crisis readiness planning process." While the FDIC OIG recognized that since the GFC the FDIC has "continued to enhance its readiness for crises impacting IDIs," the OIG found that "the FDIC does not have an overarching framework for integrating and coordinating crisis readiness activities across the [FDIC's] Divisions and Offices," concluding that the FDIC lacks a "holistic Agency-wide approach" and a "common planning template to provide for integrated, comprehensive, and consistent plan development." The FDIC OIG recalled that a 2012 "FDIC Crisis Resources Report" by FDIC staff too recommended "a cooperative, collaborative, multi-divisional Agency approach to readiness activities." The OIG observed that the FDIC had implemented only some lessons learned and recommendations made by the 2012 report.[72] The FDIC OIG made 11 recommendations, which the FDIC agreed to implement by end-March 2022 (Box 6), prioritizing agency-wide crisis preparedness and assigning responsibility to its Operating Committee for overseeing crisis readiness planning efforts.[73]

47. The FSOC should more actively oversee and engage in crisis preparedness work. The DFA established the FSOC to respond to emerging risks to U.S. financial stability. Yet, its activities on more traditional crisis preparedness have been limited and none of the five FSOC committees is responsible for crisis preparedness. Thus, the FSOC has focused less on how interagency cooperation would function in contingencies where risk reduction has not succeeded, and a crisis has materialized. It is not easy to foresee the nature of a next financial crisis and the way in which the agencies, potentially including some beyond the FSOC's purview, may need to interact in crisis management; moreover, the FSOC's design constrains its operations.[74] This reinforces the need for advance collective crisis preparation and fine-tuning the governance to ensure decisive and coordinated responses from the entire FSOC community as per a national crisis management plan.

48. Building on the extensive preparation for the resolution of individual large banks, the authorities should consider how a future systemic financial crisis extending beyond the banking system would best be handled. The COVID-19 pandemic, while still unfolding, may be an example of such a scenario. The GFC began in the investment banking sector and although it spilled over into other sectors, the needed crisis management actions were largely within the purview of the FRB and the FDIC, as long as they were prepared to interpret their mandates in a sufficiently broad manner—though they also needed the urgent appropriation of congressional funding. It is widely acknowledged that the ingenuity and shared vision of the several agencies and of the UST facilitated what was sufficiently decisive action at most of the key decision points. Despite the statutory constraints now imposed on the FBAs' toolbox, it is conceivable that a future crisis—if limited largely to banks and other regulated financial firms in closely related sectors of finance—could also be managed by ad hoc collaboration of the same type. But each financial crisis introduces new and unforeseen elements. A next crisis might have its origin and important parts of its transmission in

[72] The FDIC OIG report notes that the 2012 'FDIC Crisis Resources Report' identified 11 summary recommendations or conclusions, and identified other unnumbered lessons learned and recommendations.

[73] An agency-wide approach would help "to create a shared understanding and a common, integrated perspective of readiness across all mission areas." The Operating Committee would be responsible for "prioritizing readiness tasks, and ensuring the cohesiveness of readiness plans and activities addressing potential crises."

[74] For an in-depth discussion, see the FSAP technical note on systemic risk oversight and systemic liquidity.

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new types of failure and in new types of financial or nonfinancial firms. Needed action might, sooner or later, involve agencies other than the FBAs; although the FRB would surely still play a leading part, it might have to interact with unfamiliar counterparts and with its freedom of action constrained.

49. The FSOC should devote greater attention to preparing the modalities for crisis coordination that could be activated at the time of a next financial crisis. Such modalities would not substitute for the FBAs' statutory responsibilities, which they should continue to exercise autonomously. Interagency contingency planning would be a fruitful role for the FSOC, particularly where crisis responses would require far more than individual agencies' regular planning, such as national financial crisis communications, and in the rare possibility of a DFA Title II resolution without prior Title I planning.[75] The FSOC should ensure that all member agencies and the UST have comprehensive and complementary organization-wide crisis preparedness plans to support the FSOC mandate and to decisively respond to system-wide contingencies. The FBAs should also assess and put in place potential mitigating actions for a case in which several (larger) institutions will need to simultaneously activate their recovery or contingency funding plans. Furthermore, although the COVID-19 pandemic triggered an urgent need for innovative policy responses, the increased role of the Treasury Secretary, as mandated by the DFA for activating several important crisis response tools, has not yet been tested in an actual crisis. It is critical to crisis preparedness and prompt, decisive, and effective action in crisis, that the modalities for the interactions between the UST and the FBAs be operationalized, documented, and regularly reviewed and tested, all supported by a national financial crisis management communications plan.[76] This work should be prioritized under the auspices of the FSOC.

[75] A Title II resolution would give access to the OLF and allow the FDIC to use DFA powers that are not available under the FDI Act. This may be needed in case of a systemic event involving the failure of one or, simultaneously, some of the many large financial companies where the FBAs would not benefit from prior DFA Title I planning.

[76] The national financial crisis management communications plan should support the actions of the FBAs and the UST, help strike the right tone of voice to transmit confidence—without overpromising—to prevent or end creditor runs, reduce variances in communications of the several agencies and UST, and ensure that, collectively, they speak with one voice to financial markets and the general public, and that all senior officials are using the same facts and assumptions.

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Appendix I. Status Update 2015 FSAP Recommendations

2015 Recommendations *Source: the 2015 technical note (Table 1) and the Financial System Stability Assessment (FSSA) report.*	**2020 Implementation Status**
1. Extend the scope of OLA powers to U.S. branches of foreign banks.	The DFA was not changed on this point. The U.S. authorities work closely with foreign resolution authorities in CMGs and through firm-specific cooperation agreements (COAGs) and interagency MOUs, aiming to ensure smooth resolution preparation and execution.
2. Finalize the procedural rules detailing the interaction between the various federal authorities in relation to the commencement of a Title II proceeding under the 'three key process.'	The U.S. authorities undertake regular interagency operational exercises, meetings, teach-ins, and presentations to refresh and confirm their respective roles and responsibilities.
3. Issue guidance on the circumstances (e.g., with scenarios) under which OLA may commence prior to insolvency, with specific examples and which clearly aligns with nonviability.	While the U.S. authorities have flexibility, whether resolution would be triggered sufficiently early, particularly before insolvency and when the firm is no longer viable, will depend on the interpretation of DFA concepts, such as, "in default or in danger of default." In its February 2018 report, "Orderly Liquidation Authority and Bankruptcy Reform," UST recommended to clarify the standard for commencing a DFA Title II proceeding and to particularly specify more clearly when a firm would be considered to be "in danger of default" (pp. 35–36). Such clarification is also required by KA EN(3)(c), prescribing that the "conditions for entry into resolution or exercise of resolution powers should be clear and transparent and set out in law; the standards or suitable indicators of non-viability may be set out in guidance or other policy documents."
4. Adopt powers in the FDI Act to recover compensation, including variable remuneration, from those "substantially responsible" for the failure of the firm.	As receiver, the FDIC has broad powers under the FDI Act to pursue claims and recover monies from directors and officers of an IDI for a variety of reasons, including claims against those substantially responsible for the IDI's failure.
5. Adopt powers under the DFA and FDI Act to require companies in the same group (whether or not they are regulated or are themselves subject to a bankruptcy or resolution proceeding) to continue to provide services, including those not governed by contract, (to the entity in resolution, its successor (including a bridge entity under the SPE strategy) or an acquirer) as necessary to support effective resolution.	In 2016, the KA Assessment Methodology clarified with EN 3(j) that jurisdictions may achieve the objective of KA 3.2(iv) by providing the resolution authority with the power to ensure continuity of critical functions through corporate control over all companies within a financial group. As receiver, the FDIC has such broad powers as required under the KA and recommended by the FSAP. Furthermore, as a result of DFA and IDI Rule resolution planning, all critical services are government by contracts.

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2015 Recommendations *Source: the 2015 technical note (Table 1) and the Financial System Stability Assessment (FSSA) report.*	**2020 Implementation Status**
6. Issue a final notice or regulation, clarifying in further detail, key aspects of the SPE approach including with regard to the valuation process, the communication strategy, and the legal mechanics for establishing a new holding company, the treatment of creditors who would not meet the suitability requirements for shareholders, the disclosure and registration requirements and related waivers applying in a Title II proceeding.	The FDIC's SPE Notice for Comments was published in 2013. In subsequent DFA Title I resolution guidance and feedback letters, the FRB and the FDIC clarified and elaborated on their expectations of firms' capabilities to support their chosen resolution strategy, including on the issues noted in the recommendation, except for disclosures and waivers in DFA Title II proceedings. In the above-mentioned 2018 UST report on OLA reform (pp 35–36), it was recommended to finalize the Notice.
7. Amend the FDI Act to provide the power to override early termination rights in contracts of subsidiaries and affiliates of an IDI.	While the FDI Act was not changed—and could be strengthened—on this point, practically the issue was addressed by changes, after the 2015 FSAP, in the ISDA Master Agreement and Protocol.
8. Identify the disclosure requirements that, in the context of a Title II liquidation, may warrant a temporary and limited waiver, and adopt relevant regulatory changes.	Pertinent disclosure rules were not identified. KA 5.6, EC 5.7, EN 5(f), and EN 5(g) explicitly require statutory powers to grant temporary and short-term exemptions on disclosure rules where disclosure could affect the successful implementation of domestic resolution measures and to support foreign resolution measures. The U.S. authorities disagree with the KA; they advocate transparency to enhance market confidence.
9. Introduce statutory mechanisms to give prompt legal effect in the United States to actions taken by foreign resolution authorities, either by recognition or by taking supportive measures of such actions respecting banks.	No changes were made on this point. See paragraphs 36–40 of this note.
10. Introduce a requirement under the FDI Act for the FDIC, as resolution authority, to cooperate with foreign resolution authorities by taking into account the impact of the resolution measure taken by the FDIC on financial stability in the relevant jurisdictions	While the FDI Act was not changed—and the DFA could be clarified—on this point, there are no statutory impediments for the FDIC to consider the impact of U.S. resolution decisions on financial stability abroad.
11. Amend the bank resolution regime to require the authorities involved in the resolution of a U.S. branch (e.g., OCC, Superintendent), to cooperate with a foreign resolution authority.	Federal and state-licensed U.S. branches of foreign banks are subject to federal and state regimes, respectively, and the regimes focus on liquidation rather than resolution. Statutory duties under both regimes may hinder efforts to support actions by foreign resolution authorities.
12. Introduce a requirement under the bank resolution regime to notify and	For GSIBs, the U.S. authorities concluded COAGs with nonbinding obligations to alert home authorities when it

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2015 Recommendations *Source: the 2015 technical note (Table 1) and the Financial System Stability Assessment (FSSA) report.*	**2020 Implementation Status**
consult with the home resolution authority of a foreign firm prior to exercising resolution powers in relation to a local subsidiary or branch of such firm.	becomes apparent that a domestic branch or incorporated entity is likely to enter resolution. Similar arrangements for other banks have not been made. KA 7.1 explicitly requires that statutes strongly encourage the resolution authority to act to achieve a cooperative solution with foreign resolution authorities; EC 7.1 adds that there be no statutory material barriers to cooperation. Furthermore, KA 7.3 and EC 7.6 explicitly prescribe statutory requirements for resolution authorities to notify and consult with home authorities prior to exercising resolution powers regarding a branch of a foreign bank on its own initiative or independently of action taken by the home authority.
13. Extend the depositor preference rule to depositors of U.S. branches in foreign jurisdictions, whether or not the deposits are payable in the United States.	The FDIC's 'dual payability' rule clarified—but has yet to be confirmed in court—that dually payable foreign branch deposits are treated as deposit liabilities under the FDI Act's depositor preference rule with equal ranking as domestic uninsured deposits but not insured deposits.
14. Formalize criteria for determining the membership of CMGs.	A 2016 Federal Reserve Administrative Letter details the CMG membership criteria for FRB-supervised U.S. BHCs, banks in the portfolio of the Large Institution Supervision Coordinating Committee, and FSOC-designated nonbank financial firms with significant cross-border operations
15. Align the engagement with host authorities that are not represented on CMGs (but where the local activities of U.S.-based firms could be systemically significant or critical at the point of failure) with relevant FSB guidance.	The FDIC has taken steps to identify non-CMG host jurisdictions where U.S. GSIBs have a systemic presence and engages bilaterally with specific non-CMG host authorities on their initiative. These exchanges are supported by MOUs or similar arrangements. The FDIC also engages on request in high-level discussions with non-CMG hosts on resolution strategies, and on challenges and opportunities for cooperation. The FDIC uses similar bilateral arrangements for cooperation with host authorities of other internationally active U.S. banks.
16. Finalize resolvability assessments for all domestic systemically important firms, where appropriate in cooperation with relevant host authorities.	RRP under the DFA for and by the largest and most complex financial companies has progressed since the 2015 FSAP; large IDIs prepare resolution plans under the FDI Act.
17. Provide the agencies with explicit powers to require changes to IDIs' business practices, legal, operational or financial structures that are deemed necessary to improve their resolvability.	The FDIC has broad powers under the FDI Act that it can and does use to improve resolvability under the IDI Rule resolution planning.
18. Continue to pursue reforms to enhance resolvability, including under Title II, and where necessary invoke	In several rounds of plan filings, where the FRB and the FDIC determined that firms' DFA Title I plans had shortcomings or deficiencies, they exercised their DFA powers to require firms

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2015 Recommendations *Source: the 2015 technical note (Table 1) and the Financial System Stability Assessment (FSSA) report.*	**2020 Implementation Status**
regulatory authority to require firms to address identified deficiencies (also see KA10).	to remediate these shortcomings and deficiencies. DFA Title II plans evolved in step with Title I plans. Similarly, the IDI Rule planning has helped to enhance IDIs' resolvability under the FDI Act.
19. Provide the agencies with the authority to require recovery and resolution plans from BHCs and IDIs (irrespective of asset size) in situations where other characteristics (for example in view of their interconnectedness, substitutability and complexity) suggest that they could nonetheless be systemically significant or critical at the point of failure.	The Economic Growth, Regulatory Relief and Consumer Protection Act of 2018 gives the FRB discretion to apply enhanced prudential standards, including requirements for recovery and resolution plans, based on qualitative characteristics such as those identified in the recommendation. The discretion applies to BHCs with over US$100 billion in assets; it does not apply to IDIs. Furthermore, the OCC is authorized to impose recovery planning to a national bank below the minimum asset threshold if the OCC deems the bank highly complex or presenting heightened risk.
20. FSSA, ¶72—Assign formal crisis preparedness and management coordinating role to FSOC.	The FSOC has not assumed a crisis preparedness and management role under its existing statutory mandate to identifying risks to U.S. financial stability, to respond to emerging risks, and to facilitate close collaboration between the agencies whose heads sit on the FSOC. The FSOC was an informal forum for emerging issues, such as, Brexit, Hurricane Sandy, and MF Global's bankruptcy.
21. FSSA, ¶77—Consideration should be given to raising assessments, as bank profitability recovers, to reach the two percent deposit insurance fund target sooner.	The Deposit Insurance Fund grew from 1.09 percent in 2015Q3 (US$72.6 billion at end-2015) to 1.41 percent in 2019Q3 (US$110.3 billion at end-2019). The long-term goal stands at 2 percent.
22. FSSA, ¶78—With some credit unions potentially becoming systemic, there is a need to enhance the deposit insurance regime by removing the cap, targeting a significantly higher level of paid-in funds, and making membership mandatory for all credit unions.	The deposit insurance system for credit unions was not changed on these points.

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United States: Financial Sector Assessment Program-Technical Note-Systemic Risk Oversight and Systemic Liquidity

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IMF Country Report No. 20/246

UNITED STATES

FINANCIAL SECTOR ASSESSMENT PROGRAM

August 2020

TECHNICAL NOTE—SYSTEMIC RISK OVERSIGHT AND SYSTEMIC LIQUIDITY

This Technical Note on Systemic Risk Oversight and Systemic Liquidity for the United States FSAP was prepared by a staff team of the International Monetary Fund as background documentation for the periodic consultation with the member country. It is based on the information available at the time it was completed in July 17, 2020.

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INTERNATIONAL MONETARY FUND

UNITED STATES

FINANCIAL SECTOR ASSESSMENT PROGRAM

July 17, 2020

TECHNICAL NOTE

SYSTEMIC RISK OVERSIGHT AND SYSTEMIC LIQUIDITY

Prepared By
Monetary and Capital Markets Department

This Technical Note was prepared in the context of an IMF Financial Sector Assessment Program (FSAP) mission in the United States held during February–March 2020 led by Ms. Michaela Erbenová. It has been factually updated to incorporate COVID-19-related events in March and April 2020. It contains technical analysis and detailed information underpinning the FSAP's findings and recommendations. Further information on the FSAP program can be found at http://www.imf.org/external/np/fsap/fssa.aspx

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Glossary

ANC	Alternative Net Capital rule for broker dealers
ARRC	Alternative Reference Rates Committee
BD	Broker Dealer
BNYM	Bank of New York Mellon
CCP	Central Counterparty
CCyB	Countercyclical Capital Buffer
CFPB	Consumer Financial Protection Bureau
CFTC	Commodity Futures Trading Commission
CLO	Collateralized Loan Obligation
DERA	SEC Department of Economic Research and Analysis
DFA	Dodd-Frank Wall Street Reform and Consumer Protection Act
DVP	Delivery-versus-Payment
Fed	The Federal Reserve System
FHFA	Federal Housing Finance Agency
FHLB	Federal Home Loan Bank
FICC	Fixed Income Clearing Corporation
FINRA	Financial Industry Regulatory Authority
FMI	Financial Market Infrastructure (referred to as an FMU in the United States)
FMU	Financial Market Utility
FOMC	Federal Open Market Committee
FRA	Federal Reserve Act
FRB	Board of Governors of the Federal Reserve System
FRBNY	Federal Reserve Bank of New York
FRP	FRBNY Foreign Repo Pool
FSAP	Financial Sector Assessment Program
FSOC	Financial Stability Oversight Council
FX	Foreign Exchange
GCF	FICC General Collateral Finance repo
GFC	Global Financial Crisis
GSE	Government Sponsored Enterprise
GSIB	Globally Systemically Important Bank
HQLA	High Quality Liquid Asset
IDTA	Independent Dealer and Trader Association
IMF	International Monetary Fund
IOER	Interest on Excess Reserves
JPMC	JP Morgan
LCR	Liquidity Coverage Ratio
LIBOR	London Interbank Offered Rate
MMF	Money Market Fund
MoU	Memorandum of Understanding

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OFR	FSOC Office of Financial Research
OMO	Open Market Operations
ONRRP	Overnight Reverse Repo facility
REPO	Repurchase Transaction
SBSD	Security Based Swaps Dealer
SCB	Financial Stress Capital Buffer
SEC	Securities and Exchange Commission
SLR	Supplementary Leverage Ratio
SOFR	Secured Overnight Financing Rate
SOMA	Federal Reserve System Open Market Account
SRC	FSOC Systemic Risk Committee
TGA	Treasury General Account
TT&L	Treasury Tax and Loan account program
U.S.	United States

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EXECUTIVE SUMMARY

The heterogeneity of the United States (U.S.) financial markets and complex regulatory and supervisory institutional setup in the United States underscore the importance of enhancing systemic risk oversight and building effective macroprudential tools. An effective framework would encompass identification and prioritization of system-wide risks and vulnerabilities to spur timely policy action. Structures that ensure interagency sharing of information, identify possible emerging regulatory gaps, obtain a good overview of systemic risks, and develop a cooperative framework to address identified threats to financial stability would be necessary components of such a framework. This Technical Note reviews those processes in the United States, as well as examining the issues of systemic liquidity.

The Financial Stability Oversight Council (FSOC) plays the key role in identifying threats to U.S. financial stability and coordinating a response of member agencies. The FSOC annual report provides a comprehensive discussion of the financial risk landscape with particular attention to structural vulnerabilities. The Financial Stability Report issued by the Board of Governors of the Federal Reserve System (FRB) is a welcome and complementary addition to communication of financial stability concerns while the Office of Financial Research's (OFR) annual report provides high quality analysis. FSOC communication and effectiveness could be improved through the release of more detailed minutes and improved traceability of actions taken to address identified vulnerabilities.

Further measures could be considered to improve FSOC effectiveness. Each member should have an explicit objective to promote financial stability as it relates to the individual's work on the FSOC. While it's clear that members have internalized the importance of financial stability analysis, mandates should be robust to changes in personnel and over time. The state-based insurance sector is not represented by a member who has authority to take supervisory action, and as such, consideration could be given to make the State Insurance Commissioner representative a voting member of the Council. Significant data gaps remain, including those of collateralized loan obligations (CLOs) and repurchase transaction (repo) market activity, and it is important that efforts to close gaps be intensified. The Council has made improvements to data sharing through several interagency memorandums of understanding (MoUs).

The FSOC's final interpretive guidance now prioritizes an activities-based approach to identifying and addressing the financial stability risks in the nonbank sector. This approach, which still allows for designation of entities, is in line with international practices and has benefits over the previous entities-based approach. The FSOC should provide further detail on how the new activities-based approach will be operationalized.

The FSOC should encourage its members to prioritize the development of tools to address risks and vulnerabilities in the nonbank sector. Exposure of nonbanks to nonfinancial debt is elevated with no consensus on tools that could be used to address the buildup of risks. Reforms of housing finance (under consideration), provide an opportunity to embed macroprudential elements

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into nonbank activities, while mutual fund liquidity stress tests could be used to mitigate risks from asset managers.

Tools to address structural vulnerabilities in the banking system are generally sufficient while coverage of the Countercyclical Capital Buffer (CCyB) should be extended to improve effectiveness. The FRB's implementation framework for the CCyB highlights the need for judgment while noting the risks of activating the CCyB could lead to migration of credit activity to banks that are not subject to the CCyB, or to nonbanks. For this reason, the FRB should consider expanding CCyB to category IV banks, which would increase the coverage from around 70 percent of banking sector assets to 80 percent.

A key structural driver of money markets has been the Federal Reserve System's (Fed) balance sheet changes. The Fed responded effectively to the spike in interest rates and volatility in September 2019 by restarting regular Open Market Operations (OMOs) and reversing some of the reduction in reserves that had occurred since 2014. Fewer reserves have revealed vulnerabilities caused by a nexus of a desirable tightening in the post-crisis regulatory framework and associated tighter bank liquidity risk management frameworks. Banks have tried to optimize their balance sheets leading to a heightened conservatism with a high aversion to borrowing from the Fed's Window, with a net effect of a less flexible and nimble set of large intermediaries who are less able/willing to provide liquidity when conditions tighten.

Market resilience was severely tested in the March–April COVID-19 crisis period but was backstopped by a plethora of timely Fed actions. The Fed took many steps in line with its history of responding to crises and consistent with the recommendations of this FSAP by quickly scaling up OMOs and outright purchases of securities, improving the terms and accessibility of the Discount Window, enhancing and widening its network of central bank foreign exchange (FX) swap lines, and deploying a range of old and new liquidity support programs aimed at backstopping money and securities markets. The initial experience suggests that market pressures were quickly contained.

Market resilience could be bolstered further if the Fed retains regular OMOs once conditions stabilize and gives banks a better basis to plan to access to the Discount Window to discourage reserves hoarding. Regular OMOs should continue as they provide liquidity certainty to markets and have been proven to be scalable and effective. The Discount Window could be made more attractive if banks were given a better basis for incorporating its use in liquidity planning for monetization of high-quality-liquid-collateral. Broadening the specification of the Fed's operational target to include repo rates would also reduce uncertainty.

The authorities and market participants should work together to address the sole provider vulnerability in the government securities settlement and triparty repo markets. Bank of New York (BNYM) plays a unique role in clearing and settlement, as well as conduct of Fed's repo OMOs. Focus should be on establishing robust and effective backup plans that could be used to preserve markets functioning in the unlikely event of BNYM problems. An option is to consider the possibility

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of repo transactions settling across the Federal Reserve Bank of New York's (FRBNY) systems and accounts as is common internationally.

The Alternative Reference Rates Committee (ARRC) and the authorities have made great strides in delivering on the transition plan but more needs to be done. The end of London Interbank Offered Rate (LIBOR) is fast approaching and firms need to move from planning to transition to the Secured Overnight Financing Rate (SOFR), to actually moving their business. The authorities should play a more proactive role in ensuring that firms move business to the new benchmarks before the LIBOR cessation deadline with time-bound deadlines and firm targets.

Liquidity backstops would be bolstered if the Fed could lend bilaterally to designated systemically important nonbanks. The Fed's ability to provide bilateral liquidity support to an individual designated systemically important nonbank should be reinstated in the law. Additionally, the Fed's liquidity support tools could be enhanced if operational requirements for providing designated Central Counterparties (CCPs) were fully prepared and if procedures for providing FX liquidity support to both banks and nonbanks were better established.

Table 1. United States: Recommendations for Systemic Risk Oversight and Systemic Liquidity

Systemic Risk Oversight and Macroprudential Policies	Timing*	Agency
Improve traceability of actions taken to address identified vulnerabilities (¶12).	ST	FSOC
Ensure each FSOC member has an explicit financial stability objective in their mandate (¶13).	MT	Congress
Upgrade the State Insurance Commissioner member to a voting member (¶14).	MT	Congress
Intensify efforts to close data gaps, including reporting disclosures of holdings of CLOs and leveraged loans, to reinforce market discipline (¶15).	ST	FSOC/OFR
Complete OFR recruitment for key positions and skills as quickly as possible (¶15).	ST	OFR
Encourage its members to prioritize the development of macroprudential tools to address risks and vulnerabilities in the nonbank sector (¶28).	Ongoing	FSOC
Provide an overview of how the new activities-based approach will be operationalized (¶29).	I	FSOC
Consider extending the CCyB to Category IV banks (¶31).	MT	FRB
Systemic Liquidity		
Promote the fungibility of Treasury securities and Reserves by adjusting assumptions about firms' access to the Discount Window in liquidity metrics (¶78).	ST	Fed, OCC, FDIC

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Table 1. United States: Recommendations for Systemic Risk Oversight and Systemic Liquidity (concluded)		
Continue operating regular fine-tuning OMOs (¶80).	I	Fed
Develop robust and effective backup plans in the event BNYM is not able to settle and clear repo transactions (¶90).	MT	Fed
Include repo rates explicitly in the Fed's operational target and focus on a single policy rate (¶82 & 83).	ST	Fed
Examine the merits of an appropriately priced standing repo facility (¶84).	ST	Fed
Develop capacity to conduct repo OMOs in the absence of BNYM (¶90)	MT	Fed
Enact legislation to restore the power to provide bilateral liquidity assistance to designated systemically important nonbanks (¶86).	MT	Congress
Advance preparedness for providing liquidity to systemic nonbanks and Central Counterparties (CCPs) during stress situations (¶87).	ST	Fed, Treasury
Develop a more comprehensive framework to guide market-wide liquidity support in securities markets (¶88).	MT	Fed, Treasury
Develop FX liquidity provision protocols (¶89).	MT	Fed, Treasury
Other Cross-Cutting Issues		
Authorities to set hard targets with deadlines for firms to transition to SOFR and consider applying regulatory powers to encourage faster preparations. Authorities to provide more guidance on standards for use in new SOFR products (¶91).	I	Fed, OCC, FDIC, SEC, CFTC,
* I = Immediate (within 1 year); ST = Short term (within 1 to 2 years); MT = 'Medium Term (within 3 to 5 years).		

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INTRODUCTION

1. This note examines the systemic risk oversight framework in the United States and the capacity of the U.S. authorities to backstop liquidity in key money markets.[1] The note analyzes the systemic risk oversight and macro-prudential framework and the central role the FSOC plays in identifying financial vulnerabilities. It also updates the 2015 recommendations on systemic risk oversight and takes account of new developments—in particular, the proposed change in the FSOC's designation role to move away from designating systemically important entities to a focus on activities. The resiliency of key money markets and the authorities' capacity to backstop liquidity is considered in the context of both normal and stressed conditions for both depository institutions and nonbanks. Markets and nonbanks play a dominant role in intermediating liquidity in the United States and hence, the resiliency of market liquidity and the adequacy of liquidity backstops are key in delivering financial stability.

2. The analytical work reflected in the note was largely carried out before the global intensification of the COVID-19 outbreak. The on-site work supporting the findings and conclusions was conducted during February 18–March 5, 2020. The note has been factually updated to cover events since the conclusion of the on-site visits and is based on information available as of May 15, 2020. The characterizations of the programs implemented as part of the COVID-19 crisis response are based on public announcements by U.S. government agencies and do not reflect the depth of discussions and information-gathering as the rest of the document. The recommendations on systemic liquidity are relevant for the period after the crisis containment phase has concluded.

3. The analysis builds on findings of earlier assessments. Earlier assessments comprises the recommendations made during the 2015 U.S. FSAP (Appendix I).

IDENTIFYING SYSTEMIC RISKS: WHAT HAS CHANGED?

A. Overview

4. The heterogeneity of the U.S. financial markets and complex regulatory and supervisory institutional setup in the United States underscore the importance of enhancing systemic risk oversight and building effective macroprudential tools. The effective framework would encompass identification and prioritization of system-wide risks and vulnerabilities to spur timely policy action where warranted. Structures that ensure interagency sharing of information, identify possible emerging regulatory gaps, obtain a good overview of systemic risks, and develop a cooperative framework to address identified threats to financial stability would be necessary components of such a framework.

[1] The Technical Note was prepared by Kelly Eckhold and Darryl King (both MCM), and Ron Morrow (Bank of Canada, external expert).

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5. The FSOC continues to play a key role in identifying threats to U.S. financial stability and is responsible for coordinating the regulatory responses of member agencies to address these threats. The FSOC is made up of 10 voting members and 5 non-voting with the heads of agencies representing themselves, and not their agency, on the FSOC. The Dodd-Frank Wall Street Reform and Consumer Protection Act (DFA) gives the FSOC a range of powers that enable it to respond to emerging threats to financial stability (Box 1). The FSOC and its standing sub-committees provide a forum for member agencies to bring forward and discuss financial system risks and vulnerabilities and share data and information to support financial stability analysis.[2] The FSOC process has contributed to a collective focus on financial stability issues and helped build strong collaborative interagency relationships.

6. At the core of systemic risk identification and oversight is the monthly meeting of the Systemic Risk Committee (SRC). The main role of this committee is to monitor and analyze financial markets, the financial system, and issues related to financial stability. This analysis is, in turn, used to support the Council's identification and response to financial stability risks. All FSOC member agencies participate on the SRC. The FSOC secretariat regularly solicits member agencies for SRC agenda items, while agenda items may also be referred to the SRC by FSOC principals or deputies. The SRC also plays a key role in the preparation of the FSOC annual report.

7. The FSOC annual report provides a rich and comprehensive discussion of the financial risk landscape with particular attention to structural vulnerabilities. The 2019 report discussed in detail a wide range of risks and vulnerabilities including cybersecurity, CCP resilience, short-term wholesale funding markets, LIBOR transition, and nonbank mortgage origination and servicing. The report contains recommendations, and a section on regulatory developments and FSOC activities, however none of this is tied back to previously identified vulnerabilities.

8. The FRB's Financial Stability Report is a welcome and complementary addition to the communication of financial stability concerns. The semi-annual report, which was first issued in November 2018, covers cyclical issues with the analytical framework set across four categories: (i) asset valuations (covering a wide range of asset classes from farmland to financial assets); (ii) borrowing by businesses and households; (iii) financial sector leverage (including bank and nonbank financial institutions); and (iv) funding risks (assessing the functioning of core funding markets, liquidity conditions of banks, and liquidity and maturity mismatches in nonbanks). This coverage complements well, the FSOC contribution which focuses on structural vulnerabilities.

[2] FSOC Committees include the Deputies Committee; Data Committee; Financial Market Utilities and Payment, Clearing, and Settlement Activities Committee; Nonbank Financial Companies Designations Committee; Regulation and Resolution Committee; and Systemic Risk Committee.

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Box 1. Summary of Duties and Objectives of FSOC[1]

Facilitate regulatory coordination and identify gaps in regulation that could pose risks to the financial stability:[2] The Council has a statutory duty to provide a forum for discussion and analysis of emerging market developments and financial regulatory issues and resolution of jurisdictional disputes among the members of the council.

Facilitate information sharing and coordination:[2] The Council has a duty to collect information and coordinate among member agencies and other Federal and State agencies regarding domestic financial services policy development, rulemaking, examinations, reporting requirements, and enforcement actions.

Take an activities-based approach to identifying and assessing financial stability risk: The Council will prioritize its efforts to identify, assess, and address potential risks and threats to U.S. financial stability through a process that begins with an activities-based approach.[3]

Designate nonbank financial companies for consolidated supervision and enhanced prudential standards: If the activities-based approach does not adequately address the potential risk to financial stability, DFA Section 113 gives the Council the authority to designate nonbank financial companies for consolidated supervision by the FRB, regardless of their corporate form. Designated companies are required to meet heightened prudential standards set by the FRB.

Designate systemic Financial Market Infrastructures (FMIs) and systemic payment, clearing, or settlement activities:[2] The Council has the responsibility to designate Financial Market Utilities (FMUs) as systemically important**.** Under the DFA, designated FMUs have to comply with risk management standards prescribed by the FRB, the SEC, or the Commodity Futures Trading Commission (CFTC) as appropriate. Eight FMUs have so far been designated.[4] The Act also authorizes the Council to designate systemically important payment, clearing or settlement activities. That power has not been used to date.

Recommend stricter standards:[2] The Council has the authority to recommend stricter standards for the largest most interconnected forms, including designated nonbank financial companies. Moreover, where the council determines that certain practices or activities pose a threat to financial stability the council may make formal recommendations to the primary regulatory agencies for new or heightened regulatory standards.

Take action regarding firms that pose a "grave threat" to financial stability: The FSOC has a voting role in any determination made by the Federal Reserve whether to take certain mitigating actions with respect to firms that pose a "grave threat" to U.S. financial stability. No actions have so far been taken under this provision.[5]

---

[1] See 'Frequently Asked Questions on the FSOC' at https://home.treasury.gov/policy-issues/financial-markets-financial-institutions-and-fiscal-service/fsoc/about-fsoc. This is not a comprehensive list.

[2] DFA Section 112.

[3] 12CFR Part 13190: Authority to Require Supervision and Regulation of Certain Nonbank Financial Companies. Final Interpretative Guidance. II A (1)

[4] Designated FMUs are: Clearing House Payments Company LLC; Continuous Linked Settlement Bank International (CLS); Chicago Mercantile Exchange (CME); Intercontinental Exchange Clear Credit LLC (ICE); Depository Trust Company (DTC); Fixed Income Clearing Corporation (FICC); National Securities Clearing Corporation (NSCC); and Options Clearing Corporation.

[5] FSOC is tasked to provide an affirmative vote on such actions, following a determination by the Board of Governors of the Federal Reserve System that a firm poses a grave threat (DFA Section 121).

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9. The OFR's annual report also complements the FSOC annual report, providing an overall assessment of the risks to financial stability. The OFR structures its assessment around several key categories of risk: macroeconomic, market, credit, solvency and leverage, funding and liquidity, and contagion.[3] The OFR's report also highlights key financial system vulnerabilities based on their own analysis as well as concerns voiced by financial regulators, financial market participants, and other financial system stakeholders. The OFR produces several publications including the quarterly updates of its Financial System Vulnerabilities Monitor which presents a heat map of 58 indicators of potential vulnerabilities in the financial system.[4]

10. The FSOC has made improvements to data sharing through a number of interagency MoUs. The OFR also maintains the FSOC Interagency Data Inventory which catalogs the data collections of FSOC members and other government organizations. The inventory can be used to search for data more easily and to analyze gaps and overlaps in data collections. In the event an FSOC agency wishes to access data from another agency where there is no pre-existing MoU for data sharing, procedures have also been put in place between agencies to expedite ad-hoc data sharing. The OFR recently commenced publishing data from its new survey on cleared repo transactions, while other FSOC members have gathered data on leveraged loans, CLOs, and nonbank mortgage lending to support the systemic risk analysis. Despite the progress, data gaps related to these activities remain.

11. The OFR was restructured in 2018 with its workforce reduced by approximately 110 employees—a more than 50 percent reduction (Figure 1). It is in the process of hiring once again, and once fully staffed, is expected to employ up to 145 people. Through this transition, the agency has continued to deliver on its key mandates that critically support the systemic risk assessment work of the FSOC (data collection, standardizing data formats, developing applied and long-term research, and measuring and monitoring risks).

Figure 1. United States: OFR Resourcing

Note: Full-time staff at the Office of Financial Research and annual funding.
Sources: OFR, IMF staff.

[3] https://www.financialresearch.gov/financial-vulnerabilities/#/

[4] Bank Systemic Risk Monitor, Financial Stress Index, Financial System Vulnerabilities Monitor, U.S. Money Market Fund Monitor, and the Financial Markets Monitor.

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B. Recommendations

12. FSOC communication and effectiveness could be improved through the release of more detailed minutes and improved traceability of actions taken to address identified vulnerabilities. The traceability of actions taken to address identified vulnerabilities should be improved. The annual report is not structured in a way that allows the reader to match identified stability risks against actions currently being considered by members, or past actions already taken, to mitigate these risks. Regulatory changes made by member agencies are listed but are not linked back to identified vulnerabilities and, in some cases, are unrelated to any identified vulnerability. Where possible, specific actions being considered by member agencies to mitigate identified potential systemic risks should be identified. Subsequently, actions taken should also be linked back to identified vulnerabilities. While recognizing the full transparency of the open sessions of FSOC (generally two per year), consideration could be given to releasing more detailed minutes of the meetings held by the Principals that are not open to the public (there were three non-public meetings in 2019 and seven in 2018). These minutes currently released, are generally high level, and it is well appreciated that to release more detail requires careful consideration of the trade-off between the benefits of enhanced transparency and the need to protect supervisory and other market-sensitive data from disclosure in order to prevent destabilizing market speculation that could occur if that information were to be disclosed.

13. Many agencies represented on FSOC have only weak or no financial stability objective in their mandate. While it's acknowledged that many members have clearly internalized the importance of financial stability analysis and make significant contributions to the Council's work, mandates should be robust to changes in personnel and over time. It is recommended that each member agency should be provided with an explicit objective to promote financial stability as it relates to that member's work on the FSOC. The inclusion of a specific financial stability mandate would reinforce their focus on financial stability issues and incentivize members to take actions to address stability risks. Changing member mandates in this way would not undermine FSOC's role in financial stability issues.

14. The insurance sector does not have a voting member on the FSOC who has authority to take supervisory action. The insurance sector is represented by the independent member with insurance expertise who is a voting member, the Director of the Federal Insurance Office (who is a non-voting member), and a State Insurance Commissioner (who is also a non-voting member). Of those three members, only the State Insurance Commissioner has any authority to supervise and regulate insurers. It is recommended to upgrade the State Insurance Commissioner member to a voting member.

15. The FSOC annual report notes that significant data gaps remain and efforts to close data gaps should be intensified. Such gaps undermine efforts to conduct effective research into areas of potential financial vulnerability. Also, some market participants have been slow to adopt relevant consensus-based data standards that inhibit data sharing and collection. It is therefore important that efforts to close data gaps be intensified. Additional repo data covering the bilateral

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non-cleared market should be collected to complement existing data and create a complete picture of repo market activity, as well as data on leveraged loans, CLOs, and residential mortgages originated and serviced by nonbanks. To ensure that the OFR is well positioned to deliver on its important mandate, and in the wake of its recent restructuring the OFR should complete its recruitment for key positions and skills as quickly as possible.

DEALING WITH SYSTEMIC RISKS: IS THE TOOLKIT ADEQUATE?

A. Overview

16. Tools to address potential systemic risks are distributed across FSOC members who are collectively accountable for identifying and responding to threats to financial stability.[5] The toolkit mainly consists of agencies exercising their own powers vis-à-vis the entities they oversee, to either mitigate potential systemic risks or strengthen the resilience of the financial system against systemic risk events. Tools that reside with the FSOC consist of the authority to issue recommendations for new or heightened regulatory standards to financial regulators (DFA s120), designate nonbank financial companies for consolidated supervision (DFA s113), and designate systemically important financial market utilities or payment, clearing and settlement activities (DFA s804). The United States, however, stands out amongst its peers as not having any borrower-based tools in the housing sector.

17. Tools to deal with structural and cyclical vulnerabilities in the banking system are generally sufficient. Tools to enhance the structural resilience of the banking system include the Globally Systemically Important Bank (GSIB) capital surcharge as well as enhanced capital and liquidity standards for large banks (category I and II banks). For cyclical vulnerabilities, the CCyB is applicable to large internationally active banks, and it has not been activated since it was introduced in 2013. The FRB issued the framework for implementation of the CCyB in 2016 noting that the purpose of the instrument was to increase the resilience of large banking organizations (applicable to banks with more than US$250 billion in assets, categories I–III) when there was an elevated risk of above-normal losses and to reduce fluctuations in the supply of credit.[6] In setting the CCyB, the FRB considers a wide range of financial and macroeconomic indicators to assess financial system vulnerabilities which include asset valuation pressures, risk appetite, leverage in financial and non-financial sectors, and maturity and liquidity transformation. The FRB notes that empirical models that capture a manageable set of quantitative indicators (e.g., combinations of credit-to-GDP to trends in residential and commercial real estate) can be a useful input for the setting of the CCyB while emphasizing the need for judgement as no fixed set of indicators can adequately capture all the

[5] IMF Macroprudential Policy Survey: https://www.elibrary-areaer.imf.org/Macroprudential/Pages/Reports.aspx.

[6] Federal Register 09/16/2016: Regulatory Capital Rules: The Federal Reserve Board's Framework for Implementing the U.S. Basel III Countercyclical Capital Buffer.

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vulnerabilities on the financial system. Also considered is the extent to which activation of the CCyB could lead to migration of credit activity to banks that are not subject to the CCyB, or to nonbanks. One view is that because of high through-the-cycle capital requirements, that it is appropriate to set the CCyB at zero in a normal risk environment, which could be most of the time.[7]

18. The recently finalized stress capital buffer (SCB) also potentially operates in a countercyclical manner. This buffer includes supervisory stress test losses, four quarters of planned common stock dividends, and the GSIB buffer.[8] The SCB's two components that potentially act in a countercyclical way are: (i) the stress scenarios (the gap between the current economic conditions and the stress scenario would be smaller during a downturn which may offset some of the procyclicality in stress test loss rate), and (ii) planned dividends (banks plan to have higher dividend payouts when conditions are good and profits are high). However, the macroeconomic stress scenarios appear less effective as a countercyclical tool than the requirement to pre-fund dividends and share buybacks. In this regard, reducing the pre-fund requirement to four quarters, instead of nine, might have reduced the countercyclical nature of the stress tests.

19. In late 2019, the FSOC published final interpretive guidance that modified its approach to assessing the financial stability risks associated with nonbank financial companies. Efforts to identify, assess, and address financial risk and vulnerabilities will now prioritize an activities-based approach rather than the previous approach where the focus was on entities. The FSOC states in the guidance that the new approach may allow it to more effectively identify and address the underlying sources of risks to financial stability on a system-wide basis and reduce possible competitive market distortions that could result from entity-specific designations.

20. The first step under this new approach involves an ongoing activities-based assessment of nonbank financial entities. As potentially risky activities are identified, the FSOC will focus on framing questions in the first step of the activities-based approach: (i) What are the triggers that could give rise to a potential financial stability risk (e.g., sharp reductions in asset prices or large credit losses)? (ii) What is the manner or mechanism in which this potential risk is transmitted to other parts of the financial system? (iii) What is the magnitude and breadth of the spillover effects from this risk to other companies and markets? (iv) Could the cumulative adverse effects of the potential risk impair the financial system and harm the U.S. economy?

21. When the FSOC identifies an activity that poses a potential risk to financial stability it will then engage with relevant state and federal financial regulators. The overall objective is to leverage existing regulators knowledge and expertise as well as their ability to take the necessary regulatory or supervisory actions to mitigate the identified risks or vulnerabilities.

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[7] For example, see Quarles R.K. March 29, 2019: Frameworks for the Countercyclical Buffer. These remarks represent personal views, which do not necessarily represent those of the Federal Reserve Board or the Federal Open Market Committee.

[8] For further discussion on the SCB, see USA FSAP Technical Note 2020: Banking Supervision and Regulation.

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22. If the FSOC believes that the actions taken by relevant regulators do not adequately mitigate the potential risks to financial stability it can then publicly issue non-binding recommendations to the relevant regulators. This is an existing power of the FSOC (DFA s120), but it is now subject to a cost-benefit test under the "final interpretive guidance." The FSOC will ascertain whether the relevant primary financial regulatory agency would be expected to perform a cost-benefit analysis of the actions it would take in response to the Council's contemplated recommendation. In cases where the primary financial regulatory would not be expected to conduct such an analysis—the Council itself will prior to making a final recommendation—conduct such an analysis. The FSOC will issue the recommendation only if it believes that the results of its assessment of benefits and costs support the recommendation.

23. If the activities-based approach does not adequately address the potential risk to financial stability, the FSOC may still consider entity-specific designation as last resort. Entity-based designation, which subjects nonbank financial institutions to consolidated supervision by the FRB is an existing power of the FSOC (DFS s113) but is now subject to both a cost-benefit analysis and an assessment of the likelihood of the nonbank financial company's material financial distress under the "final interpretive guidance." Importantly, under Section 113(f) of the DFA, the FSOC may waive or modify the procedural requirements related to nonbank financial company designations if the FSOC determines that such action is necessary or appropriate to prevent or mitigate threats posed by a nonbank financial company to U.S. financial stability.

24. The activities-based approach to identifying risks to financial stability is in line with international practices and has benefits, although the specifics around its implementation, are yet to be announced. The activities-based approach is intended to identify and address risks to financial stability on a system-wide basis, regardless of the type of entity, regulatory body, or charter and will reduce potential for regulatory arbitrage and competitive disadvantages across entities and sectors. This will allow existing regulatory entities, for example, the state insurance regulators, to address potential threats to financial stability rather than have an additional regulator, (i.e., the FRB) involved. Under the "final interpretive guidance," risks to financial stability that can be assessed include elevated asset valuation risk, rising credit risk, excessive leverage, elevated liquidity risk, interconnectedness across the financial sector, growth of unregulated financial activities, and operational risks including those arising from the digital transformation of the financial sector.[9]

25. The new restriction placed on the use of DFA s120 and s113 is a potential barrier to the FSOC's ability to issue recommendations to primary regulators or undertake entity-specific designation. In order to conduct a cost-benefit analysis of either a recommendation or a designation decision, the expected benefits of such an action must be calculated under the final interpretive guidance. This requires the calculation of the expected costs that will arise if a financial stability risk is triggered, and an estimate of probability of the trigger occurring. The former is challenging enough which will require several strong assumptions, including determining how the risk will impact other financial institutions, financial markets, and the economy as a whole. The latter

[9] Federal Register/Vol. 84, No 249: Financial Stability Oversight Council 12 CFR Part 1310, RIN 4030-ZA00.

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will be exceptionally difficult to assess, given the inherently large number of extreme but plausible events that could trigger the risk. Of concern here, is to ensure that the process does not constrain the FSOC from responding to all identified risks within the timeframe that allows for the mitigation of such risks.

26. The new activity-based approach could also make it difficult to identify situations where an entity's activities are collectively systemically important, but the activities individually are not seen to be a risk to financial stability. As an example, a nonbank financial institution operating with high leverage and reliance on short-term wholesale funding may perform multiple activities including as an intermediary across multiple markets, but none of these activities when considered individually give rise to the potential for systemic risk. In such a scenario, the activities-based approach will be challenged to identify situations where the firm's simultaneous failure across multiple activities could lead to a cascading series of failures across markets and other participants giving rise to a systemic risk event. An example of such a situation is Lehman Brothers—a firm whose failure was a catalyst for systemic risk contagion during the global financial crisis (GFC).

27. A final challenge for the new approach may involve activities that are outside of the current regulatory perimeter. Payment service providers, which are currently not subject to state or federal prudential regulatory requirements, offer a possible example of this type of situation. Here, if the payment service provider started to play a dominant role in payments intermediation, the disruption of that payment service provider could pose significant risk to the financial system. In this example, there may not be a primary financial regulator to help gather information or take action to address the potential risk, yet it is still part of the FSOC's mandate to highlight the gap in regulation (DFA s112(a)(2)(G)).[10]

B. Recommendations

28. In keeping with its mandate to respond to emerging threats to financial stability, the FSOC should encourage its members to prioritize the development of macroprudential tools to address risks and vulnerabilities in the nonbank sector. Of high priority here is to develop tools to address the systemic risks arising from high corporate leverage, while two further areas are noted:

- Changes to key elements of the U.S. mortgage finance system, which are currently under consideration, provide an opportunity to embed macroprudential elements into nonbank activities.[11] The Consumer Financial Protection Bureau (CFPB) is currently considering changes to the qualified mortgage definition, while at the same time, the Treasury and Federal Housing

[10] The FSOC is required to report to Congress any case in which no primary financial regulatory agency exists for a nonbank financial company conducting financial activities which pose a risk to financial stability.

[11] Of the US$11 trillion in residential mortgages, US$3.6 trillion (33 percent) is held by banks, representing 20 percent of banking sector assets. Over half of the mortgages are originated by nonbank mortgage companies.

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Finance Agency (FHFA) are examining options for ending the conservatorship of Fannie Mae and Freddie Mac.[12] This provides an opportunity for a holistic approach to be taken to the design and interaction of the Government Sponsored Enterprise (GSE) capital regime, mortgage underwriting and insurance standards, and lending restrictions aimed at ensuring borrowers' ability to repay their mortgage loan. As authorities undertake this work, they should consider the full range of changes and how best to integrate and calibrate macroprudential elements (e.g., debt service ratio standards or integration of CCyB-like element into GSE capital requirements) to improve the resilience of the financial system.

- Consistent with stress testing work undertaken during the FSAP, the Securities and Exchange Commission (SEC) should consider several changes to mitigate asset manager liquidity risks. First, the SEC should explicitly require mutual funds to perform liquidity stress tests as part of their liquidity risk management program. Second, asset managers should be required to align the redemption frequencies more closely with the asset liquidity. Finally, the SEC could consider mandatory liquidity buffers for mutual funds exposed to liquidity risk.

29. The FSOC should, as soon as possible, provide more detail on how the new activities-based approach will be operationalized. Authorities indicated that the FSOC Deputies Committee has approved a process for implementing the activities-based approach—this information, perhaps in a summarized but sufficiently detailed form, should be promptly communicated to the public.

30. The FSOC should be transparent about its use of the activities-based approach in its annual report. Many of the risks and vulnerabilities already identified in the FSOC's annual report fit well with an activities-based approach. To this end, the FSOC should clearly identify the potential risks being considered under this new approach and describe its ongoing engagement with relevant regulators. This description should cover the actions that have been or will be taken by primary regulators to better understand and mitigate the potential risk, as well as those actions taken to strengthen the resilience of the financial system in light of the potential risk.

31. The FRB should consider extending the CCyB to Category IV banks. Limiting application of the CCyB to Category I–III banks results in 70 percent of banking asset coverage and with it the risk that activation could lead to migration of credit activity to other large banks, a concern noted by the FRB. Extending the CCyB to Category IV banks would increase coverage by another 10 percent of banking assets which reduces the risk of such migration, while increasing the efficacy of the instrument. This approach is aligned with the recommendation for the authorities to consider extending the Liquidity Coverage Ratio (LCR) and the Net Stable Funding Ratio to all large banks (see Technical Note on *Banking Supervision and Regulation*).

[12] The DFA (s1411 and s1412) requires that for residential mortgages, creditors must make a reasonable and good faith determination that the consumer has a reasonable ability to repay the loan. Congress established a presumption of compliance for 'qualified mortgages' which are mortgages that meet criteria as defined in CFPB rules.

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ARE THERE VULNERABILITIES IN MONEY MARKETS AND ARE BACKSTOPS ADEQUATE?

A. Background—Systemic Liquidity Risks and Their Financial Stability Implications

32. Systemic liquidity risk is the risk that multiple institutions simultaneously face liquidity difficulties. Such risks, if not contained, can lead to solvency concerns across the financial system. Individual institution liquidity stresses can amplify into to systemic risk through financial system interconnectedness. An initial shock could be amplified in financial markets to dislocate important liquidity markets.

33. Maturity mismatches and foreign exchange mismatches increase systemic liquidity vulnerabilities. Maturity mismatches lie at the heart of systemic liquidity vulnerabilities as institutions to can encounter difficulties in accessing new funding or refinancing existing funding (funding liquidity risk). If markets become less liquid, firms may be unable to liquidate assets at reasonable prices within a reasonable timeframe (market liquidity risk). FX asset-liability mismatches compound systemic liquidity vulnerabilities as central banks can more easily and effectively backstop domestic currency funding shortfalls.

34. The U.S. financial sector structure raises the importance of the maintenance of an adequate level of money market liquidity for financial stability. Credit intermediation in the United States occurs primarily in markets. While banks only hold about one-fifth of financial system assets, nonbanks play a large role and are heavy users of markets to raise funding and to manage liquidity risks.

Key Liquidity Markets

35. The Fed funds market is the key unsecured interbank segment.[13] The Fed funds market typically trades between US$40–80 billion per a day but has declined in prominence over the last 20 years as the repo market has grown to encompass a much wider range of entities (Figure 2, panel 1). The Fed's expansion of reserve balances—quantitative easing (QE)—also played a role in reducing Fed Funds market trading. Activity in the Fed funds market largely reflects Federal Home Loan Banks (FHLBs) and other GSE lenders of funds (whom have relatively conservative investment guidelines and more limited investment options) to domestic and foreign banks (who find such borrowing advantageous from a regulatory perspective).[14] Both banks and GSEs operate in the repo and Fed

[13] The Fed funds market is segmented. Depository institutions receive remuneration on their balances at the rate set on Interest on Excess reserves, while balances held by the FHLBs are not remunerated.

[14] The outflow assumptions banks must make when calculating their Liquidity Coverage Ratio (LCR) are less conservative for short term loans banks take from GSEs and the FHLBs in the Fed funds market compared to other types of short-term borrowings. Hence, bank borrowers in the Fed funds market have lower liquid asset requirements (at the margin) and a lower effective cost of funds associated with such funding.

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funds markets with price discovery increasingly occurring in the much larger repo market and transmitted to the Fed funds market through arbitrage (Box 2).

Box 2. Price Discovery in Key Money Markets

Historically the Federal Reserve has always focused on the level of the Fed funds rate when determining the implementation of monetary policy. Motivating this has been that the Federal Reserve itself directly supplies the reserves that balance Fed funds demand. Banks in the 1990's were active in the Fed funds market and it was an important marginal source of funds for banks (Figure 2, panel 1).[1]

There is a significant body of research that shows that there is a two-way link between trends in the Fed Funds market and the repo market. These links fluctuate depending on the strength of arbitrage, the level of interest rates, and the relative abundance of reserves. Bech, Klee and Stebunovs (2011) show that the pass through of the Fed funds rate to repo rates deteriorated during the zero lower bound period.[2]

Statistical analysis of the Granger Causality between the Fed funds and repo markets confirms that a two-way causality exists (Box table below). This seems consistent across different sub-periods since 2014 and after taking account of exogenous factors such as quarter end effects and the level of excess reserves.

Granger causality analysis of the links between the Federal Funds and Repo markets.[3]

Period	Exogenous	Equation			
		EFFR SOFR		SOFR-EFFR	
		F-Stat	adj. R^2	F-Stat	adj. R^2
August 2014-November 2019	None	7.44 (****)	0.11	6.76 (****)	0.11
"	Quarter-end	9.65 (****)	0.23	11.6 (****)	0.45
"	Excess Reserves	7.25 (****)	0.11	6.49 (****)	0.11
"	Quarter-end and Excess Reserves	9.49 (****)	0.23	11.35 (****)	0.47
August 2014 - December 2017	None	5.95 (****)	0.23	2.31 (**)	0.16
"	Quarter-end	9.3 (****)	0.41	7.28 (****)	0.45
"	Excess Reserves	7.04 (***)	0.26	3.04 (**)	0.2
"	Quarter-end and Excess Reserves	9.24 (****)	0.42	7.24 (****)	0.45

(**) 5% significance, (***) 1% significance, (****) 0.5% significance
Estimates for VAR models in differences with 3 lags. Lag length was chosen using selection-order critera as AIC, SBIC, FPE
Dummies for End-of-month, FOMC meeting, or FOMC minute release were not significant and thus not included

[1] See Bech and Atalay (2008) https://papers.ssrn.com/sol3/papers.cfm?abstract_id=1299021 for a useful analysis of the literature on the operation of the Federal Funds market and for data on the volumes traded and activity of the market from 1997–2006.

[2] See Bech, Klee and Stebunovs (2011) Arbitrage, Liquidity and Exit: The Repo and Federal Funds Markets Before, During, and After the Financial Crisis, Paolo Baffi Centre Research Paper No. 2011–99 https://papers.ssrn.com/sol3/papers.cfm?abstract_id=1884155.

[3] Federico Grinberg (IMF) contributed to this analysis.

36. The FX swap market is a key liquidity conduit given the U.S. dollar's global funding currency role. International investors and borrowers are an important part of the U.S. dollar money markets. Developments in the domestic U.S. money market critically influence and are influenced by the supply and demand for U.S. dollars globally. The FX swap market is a key conduit linking the

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offshore and domestic money markets. Turnover in FX swaps involving the U.S. dollar dominate global FX swap market turnover at around US$2.9 trillion per day.[15]

37. Short term Treasury and U.S. government agency markets along with the commercial paper market are important sources of funding for the wider economy. These markets are still of a significant size (e.g., corporate paper outstanding was around US$1,149 billion as at the end of January 2020) but are less heavily traded in the secondary markets. Hence activity in these markets is less important for price discovery and the liquidity management of intermediaries.

38. The U.S. money markets center around a vibrant repo market. The repo market is the largest globally and is central to channeling liquidity and funding between banks, FHLBs, and nonbanks. Repo market turnover is at least US$2.9 trillion a day, dwarfing turnover in other key market segments (Figure 2, panel 2).

B. Repo Markets

39. The repo market is very large with most repos transacted on an overnight basis. There are several actively traded repo market segments (Figure 2, panel 3). The extent of total activity is uncertain as the uncleared bilateral repo market is not well measured even though it is widely understood to comprise around half of total activity.[16] Much activity is in the overnight segment, but perhaps a third to a half of activity is for longer maturities up to six months. Overnight repo trading is favored by cash investors and borrowers alike. Repo is heavily used by leveraged investors in U.S. treasuries who have tended to favor overnight funding in recent years as liquidity has been plentiful and funding cheap. A significant increase in the supply of U.S. treasuries in recent years has been a key driver of increased repo market activity.

40. A wide range of investors and borrowers use repo markets for funding and liquidity management. Fund and asset managers, along with other liquid nonbank financial institutions (for example foreign central banks) are important cash lenders in the repo market. Cash borrowers include primary dealers, hedge funds, and other smaller broker dealers (BDs) who use repo to finance securities holdings or matched repo books (primary dealers in particular). Money market funds play as especially prominent role as key cash investors via overnight repos, consistent with the tighter liquidity requirements in the wake of the money market fund reforms completed in

[15] BIS triennial FX turnover survey, April 2019 https://stats.bis.org/statx/srs/table/d11.1 .

[16] One of the most comprehensive estimates was obtained by a pilot study of the bilateral repo market conducted by the OFR and the Federal Reserve with input from the SEC which estimated bilateral repo trading at around half of the total market. See "The U.S. Bilateral Repo Market: Lessons from a New Survey (PDF)," by Viktoria Baklanova, Cecilia Caglio, Marco Cipriani, and Adam Copeland, Office of Financial Research Brief Series 16–01, January 2016. The OFR intends to issue a data collection rule establishing a permanent collection of bilateral repurchase agreements and certain securities lending activity data (see the Minutes of the Financial Stability Oversight Council (PDF), September 22, 2016.).

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October 2016. Primary dealers play a key intermediation role and the biggest primary dealers are affiliated with U.S. banks.

41. Smaller broker-dealers play a significant role in the repo market—especially in the cleared Fixed Income Clearing Corporation (FICC) Delivery-Versus-Payment (DVP) repo market segment. Comprehensive estimates of their total turnover are not available although a group of the larger entities that form the "Independent Dealer and Trader Association" (IDTA) estimated their members daily turnover of US$150–200 billion per day from April 2018–February 2019. This was around a fifth of the total repo turnover used to calculate the SOFR benchmark over the same period.[17] Smaller broker-dealers are less tightly regulated than primary dealers and banks and tend to be highly leveraged owners of U.S. government and agency securities financed using overnight repos in the cleared DVP repo market segment.[18]

42. Repos trade across two main segments—each of which has a centrally cleared and uncleared sub-segment. Tri-party repo is around a third of the market (Figure 2, panel 3) and is based on the clearing and settlement infrastructure provided by the BNYM.[19] JP Morgan provided these services until they withdrew in 2016. BNYM provides collateral valuation, margining, and management services to facilitate tri-party trading. There are two tri-party repo segments: non-centrally cleared tri-party repo, which are tri-party transactions not cleared through the FICC; and General Collateral Finance (GCF) repo, which is an inter-dealer market where repos are traded in a blind-brokered market and novated to the FICC, which acts as a central counterparty. The bi-lateral repo segment comprises half of the market. The uncleared segment is not well measured and reflects transactions negotiated and settled directly between broker-dealers and customers. There is a robust DVP centrally-cleared market, additionally, there is a relatively small but fast growing cleared bilateral repo segment that exists in the DVP repo market, called sponsored repo, where transactions are negotiated bilaterally but settled at the FICC, through a set of participants that act as settlement agents and guarantors for the repo trades of their clients.

43. While a wide range of securities are used as collateral, Treasury, and agency securities predominate. Treasury and agency securities are the largest collateral segments, but a very wide range of other collateral is available in repo—especially outside of the tri-party repo market.[20]

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[17] See IDTA, White Paper on the Repo Market Affecting U.S. Treasury and Agency MBS, December 6, 2019—https://www.idtassoc.com/s/IDTA-White-Paper-12619-c2.pdf.

[18] The SEC Department of Economic Research and Analysis (DERA) quarterly Economic and Risk Outlook issued in November 2019 provides a useful overview of the activities of the SEC-registered broker-dealer community—see pages 9–11 at https://www.sec.gov/files/DERA_Quarterly%20Economic%20and%20Financial%20Outlook%20Nov%202019.pdf

[19] A useful overview of the structure of the repo market is available at Bowman, David, Joshua Louria, Matthew McCormick, and Mary-Frances Styczynski (2017). "The Cleared Bilateral Repo Market and Proposed Repo Benchmark Rates," FEDS Notes. Washington: Board of Governors of the Federal Reserve System, February 27, 2017, https://doi.org/10.17016/2380-7172.1940.

[20] Federal Reserve Bank of New York data indicate that 60 percent of repos were against US Treasury securities over 2019—see https://www.newyorkfed.org/data-and-statistics/data-visualization/tri-party-repo#interactive/tripartygcf

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Figure 2. United States: Structure of Key Money Market Segments

The repo market has increased in importance as more participants have gained repo market access…

1. Estimated Federal Funds market versus Repo market traded volumes 1998-2000
(USD billions)

Sources: Federal Reserve Bank of New York, Bech, Klee and Stebunovs (2011)

….and is the key liquidity conduit

2. Traded volumes in key money market segments (2019 daily average, USD billions)

Sources: Federal Reserve Bank of New York, SIFMA

Repo activity is diversely spread between bilateral, centrally cleared and triparty venues ….

3. Share of repo trading by segment in 2019
(Percent)

Sources: Federal Reserve Bank of New York, Office of Financial Research, IMF Staff calculations

Repo activity is growing strongly in part reflecting growth in centrally cleared sponsored repo….

4. Significant non-bilaterally settled repo volumes
(USD billions)

Sources: Federal Reserve Bank of New York, Office of Financial Research

Repo rates are variable although Federal Reserve Open Market Operations have effectively quelled variability

5. Distribution of intraday repo market trading versus approximate volumes traded above the Federal funds target range
(Percent, USD billions)

Sources: Federal Reserve Bank of New York, IMF Staff calculations

Market reliance on LIBOR is very high

6. Volumes of Instruments Tied to USD LIBOR (USD trillions, end 2016)

Sources: ARRC Second Report, 2018

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44. There are tight linkages between the cleared and tri-party repo market as these all use BNYM's tri-party repo settlement infrastructure. BNYM provides a critical monopoly role in the settlement of U.S. Treasury securities. Primary issuance of U.S. treasuries occurs over the accounts of BNYM. The cleared repo market segments ultimately settle at BNYM and even the FRBNY's repo transactions settle at BNYM. These tight links reflect the efficiencies that concentrating settlements at BNYM provide for broker-dealers. Primary dealers have concentrated their collateral management operations with BNYM making it most efficient from a business-as-usual perspective for all the significant ancillary repo market segments to also settle there.

45. Tri-party repo market reforms have reduced risks. Tri-party repo has been important as it allows participants to minimize cash requirements while at the same time optimizing collateral use. Historically the tri-party repo providing banks had provided intraday credit to dealers rolling over maturing overnight repo transactions providing another significant benefit to the Tri-party system. However, such overdrafts, while still available, are now very costly and are not significantly utilized reflecting regulatory reforms in the wake of the GFC when it was recognized that these daylight overdrafts were a significant financial stability concern.

46. Demand for cleared repo is increasing so participants can harness the benefits of netting and obtain better repo market access. Growth in FICC sponsored repo has allowed a much wider range of cash investors (money market funds in particular) and borrowers (leveraged investors and hedge funds) access to centrally cleared, netted repo. Cleared repo has proven advantageous from a risk management perspective as well as being balance sheet efficient for participants seeking to offset the impact of tighter leverage, capital and liquidity rules.

C. Key Developments in Money Market Liquidity and Resiliency Before March 2020

47. Money market volatility picked up as the Fed reduced its balance sheet. Volatility patterns shifted from early 2017 as commercial bank reserves at the Fed fell reflecting tighter liquidity (Figure 3, panel 1). Month-end pressures (driven by some market participants that face regulatory driven incentives to withdraw from markets) changed from seeing lower rates to higher rates at month ends before 2017 (Figure 3, panel 2). Interest rates have become more sensitive to changes in reserve supply (Figure 3, panel 3). The Fed funds rate drifted up relative to the target range, ultimately requiring adjustments to the Fed's administered policy rates to ensure the Fed funds rate remained well inside the Federal Open Market Committee's (FOMC's) target range. There have been several volatility spikes culminating in an exceptional period of volatility in mid-September 2019 where the Fed funds rate moved outside of the target range and repo rates sharply spiked to 10 percent.

48. The money markets have generally functioned well even despite the increased volatility—although the support of the Fed was instrumental in managing the September 2019 spike. Notwithstanding increased volatility, markets have continued to function well and even on the most volatile days the repo market remained active with the market clearing.

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The Fed funds market has been less resilient as traded volumes and the diversity of participants is lower than in repo and there are some signs of reduced liquidity on more volatile days (Figure 3, panel 4). Encouragingly, volatility spikes in repo and Fed funds markets have not generally been transmitted more widely in key funding and liquidity markets. For example, the commercial paper and longer-term FX swaps markets were not greatly impacted by the September 2019 volatility. To some extent, the absence of wider impact was because most spikes were perceived to be transitory. There was more concern about the September quarter 2019 volatility event, although the Fed's significant and regular repo operations on a scale not seen since the GFC combined with resumed Treasury securities purchases was instrumental in restraining liquidity fears and backstopping markets (Figure 4, panel 5).

49. The impact of the Fed's balance sheet normalization strategy has been significant. The Fed decreased reserve balances by about US$1.25 trillion from the peak in 2014 to the September 2019 trough—a reduction of almost 50 percent.

50. The Fed's non-reserve liabilities have expanded creating another liquidity drain in the absence of regular OMOs. While much of the decrease in reserve balances has reflected reduced Fed securities holdings, growth in the Fed's non-reserve liabilities has also contributed. The Treasury General Account (TGA) has expanded reflecting the Treasury's desire to hold additional precautionary cash balances and has become more variable, in part due to exceptional run-downs of the TGA during periods when the debt ceiling has been binding.[21] The Fed offers foreign central banks a service where it takes deposits secured on U.S. treasuries known as the Foreign Repo Pool (FRP). The FRP has grown significantly over the last five years as the Fed has loosened rules that previously restricted the size and variability of foreign central bank deposits in an environment where reserves have been plentiful, and the return paid by the Fed has been attractive to other short-term, risk-free investments. More recently, the size of the FRP has dipped as the Fed reviewed the remuneration paid and set it in line with the Overnight Reverse Repo rate (ONRRP). Finally, Title VIII of the DFA allowed the Fed to open accounts for designated FMIs that CCPs use to hold their cash collateral. Normally, central banks offset these drains of reserves in regular OMOs, but the Fed hasn't regularly held OMOs in the period of ample reserves and hence the growth of non-reserve liabilities has organically contributed to the Fed's balance sheet normalization process.

51. The cyclical increase in U.S. Treasury supply has been an important influence. Collateral supply has expanded significantly as the U.S. budget deficit has increased. Primary dealers and other leveraged investors have absorbed this supply and required more repo to finance Treasury purchases (Figure 3, panel 5). Smaller broker-dealers and hedge funds have stepped in to help

[21] The Treasury shifted from holding the bulk of its funds in secured deposits with commercial banks under the Treasury Tax and Loan (TT&L) program to the Federal Reserve in 2008 when the Fed received the authority to pay interest on reserve balances to commercial banks. The Treasury does not receive an explicit interest rate on its TGA balance but receives an implicit return as the Fed's net income is returned to the Treasury regularly through the year. The agreements with banks included in the TT&L program are no longer in force and would need to be renegotiated to reactivate the program.

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absorb supply. Most players have used overnight repos to finance the growth in collateral supply as overnight repo has been cheap and readily available in the era of ample reserves (Figure 3, panel 6).

52. The impact of regulation on market functioning led to important behavioral changes. Since the GFC, banks and their affiliated broker-dealers have been subject to heightened prudential regulation and have significantly upgraded internal liquidity risk management frameworks and governance. These changes may have contributed at least indirectly to cash hoarding, diminished incentives to intermediate liquidity and decreased willingness to quickly step-in during sudden periods of market volatility and uncertainty by banks and broker-dealers. To some extent this is reflected by the fact that reserves are now concentrated at the GSIBs (Figure 4, panel 1). The pressures have been building for some time but masked by the Fed's large balance sheet until more recently. There are a range of relevant regulatory constraints that bind to different extents across firms including: the supplementary leverage ratio (SLR); the GSIB surcharge; liquidity stress test requirements; and resolution funding requirements. Box 3 discusses in more detail how these various regulatory requirements impact on the demand for reserves and the elasticity of the demand curve.

53. Tighter bank risk management has meant fewer buffers available to customers and less balance sheet flexibility in major intermediaries. The capital and liquidity risk management infrastructures of banks has increased significantly in terms of scope and complexity/sophistication in the years since the GFC. Three underlying factors have driven this trend.

- Firstly, a key driver has been increased market discipline on firms seen to be falling short of regulatory requirements or whom are reliant on the Fed for liquidity support. Senior management has consequently been less tolerant of liquidity shortfalls prompting the construction of frameworks and buffers to make shortfalls less likely.

- Secondly, the regulatory framework itself has been more restrictive and sophisticated which has driven increased sophistication in bank liquidity risk management frameworks. Firms have been required to think more carefully about how they might manage liquidity in stress and resolution situations that are very different to business-as-usual. Considering these tail-event risks in more detail has led to better risk management frameworks but also a need for larger buffers and more constraints to ensure the diverse lines of business within large financial firms can all remain within regulatory requirements. Liquidity buffers now often feature a more prominent role for cash as these new sophisticated frameworks have been developed in an environment where reserves have been cheap and abundant, and management has become very comfortable with cash reserve buffers due to its superior liquidity properties.

- Finally, pressures on returns has driven a greater desire of management to optimize bank balance sheets. Fewer capital and liquidity buffers have been left laying idle. This has meant a reduction in bank flexibility which means banks are not as responsive to short term fluctuations in the demand for liquidity by customers as prior to the GFC. Firms focus on ensuring current customer needs can be met—and they plan with customers to try and ensure that adequate capital and liquidity is available to meet their projected business needs. But unexpected needs

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from other market players may not easily be accommodated quickly. In some circumstances, this means interest rate volatility needs to be persistent to warrant a response that can come but only with time. In other situations, there may be a very inelastic demand for reserves.

D. The Federal Reserve's Liquidity Provision Approach in Normal Times

54. Prior to the COVID-19 crisis, the Fed operated an ample reserves system with few regular OMOs in business as usual circumstances. The Fed supplied significantly greater reserves than required by banks to meet reserve requirements (which were moved to zero in March —Figure 4, panel 2). The FOMC's balance sheet normalization principles state that the Fed will operate its ample reserves framework with the smallest balance sheet possible while ensuring the Fed funds rate remains well within the 25-point-wide target range established by the FOMC (Figure 4, panel 3).[22] No regular OMOs were held as the presence of excess reserves ideally meant that the interbank market should be robust to short term fluctuations in autonomous factors.

55. The Fed aims to influence market rates by varying the rates on its standing facilities. The key tools are the rates the Fed offers on its liquidity absorbing standing facilities: The ONRRP; and the Interest on Excess Reserves (IOER) to depository institutions. As the demand for reserves changes over time, the Fed responds by varying the interest rates paid on its liquidity absorbing standing facilities. The Fed has made a series of changes to the level of IOER and ONRRP in the last two years in order to keep the Fed funds rate well within the target range.

56. The operating target guiding liquidity management is the Fed funds rate although other rates play some role. The FOMC's focus is mainly on the level of the Fed funds rate and communications are focused on the level of the Fed funds rate relative to the target range. However, market participants believe the Fed considers a wider set of benchmark money market rates when determining its operational stance including developments in repo rates. The actual role of rates other than the Fed funds rate is not clearly specified by the Fed.

[22] The FOMC's balance sheet normalization principles are available at https://www.federalreserve.gov/monetarypolicy/policy-normalization-discussions-communications-history.htm.

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Figure 3. United States: Developments in the Liquidity and Resiliency of Key U.S. Money Markets

The level of money market volatility has increased....

1. Standard Deviation of Daily Changes in Overnight Rates (In percent)

Sources: Federal Reserve Bank of New York, DTCC, IMF Staff calculations

... and volatility patterns have changed as Fed balance sheet unwind has progressed ....

2. SOFR, GCF Repo, Fed Funds Rates (Percent, USD billions)

Sources: Federal Reserve Bank of New York, DTCC

The reserves demand curve has steepened, in part reflecting tighter regulatory constraints ...

3. Fed Funds Effective less IOER vs. Reserve Balances (Percent, USD millions)

Sources: Federal Reserve Bank of New York, IMF Staff calculations

... money markets are usually resilient but increasing signs of vulnerability in times of stress are evident

4. Daily Federal Funds market liquidity indicators

(2016-20, Index, USD billions, excluding month end and policy rate change periods)

Sources: Federal Reserve Bank of New York, IMF Staff Calculations

Primary dealers need for repo financing has increased as with the supply of treasuries ....

5. US Treasuries Outstanding vs Treasury Repos by Primary Dealers

(USD billions)

Sources: Federal Reserve Bank of New York, SIFMA

...and much of this financing has been on an overnight basis raising refinancing risks and decreasing resiliency

6. US Treasury Repo by Primary Dealers

(USD billions)

Sources: Federal Reserve Bank of New York

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Figure 4. United States: Aspects of the Federal Reserve's Liquidity Provision Framework

Reserves are relatively heavily concentrated at large banks... Error! Bookmark not defined.

1.Proportion of total reserves held by size of institution
(In percent)

Sources: Federal Reserve Board

... and the Federal Reserve supplies ample reserves

2. Total versus required reserve balances
(US dollar billions)

Sources: Federal Reserve Board

The Federal Reserve's operating target is to keep the Fed Funds rate well inside the 25-basis-point-wide target range

3. Federal Reserve target range, administered and federal funds effective rates
(Percent)

Sources: Federal Reserve Bank of New York, Federal Reserve Board

The Federal Reserve supplies reserves through long-term asset purchases

4. Composition and duration of the SOMA portfolio
(USD billions and years (right axix))

Sources: Federal Reserve Bank of New York

Recent illiquidity in money markets saw a resumption of short-term repos and T-bill purchases

5. Federal Reserve treasury bill holdings and repos outstanding
(USD bilions)

Sources: Federal Reserve Bank of New York, IMF Staff calculations

The Discount Window is not heavily used...

6. Discount Window Usage -2011 - 2020
(USD millions)

Sources: Federal Reserve Board

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57. The Fed's counterparties vary depending on the facility/operation concerned but the main counterparts are depository institutions and primary dealers. The Fed deals with money market funds, depository institutions, GSEs and primary dealers. Money market funds only have access to the ONRRP facility where counterparties can invest cash overnight in exchange for government securities via reverse repo with the Fed.[23] Depository institutions can access the full range of Fed facilities (in principle) including the ONRRP, IOER, term deposit auctions, as well as the Fed's standing credit facilities. GSEs only have access to the ONRRP facility as they are not permitted to receive interest on reserves. Primary dealers have access to Fed OMOs (if held) and are the main conduit between the Fed and the wider market. The Fed currently has 24 primary dealers.[24]

58. The structural demand for liquidity is met through the purchase of U.S. Treasury and agency securities. Growth in the Fed's non-reserve liabilities such as currency in circulation gives rise to a structural liquidity shortage which is balanced through the purchase of securities held in the System Open Market Account (SOMA) portfolio (Figure 4, panel 4). The SOMA is currently composed of both U.S. Treasury and Agency securities reflecting past QE operations. The FOMC's normalization principles state that in the long term the Fed will aim to predominantly hold U.S. Treasury securities in the SOMA. Currently, the composition of the SOMA is in transition where a portion of maturing Agency securities are rolled over, and the balance reinvested in new treasuries. The average duration of the domestic securities in the SOMA portfolio was around 5.5 years in 2018.[25]

E. Liquidity Backstops

Bilateral Liquidity Backstops: The Fed's Discount Window

59. The Discount Window provides a very broad, flexible, and transparent bilateral liquidity backstop for depository institutions. The Federal Reserve Act (FRA) Section 10(B) provides the authority underlying the Discount Window and Regulation A provides the detailed implementation guidelines. The Primary Credit facility is available to depository institutions (including U.S. branches and agencies for foreign banking organizations) in sound financial condition to meet unexpected liquidity shortfalls on a "no questions asked" basis that, as of March 9, was priced at 50 basis points over the top of the Fed funds target range. Primary Credit is typically advanced for one day but may be extended up to a few weeks for smaller institutions. The Secondary Credit facility provides credit to weaker financial institutions at a further 50 basis point

[23] The list of Fed Money Market Fund counterparties are available at https://www.newyorkfed.org/markets/rrp_counterparties. There are currently just over 100 MMF counterparties.

[24] The current list of primary dealers and the criteria for selection and associated obligations are available at https://www.newyorkfed.org/markets/primarydealers.

[25] See the Federal Reserve Bank of New York's 2018 OMO Report - https://www.newyorkfed.org/medialibrary/media/markets/omo/omo2018-pdf.pdf.

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margin above the Primary Credit rate.[26] Secondary Credit is also typically extended on an overnight basis, but may be advanced for a longer period as a backup source of funding to a depository institution that is not sufficiently sound to be eligible for Primary Credit if, in the judgment of the relevant regional Federal Reserve Bank, such a credit extension would be consistent with a timely return to a reliance on market funding sources. Secondary Credit may also be extended to facilitate the orderly resolution of serious financial difficulties of a depository institution. Discount Window loans must be collateralized to the satisfaction of the advancing reserve bank. A very broad set of collateral may be used to secure Discount Window loans.[27] As noted above, Discount Window loans are typically extended for short maturities; however, during recent crisis periods (including since March 15, 2020) Discount Window loans have been permitted to be rolled over upon request of the borrower, subject to the discretion of the lending Reserve Bank and legal limitations on lending to undercapitalized FDIC-insured depository institutions.

60. The Discount Window is rarely used in significant volumes. Prior to March 2020, usage was low and dominated by idiosyncratic liquidity needs of smaller depository institutions (Figure 4, panel 6). Larger depository institutions did not use the Discount Window and did not incorporate access to it in their liquidity planning. Fed surveys of large depository institutions have consistently shown a strong aversion to using the Discount Window. Firms instead planned on raising more funding from customers (for example, FHLBs) or reducing lending to customers and running down liquid assets. The Discount Window was not used by depository institutions during recent periods of money market volatility even though, it should have been profitable to do so to fund repo market investments.

61. The Discount Window is heavily stigmatized. Stigma is a function of several factors including, but not limited to, the penalty rate applied to the Discount Window, publication of use, lack of use, and bank risk management preferences and incentives. Many of these features potentially leave banks and investors with the impression that the Discount Window is a facility used when something has gone wrong—and bank management and markets are very averse to such signs. Another factor that potentially adds to stigma is that the Discount Window has a mix of market backstopping and Emergency Liquidity Assistance (ELA) objectives.[28] Primary Credit is more

[26] The Primary and Secondary Credit Facility margins are as of February 2020 and are subject to change by the FOMC and Federal Reserve banks.

[27] For details on eligible collateral and applicable haircuts and operational procedures see https://www.frbdiscountwindow.org/pages/collateral/discount%20window%20margins%20and%20collateral%20guidelines.

[28] Emergency Liquidity Assistance refers to the provision of liquidity in the event of an idiosyncratic shock affecting one or a few individual financial institutions. ELA has two principal objectives: to mitigate the risk that temporary illiquidity leads to insolvency and to avoid contagion. It may be required when one or a few individual financial institutions are unable to maintain or roll over funding (whether retail or wholesale). Managing systemic banking crises: new lessons and lessons relearned / prepared by an IMF staff team lead by Marc Dobler, Marina Moretti, and Alvaro Piris discusses the concept as used in this Technical Note. See https://www.imf.org/en/Publications/Departmental-Papers-Policy-Papers/Issues/2020/02/10/Managing-Systemic-Financial-Crises-New-Lessons-and-Lessons-Relearned-48626.

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like a standard central bank standing credit facility aimed at capping interbank rates whereas Secondary Credit looks more like an ELA instrument.

62. CCPs designated by the FSOC as systemically important have access to Fed liquidity in extremis. Title VIII of the DFA allows designated CCPs access to Fed services including emergency credit. The DFA sets a high bar for advancing credit to a CCP, and the Fed expects CCPs to plan prudently to ensure they do not need recourse to the Fed for liquidity support. Practical arrangements to facilitate liquidity provision to a CCP are not fully developed. Designated CCPs have accounts at the Fed that could be used to receive funds and transfer securities for collateral purposes. The Fed has done internal planning but detailed operational arrangements (for example, the preparation of legal lending contracts, arrangements to receive collateral) are not in place. The Fed anticipates it would be able to act quickly to make such arrangements in the event it became necessary.

63. The ability for other nonbanks to receive bilateral liquidity support is much more constrained. The DFA and FRA restrict such support. The Fed has the legal authority to extend credit to other nonbanks through Section 13-3 of the FRA. However, this can only be the case in the context of a broad-based facility. Hence bilateral liquidity support arrangements of the types provided to Bear-Stearns and AIG in the GFC are no longer possible.

Market-wide Liquidity Provision: Open-Market Operations and Standing FX Swap Lines

64. The Fed has broad authority to use OMOs to support market-wide liquidity. The Fed has broad authority to operate in money markets in OMOs (Section 14 of the FRA) using U.S. government and agency securities for market liquidity support.[29] OMOs using repos are flexible and scalable as the 2019 experience illustrates.

65. The Fed lacks a well-defined framework for intervening to support key securities markets.[30] The potential for outright purchases securities markets is limited as the FRA does not allow for asset purchases outside of Treasuries- and Government-guaranteed agencies, except within the context FRA 13-3 program approved by the Treasury Secretary.[31] Instead, the Fed has the authority to provide collateralized credit to depository institutions or to special purpose vehicles whom may then purchase securities as opposed to directly purchasing a wide range of assets itself. The Fed notes that it was able to develop a range of programs in the GFC which helped liquefy

[29] Section 14 of the FRA also allows OMOs using short term foreign government securities and various classes of home loan agency, state and municipal short-term securities. In practice, OMOs are conducted using US government and Agency securities (with a government guarantee).

[30] See King, Brandao-Marques, Eckhold, Lindner and Murphy (2017) IMF Working Paper 17/152 https://www.imf.org/en/Publications/WP/Issues/2017/07/10/Central-Bank-Emergency-Support-to-Securities-Markets-45012 and a discussion of principles that might guide such a framework is available in Fisher (2010) at https://www.bankofengland.co.uk/-/media/boe/files/speech/2010/the-corporate-sector-and-the-bank-of-englands-asset-purchases-speech-by-paul-fisher.pdf?la=en&hash=038C517EE6E40C3E12835D79F1BC8E689670AC49.

[31] Geithner 2016 also notes this limitation in the FRA—see http://www.perjacobsson.org/lectures/100816.pdf.

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securities markets. It expects it will be able to act quickly to develop a securities intervention approach, if required, in a future crisis.

66. The Fed's network of bilateral FX swap lines is an important source of market wide liquidity support. This network is critical given the prominent role that the U.S. dollar plays in global money markets and the highly integrated U.S. domestic and global money markets. The network has been scaled back since the height of the GFC to a set of five countries, but these lines are now permanent standing lines whereas during the crisis they were temporary. The FOMC has broad authority to deploy and extend the FX swap line network in a future stress event. But its focus is on market wide liquidity support and not country-specific or individual institution issues. Countries are expected to resort to their own FX reserves and official institutions for idiosyncratic U.S. dollar liquidity support.

67. Market-wide liquidity provision to nonbanks must adhere to the restrictions of FRA Section 13-3. The Dodd-Frank Act requirement that any 13-3 lending program be broad-based (interpreted as meaning that any facility offered needs to be available to five or more entities) potentially complicates the Fed's liquidity support options to the nonbank sector and securities markets. However, many market-wide liquidity support options deployed in the GFC could be used again (for example, the Term Asset-backed Securities Loan Facility). Depending on the details of the program, such programs can be supported by the Treasury via resources from the Exchange Stabilization Fund to provide the Fed a buffer from the increased risks associated with such programs. Also, 13-3 based programs need to be pre-approved by the Treasury Secretary and certain lending within such a facility reported to Congress within a week. These provisions mean that the Fed does not provide loans anonymously and can't provide liquidity assistance on a confidential basis which could make entities uncomfortable with using new 13-3 facilities, reducing their effectiveness.

Foreign Exchange Liquidity Provision

68. The framework for liquidity provision in currencies other than U.S. dollar appears less well developed. The FRB has not taken a public position on the FRA's authority to advance liquidity in currencies other than U.S. dollar and hasn't developed further its policy or operational framework. The sources of FX to meet a FX liquidity need include the Fed's FX liquidity swap lines but are not clear beyond those. FX liquidity provision could become important in the event of liquidity stress in a CCP, as these entities clear instruments in currencies aside from the U.S. dollar.

F. Response to Market Pressures Stemming from COVID-19[32]

69. Markets were severely disrupted by the COVID-19 crisis from late February 2020 leading to an all-encompassing policy response. This section discusses the period from late

[32] Section F covers events since the conclusion of the FSAP on-site visits in early March 2020. The characterizations of the programs are based on public announcements by U.S. government agencies and do not reflect the depth of discussions and information-gathering as the rest of the document.

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February 2020 when market concerns about the global spread of the COVID-19 spiked. The Fed responded quickly with a broad-based set of crisis management measures.

70. The Fed rolled out a comprehensive set of liquidity support measures to combat widespread market dysfunction and to enhance monetary policy transmission. Figure 5 shows the sequence of measures that combined significant monetary policy easing, outright long-term asset purchases, an expansion of standard repo OMOs, enhancement of the Primary Credit Facility, elimination of reserve requirements, and globally coordinated U.S. dollar liquidity provision through an expanded FX swap line network and the introduction of a panoply of crisis liquidity support measures using Section 13-3 of the FRA.

Figure 5. United States: Liquidity Measures in Response to COVID-19 Crisis as of end March 2020* Error! Bookmark not defined.

Source: IMF Staff

* The figure includes actions taken up to end March 2020. In April 2020 the Federal Reserve introduced new facilities to provide liquidity to provide liquidity to businesses via the Paycheck Protection and Main Street Lending Programs. The figure does not show other measures in the area of bank regulation and guidance that were also taken in March 2020 to increase the efficacy of these programs.

71. The focus of initial policy response was on combating extreme dysfunction in money and securities markets. Liquidity dropped significantly across a range of key money markets through March. Repo rates rose significantly, the Fed Funds rate moved to the top of the target range and commercial paper and asset-backed rates rose significantly, and volumes dropped. Cross currency basis swap margins to risk free rates rose significantly reflecting a global shortage of U.S. dollar liquidity. Securities markets exhibited extreme stress and became illiquid—even in core U.S. Treasury and U.S. Agency MBS markets—as evidenced by wider credit spreads and on-the-run off-the-run Treasury spreads (Figure 6).

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72. Coordinated global central bank action helped stabilize FX swap markets. The Fed quickly enhanced and expanded its FX swap lines in order to provide U.S. dollar liquidity globally, helping reduce pressures on the domestic money market. The announcement of the new Foreign and International Monetary Authorities Repo facility further calmed markets by providing most foreign official institutions a mechanism to quickly raise funds from the Fed without resorting to outright securities sales in the stressed treasuries market.

73. Many GFC-era liquidity facilities were re-activated under Section 13-3 of the FRA with the support of the Treasury. Money market stress required the re-activation of the Primary Dealer Credit Facility to provide liquidity support to Primary Dealers. Support to securities markets was provided by re-activating the Commercial Paper Funding, Money Market Mutual Fund.

Figure 6. United States: New Fed Facilities

Sources: Federal Reserve Board

74. Liquidity, and the Term Asset-Backed Securities Loan facilities (Figure 6). New corporate securities support facilities were developed in the form of the Primary and Secondary market credit facilities. The elevated risks associated with these facilities was backed through an injection of US$105 billion of capital funding from the Treasury's Exchange Stabilization Fund and through the CARES Act. These securities market support facilities were operationalized through a set of single Special Purpose Vehicles.

75. The Fed's actions were effective in bringing markets under control. Much of the impact in March has been an announcement effect as few of the newly announced facilities were immediately operational implying high credibility of the Fed's timely measures. Money market volatility came down relatively quickly and repo and Fed funds rates moved back inside the Fed funds target range (Figure 7). Commercial paper and other securities markets took longer to respond reflecting the significant uncertainty about corporate credit quality and the underlying business environment.

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Figure 7. United States: Money Market Conditions and Fed Lending Programs in March 2020

Money market volatility spiked with COVID-19 concerns

Sources: Federal Reserve Bank of New York, DTCC

The Fed quickly scaled up repo OMOs and asset purchases

Sources: Federal Reserve Board

Markets heavily used the expanded Fed facilities

Sources: Federal Reserve Board

Global U.S. dollar provision was an important stabilizer

Sources: Bloomberg, Federal Reserve Board

G. Recommendations

Preserving Bank Incentives to Intermediate Liquidity

76. Large firms' responses to regulatory constraints combined with greater conservatism in bank risk management have likely reduced large bank's willingness and capacity to provide liquidity in times of stress. Banks consistently cite a range of regulatory constraints that have changed their demand for cash and their incentives to act as intermediaries. The key issues center around intraday liquidity stress test requirements, resolution funding requirements, the GSIB surcharge and the Supplementary Leverage Ratio. To a significant extent, the issue is not the regulations themselves (which are largely silent on the composition of bank High Quality Liquid Asset (HQLA) holdings and focus more on the total required level of HQLA) but how firms have incorporated these regulatory requirements in more granular and sophisticated risk management frameworks. The net impact has been to both increase the demand for reserves as well as increase

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its slope. Box 3 discusses how specific regulatory factors indirectly impact the supply and demand balance in the money markets. The overall implication is that the demand for reserves, and the volatility of money market rates for any given level of excess reserves has increased.

Box 3. Regulatory Drivers of Reserves Demand

Regulatory factors indirectly drive the demand for reserves through their impact on the precautionary demand for reserves of depository institutions. Two types of impact are possible: on the *level of demand* for reserves—i.e., on the position of the reserves demand curve relative to reserves supply; and on the *slope of the demand curve*—which relates to the degree of substitutability of reserves for other types of HQLA as the price of reserves varies relative to other HQLA. Most regulatory constraints interact with the risk tolerance of bank liquidity managers and the flexibility of their balance sheet management models and impact both the level of slope of the demand for reserves.

Factors that likely impact more on the level of demand are those regulatory factors than encourage firms to hold more HQLA in aggregate and cash in particular, due to its superior liquidity characteristics for meeting very short-term payments obligations. Firms may have limited ability to substitute between cash and other HQLA to meet these types of requirement hence the impact may be more on the level of the demand than its slope (which would generally be highly inelastic). Examples include:

- *Banks' internal intraday liquidity stress testing requirements* as these require firms to hold liquidity to meet very short horizon payments obligations. Non-reserves HQLA is generally unsuitable to meet such obligations if managers assume no access to the Federal Reserve Discount Window. Some parts of the firm may not have Discount Window access in any case (for example the BD affiliate of a GSIB).

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Box 3. Regulatory Drivers of Reserves Demand (concluded)

- *Resolution funding requirements* as these also require firms to hold liquidity to meet payments obligations in situations where the degree of payments inflows may be uncertain and/or the firm's access to repo funding in the market may be uncertain. Larger, more complex firms require more resolution funding all else equal as liquidity needs to be prepositioned within each material entity within the group. Some entities within a group may not have access to financial markets to raise repo funding and as such need to hold cash to meet their operating needs in resolution.

Factors that impact the slope of the demand curve are those regulatory factors that cause interbank market frictions that reduce incentives to intermediate reserves. Frictions can be overcome if the price of reserves is sufficiently high to cover the intermediation costs associated with the frictions. Examples include:

- *The Supplementary Leverage Ratio* as this adds an extra capital cost for a leveraged broker-dealer to engage in the marginal dollar of financing activity. For a dealer to lend funds they must also borrow funds, thus increasing leverage which they need to be compensated for.
- *The GSIB surcharge* as this adds a very high capital cost on the entire firm if the marginal dollar of financing activity leads to the firm moving from one GSIB category to another. The impact will be most evident in December 31, when some of the balance sheet indicators will be measures. However, as firms preposition their balance sheets in the months leading up to the end of the year, some impact on the willingness to provide financing to customers will occur ahead of year end. Hence the slope of the demand curve may steepen in the latter part of the calendar year.

Both level and slope factors could be influenced by the specification of regulations and the terms under which the central bank offers liquidity to firms without relaxing or undermining the stringency of the regulations themselves (which are supposed to be agnostic on whether liquidity needs are met through reserves holdings or other HQLA). Improving firms access to the Discount Window (or providing an alternative standing repo facility) gives firms an option to use non-cash HQLA to meet cash needs as firms would have a better basis for assuming monetization of non-reserves HQLA. This would reduce the demand for reserves and potentially make its slope more elastic. Other initiatives that allow intermediation to occur without grossing up the balance sheet also help ease liquidity constraints. Examples include the expanded availability of cleared repo through sponsored repo which effectively allows intermediaries to do a greater volume of business within a given balance sheet.

The figure above illustrates the potential impacts. The impact of the post-crisis regulatory environment has been to shift the demand curve to the right and steepen the curve. The Fed supplies more reserves consequently to keep interest rates in the target range. Policies that are effective in providing firms more options to meet liquidity requirements than holding cash could both shift the demand curve back left and flatten the curve. The result would be a smaller Fed balance sheet and less sensitivity of interest rates to fluctuations in the supply and demand for reserves.

77. Complexity of large bank risk management frameworks combined with the push to optimize balance sheets has reduced the flexibility of large banks to quickly respond to shocks to liquidity demand. Large bank holding companies now have more complex and granular balance sheet management frameworks that are designed to ensure compliance with the panoply of regulatory requirements while also optimizing capital and liquidity usage as much as feasible. The impact is for the individual business areas of large firms to have some balance sheet capacity to meet expected customer demand but less flexibility to quickly respond to unexpected spikes in demand for liquidity—especially from other market participants. Changes in capacity to

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accommodate new lending business or in the ability to alter the composition of the HQLA portfolio are possible but take time as any changes need to fit within the firm's aggregate balance sheet optimization framework. This means that large firms may not have much flexibility to scale up liquidity provision to the market or alter the HQLA portfolio unless the change in market demand is persistent and hence the potential for market volatility is elevated.

78. The U.S. authorities should take steps to promote the Discount Window as a tool firms can utilize to make reserves and Treasuries more fungible once conditions normalize. The reluctance for large firms to incorporate access to the Discount Window encourages a larger demand for reserves, and a less flexible response to unexpected changes in market demand for reserves. In the absence of usable liquidity backstops, market participants self-insure and demand more reserves ex-ante which, if the Fed does not provide, will result in increased interest rate volatility and the efficiency of monetary policy implementation will be reduced. Incentives to intermediate and provide liquidity are undermined as firms focus more heavily on meeting their own liquidity needs and are less interested in helping others meet their needs with market resiliency and financial stability implications. Increased fungibility of reserves and Treasuries would help reduce the slope of the reserves demand curve, reducing interest rate volatility and bolstering market resilience. A fall in the demand for reserves could also enable the Fed to operate with a smaller balance sheet. A reduced demand for reserves could be encouraged by the regulatory authorities clarifying that it is acceptable and desirable for regulated firms to assume access to the Discount Window (using U.S. Treasury securities as collateral) in a stress situation when planning for meeting resolution planning and intraday stress test requirements.[33] This could be achieved through clarifications to the Fed's Regulation A (which governs the Discount Window) and through revised interagency guidance to banks (for example in the areas of resolution funding and liquidity stress test requirements). This could be limited to the use of Treasuries in liquidity planning given that the Discount Window allows use a wider set of collateral including non-HQLA. Outreach to regulated firms would help encourage incorporation of this guidance into liquidity planning.[34] The Bank of Canada and the Bank of England provide recent examples of useful approaches. The measures taken by the Fed in the COVID-19 crisis period to reduce the cost of accessing Primary Credit, lengthening its maturity and by providing guidance to banks that use of Primary Credit are desirable and good examples of

[33] Any revisions to resolution liquidity requirements should not undermine the purpose of these requirements, which to ensure that material entities of US banking groups have adequate access to liquidity in a resolution scenario. See FSB "Guiding principles on the temporary funding needed to support the orderly resolution of a global systemically important bank" (2016) at https://www.fsb.org/2016/08/guiding-principles-on-the-temporary-funding-needed-to-support-the-orderly-resolution-of-a-global-systemically-important-bank-g-sib/ for a discussion of the relevant principles governing the forms that resolution funding might take. These Guiding Principles suggest that central banks could consider providing liquidity support to banks in resolution.

[34] Expanded recovery planning obligations on banks might provide an additional avenue that could complement efforts to destigmatize the Discount Window. Requiring banks to plan for access to central bank facilities is a required element of recovery planning in other major jurisdictions, such as the UK (see paras 2.31–2.35 here: https://www.bankofengland.co.uk/-/media/boe/files/prudential-regulation/supervisory-statement/2017/ss917.pdf).

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changes which might aid de-stigmatization. The tentative early evidence is encouraging as there has been a significant increase in use of Primary Credit in March (see Section F).[35]

79. Banks have an incentive to access funding from FHLBs, which increases interconnectedness. Funding from FHLBs remains relatively generously treated in the LCR, while FHLBs procure funding for advances by issuing short-term notes purchased by Money Market Funds (MMFs) and other investors.[36] FHLBs thus play an important intermediation and funding role in the money markets. Reconsidering the treatment of funding from FHLBs in the LCR to ensure a level playing field with other unsecured lenders in the Fed funds market would help reduce concentration risks on FHLBs (who themselves are subject to significant liquidity mismatches as the maturity of their advances is typically much longer than the short term funding received from MMFs) and enhance the resiliency of markets in situations where FHLBs themselves run into liquidity problems.

Designing the Fed's Operational Framework to Support Money Market Resilience

80. The Fed's ample reserves system could be more effective in supporting market resilience if supplemented with regular fine-tuning operations in normal times. The system is very robust to a wide range of supply and demand shocks; however, availability of reserves in aggregate does not assure access to reserves to individual institutions and especially nonbanks. The Fed's current preference to operate without regular liquidity providing operations reduces the liquidity insurance that the ample reserves regime could provide. Such a passive liquidity provision approach is different to how ample reserves regimes are operated elsewhere.[37] The Fed could better bolster the liquidity certainty it provides markets by adjustments to its operating framework by (i) restructuring the SOMA to include a higher proportion of short-term instruments (treasury bills, repo operations) that can be regularly rolled over, and (ii) regularly operating repo OMOs where the Fed varies the volume of OMOs offered in response to the revealed demand of markets. This would allow primary dealers regular access to Fed repo OMOs and those OMOs could be easily scaled up if bidding behavior suggested increased demand for Fed repo. The Fed could also explore conducting its repo (and reverse repo) operations via the FICC's cleared repo services as this could widen the reach of the Fed's OMOs, reduce pressures on dealer balance sheets (as repo operations could be netted) and there would be reduced reliance on the BNYM (see para 82 for further discussion).

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[35] See https://www.bankofengland.co.uk/-/media/boe/files/prudential-regulation/consultation-paper/2019/cp2719.pdf for details on the proposed Bank of England guidance.

[36] The treatment of FHLBs in the LCR rule has been assessed by the Basel committee in 2017 as part of the RCAP. See https://www.bis.org/bcbs/publ/d409.htm.

[37] Norway and New Zealand have the longest experiences of operating ample reserves regimes outside of Quantitative Easing periods. In both cases, these central banks incorporate regular OMOs of short term instruments into their liquidity management strategy that then gives the central bank the ability to scale up and down liquidity provision, as well as vary the terms under which liquidity is provided, in response to changes in the demand for liquidity. The U.K. proposed a similar strategy when consulting on their post-QE implementation regime in August 2018—see https://www.bankofengland.co.uk/-/media/boe/files/paper/2018/boe-future-balance-sheet-and-framework-for-controlling-interest-rates.pdf?la=en&hash=5698143A9EA823D16162E8EE8E1D3854A4A35AF4.

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81. Such adjustments improve the Fed's liquidity insurance and would make the operational framework more robust to shocks. Liquidity more readily and regularly available in a de-stigmatized form thus providing liquidity insurance to markets as well as providing the Fed with regular information on the liquidity and resiliency of the money markets. Such an approach would be robust to changes in the demand for liquidity—for example of the nature that occurred in September 2019—as the Fed's operations could quickly scale up to meet market demand. The rapid scaling up and lengthening of the Fed's repo operations in the COVID-19 period is an example of where the Fed can more easily quickly and effectively respond to market pressures by regularly conducting repo operations (see Section F).

82. The Fed could explicitly include repo rates in its operational target to better guide liquidity provision. The focus on the Fed funds rate as the operational target guiding liquidity provision operations diverts attention from the more important repo markets that are key to price discovery and liquidity risk management for banks and nonbanks. While the transmission between the Fed funds and Repo markets runs both ways, in many cases shocks to liquidity demand are initially felt in the repo markets (for example if nonbanks need repo funding) and is then transmitted to the Fed funds market as banks, FHLBs and GSEs operate in both markets. The operating target could be adjusted by the FOMC reconsidering the nature of its operating target by including repo rates—either explicitly in their own right by referencing SOFR as the operating target or by specifying the operating target in terms of the general level of overnight wholesale market rates (thus incorporating the Fed funds rate and other unsecured wholesale market segments included in the Overnight Bank Funding Rate). The Fed aggressively responded to increased repo market pressures during the March COVID-19 crisis period even though there was less pressure in the Fed funds market. These actions were appropriate and would be clearer and more easily anticipated by market participants if repo rates were more explicitly included in the Fed's operational target.

83. Ample reserves systems should be focused on aligning market rates with a single central bank policy rate. It is unusual for central banks operating ample reserves (floor) systems to have a target range for short term rates as, usually, central banks use their main liquidity absorbing facility rate as their policy rate (the IOER in the Fed's case). Using a single policy rate does not mean that the Fed need manage volatility in market rates very closely. It is only necessary that overnight money market rates settle close to the policy rate on average over time to achieve adequate control. Short term volatility is acceptable and indeed valuable as it allows markets the opportunity to trade risk and conduct price discovery. A single policy rate could be expressed as the level at which both the ONRRP and IOER rates are set. Regular OMOs could then focus on providing whatever liquidity is required to keep overnight money market rates close to the policy rate on average over time.

84. If a standing repo facility were to be considered, important design tradeoffs would need to be confronted. Stigma is a challenge facing all central banks operating ample reserves regimes as in such regimes standing facilities are costly and rarely used. Market participants are only likely to be comfortable with using any new standing repo facility if it is priced close to normal market rates. This is problematic as the implication is a very narrow interest rate corridor with relatively little role for market-based price discovery. A standing repo facility may also need to be

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more widely accessible than the current list of large primary dealers if there are concerns on the capacity of primary dealers to intermediate between the Fed and the wider nonbank repo market in times of liquidity stress. Introducing a new standing facility is best considered if strategies to destigmatize the Discount Window prove ineffective. The FSAP recommends that the authorities first try to get banks to incorporate the Discount Window in their liquidity planning (as discussed in paragraph 78) and move to introduce a new standing facility if destigmatizing the Discount Window fails, noting that some trade-offs in terms of counterparty access and pricing versus stigma as well as moral hazard risks need to be confronted. A new standing facility that uses U.S. government securities as the only eligible collateral might be constructed with a price somewhat closer to the top of the FOMC target range to try and induce more regular use. The facility could be made available to large banks who have a regular interbank market presence and broker-dealers (perhaps wider than the existing Primary Dealers if those dealers can meet the Fed's counterparty credit standards). The Fed's experience of the usefulness of changes to the Primary Credit facility and introduction of the Primary Dealer Credit Facility in the COVID-19 crisis period (see Section F) will be instructive in terms of the nature of reforms that will be most effective in the long term.[38]

85. The Fed could consider implementing a quota system for the payment of IOER to depository institutions to stimulate interbank activity. The central banks of New Zealand and Norway have implemented ample reserves systems for some time, and both use a quota or tiering system to try and stabilize the demand for reserves and disincentivize liquidity hoarding. These systems are effective and could be considered in the U.S., although the diversity of depository institutions might make developing a quota system challenging.[39]

Developing Liquidity Provision Options to Backstop Liquidity Needs at Nonbanks

86. The authorities need powers to provide bilateral liquidity support to systemically important nonbanks. The DFA restricts the Fed's ability to provide liquidity support to nonbanks and severely constrains the Fed's options to maintain financial stability in a situation where a large, interconnected nonbank faces liquidity difficulties. Such powers are a useful adjunct to the existing DFA Orderly Liquidation Authority and would allow scope for the Fed to act earlier to prevent liquidity problems at a solvent but illiquid systemically important nonbank from spilling over to the financial system more widely. Legislative changes should be enacted that return the power for the authorities to provide bilateral liquidity support to a FSOC designated systemic nonbanks should be explored.

87. Preparedness to operationalize liquidity provision to designated CCPs could be improved. The authorities have the power to provide liquidity support to FSOC designated systemically important CCPs, but the DFA appropriately sets a high bar to provide liquidity support to a CCP which is desirable from a moral hazard perspective. Additionally, the supervisory agencies

[38] Such a facility could be done under FRA section 14's OMO authority.

[39] It is possible that a simple system might be developed where the bulk of banks (for example with assets less than US$50 billion) were developed a de-minimis quota leaving the main task of allocating more specific quotas to larger firms based on their specific balance sheet and payments system characteristics.

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of CCPs have well developed oversight arrangements that provide timely and granular information on the liquidity situation of CCPs. While CCP supervisors have taken steps to ensure that CCP liquidity resources will be adequate, even in stressed market conditions, there are still very extreme circumstances that could conceivably challenge the stressed liquidity plans. To better prepare for such circumstances it is recommended that the Fed enhance arrangements to provide emergency liquidity support to designated CCPs quickly if authorized.

88. A more comprehensive framework to guide market-wide liquidity support in securities markets should be developed to combat possible market dysfunction. Banks and nonbanks alike heavily rely on liquidity in key securities markets to manage liquidity and intermediate credit to the economy. The Fed deployed programs to support key securities markets in the GFC and COVID-19 crisis periods. Preparedness to provide such support in a future crisis would be enhanced if there was a more formal framework for determining which markets would be candidates for support and associated operational modalities to quickly facilitate support. The need for such support of securities markets is only emphasized by the Fed's actions in the COVID-19 crisis period (see Section F).

Preparedness for Providing FX Liquidity

89. FX liquidity provision protocols need development. The system of standing central bank FX swap lines provides a useful source of FX to finance FX liquidity provision, although it is less clear whether the FX reserves of the Treasury might be available for this purpose. It is recommended that the FRB develop its FX liquidity support protocols to both banks and CCPs.

Improving the Resilience of Repo Market Clearing and Settlement

90. The concentration of risks on BNYM is a significant concern that warrants structural change. The authorities should work with market participants to develop the capacity for repo clearing and settlement services to continue in the absence of BNYM, possibly involving direct settlement arrangements at the Fed. The resilience of the cleared FICC repo market could be enhanced if those cleared transactions could settle away from BNYM, at least as a backup. The Fed should also develop an effective option to conduct repo operations in the event of a protracted outage at BNYM. The FRB should undertake a simulation exercise to test a response to a tail risk of a protracted BNYM operational outage or reduction in BNYM capacity.

Managing Risks to Systemic Liquidity from the Transition from LIBOR to SOFR

91. The ARRC and the authorities have made great strides in developing and delivering on an ambitious transition plan but there is a need to move towards firm targets and deadlines. The U.S. authorities have been heavily engaged with the ARRC in promoting a fast and well managed transition away from Libor by end 2021. Efforts have been focused on raising awareness, using supervisory tools to prompt the disclosure and management of Libor-related risks and providing regulatory relief to facilitate the transition and international coordination. Most Libor-related exposures are in the derivatives markets where significant progress has occurred and where

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new markets that reference SOFR are developing fast. Slower progress is evident in the corporate securities and loan markets where a wider variety of users are involved and where some more significant changes in the structure of instruments are required. Market participants need to continue to work hard to transition away from Libor as quickly as possible. Libor transition risks could be reduced by:

- The authorities remaining focused on ensuring regulated firms manage and disclose Libor related risks effectively.
- The authorities (Fed, SEC, and CFTC) moving to set hard targets with deadlines for firms to transition to SOFR based products. Such targets and deadlines could be supported by the use of supervisory tools and adjustments to collateral haircuts and eligibility to encourage firms to transition more quickly.
- The authorities could provide more guidance on best practices and common standards when structuring new SOFR-based products thus helping markets develop and transition faster.

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Appendix I. FSAP 2015 Recommendations and Follow-Up

2015 FSAP Findings and Recommendation[1]	Current Status
Systemic Risk Oversight[2]	
Remit, Responsibilities, and Organization of FSOC	
To underscore the independence of FSOC, it would be helpful to clarify the organization and governance arrangements for each of the Committees in the Charters that are under development, ensuring that the expertise of each of the member agencies is drawn on appropriately. Moreover, it would be helpful to appoint Chairs for each of the supporting staff Committees, drawing upon the expertise of the member agencies.	**Partially implemented** Charters include suggestions that participants have the necessary experience.
The mandates and mission statements of each of the FSOC member agencies should be supplemented by addition of an explicit financial stability mandate. As an immediate step towards this goal, member agencies are encouraged to publish voluntary statements that the agency fully supports the work of the Council, subject to meeting the mandate and mission of the individual agency.	**Not Implemented**
Strengthening Systemic Risk Identification in the United States	
FSOC should set a clear short-term deadline to address outstanding obstacles to data sharing, and to agree a flexible, data sharing protocol across member agencies to support collective systemic risk oversight.	**Partially implemented** MoUs are in place across the FSOC membership.

[1] Based on the Financial System Stability Assessment and the technical note—pages 28–48).

[2] These issues were discussed in pages 9–28 of the technical note on systemic risk oversight.

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FSOC should continue to direct the OFR to prioritize work to address data gaps in short-term wholesale funding markets, in nonbank financial intermediation (such as asset management) and in interconnectedness indicators across the financial system.	**Partially Implemented** Surveyed data on cleared repo is published but other areas have not been addressed.
FSOC should publish additional information on the monitoring framework underpinning systemic risk identification and on the work of the SRC, to aid transparency and accountability. The monitoring framework should set out the responsibilities for monitoring risks beyond the regulatory perimeter and risks from global financial developments.	**Not Implemented**
FSOC should publish additional guidance in each Annual Report on the materiality the Council attaches to each of the identified threats to U.S. financial stability, including a judgment on their likelihood and impact.	**Not Implemented**
Addressing Identified Threats to Financial Stability	
For each identified material threat to financial stability highlighted in the Annual Report, FSOC should publish specific follow up actions to address each identified priority threat, stating clearly where responsibility for delivery of the actions lies, and specifying an agreed timeline for implementation and reporting of the results.	**Partially implemented** The FSOC's Annual Reports discuss in a detailed manner each material threat identified, provide updates on regulations and other measures proposed or implemented in response to each threat, and outline the research agenda. However, specific timelines and responsible agencies are not identified.
To strengthen coordination and collective ownership of the risk mitigation actions, members should consult FSOC as standard practice on the development and implementation of major new regulatory rules that could impact financial stability	**Partially implemented**
At a point in the conjuncture where financial stability risks appear to be	**CCyB has been finalized.**

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building, FSOC and its member agencies should prioritize the development of the U.S. macroprudential toolkit, focusing particularly on developing new time-varying measures to address the buildup of cyclical and sectoral risks and to strengthen the resilience of financial markets to run risks and fire sales.	
FSOC and its member agencies should ensure that the instruments are ready to use, and that the appropriate legal authorities are in place. Members should consult FSOC as standard practice on the potential new application of macroprudential tools.	**Not Implemented**
To provide clarity on the toolkit and on the readiness to deploy the instruments (as well as identifying remaining gaps), FSOC is encouraged to publish a summary of the U.S. toolkit identifying which tools are available to address particular types of risk and which agency/agencies have responsibility to deploy them, including the definition of triggers and the framework/approach to implementation. Updates should be published periodically as the toolkit is enhanced.	**Not Implemented**
Systemic Liquidity	
Tri-Party Repo Infrastructure An important next step to reducing the risks around tri-party repo is to reduce reliance on the two clearing banks, for example by developing options that might allow settlement in central bank funds.	**Not implemented** The Federal Reserve, in conjunction with an industry Task Force, was successful in reforming the tri-party repo infrastructure and market behaviors from 2010 through 2016 resulting several key accomplishments including: • All trades are matched prior to settlement • Reducing the provision of intraday credit from 100 percent uncommitted and unsecured to less than 1 percent secured and committed (including FICC GCF settlements)

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	• Improved risk management practices across the industry Additionally, although there has not been a fulsome solution for the reduction of firesale risk, the market CCP has introduced several new products and enhancements to its existing services that have resulted in significantly more activity being introduced to central clearing. In 2016, JP Morgan (JPMC) announced its decision to exit Broker Dealer clearance and settlement (including collateral management) resulting in one dominant provider, BNYM. The transition from JPMC to BNYM occurred smoothly over a two-year period, concluding at the end of 2018. Federal Reserve and other regulators continue to monitor the market and supporting infrastructures as it continues to evolve. Federal Reserve has not taken additional steps to significantly change the infrastructure post 2016 or after the transition of JPMC activity to BNYM, including steps to settle in central bank funds.
Repo Safe Harbors The authorities are encouraged to consider reviewing the financial stability impact of allowing mortgage-backed securities and other illiquid loans and securities safe harbor from bankruptcy proceedings.	**Not implemented** The Federal Reserve has not taken any actions related to the scope of Repo Safe Harbors. Changes to the scope of Repo Safe Harbors would require legislative (not regulatory) action.
Broker-dealers Completion of the review of regulation at the broker-dealer level is a priority. The SEC should move to finalize and implement rule changes to contain risk taking thereby reducing the prospect of regulatory arbitrage in the future.	**Partially implemented** In June 2019, the SEC adopted rules establishing capital and margin requirements for security-based swap dealers for which there is not a prudential regulator (nonbank SBSDs).[3] Nonbank SBSDs also registered as broker-dealers (other than registered OTC derivatives dealers) will be subject to the pre-existing requirements in the capital rules that apply

[3] See Capital, Margin, and Segregation Requirements for Security-Based Swap Dealers and Major Security-Based Swap Participants and Capital and Segregation Requirements for Broker-Dealers, Release No. 34-86175 (June 21, 2019), available at https://www.sec.gov/rules/final/2019/34-86175.pdf.

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	to broker-dealers, as amended to account for security-based swap and swap activities of broker-dealers. All other nonbank SBSDs will be subject to similar capital requirements in new Rule 18a-1 under the Securities Exchange Act of 1934. In June 2019, the SEC also adopted rules that, among other things, increase the minimum net capital requirements for broker-dealers that use internal models to compute net capital (Alternative Net Capital rule for BDs (ANC)). For example, under these rules, ANC broker-dealers will be subject to: (i) minimum tentative net capital requirements (tentative net capital equals net capital before deducting market and credit risk charges) of US$5 billion and (ii) a minimum net capital requirement that is the greater of a fixed-dollar amount of US$1 billion and an amount equal to 2 percent of the firm's exposures to its SBS customers, plus the existing ratio-based minimum net capital requirements in Rule 15c3-1 (either the 15-to-1 aggregate indebtedness ratio or the 2 percent of customer debit items ratio). In the June 2019 final rule, the SEC also increased the early warning notification requirement that requires an ANC broker-dealer to provide notification to the SEC if the firm's tentative net capital falls below US$6 billion. With respect to applying credit risk charges, the SEC also modified the existing portfolio concentration charge for ANC broker-dealers so that firms must take a capital charge equal to the aggregate amount of uncollateralized current exposures across all counterparties arising from derivatives transactions that exceed 10 percent of the firm's tentative net capital (a reduction from 50 percent of the firm's tentative net capital). The 10 percent cap was designed to limit the amount of a firm's capital base that comprises unsecured receivables. These assets generally are illiquid and cannot be readily converted to cash, particularly in a time of market stress. Permitting additional unsecured receivables to be allowable assets for capital purposes could substantially impair the firm's liquidity and ability to withstand a financial shock.

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	In 2015, the Financial Industry Regulatory Authority (FINRA) also published Regulatory Notice 15-33 (http://www.finra.org/sites/default/files/Regulatory-Notice_15-33.pdf) which provides guidance on liquidity risk management practices directed to firms that hold inventory positions or clear and carry customer transactions. In the notice, FINRA noted that it expects that each firm would, among other things, rigorously evaluate its liquidity needs related to both market wide stress and idiosyncratic stresses; develop contingency plans for addressing those risks so that the firm will have sufficient liquidity to operate after the stress occurs while continuing to protect all customer assets; and conduct stress tests and other reviews to evaluate the effectiveness of the contingency plans. In 2016, the SEC approved a proposed rule change to amend FINRA's margin rule for broker-dealers to implement margin requirements for forward-settling agency mortgage-backed securities transactions, including to-be-announced securities.
Money Market Mutual Funds The authorities should consider reducing the risks of forced sales by restricting the repo collateral to securities that the MMFs are able to hold outright. Variable NAVs should be applied to all MMFs thereby aligning the treatment with other open-ended mutual funds.	**Not implemented –** authorities note that less than 7 percent of MMF collateral consist of securities that are not Treasury or government agency securities, which reduces the risk of forced sales. **Not implemented** Rules issued by the SEC that have been fully implemented require floating NAVs for institutional non-government MMFs. Retail and government MMFs meeting the conditions of the applicable rule are permitted to use the amortized cost method of valuation and the penny rounding method of pricing to maintain a stable NAV. Historically retail investors have been less likely to make large redemptions quickly in response to signs of market stress and government MMFs typically receive inflows, not redemptions, during times of stress due to their low risk characteristics. For retail MMFs, the rule also provides additional

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	tools—liquidity fees and redemption gates—if historical redemption patterns change and any redemption pressures do occur in the future. MMFs are required to file Form N-MFP monthly, which includes information regarding, among other things, their portfolio holdings, market-based NAV, and levels of daily and weekly liquid assets. SEC staff monitors the information provided in these forms to, among other things, monitor changes and trends, such as trends in liquidity, credit quality, and portfolio composition. SEC staff also monitors this data to identify "outliers" based on, for example, investment exposures or liquidity profile, all of which can help to identify MMFs that may be susceptible to runs. MMFs also must conduct stress testing. MMFs must file, upon the occurrence of certain specified events (such as the default of a portfolio security), Form N-CR with the SEC.
FSOC could consider promoting commonly-agreed definitions of "cash and "cash equivalent," and metrics for judging the liquidity of assets.	**Not implemented**
Fed Exit and Financial Stability[4] During normalization: • Continue with the Fed funds rate as the operating target of monetary policy. • Announce that a floor system will be used during most, if not all, of the normalization period, and therefore the rate set on the IOER will equate with the Fed funds target.	**Partially implemented** Following the January 2019 FOMC meeting, the FOMC released a statement regarding monetary policy implementation and balance sheet normalization. This statement indicated that the FOMC would continue to view changes in the target range for the Federal funds rate as its primary means of adjusting the stance of monetary policy. The FOMC further indicated that it would implement monetary policy in a regime in which an ample supply of reserves ensures that control over the level of the Federal funds rate and other short-term interest rates is exercised primarily through

[4] Note that these issues were discussed in the FSAP technical note (Box 2 page 36) and expanded on in pages 65–88 of the Selected Issues Paper to the 2014 Article IV Consultation "USA Selected Issues Paper: The Operational Framework for Monetary Policy: July 2014".

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	the setting of the Federal Reserve's administered rates, and in which active management of the supply of reserves is not required. A further statement about plans to maintain an ample level of reserves was issued in October.
• Use the ONRRP, with counterparty allotment caps, as the primary monetary policy tool to manage the Fed funds rate at or slightly above the IOER.	**Implemented** As noted on the website of the FRBNY, here have been a number of changes in the list of ONRRP counterparties since 2015.[5]
• Assess the need for further expanding the counterpart list if the ONRRP is not sufficiently effective.	A statement on the use of the ONRRP, including use per-counterparty limits per operation, is posted on the FRBNY website.[6]
• Manage the dis-intermediation and shadow banking risks of the ONRRP by announcing that it is unlikely that the instrument will be used post-normalization and that allotment caps may be changed to contain flows.	**Not implemented**
• Re-instate the single rate policy target; with the first modest move from the current 0–0.25 percent to 0.25 percent. Communicate the prospect that given abundant liquidity, there could be somewhat higher variation around the policy target than in the past.	**Not implemented**
• Explore the use of term sterilization instruments—deposits and reverse repos—to lessen operational risks. Small term premiums could be justified to reduce the burden of a daily rollover of large transaction volumes.	**Implemented**

[5] https://www.newyorkfed.org/markets/rrp_counterparties#additions-and-removals.

[6] https://www.newyorkfed.org/markets/opolicy/operating_policy_151216.html.

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Post-normalization considerations: • Consider alternate operating targets after it is clear how markets have adapted to the regulatory changes. Consider de-emphasizing the importance of a single rate in favor of focus on the general level of money market rates, while highlighting what the Fed considers to be the most important indicators (e.g., GCRR, Fed funds rate).	**Implemented**
• Continue with the floor system.	**Implemented** In October 2019, the FOMC reaffirmed its intention to implement monetary policy in a regime in which an ample supply of reserves ensures that control over the level of the Federal funds rate and other short term interest rates is exercised primarily thorough the setting of the Federal Reserve's administered rates and in which the active management of the supply of reserves is not required.
• Withdraw the ONRRP: because the IOER will provide an effective floor once liquidity conditions tighten.	**Not implemented**
• Use short-term repos and reverse repos to manage the operating target close to floor.	**Not implemented**
• Abolish the reserve requirement, as it provides no benefit and is administratively cumbersome.	**Implemented** On March 15, 2020, the Board of Governors of the Federal Reserve announced that it had reduced reserve requirement ratios to zero percent effective on March 26, the beginning of the next reserve maintenance period.

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Data Gaps Publish more granular data on tri-party repos—including on cash providers, repo maturities and collateral type and maturity.	**Implemented** Data on the triparty and GCF repo markets are published regularly. In February 2019, OFR adopted rules requiring daily reporting by covered central counterparties of centrally cleared repo transactions, comprising approximately one-quarter of all U.S. repo market transactions. In October 2016, SEC adopted new reporting requirements for registered investment companies, which include information about their securities lending activities. Registered investment companies were required to comply with requirements to provide annual information regarding securities lending beginning on June 1, 2018. Pursuant to the FRB's supervisory authority, the FRBNY collects trade-by-trade data on tri-party repo transactions on a daily basis from the Bank of New York Mellon. In February 2019, the OFR published a final rule that will require the Fixed Income Clearing Corporation (FICC) to report data on FICC-cleared repo transactions beginning in October 2019. The FRB will act as OFR's collection agent, with required data to be submitted directly to the FRBNY. (Currently, the FRBNY relies on a voluntary agreement with an FICC affiliate to obtain data regarding bilateral repos and General Collateral Financing Repo transactions that are cleared by FICC).
Liquidity Backstops • The Fed could create a facility open to well-capitalized depository institutions that are direct members of Fedwire, available from 3 p.m. onwards to address an institution's unexpected shortfall in receipts that may have arisen because of an overall shortage of reserves, with collateral limited to Treasury and agency securities.	**Partially implemented** The Primary Credit and Secondary Credit Discount Window lending facilities are available to depository institutions (including U.S. depository institution subsidiaries of a foreign bank and U.S. branches or agencies of a foreign banks) to meet shortfalls in reserves. These facilities are available all day until the closing of Fedwire. A wide variety of assets may serve as collateral. Policymakers have also discussed the possibility of a standing repo facility that could involve Treasury securities and/or Agency securities as collateral.

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	Key design features for such a facility, including the fixed rate offered to counterparties, the set of eligible counterparties, and the range of securities eligible to be placed at the facility.
• Consider the systemic implications of the calibration of the LCR which allows for preferential treatment of FHLB funding; and the adequacy of FHFA liquidity and capital requirements imposed on the individual FHLBs, in light of the apparent increase in interconnectedness with banks.	**Partially implemented** In August 2018, the Federal Housing Finance Agency (FHFA) issued guidance[7] to the Federal Home Loan Bank (FHLBs) to strengthen their on-balance sheet liquidity. The guidance uses a countercyclical approach recommending that the FHLBs maintain a specified number of positive liquidity days ranging from 10 to 30 days. In addition, the guidance reduces or eliminates liquidity arbitrage between the regulatory regime applied to FHLBs and their depository members. The cash flow measure used in the new guidance generally precludes an FHLB from including inflows from maturing advances, which essentially is a 100 percent haircut, well above the 75 percent haircut in the Liquidity Coverage Ratio. The guidance increases the ability of the FHLBs to provide liquidity to their members during stress periods, reducing the funding risks of FHLB members. At this time, FHFA does not believe there is a need to adjust the capital requirements of the FHLBs. The FHLBs may appear to have low nominal capital ratios compared to other depository institutions; but in the context of their risk profile, it is more than adequate. Generally, 60 percent of the FHLB System's combined balance sheet is comprised of secured advances (over collateralized). Further, every FHLB holds multiples of their risk-based capital (RBC) requirement and all 11 FHLBs are able to meet their RBC requirement through retained earnings alone.

[7] Federal Housing Finance Agency, Federal Home Loan Bank Liquidity Guidance, Advisory Bulletin AB 2018–07, August 27, 2018.

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• The broad-based eligibility criteria for Fed liquidity support in the Dodd Frank Act should be reviewed, with consideration given to allowing the Fed, at its discretion, to extend liquidity support to any solvent individual institution that is designated by the FSOC (DFA Title I) as being systematically important. The Fed would need to ascertain solvency before extending any such lending and is encouraged to complete the proposals and subsequently establish heightened prudential standards for designated nonbanks as required by DFA.	**Not implemented** In November 2015, the Federal Reserve approved a final rule specifying its procedures for emergency lending under Section 13(3) of the Federal Reserve Act. Since the passage of the DFA in 2010, the FRB's emergency lending activity has been limited to programs and facilities with "broad-based eligibility" that have been established with the approval of the Secretary of the Treasury. The rule provides greater clarity regarding the FRB's implementation of limitations to emergency lending, and other statutory requirements. The final rule defines "broad-based" to mean "a program or facility that is not designed for the purpose of aiding any number of failing firms and in which at least five entities would be eligible to participate." These additional limitations are consistent with and provide further support to the revisions made by the DFA that a program should not be for the purpose of aiding specific companies to avoid bankruptcy or resolution. Solvent nonbanks that have been designated as systemically important by the FSOC would be able to participate in these programs to the extent they satisfy the applicable facility eligibility requirements.
Investment Funds and Systemic Risk Settlement to exiting investors should accurately reflect sales prices of assets liquidated where asset sales are made to redeem the claims. This could include a change in settlement to sales date NAV instead of redemption-date NAV, and to actual sales price (the bid price) from mid-price. Where leverage is used to settle redemption claims, redemption fees could be increased to reflect the expected cost to the MF.	**Implemented** Under Investment Company Act rule 22c-2, open-end funds may impose redemption fees. Although funds often use these redemption fees to recoup costs incurred as a result of investors' short-term trading strategies (such as market timing), a fund may adopt a redemption fee under this rule to eliminate or reduce any dilution in the value of shares from shareholder transaction activity more generally. In addition, under a new SEC rule adopted in 2016 and effective in 2018, open-end funds are permitted to use swing pricing to mitigate shareholder dilution from shareholder transaction activity.

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The pilot survey of the OFR, FRB, and SEC to collect and examine data on securities lending activities and the FSOC Request for Comments on Asset Management Products and Activities are very welcome. It is recommended to use insights from this exercise to extend data disclosure requirements on securities lending activities across the industry.	**Implemented** In early 2016, the OFR, FRB, and SEC completed a joint securities lending data collection pilot. The purpose of the pilot data collection was to collect information directly from seven securities lending agents that participated in the pilot project voluntarily. In April 2016, the Council expressed its view that without comprehensive information on securities lending activities across the financial system, regulators cannot fully assess potential financial stability risk, and encouraged enhanced and regular data collection and reporting, as well as interagency data sharing, regarding securities lending activities. Additionally, the Council encouraged efforts to propose and adopt a rule for a permanent collection of data on securities lending Relevant agencies continue to consult on these issues. In October 2016, the SEC adopted new reporting requirements for registered investment companies, which include information on their securities lending activities. Larger registered investment companies were required to comply with requirements to provide annual information regarding securities lending beginning on December 1, 2018. The compliance date for smaller entities was June 1, 2019.

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United States: Financial Sector Assessment Program-Technical Note-Banking Supervision and Regulation

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UNITED STATES

FINANCIAL SECTOR ASSESSMENT PROGRAM

August 2020

TECHNICAL NOTE—BANKING SUPERVISION AND REGULATION

This Technical Note on Banking Supervision and Regulation for the United States FSAP was prepared by a staff team of the International Monetary Fund as background documentation for the periodic consultation with the member country. It is based on the information available at the time it was completed in July 17, 2020.

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INTERNATIONAL MONETARY FUND

UNITED STATES

FINANCIAL SECTOR ASSESSMENT PROGRAM

July 17, 2020

TECHNICAL NOTE

BANKING SUPERVISION AND REGULATION

Prepared By
Monetary and Capital Markets Department

This Technical Note was prepared by IMF staff in the context of an IMF Financial Sector Assessment Program (FSAP) in United States held during October-November 2019 and February-March 2020. It was led by Ms. Michaela Erbenová. It contains technical analysis and detailed information underpinning the FSAP's findings and recommendations. Further information on the FSAP can be found at http://www.imf.org/external/np/fsap/fssa.aspx

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Glossary

AMA	Advanced Measurement Approach
BCP	Basel Core Principles for Effective Banking Supervision
BHC	Bank Holding Company
CBO	Community Bank Organization
CP	Core Principle
CET1	Common Equity Tier 1
CCAR	Comprehensive Capital Analysis and Review
CECL	Current Expect Credit Losses
CLAR	Comprehensive Liquidity Analysis and Review
CRA	Congressional Review Act
CRO	Chief Risk Officer
CVA	Credit Valuation Adjustment
DAR	Detailed Assessment Report
DFA	Dodd Frank Act
EGRRCPA	Economic Growth Regulatory Relief Consumer Protection Act
eSLR	Enhanced Supplementary Leverage Ratio
GDP	Gross Domestic Product
IRR	Interest Rate Risk
IRRBB	Interest Rate Risk in the Banking Book
FBA	Federal Banking Agencies
FDIA	Federal Deposit Insurance Act
FDIC	Federal Deposit Insurance Corporation
FBO	Foreign Banking Organization
FFIEC	Federal Financial Institutions Examination Council
FRB	The Federal Reserve System
FSAP	Financial Sector Assessment Program
FSOC	Financial Stability Oversight Council
GAAP	Generally Accepted Accounting Principles
GAO	Government Accountability Office
GFC	Global Financial Crisis
GSIB	Global Systemically Important Bank
LFBO	Large and Foreign Banking Organization
LFI	Large Financial Institution
LISCC	Large Institution Supervision Coordinating Committee
MRA	Matter Requiring Attention
MRBA	Matter Requiring Board Attention
MRIA	Matter Requiring Immediate Attention
NSFR	Net Stable Funding Ratio
OCC	Office of the Comptroller of the Currency
OIRA	Office of Information and Regulatory Affairs

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RBO	Regional Banking Organization
RWA	Risk Weighted Assets
SCCL	Single-Counterparty Credit Limits
SLR	Supplementary Leverage Ratio
SNC	Shared National Credit
U.S.	United States

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EXECUTIVE SUMMARY AND KEY RECOMMENDATIONS

This technical note leverages on the 2015 FSAP which concluded that the United States (U.S.) had a high degree of compliance with the Basel Core Principles (BCPs). The FSAP reviewed the progress achieved in addressing the main weaknesses previously identified and the main supervisory and regulatory developments since then. The key focus are the steps taken by the U.S. authorities in recent years to recalibrate and further tailor the banking regulatory and supervisory framework and the role of stress tests in the supervision process. The FSAP team has not covered the impact of COVID-19 outbreak on banks supervision and has not discussed with authorities the related policy response. The FSAP recommendations are meant to be considered once the impact of the pandemic on the economy and the banking sector becomes clearer.

The United States (U.S.) has a sound framework for the supervision of the banking sector. The U.S. dual banking system with multiple Federal Banking Agencies (FBAs) which have distinct but overlapping responsibilities forms a complex framework, which puts an absolute premium on effective cooperation among the agencies. However, the clear roles and responsibilities assigned to each agency, an appropriate suite of tools and powers to conduct effective supervision and undertake timely corrective action, and a comprehensive and risk-based supervisory approach forms the base of a solid supervisory regime.

The United States should implement remaining aspects of the BCPs, some of which persist from the previous assessment and require further attention. Several key recommendations made in the 2015 FSAP have not been implemented. The authorities should introduce heightened standards on governance to large and complex banking holding companies, enhance the related-party framework, introduce rules on concentration risk management, and include more quantitative standards on interest rate risk in the banking book.

The prudential framework should also be reviewed to address regulatory gaps which are emerging from a shifting balance between regulations, guidance and supervisory discretion. For several topics such as those mentioned above, FBAs views have been traditionally articulated in guidance rather than regulations. While the 2018 interagency statement on the role of supervisory guidance has not changed the legal status of this type of instrument, there are signs that attitudes toward it are changing and thus incentivizing some banks to challenge the applicability of guidance. Authorities should take this opportunity to review the framework, aiming to address the regulatory gaps; streamline and simplify requirements which, sometimes, are spread in many documents from different agencies; and consider rewritten certain prudential guidance as regulation.

The diversity of deposit-taking institutions that comprise the U.S. banking sector is conducive to a proportional approach to regulation, but all segments should be subject to rigorous prudential standards. For the U.S. GSIBs, considered as internationally active banks by the authorities, capital and liquidity requirements meet and sometimes exceed the Basel standards. While the principle of proportionality is key for effective regulation, the focus should be on reducing disproportional compliance costs. The scope of application of the recently enacted tailoring reforms

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is wide ranging, and we encourage U.S. authorities to maintain the overall stringency of prudential requirements for non-internationally active banks at a time when medium-term financial stability risks are rising. Regulatory changes will require fewer banks (other than the GSIBs) to be subject to the full set of Basel standards and will no longer require non-internationally active banks to comply with the full set of the Basel standards. In line with the BCPs, non-internationally active banks (Categories III and IV firms) should be required to comply with capital requirements that are broadly consistent with the Basel capital framework and appropriate large exposure limits. Authorities may also want to consider extending the full liquidity coverage ratio requirements to non-internationally active banks.

It is also important to ensure that the supervisory and regulatory arrangements remain effective, independently of the charter choice of the supervised institutions. The U.S. dual banking system with multiple Federal Banking Agencies (FBAs) which have distinct but overlapping responsibilities and numerous State supervisors forms a complex framework, which puts a premium on effective cooperation among the agencies. Despite the steps taken to reduce room for arbitrage, financial institutions have ample room to choose their charter, raising concerns that some institutions might seek more favorable supervisory treatment. The legal dispute between federal and state supervisors about the ability to grant a special purpose national bank charter to fintech firms suggests that the risks associated with charter shopping may rise. As new technologies blur lines between banks and some fintech firms and may allow these firms to potentially become systemic in a relatively short time, supervisors need to ensure that they will be appropriately supervised irrespective of their charter.

Recent changes to the stress test program will likely result in lower regulatory capital requirements for many large banks, calling for caution. Most banks subjected to the supervisory stress testing process consider it to be the main driver of their capital requirements. It will be important to ensure that the combined effect of all changes to the program and their interaction with the tailoring initiatives do not pose undue risks to the safety and soundness of affected banks. Supervisors are encouraged to intervene promptly to ensure that banks continue to adhere to sound capital planning practices and good governance and risk management.

The new supervisory environment created by the regulatory tailoring further increases the importance of high-quality bank supervision. The FBAs have been very successful fulfilling their mandate and enhancing the resilience of the banking sector. However, to effectively face new challenges arising from regulatory changes, rapid technological transformation of financial services, renewed industry pressure against supervisory actions and vulnerabilities that continue to build in a maturing credit cycle, it is key to maintain the intensity of supervisory scrutiny and to be agile in responding to new threats to financial stability. As supervisory stress tests become less frequent and capital and liquidity requirements less stringent for some non-internationally active banks, supervision needs to maintain an intrusive approach and continue enhancing its effectiveness. While regulation and supervision are not perfect substitutes, the FBAs can mitigate the risks using the full gamut of their toolkit to effectively address them.

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Table 1. United States: Main Recommendations

Recommendation	Priority	Timeline
Amend the 2009 interagency statement on charter conversions to ensure that the supervisory arrangement remains effective, independently of the charter choice of the supervised institutions. (¶29)	High	NT
Streamline regulatory requirements, and consider rewriting certain prudential guidance as regulation. (¶30)	High	MT
Streamline and simplify the regulatory framework by reducing the number of guidance statements on the same topic, improving the consistency between all requirements and guidelines, and further developing interagency work. (¶70)	Medium	MT
Review capital requirements for non-internationally active banks (Category III and Category IV firms) and ensure that they are broadly consistent with the Basel standards and appropriate concentration limits. (¶70)	High	NT
Consider extending the full liquidity coverage ratio requirement to non-internationally active banks (Category III and Category IV firms). (¶70)	High	NT
Introduce a capital charge for operational risk for those non-internationally active banks and BHCs using standardized approaches and expand the scope of supervisory reporting of operational risk events and associated losses. (¶70)	High	MT
Introduce heightened standards on the governance of large and complex banking holding companies, enhance the related-party framework, introduce rules on concentration risk management, and include more quantitative standards regarding interest rate risk in the banking book. (¶70–71)	High	MT
Assess the combined impact of all recent reforms including changes to the stress test program and ensure that they do not pose risks to the safety and soundness of banks. (¶80)	High	NT
Continue work on exploring second-round effects, possibly by integrating capital and liquidity stress tests. (¶79)	Medium	MT
Leverage the stress test framework to probe the prudential implications of longer-term structural issues in the banking industry. (¶79)	Medium	MT
Take further actions to tackle aging resolution of matters requiring attention, including: actions to further improve communication; and introducing more explicit rules and processes to escalate supervisory actions in the absence of timely and appropriate responses from banks. (¶98)	High	NT
Enhance the early intervention framework with policy limits for issues such as concentration and interest rate risks. (¶99)	Medium	MT

NT = Near Term (within six months / one year); MT = Medium Term (within 23 years)

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INTRODUCTION

A. Scope and Approach

1. This technical note analyzes the key aspects of the regulatory and supervisory framework for banks operating in the United States. The analysis is part of the 2020 Financial Sector Assessment Program (FSAP) of the United States. It is based on the regulatory framework in place and the supervisory practices employed as of March 10, 2020.[1] The analysis was based on a review of regulations and supervisory guidance, meetings with the Federal Banking Agencies' (FBAs[2]) and review of their joint self-assessments and responses to questionnaires. The FSAP team also met with selected state bank supervisors and representatives from banks, consulting firms, credit rating agencies and industry associations.

2. The 2015 FSAP performed a full assessment of compliance with the 2012 Basel Core Principles for Effective Banking Supervision (BCP), concluding that the United States had a high degree of compliance with the BCPs. This technical note leverages that assessment by reviewing the progress achieved in addressing the main weaknesses previously identified and the main supervisory and regulatory developments since then. While the BCP served as the basis for the evaluation, no formal assessment has been conducted against BCP principles.

3. A key focus this time around is the steps taken by the U.S. authorities in recent years to recalibrate and further tailor the banking regulatory and supervisory framework. In response to the global financial crisis the 2010 by the Dodd-Frank Wall Street Reform and Consumer Protection Act (DFA) led to an increase in supervisory intensity and increased the stringency of the regulatory framework. The U.S. authorities have argued that the sweeping scope and excessive costs imposed by the DFA have resulted in a slower rate of bank assets and loans growth; and that it was necessary to correct regulatory imbalances impacting market liquidity and the extension of credit.[3] In May 2018, the U.S. Congress passed The Economic Growth, Regulatory Relief, and Consumer Protection Act (EGRRCPA). It sought to recalibrate some regulatory requirements, notably for smaller banks and for those banks with assets between US$50–250 billion that had been considered systemic under the DFA. The EGRRCPA also specifically directed the FBAs to tailor oversight of institutions. In response, the FBAs have been adjusting the regulatory and supervisory framework to the size and systemic importance of financial institutions.

4. Special attention has also been devoted to the role of official stress tests within the regulatory and supervisory framework. The importance of stress tests in the regulatory and

[1] The main authors of this technical note are Caio Ferreira and Luc Riedweg (IMF) and Lyndon Nelson (IMF expert, Deputy Chief Executive Officer of the Bank of England Prudential Regulatory Authority). Input was also provided by Mark Zelmer (IMF expert, former Deputy Superintendent at the Office of the Superintendent of Financial Institutions Canada).

[2] For the purposes of this assessment, the FBAs are the Federal Deposit Insurance Corporation (FDIC), the Federal Reserve Board (FRB), and the Office of the Comptroller of the Currency (OCC).

[3] U.S Treasury report "A financial System that Creates Economic Opportunities – Banks and Credit Unions", June 2017.

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supervisory framework has grown over the past five years. Supervisory stress tests and the CCAR qualitative reviews of bank capital plans and governance/risk management practices have become important tools for U.S. supervisors in their assessments of the soundness and resilience of large banks. Indeed, most banks subjected to the supervisory stress testing process and many observers consider it to be the main driver of bank capital requirements. Given this significant importance and several recent adjustments of the methodology, this FSAP analyzed the evolution and risk coverage of the stress testing program along with the balance between supervisory stress tests and other supervisory examination processes.

5. The FSAP team has not been able to quantitatively assess the materiality of some regulatory reforms. Regulatory proposals issued by FBAs are usually very granular, providing the public with valuable information, including impact analyses. However, additional details which are important to assess financial stability such as banks specific information as well as the combined effects of reforms are not available. The team believes that it is important that the FBAs put out a comprehensive and cumulative impact assessment based on all regulatory changes to provide the assurance that these measures will not lead to a material reduction in the capital and liquidity buffers that have been built up with the objective of reducing the likelihood and severity of the occurrence of systemic crises in the future

6. The IMF mission thanks the authorities and private sector participants for their cooperation. The FSAP team benefited greatly from the inputs received and exchanges of views during meetings with supervisors and market participants. The team sincerely thanks the FBA' staff for their professionalism, spirit of cooperation, and for making enormous efforts to respond to the team's requests and overcome logistical challenges.

B. Financial Sector Structure

7. The United States has a large and diverse financial sector. With total assets at about US$98 trillion and 480 percent of GDP, the U.S. financial sector is the largest in the world. The system is more diverse than those in other advanced countries. As a result, despite its sheer size, the share of banking sector assets in the financial system, about 19 percent, is smaller than in most countries.

8. Non-bank financial institutions have become increasingly important over the last decade. Between 2008 and 2019, banking sector assets have grown at an average annual rate of 3 percent to US$19.5 trillion (92 percent of GDP). The pension and investment funds sectors have grown considerably faster and are now larger than the banking sector (Figure 1).

9. While banks are present in almost every credit market, other types of institutions play a large role in credit intermediation. Banks are the main providers of mortgage credit, but Government Sponsored Enterprises have substantial mortgage credit risk exposure, largely because they provide a credit guarantee to investors on mortgage-backed securities. Banks also play an important role in consumer credit market (together with finance companies). Insurance sector and investment funds are the main source of financing of corporate debt securities.

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Figure 1. United States: Financial Sector Structure

The U.S. financial system is large in absolute and relative terms.

Sources: Flow of Funds, Haver Analytic.

Despite its very large size, the relative importance of the banking sector is lower than in most countries.

Sources: FSI database, Haver analytic.

During the last decade banks have grown at a slower pace than the asset management industry.

The banking sector is consolidating, and the number of banks has followed a long downward trend.

Sources: FDIC.

The large banks comprise the majority of the banking system assets.

But the system is less concentrated than in other advanced countries.

Sources: Flow of Funds; Global Financial Development Database, FRB, FDIC, IMF staff calculation.

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Figure 2. United States: Banking Sector Indicators

Structural and regulatory specificities increase the average risk-weight of U.S. banks exposures....

Risk Weighted Assets-to-Total Assets
(In percent)

...contributing to a relatively low leverage sector,...

Capital-to-Total Assets
(In percent)

...despite average capital ratios below peers.

Banks profitability is substantially above peers.

Tier 1 Capital-to-Risk Weighted Assets
(In percent)

Return on Assets
(In percent)

Asset quality has improved during the last decade and is strong.

Banks liquidity also compares favorably in relation to peers.

Non-Performing Loans-to-Total Gross Loans
(In percent)

Liquid Assets-to-Short-Term Liabilities
(In percent)

Sources: IMF, Financial Soundness Indicators database; IMF staff calculations.

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10. The banking sector is comprised of about 5,300 banks with a wide range of sizes and business models. The overall number of banks has been on a downward trend since the early 1990s, but consolidation has not increased the asset share of the top banks during the last decade and the system remains less concentrated than the banking sector of other industrialized countries. The eight U.S. GSIBs and the four foreign bank organizations with complex operations in the United States have US$12.3 trillion of assets, or approximately 61 percent of the total U.S. depository assets. These banks have complex business models and operate globally. The sector contains another 32 banks with total assets above US$100 billion, which usually operates nationally and represent 31 percent of the system assets. The vast majority of the institutions are community banks, with total assets below US$10 billion and relatively simple business models.

11. Banks' balance sheets and income statements have strengthened. Comparing to a period before the global financial crisis, banks are more liquid, holding more liquid assets and attracting more deposits. At the same time, banks are holding more capital, and are less leveraged. Nonperforming loans have fallen substantially during the last decade, improving asset quality. Profitability has also been improving, although average ratios remains low (Figure 2).

INSTITUTIONAL SETTING

12. The framework for banking supervision is complex, but well established. Clear roles and responsibilities are assigned to the different agencies. The FBAs have a wide range of supervisory tools and powers to take measures against regulated firms that are in violation of laws and regulations or are engaging in unsafe or unsound business practices. However, the U.S. dual banking system with multiple FBAs which have distinct but overlapping responsibilities continues to put an absolute premium on effective cooperation and allows room for financial institutions to choose their supervisor. In addition, the prudential framework may need to be reviewed to address regulatory gaps which may emerge from a shifting balance between regulations, guidance and supervisory discretion.

A. A Dual Banking System

13. In the United States, a bank can be authorized to operate either by the Federal government or by a state. The United States operates under a "dual banking system". Federal bank charters for "national banks" and "federal savings associations" are issued by the Office of the Comptroller of the Currency (OCC), while each of the 50 states has a banking authority that charters banks under its own laws and regulations to operate within the state in question. These banks are generally referred to as "state banks" or "state savings associations."

14. Each U.S. bank, whether chartered under federal or state law, is subject to regulation, and supervision by a primary federal banking supervisor. Following the DFA reforms, the division of responsibilities among the FBAs are:

- The OCC is responsible for all national banks and federal savings associations and for supervising federal branches and agencies of foreign banks.

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- The FDIC is responsible for state banks and savings associations that choose not to be members of the Federal Reserve System. The FDIC also operates the federal deposit insurance program. As a result, it has the authority to examine for insurance purposes any bank, either directly or in cooperation with state or other federal supervisory authorities.

- The FRB has responsibility for state banks that are members of the Federal Reserve System; companies that own or control a national or state bank (a Bank Holding Company) or a state or federal savings association (a savings and loan holding company); and the U.S. operations of foreign banking organizations (including state-licensed branches and agencies of foreign banking organizations).

15. In practice, most domestic banks have two or more federal supervisors. For instance, an insured national bank that is owned by a Bank Holding Company (BHC) will be subject to supervision by the OCC, the FRB, and the FDIC. If the bank has assets above US$10 billion, it will also be overseen by the Consumer Financial Protection Bureau (CFPB) with respect to compliance with certain consumer financial protection statutes.

Coordination Among Supervisors

16. This complex supervisory framework leads to substantial overlaps and duplications, putting a premium on effective coordination in establishing regulatory requirements and supervising financial institutions. While the existence of multiple regulators can strengthen the supervisory framework by mitigating the risk of group thinking, taking advantage of this arrangement without excessively burdening the supervised institutions is challenging. The FBAs have enhanced coordination and established several formal and informal mechanisms for information sharing and cooperation to reduce the inevitable inefficiencies generated by the existing regulatory structure. Nonetheless, there is substantial duplication of supervisory effort, particularly in respect of entities in major banking groups, and the ongoing risk of inconsistent messages from the agencies.

17. The FBAs, the CFPB, and state banking regulators formally coordinate examination policies through the Federal Financial Institutions Examination Council (FFIEC). Prudential regulators have been engaging in a number of coordination activities to avoid duplication. For example, when exercising its backup examination authority, the FDIC coordinates with the primary federal prudential regulator and generally participates with them during its onsite examination activities. In addition, the FRB is required to rely on reports of examination made by other regulatory agencies in its role as the holding company supervisor and to avoid, to the fullest extent possible, duplication of examination activities. The FBAs have also increased joint supervisory presence at examinations of systemically important banks and joint participation in the FRB's horizontal reviews. In addition, several joint regulatory proposals demonstrate a stronger commitment to issue joint regulations and supervisory guidance.

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18. While the FBAs have made progress in coordinating their activities, there are areas for further improvement. These include:

- **Supervisory cycle.** The ongoing efforts to collaborate could go further if supervisory planning cycles were aligned. Now, with supervisors beginning their planning at different time, there is a risk that resources are committed before another regulator has completed their plan and made a bid for assistance.[4]

- **Data and document sharing.** While supervisors of the FRB rely on information from primary federal regulators, access to this information varies and data processing challenges and miscommunications can lead to some documents being inaccessible for examiners.[5] System and processes that facilitates more efficient document sharing could help boost cooperation.

- **Guidance, rules and data requests.** While the FBAs have increased the issuance of joint supervisory guidance and rules, a meaningful amount of them on issues such as risk management and corporate governance continue to be issued separately, and sometimes, with different content.

- **Data requests and format.** The FFIEC has made substantial progress harmonizing call reports. However regulated entities mentioned requests from individual supervisors essentially asking for similar data in different formats.

Charter Switching

19. The dual banking structure allows room for banks to choose their supervisors, raising concerns that some institutions could switch charter in search of more favorable treatment. Banks can choose to operate under a state or federal charter to best accommodate their business needs. Further, state-chartered banks can choose to become a member of the Federal Reserve System, in effect choosing the FDIC or the FRB as their primary federal supervisor. While banks do need the approval of the new chartering authority, they do not need the approval of their current authority to make the switch. In practice, banks face no difficulties in switching charters if they are considered safe and sound. Evidence suggests that banks receive more favorable ratings from their new supervisor after they change charters.[6]

20. The DFA and the prudential regulators have taken steps to reduce the room for arbitrage. In a statement issued by the FFIEC in 2009, the members of FFIEC re-affirmed that charter conversion or changes in primary federal regulatory should only be conducted for legitimate

[4] For the Federal Reserve, the OCC's and FDIC's planning period is less relevant for companies under $100B, because the Federal Reserve leverages their supervisory plans and exam results. See SR 16–11.

[5] See Office of Inspector General Evaluation Report 2018-SR-B-010, June 20, 2018.

[6] See Rezende, Marcelo 2014. "*The Effects of Bank Charter Switching on Supervisory Ratings*". *Federal Reserve Bank Staff Working Paper No. 2014–20.*

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business and the prospective chartering authorities agreed to consult with the FDIC and the FRB (in the case of a holding company) on any conversion application involving an institution for which its current supervisor has either rated or proposes to rate that institution as less than satisfactory.[7] The statement is not legally binding but, in the immediate post-crisis period, seemed to curb charter switching for questionable reasons. The legal framework was enhanced in 2010 by the DFA which generally prohibits charter conversions while the institution concerned is subject to any formal enforcement actions that involve significant supervisory matters.[8] Further, by eliminating the Office of the Thrift Supervision and placing thrift holding companies under consolidated supervision of the FRB, the DFA removed the option for firms to choose their consolidated supervisor based on the type of depository institution subsidiary the firm owns.

21. However, the potential for regime shopping still exist. Many well-rated depository institutions currently fall outside the scope of both the DFA and the FFIEC statement on charter conversions. Data suggests that there seems to continue exist a steady stream of conversions. Between June 2014 and June 2019, 364 financial institutions surrendered their national charter through conversions to state charters (172) and mergers with state institutions (192). Five financial institutions converted into a national charter in the same period. In addition, the risk of charter shopping is likely to become more relevant as new technologies and the transformation of the financial sector allows fintech firms providing bank-like services to grow very quickly and become systemic in a relatively short period. The current legal dispute between federal and state supervisors about the potential grant of a special purpose national bank charter to fintech firms suggests that the risks associated with charter shopping may rise. The FBAs need to guard against perceptions of differences in supervisory style or treatment in their regional offices that could influence the choices made by banks and fintech firms in their charter choice.

B. Supervisory Objectives, Powers, and Independence

22. The FBAs have a clear mandate and commitment to promote the safety and soundness of the banking system. They, however, have multiple objectives, and the primacy of the safety and soundness objective is not enshrined in legislation. The OCC has the added objectives of assuring fair access to financial services and fair treatment of customers. The FRB has the objectives of maintaining the stability of the financial system and containing systemic risk that may arise in financial markets and influencing money and credit conditions in the economy in pursuit of full employment and stable prices. The FDIC has an additional objective of minimizing the disruptive effects that can occur within the financial system when bank or nonbank financial firms fail. Currently there seems to be no confusion on the part of the agencies or the public that the focus of bank supervision relates to safety and soundness. However, with the FRB's much broader mandate which includes monetary policy goals of promoting maximum employment and stable prices, there is some potential for banking supervision actions to be seen as interacting with these goals.

[7] That means 3 or poorer in a rating system that range from 1 to 5, where 1 is assigned to banks that raise no supervisory concern and 5 is assigned to institutions that warrant immediate attention from supervisors.

[8] DFA, Section 612.

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23. Federal statutes provide for the operational independence of each agency. The self-funding status of the agencies which does not come from Congressional appropriations and their strong transparency and accountability framework also contribute to their operational independence. The processes for the appointment of agency heads are well-established but there are no laws specifying the acceptable reasons for removal. Stakeholders confirmed that FBAs' practices and decision making are clear evidence of their independence.

24. The legal framework provides supervisors an appropriate suite of powers to conduct effective supervision and undertake timely corrective action. The FBAs have delegated authority for the imposition of prudential standards and they also issue guidance and manuals that describe supervisory expectations. The FBAs have the authority to examine supervised entities and their subsidiaries and obtain a broad array of information from them. In addition, the FRB has the authority to examine and obtain reports from bank holding companies, savings and loan holding companies, and their subsidiaries. The FBAs also have broad authority to take (or require a bank to take) remedial measures when, in their judgment, a bank or holding company is not complying with laws or regulations or is, or is likely to be, engaged in an unsafe or unsound practice.

Potential Future Challenges

25. The 2018 statement on the role of supervisory guidance might create obstacles to the implementation of key supervisory expectations. In the U.S. framework, supervisory guidance traditionally addresses some critical issues such as corporate governance and risk management and, for many years, seem to have taken a meaningful role in corrective and other supervisory actions. In September 2018, responding to inquiries that the differences between supervisory guidance and laws and regulations could be unclear, the FBAs and other federal agencies issued a statement clarifying the role of supervisory guidance. The statement restates administrative law principles and clarifies that the agencies do not take enforcement actions based on supervisory guidance and do not criticize a supervised financial institution for a "violation" of supervisory guidance. While the statement doesn't change the legal interpretation about the role of supervisory guidance, in practice, attitudes toward it may change and thus incentivize some institutions to challenge the applicability of guidance in the future. Breaches of provisions included in guidance can solely lead to enforcement action if they are viewed as constituting unsafe and unsound practices or they violate statutes, regulations, or other enforceable conditions. However, for some topics, the safety and soundness requirements are very high level and the connection between them, and guidance and supervisory action is harder to make.

26. In addition, the new procedures introduced for the operationalization of the Congress Review Act might impact the ability of the FBAs to independently issue new regulation and guidance. The Congressional Review Act (CRA), enacted in 1996, establishes a mechanism by which Congress can exercise direct oversight of federal agencies' regulatory actions by requiring the notification to Congress of rules they have promulgated and giving them an opportunity to overturn these rules. In April 2019, the Office of Management and Budget (OMB) issued a memorandum for the heads of agencies providing guidance on compliance with the CRA. The memorandum indicated that non-binding guidance and other documents, in addition to regulations, are covered by the CRA

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and outlines procedures for submitting agency rules to the OMB's Office of Information and Regulatory Affairs (OIRA) to determine whether the rule is "major" under the CRA. The memorandum sets forth for the first time a determination process whereby independent financial regulatory agencies conduct more extensive major-rule analysis under OIRA methodology for most rules (which may include guidance, general statement of policy, and interpretative rules), such analysis being reviewed by OIRA. Additionally, if OIRA were to reject the adequacy of the agency's major-rule analysis, OIRA could withhold providing to the agency its own major-rule determination which could delay the rule from going into effect. Currently the agencies are discussing the legal interpretation and the detailed implementation of the memorandum. A broader interpretation of the applicability of the CRA, could lead to the potential overturn of long-standing supervisory guidance[9] and represent a meaningful change from previous practices. Given the recentness of the memorandum, the FSAP team was not able to evaluate its practical implications.

Proposals to Streamline the U.S. Regulatory Structure

27. The United States' authorities have advocated for rationalization and streamlining of the U.S. regulatory structure. In 2017, the U.S. Treasury argued that there exist significant opportunities to rationalize the U.S. regulatory framework and that doing so could improve its efficacy. Along the same line, the Government Accountability Office (GAO) suggested that the existing regulatory structure does not always ensure efficient and effective oversight.

28. The Treasury recommended that Congress take action to reduce supervisory fragmentation and increase accountability for all regulators. The Treasury suggested that measures could include consolidating regulators with similar missions and more clearly defining regulatory mandates. Treasury also recommended that Congress expand the Financial Sector Oversight Council (FSOC)'s authority to play a larger role in the coordination and direction of regulatory and supervisory policies, including by giving it the authority to appoint a lead regulator on any issue on which multiple agencies may have conflicting and overlapping regulatory jurisdiction. Finally, the Treasury also recommended increased accountability for all regulators which, in its views, could be achieved through oversight by an appointed board or commission or, in the case of a director-led agency, appropriate control and oversight by the Executive Branch, including the right of removal at will by the President. The FSAP team understands that, for the time being, no action has been taken in response to these recommendations.

C. Recommendations

29. The FBAs need to ensure that the supervisory arrangement is effective, independently of the charter choice of the supervised institutions. The situations where charter switching is legally prohibited are relatively limited, raising concerns that some institutions could choose its charter in search of more lenient supervisory treatment. As new technologies may allow fintech firms

[9] On October 22, 2019, the GAO expressed its legal opinion that three "guidance" letters issued by the FRB as long ago as 2011 are rules under the purposes of the CRA and thus are subject for consideration to be overturned by Congress. See GAO B-330843 available at https://www.gao.gov/assets/710/702205.pdf

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to become potentially systemic in a relatively short period, the risks associated with charter shopping may rise. The FBAs and State bank supervisors need to discuss how to handle these cases and amend and complement their charter switching statement issued by the FFIEC in 2009 to ensure that banks and fintech firms will be soundly supervised irrespective of their charter.

30. The prudential framework should be reviewed to address regulatory gaps which are emerging from a shifting balance between regulations, guidance and supervisory discretion. Following the 2018 statement on supervisory guidance, the FBAs will need to be mindful that their interpretations of rules, laws and regulations are well anchored and that if there are any gaps from a safety and soundness perspective, the laws and regulations are adjusted accordingly. Authorities could take this opportunity to review the framework, aiming to streamline and simplify requirements which, sometimes, are spread in many documents from different agencies; address some regulatory gaps; and consider whether there are any key prudential guidance that could be rewritten as regulation.

31. While balanced by an effective accountability framework, it is important to safeguard the independence of the FBAs. Timely supervisory action requires institutional frameworks with decision making processes free from lobbying by the financial industry and political pressures. The FBAs independence, responsibilities and powers require appropriate mechanisms for checks and balances that are in place. As required by the BCP, changes to the accountability framework or to the ability of the FBAs to issue regulation need to ensure that the supervisor maintains operational independence, transparent processes and sound governance.

PRUDENTIAL REGULATIONS AND REQUIREMENTS

32. The wide range of institutions that form the U.S. banking sector is conducive to a proportional approach to regulation, but all segments should be subject to rigorous prudential standards. The FBAs are focused on increasing the efficiency of the regulatory framework by further tailoring it to banks size and complexity. Considering the diversity of institutions subjected to the regulation, this approach is appropriate. However, the EGRRCPA and related regulatory proposals have reduced the stringency of several prudential requirements for some large banks. While the principle of proportionality is key for effective regulation, the focus should be on minimizing disproportional compliance costs without reducing the rigor of the regulation.

A. Regulatory Framework for Banking Supervision

33. The U.S. prudential regulatory framework is complex and combines federal statutes, regulations and various forms of guidance. Under existing legislation, FBAs have delegated authority to formulate and enforce regulations. In addition, the FBAs issue various types of guidance to their respective supervised institutions, including interagency statements, bulletins, policy

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statements, advisory and interpretive letters, and frequently asked questions.[10] Supervisory expectations are also included in several examination manuals. The banking statutes and regulations establish a framework of minimum prudential standards that banks and BHCs must comply with, while policy statements, interpretations, and supervisory guidance and manuals provide examples of safe and sound conduct, appropriate consumer protection and risk management practices, and other actions for addressing compliance with laws or regulations.

34. The prudential supervisory regime is governed by numerous regulations and guidance. The implementing regulations, guidelines and manuals are required to be made publicly available, thus providing a high level of transparency. However, it is not uncommon to have several statements of guidance on the same topic. For example, the guidance on the roles and responsibilities of banks' board of directors are included in at least 27 supervisory letters issued by the FRB alone.

35. For certain topics, FBAs' views have been articulated in guidance rather than regulations. For example, guidance issued covers governance and risk management standards including model risk management, expectations around various types of banking lending activities (commercial real estate lending, leverage loans, student loans, etc.), and principles for sound management of liquidity risk that apply to banks with less than US$100 billion in assets.[11] Guidance that have been used for decades by FBAs often provide detailed and concrete examples of practices that the FBAs consider to be generally consistent with safety-and-soundness standards. Overall, post-crisis, the FBAs have been issuing a very large number of guidance statements to set supervisory expectations.[12] This has significant practical implications given that FBAs cannot criticize banks for a "violation" of supervisory guidance, as noted in the 2018 Interagency Statement Clarifying the Role of Supervisory Guidance, as already discussed.

36. Regulations are frequently revised and updated in a transparent way. Several statutes require the FBAs to review their regulations at regular intervals to ensure that they remain effective and relevant to changing industry and regulatory practices. These reviews are conducted through a process that allows for widespread public participation. Regulations only take effect after the FBAs have responded to comments on the proposal in a final rulemaking document.

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[10] FDIC Advisory Opinions, FDIC Statements of Policy, OCC's advisory and interpretive letters addressing various legal and banking issues, FRB's Supervision and Regulation (SR) Letters, etc. SR Letters address significant policy and procedural matters related to the Federal Reserve System's supervisory responsibilities.

[11] Examples of guidance statements include: Interagency Guidance on Leverage Lending, Guidance on Model Risk Management (market risk), Interagency Counterparty Credit Risk Management Guidance, Interagency Guidance on the New Accounting Standard on Financial Instruments – Credit Losses, Supervisory Guidance for Assessing Risk Management at Supervised Institutions with Total Consolidated Assets Less than US$50 Billion, Interagency Policy Statement on Funding and Liquidity Risk Management, Supervisory Guidance on Stress Testing.

[12] Individually or collectively (though joint statements or interagency guidance), the FBAs (FDIC, FRB and OCC, excluding CFTC, SEC and CFPB) and the FFIEC have issued 186 guidance documents and examination manuals since 2010: 16 in 2019 (as at September 30), 37 in 2018, 40 in 2017, 33 in 2016, 29 in 2015, 23 in 2014, 2 in 2013, 6 in 2012, but none in 2011 (source: https://www.stlouisfed.org/federal-banking-regulations/#). This site is not an authoritative listing of guidance, and several SR letters seem to have been omitted. The actual number should be higher.

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37. Prudential requirements are tailored to be more stringent for large, more systemic banks and less strict for smaller, less-systemic institutions. Supervisory expectations in the United States have long been defined on a proportionate basis, considering the risks posed to the safety and soundness of firms and to U.S. financial stability generally. This is of particular relevance in a jurisdiction where some of the world largest and complex banks are headquartered and operating, alongside a large number of small mono-activity community banks relying on a relatively straightforward business model.

38. This tiered approach to regulation is directly embedded in legislation. Under Section 165 of the DFA, certain large BHCs, including foreign banking organizations are subject to enhanced prudential standards that are more stringent than standards applicable to other BHCs that do not present similar risks to U.S. financial stability.[13] These extensive enhanced prudential standards covering capital, liquidity, risk management, resolution planning, and concentration limits do not apply to smaller banks; nor do the requirements for stress testing. While a tiered approach has been one of the main features of the U.S. prudential regulatory framework, there is a growing tendency to further differentiate regulatory measures for different kinds of U.S. banks, as detailed below. More recently, the FBAs have introduced several categories within the universe of banking organizations that will drive the choice of applicable prudential requirements (tiered, or "segment" approach).

B. Recent Changes: Tailoring Regulation to Risks

39. The reforms adopted in the aftermath of the GFC represented a substantial strengthening of the regulatory framework. The U.S. Congress introduced enhanced prudential standards as part of the financial sector reform in the DFA. In addition, in 2013 and 2014, the FBAs finalized rules – which improved the quantity and quality of regulatory capital and established a capital conservation buffer that were applied to all banking organizations. Further, banking organizations considered internationally active – generally, those with US$250 billion or more in total consolidated assets or US$10 billion or more in on-balance sheet foreign exposure – became subject to a wider set of prudential standards, consistent with all Basel standards (including, for example, the Liquidity Coverage Ratio, the Supplementary Leverage Ratio and the Countercyclical capital buffer).

40. In the wake of the U.S. Department of Treasury's review of the regulatory framework, several legislative and regulatory reforms and initiatives reduced the stringency of some standards. The report issued in June 2017 *(A Financial System that Creates Economic Opportunities: Banks and Credit Unions*) made several detailed recommendations to improve regulatory efficiency and effectiveness, reducing regulatory burden by reducing unnecessary complexity, and tailoring the regulatory approach based on size and complexity of regulated firms. While these reforms detailed below preserve the core of the approach to regulation that was legislated under the DFA in the aftermath of the GFC, the recent trend has been a steady sequence of "fine-tuned" steps that

[13] Prior to the DFA which introduced the distinction between BHCs subject to enhanced prudential standards, another category existed that identified firms subject to the so-called advanced approaches risk-based capital requirements of Basel II.

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reduced the stringency of some standards for a range of firms at a time when financial stability risks within the system as a whole are elevated by historical standards and rising. Changes resulted from the EGRRCP Act, as well as from decisions and initiatives taken by the FBAs in response to legislative developments. Apart from changes mandated by statute, several other regulatory reforms have also been decided by the FBAs or are under way (Figure 3 and Box 1).[14]

Figure 3. United States: Regulatory Tailoring

Source: IMF Staff.

[14] See https://www.reginfo.gov/public/do/eAgendaMain. As described on the OMB's website, "The Trump Administration's Unified Agenda of Regulatory and Deregulatory Actions (Agenda) reports on the actions administrative agencies plan to issue in the near and long term".

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Box 1. Regulatory Changes

Following the package of reforms initiated after the GFC (DFA, U.S. rules implementing Basel III):

- All firms with US$50 billion or more in assets were subject to enhanced standards, including supervisory stress tests, capital plan submissions, resolution plan requirements, single counterparty credit limits, and reduced LCR requirements.
- Firms with at least US$250 billion in assets or US$10 billion in on-balance-sheet foreign assets were also subject to the advanced approach risk-based capital requirements of Basel II, the Basel III supplementary leverage ratio (3 percent), a full LCR requirement, and the countercyclical capital buffer provision of Basel III.
- On top, each GSIB is subject to a leverage buffer of 2 percent under the Enhanced Supplementary Leverage Ratio (eSLR) rule; and meet higher risk-based capital requirements (GSIB surcharge).

The EGRRCP Act passed in May 2018 raised the enhanced prudential threshold from US$50 billion or more in assets to US$250 billion. The law also directed the U.S. banking regulators to tailor supervision and regulation of large banking organizations with more than US$100 billion in assets. The Act eliminates the supervisory stress tests for BHC with less than US$100 billion in assets, requires periodic (rather than annual) supervisory stress test for firms in the US$100 to US$250 billion range, and removes the company-run stress tests requirements for banking organizations with less than US$250 billion in assets and other financial companies with US$250 billion in assets or less. The law contains a number of other provisions: it includes a simplified regulatory regime for community banks that meet certain risk profile criteria (ability to opt for a capital requirement based on a simple leverage ratio), requires FBAs to amend the SLR rule for custodial banks to exclude from the leverage exposure measure qualifying deposits at certain central banks, mandates FBAs to amend the LCR rule to classify all investment-grade, liquid and readily-marketable municipal securities as level 2B liquid assets, introduce Volcker Rule exemptions, and a less restrictive definition of high volatility commercial real estate.

Consistent with the provisions of the EGRRCP Act, the FBAs introduced in October 2019 a new round of changes to applicability thresholds for the more stringent regulatory capital and liquidity requirements. Under the final rule, there will be four categories of regulatory standards for banks with over US$100 billion in total consolidated assets, with standards increasing in stringency (Category I standards being the most stringent and Category IV standards the least stringent):

- Banks in category IV—generally those with US$100 billion to US$250 billion in consolidated assets—will no longer be subject to standardized liquidity requirements, such as the LCR or the proposed NSFR unless weighted short-term wholesale funding is higher US$50 billion or more (in that case, requirements will be calibrated at 70 percent of the full LCR requirements). Liquidity stress testing requirements and risk management standards will be further tailored (e.g., with a reduction of the frequency of collateral calculation). Capital standards will continue to maintain the same applicable risk-based capital requirements and the U.S. leverage ratio. These banks will no longer be required to conduct company-run stress tests, and supervisory stress tests will be carried out every two years, instead of on an annual basis.
- Banks in Category III—generally those with assets in the US$250 to US$700 billion range—will have to comply with a reduced LCR and NSFR (i.e., 85 percent of the full LCR requirements, below the 100 percent contained in the Basel standards and reflected in the previous U.S. regulation). If weighted short-term wholesale funding for Category III institutions is higher than US$75 billion, full LCR requirements would then apply. Category III banks will also be required to conduct company-run stress tests on a two-year cycle, rather than semi-annually, but will remain subject to annual supervisory stress tests. Capital standards will continue to include applicable risk-based capital requirements, the U.S. leverage ratio, the SLR, and the countercyclical capital buffer. However, these institutions that were previously advanced approaches institutions will no longer have to include unrealized gains and losses in regulatory capital.
- U.S. GSIBs (Category I) and banks having more than US$700 billion in assets or more than US$75 billion in cross-jurisdictional activity (Category II) will not see any changes to their liquidity and risk-based capital requirements.

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Box 1. Regulatory Changes (concluded)

Given their size, Category IV and Category III banks are unlikely to reach the US$50 and US$75 billion thresholds for the *weighted* short-term wholesale funding indicator that would trigger higher LCR requirements.[1] Currently, it is projected that no Category IV banks would have to meet reduced LCR requirements and one Category III bank would have to comply with the full LCR requirements. Therefore, the rule is likely to either eliminate or weaken the application of the LCR and NSFR for a significant part of the banking system. The FRB estimates that the changes would result in an aggregate 0.6 percent decrease in the required capital and a reduction of 2.5 percent of the liquid assets for all banks with over US$100 billion in assets (given no changes to the largest banks—this implies significantly larger declines for banks in the US$100 to 700 billion group).

A framework which is substantially the same has been introduced for Foreign Banking Organizations (FBOs) with US$100 billion or more in combined U.S. assets (October 2019).

FBAs have advanced several additional proposals and tailored other prudential regulations:

- Recalibration of the enhanced SLR for GSIBs and certain of their depository institution subsidiaries (April 2018): the proposal, issued by the OCC and the FRB would replace the current fixed leverage ratio buffer (2 percent) that applies uniformly to all GSIBs holding companies with a leverage buffer tailored to each GSIB, set at 50 percent of the GSIB risk-based surcharge, thereby mirroring the Basel approach.[2/] The proposal would similarly tailor the fixed leverage ratio buffer that applies to depository institution subsidiaries of GSIBs that are regulated by the Board and OCC. Leverage ratio requirements would still be more stringent than international standards, as GSIB risk-based capital surcharges applicable to holding companies in the United States are more conservative than the ones prescribed by the BCBS. This is consistent with the fact that risk-weight densities are higher in the U.S. than in some other jurisdictions (for the leverage ratio to play a backstop role, it should therefore be higher than Basel standards). The final rule has not yet been issued.
- The FDIC proposed to ease collateral provisions of the 2015 interagency swap margin rule by removing the requirement that financial institutions post initial margin in derivatives transactions between their own affiliate (September 2019). This proposal is not the final rule.
- Simplification to the capital rules for non-advanced approaches banking organizations: the final rule replace the 10 percent of CET 1 capital deduction thresholds for each category (deferred tax assets, mortgage services rights, investments in unconsolidated financial institutions) with 25 percent of CET 1 capital thresholds, eliminates the aggregate 15 percent of CET 1 threshold for the combined impact of the three categories of deduction items, and allows banking organizations to include minority interest up to 10 percent of the parent banking organization's CET1 capital. Under the final rule, Category III, Category IV and all other firms will be allowed to use these less stringent regulatory adjustments to CET1 capital.
- Volcker Rule revisions (August 2019): the final rule establishes a three-tier compliance framework. Banks with $20 billion or more of trading assets and liabilities would be subject to many of the compliance program requirements. Banks with moderate and limited trading assets and liabilities are exempted from a number of requirements (such as reporting, internal control, CEO attestation). If an instrument is held for longer than 60 days, banks can presume (subject to supervisory rebuttal) that the rule will not apply to such instruments.

Lastly, the FBAs have finalized rules to tailor certain aspects of the stress testing rules (as further discussed below in the stress tests section). On the positive side, the Stress Capital Buffer (SCB) rule issued in March 2020 will integrate two approaches (the capital rule and the CCAR process). Under the final rule, the GSIB surcharge will become additive to the SCB. This change is significant as a firm is not currently required to have enough capital on a post-stress basis to meet its GSIB surcharge. The SCB rule will also modify certain assumptions (a firm will have to "pre-capitalize" four quarters of planned dividends instead of having to pre-fund dividends and share buy-backs over a longer timer horizon) and the net impact will vary across the range of banks (including across GSIBs). Also, the final rule no longer includes a stress leverage buffer requirement.

[1] Based on the methodology for calculating the *weighted* short-term funding (wSTWF) (exposures are weighed in accordance with the remaining maturity and the type of collateral), it appears that a bank with US$220 billion in total liabilities would need to raise more than US$200 billion of wholesale funding secured by Level 1 assets to reach a wSTWF indicator of US$50 billion.

[2] Given existing risk-based capital surcharges, the leverage buffer would be in the 0.75 –1.75 percent range (compared to 2 percent under the existing rule).

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41. In principle, regulating banks in a proportionate manner using a risk-based approach is appropriate. The FBAs emphasized that the intention is to make the current regulatory supervisory environment more efficient, transparent and simple and ensure that compliance burden for less complex firms, especially community banks is minimized without compromising firms' safety and soundness. Regulating banks in an efficient manner obviously requires technical adjustments at regular intervals to take into consideration lessons from experience. Further, there is arguably scope for better tailoring certain aspects of the U.S. regulatory framework and reducing compliance costs arising from the multiplicity of rules and guidance. In this regard, the implementation of a simplified regulatory regime for community banks falls into this objective. Similarly, the review of the Volcker Rule is warranted based on the experience to date (i.e., implementation challenges for both regulators and banks).

Potential Risks and Concerns

42. Compared to the previous regime, fewer banks will have to comply with full Basel standards. In addition to proposing a revision of certain rules such as the leverage ratio requirements for GSIBs that were previously implemented in a manner more stringent than the international standard, the FBAs have narrowed the scope of firms' subject to full Basel standards. Under the final rule, only Category I banks (with the eight U.S. GSIBs) and Category II banks (one U.S. firm) will have to comply with standards generally consistent with standards developed by the BCBS, whereas Category III and Category IV will include fewer standards (reduced or no LCR and NSFR requirements; less stringent deductions to CET1 capital; and reduced scope of the large exposure framework). While there is no expectation that Basel III should be fully applied to non-international active banks, the BCP specify that the capital requirements applied to non-internationally active banks should be broadly consistent with the principles of the applicable Basel standards relevant to internationally active banks.[15] The review of the final tailoring rule reveals that regulatory adjustments to CET1 capital are not broadly consistent with the Basel framework for Category III and Category IV banks.[16] There will be more differences between the U.S. regime and the Basel

[15] "For non-internationally active banks, capital requirements, including the definition of capital, the risk coverage, the method of calculation, the scope of application and the capital required, are broadly consistent with the principles of the applicable Basel standards relevant to internationally active banks." (CP 16 Additional criteria 1). Additional criteria were introduced to better assess jurisdictions that are important financial center.

[16] For DTAs, MSRs and investments in unconsolidated financial entities, there is a limited recognition in capital capped at 25 percent of CET1 for each category (instead of only 10 percent in the Basel standard), the amount of the three items that remains recognized after the application of all regulatory adjustments is not capped (a 25 percent cap is included in the Basel framework). Further, firms have the option to exclude gains and losses from regulatory capital (i.e., unrealized losses are not deducted from capital). This is less conservative under stressful conditions.

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framework, on top of existing ones, such as the absence of operational risk and CVA charges (for firms that are not included in Category I or II), the limited scope of the market risk rule, and the scope of the Countercyclical Capital Buffer (that does not apply to Category IV banks and all other firms with less than US$100 billion in assets).[17]

43. The mission supports the authorities' goals of building a proportionate and simpler regulatory framework but has concerns about a potential reduction of the stringency of the regulation. Category III and Category IV banks that will be subject to less stringent prudential requirements are large institutions. While individually they are considered less systemically important than Category I and II firms, their size and complexity pose risks to the financial system. As whole, non-LISCC banking organizations (U.S. firms and FBOs) with more than US$100 billion in consolidated assets hold a combined US$6.2 trillion in assets as of December 2018 (compared to US$12.1 trillion for the LISCC firms).[18] Reduced prudential standards could facilitate increased risk taking by these large but not GSIB firms without the countervailing regulatory constraints that were provided by the previous regime. Other things being equal, reduced capital and/or liquidity requirements make the distress or failure of a bank due to firm-specific idiosyncratic factors more likely, and more costly when failure occurs. Likewise, such institutions would be less resilient in the case of a systemic crisis.

44. The tailoring approach is largely driven by the size of the banks. FBAs have tailored the regulatory and supervisory approach "*to account for the size, complexity, risk profile, and systemic importance of regulated firms*" (Table 2). However, the tailoring is, in practice, largely driven by size-related indicators, including the total size of firms (See Appendix 1 for more details on the indicator-based approach). It is important to note that several large FBOs will fall into Category III while being supervised under the LISCC program which has been precisely designed to cover firms posing the greatest risk to U.S. financial stability.

[17] See Appendix I for a comparison between the prudential framework in the U.S. and the Basel requirements.

[18] The LISCC supervisory framework provides heightened supervision of 12 large firms that may pose elevated risks to U.S. financial stability: eight U.S. GSIBs and four FBOs with large and complex U.S. operations.

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Table 2. Capital and Liquidity Requirements

	Category I	Category II	Category III	Category IV
	U.S. G-SIBs	≥ US$700 bn Total Assets or ≥ US$75 bn in Cross-Jurisdictional Activity	US$250 bn Total Assets or US$75 bn ≥ in nonbank assets, wSTWF, or off-balance sheet exposure	Other firms with US$100 to 250 bn Total Assets
Capital				
Risk-based capital framework	Advanced approaches	Advanced approaches	Standardized approaches	Standardized approaches
G-SIB surcharge	Yes	N/A	N/A	N/A
Deduction to capital - simplified regime	No	No	Yes	Yes
AOCI capital inclusion opt-out	No opt-out	No opt-out	Allow opt-out	Allow opt-out
Supplementary leverage ratio	Yes	Yes	Yes	No
Single-counterparty credit limit (SCCL)	Yes	Yes	Yes	No
Countercyclical capital buffer	Yes	Yes	Yes	No
Stress testing				
Annual supervisory stress testing	Yes	Yes	Yes	Every other year
Annual company-run stress testing	Yes	Yes	Every other year	No
Annual capital plan submission	Yes	Yes	Yes	Yes
Liquidity				
LCR and proposed NSFR	Yes	Yes	Reduced LCR and NSFR 1/	No LCR and NSFR 2/
Reporting FR 2052a	Daily	Daily	Monthly	Quaterly
Liquidity stress testing	Monthly	Monthly	Monthly	Quaterly
Liquidity risk management	Yes	Yes	Yes	Tailored

Source: Federal Reserve

1/ Full LCR requirements if wSTWF≥US$75 bn

2/ Reduced LCR (70%) if wSTWF≥US$50 bn

45. Taken together, the changes have the potential to meaningfully reduce prudential requirements. The scope of application of these reforms is wide ranging, and a vast majority of the adjustments are made in the same direction (lower), capital and liquidity requirements may risk being inconsistent with Basel III standards, and the driving factor of differentiation is mostly size and not risk.

- **Liquidity requirements.** The modified LCR and proposed NSFR requirements represent a material reduction in the liquidity regulatory framework for U.S. banks with US$100–700 billion in consolidated assets.

- **Leverage requirements.** The FRB has estimated that the proposed recalibration of the eSLR for GSIBs would reduce the amount of Tier 1 capital required across the insured deposit institutions (IDI) subsidiaries of the GSIBs by approximately US$121 billion. Alternatively, this could lead GSIBs to increase their leverage exposures (by about US$4 trillion according to some studies from the banking industry). The removal of the stress leverage buffer requirement may also contribute to increase leverage. Despite this, leverage ratio requirements would still be more stringent than international standards.

- **Capital requirements.** The simplification of capital rules for non-advanced approaches firms will entail less stringent regulatory adjustments to be applied to regulatory common equity Tier 1. While the FBAs stated that they expect that these changes will not have a significant impact on

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the capital ratio of most non-advanced approach banks, the quantitative impact of the new rules has not been publicly released.

- **Stress capital buffer.** Requiring firms to prefund four quarters of dividends (instead of nine as now) will reduce the capital buffer when planned dividends are high. According to the FRB, considering the period from 2013 to 2019, the impact of the final rule on CET1 capital requirements ranges from a decline of US$59 billion to an increase of US$78 billion, with an average increase of US$11 billion, or 1 percent of current requirements. The SCB, however, will substantially reduce capital requirements in the current stage of the cycle, when dividends are relatively high. See section on stress tests.

- **Impact of the reforms.** The proposals issued by FBAs are extremely detailed, providing the public with valuable information, including impact analyses. However, certain important details are missing (e.g., potential reduction of high-quality liquid assets for each category of banks), and the combined effect of these reforms have not been analyzed (e.g., impact of the revised eSLR and the removal of the stress leverage buffer). It is fair to recognize the difficulty associated with assessing the cumulative impact of reduced quantitative requirements and relaxed qualitative requirements. Similarly, it is not straightforward to quantify the impact of some measures, such as the reduced scope of the single-counterparty credit limits regime that will no longer apply to Category IV banks. Given these are inherent limitations, the results of the quantitative impact studies should be carefully interpreted.

46. The new rules will shift the burden to supervisors to ensure that banks maintain adequate capital levels and liquidity. While the simplifications to the capital rule provide non-advanced banking organization with flexibility when deciding which investments in the capital of unconsolidated financial institutions to risk weight and which to deduct in certain cases, the FBAs have indicated that they would be able to address any potential safety and soundness concerns that may arise from this flexible treatment through the supervisory process. During the meeting with the FSAP team, the FBAs explained that a broader set of regulatory and supervisory tools than the LCR will continue to be used to ensure that banks maintain an adequate liquidity risk profile (internal liquidity stress testing requirements, extensive supervisory reports, qualitative requirements, and enforcement measures). However, supervision should not be used to compensate for reduced regulatory requirements. Also, as further discussed below, there will be a challenge to maintain supervisory intensity and intrusion given stronger pressure and challenges by banks.

C. Specific Prudential Requirements

Corporate Governance and Risk Management

47. The regulatory framework for corporate governance and risk management of banks includes a combination of various laws, regulations and guidelines. The safety and soundness provisions of the Federal Deposit Insurance Act ("FDIA") (section 39) require each FBA to prescribe—by regulation or by guideline—standards relating to internal controls, information systems, and internal audits, among other topics. The Interagency Guidelines Establishing Standards for Safety

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and Soundness implement these provisions. Also, the FBAs have taken significant additional steps to enhance corporate governance and risk management standards. The OCC, for example, through its Heightened Standards Guidelines places corporate and governance requirements on banks with total consolidated assets of US$50 billion or more, while reserving right to impose on others.[19] The FBAs have also issued several new guidance documents, promoting the expectation that banks should have independent risk management functions covering all material risks[20] and have provided additional detailed guidance on risk management practices for specific products.[21] Expectations regarding corporate governance and risk management are generally tailored for institutions of different sizes, scope of operations, activities, and systemic importance. For example, board risk committees are required only for banks covered under Heightened Standards Guidelines or publicly traded BHCs with total consolidated assets of US$50 billion or more.

48. There is a strong emphasis on governance and risk management throughout supervisory processes. The FBAs have high expectations of banks' risk management. Several Handbooks and Examination Manuals of the FBAs provide detailed direction to examiners in assessing the quality of risk management, along with compliance to applicable laws and regulations, as part of any focus area. Governance and risk management activities are assessed by the FBAs through combinations of regular onsite inspections, horizontal examinations and off-site monitoring. The FBAs' supervision approach and activities are tailored to the size, complexity, and risk profile of the supervised entity with continual supervision practiced for the larger and more complex financial institutions. At the holding company level, the Governance and Controls Program, which includes horizontal reviews and firm-specific onsite examinations, is a key component of the FRB's LISCC supervisory framework. The FRB's new Large Financial Institution (LFI) rating system implemented in 2019 reflects three core areas that are considered critical to an LFI's strength and resilience, one of them being governance and controls. As part of the governance and controls component, it includes an evaluation of the effectiveness of a firm's board of directors, management of business lines and independent risk management and controls, and recovery planning.[22] For

[19] The OCC guidelines are enforceable and establish standards for the design and implementation of a risk governance framework that defines the bank's approach to effectively manage risk through its risk culture, risk appetite, and risk management system. The formal risk governance framework establishes responsibilities and delegates authorities, for such things as a board risk committee, a chief risk officer, and an independent risk management function. A chief risk executive must have unrestricted access to the board of directors.

[20] Such statements of guidance include: FRB Supervision and Regulation Letter SR 12-17 "Consolidated Supervision Framework for Large Financial Institutions"; and SR "16-11 "Supervisory Guidance for Assessing Risk Management at Supervised Institutions with Total Consolidated Assets Less than US$50 Billion". OCC bulletins provide supervisory guidance relative to the assessment of risk management that includes board oversight for the given supervision topic.

[21] For example: Interagency Guidance on Home Equity Lines of Credit (SR 14-5/CA 14-4) (July 2014), Guidance on Private Student Loans (SR 15-2/CA 15-1) (January 2015), Interagency Statement on Prudent Risk Management for Commercial Real Estate Lending (SR 15-17) (Dec. 2015), Supervisory Expectations for Risk Management of Reserve-Based Energy Lending Risk (SR 16-17).

[22] The FBAs assign CAMELS (Capital Adequacy, Asset Quality, Management, Earnings, Liquidity, and Sensitivity to Market Risk) ratings to banking organizations. The LFI rating system is used to evaluate and communicate the supervisory condition of BHCs with total consolidated assets of US$100 billion or more; all non-insurance, non-commercial savings and loan holding companies with total consolidated assets of US$100 billion or more; and

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purposes of determining whether a firm is ''well managed,'' each component in the LFI rating system must be rated either "*Broadly Meets Expectations*" or "*Conditionally Meets Expectations*." Overall, the FBAs employs a range of actions (informal and formal measures) to require supervised firms to correct corporate governance deficiencies. This is evidenced by several examples of formal enforcement actions, as well as non-public supervisory findings. Various examples were provided to the FSAP team.

49. Further action is warranted in a number of areas:

- Apart from the OCC's Heightened Standards and the Safety and Soundness Provisions which are enforceable, the supervisory expectations on risk governance framework and risk management are almost entirely included in statements of guidance.

- The OCC's Heightened Standards guidelines strengthen the governance and risk management practices of large national banks (with total consolidated assets of US$50 billion or more) are comprehensive and thorough. However, general risk management standards contained in the Interagency Guidelines Establishing Standards for Safety and Soundness that are applicable to all firms, regardless of the size, are not detailed. Apart from requirements on credit risk and IT risk, the safety and soundness standards provide very broad objectives[23] and do not prescribe specific requirements in a number of areas (model risk management, concentration risk for example). Moreover, while the FRB' guidance (SR 16 –11) clarifies risk management expectations for institutions with total consolidated assets of less than US$50 billion, enhanced standards have not yet been defined for larger firms (with assets of US$50 billion or more) supervised by the FRB. A corporate governance proposal was issued by the FRB in August 2017, but the supervisory expectations have not been finalized. Consequently, these firms including the large and complex BHC remain solely subject to the safety and soundness provisions and older guidance.[24]

- Several 2015 FSAP recommendations have not been implemented. Clear requirements on the arrangement for the removal of Chief Risk Officers (CROs) have not been introduced by all FBAs (only the OCC Heightened Standards prescribes that a bank's board or its risk committee shall approve the removal of the CRO). Similarly, explicit requirements that banks promptly inform the

U.S. intermediate holding companies of FBOs with combined U.S. assets of US$50 billion or more. It replaces the current BHC rating system (known as the "RFI rating system") for these firms. Unlike the RFI/C(D) system and the CAMELS ratings, the LFI rating system does not include a standalone composite rating.

[23] For example, concerning interest rate exposures, the safety and soundness guidelines simply mention that an institution should manage interest rate risk in a manner that is appropriate to the size and complexity of its assets and liabilities and provide for periodic report to management and the board of directors, without specifying any additional guidance. Similarly, requirements on compensation arrangements are not detailed. Similarly, concerning large BHCs, expectations around the risk governance framework and the content of the risk appetite statement are not described in detail either in the Safety and Soundness Guidance or in applicable Supervision and Regulation Letters (SR 12–17 for example).

[24] Large and complex BHCs have total consolidated assets of US$250 billion or more or consolidated total on-balance sheet foreign exposure of US$10 billion or more.

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supervisors about material developments that may affect the fitness and propriety of Board directors and senior management have not been specified. Lastly, the FRB's guidance (SR 16–11) that provides clarification on and distinguishes supervisory expectations for the roles and responsibilities of the board of directors and senior management for an institution's risk management only applies to institutions with total consolidated assets of less than US$50 billion.

- No detailed guidelines have been issued on risk data aggregation and risk monitoring and the FBAs are still in the process of preparing a rule related to Pillar 3 compensation disclosure. [25] In some cases, standards have not been specified in a systematic fashion across FBAs. For example, the OCC has issued a guidance on new products, but the FRB has not done so.

Credit and Concentration Risk

50. The regulatory framework for credit risk is well developed. Banks and BHCs are subject to detailed credit risk management requirements. According to the Interagency Guidelines Establishing Standards for Safety and Soundness, regulated firms should establish a system that is commensurate with the institution's size and the nature and scope of its operations to maintain prudent underwriting practices, identify problem assets and prevent deterioration in those assets while considering the size and potential risks of material asset concentrations.[26] The FBAs have also provided additional topical guidance on specific aspects of credit risk. Firms follow U.S. GAAPs and FBAs supplement U.S. GAAPs with policies and guidance. Pursuant to the safety and soundness provision of the FDI Act, the FBAs have introduced in their examination manuals several criteria for identifying an asset as "impaired" and measuring the impairment on such an asset using criteria consistent with U.S. GAAPs.

51. The large exposure regime only applies to a subset of banks. Under the FRB single-counterparty credit limits (SCCL) rule issued in June 2018 in accordance with the provisions of the EGRRCP Act and recently amended by the final tailoring rule, the aggregate net credit exposure of a U.S. GSIB and any BHC or SLHC subject to Category II or III standards to a single counterparty is subject to a limit of 25 percent of CET1 capital (reduced to 15 percent when a GSIB has a credit exposure to another GSIB). Additionally, the OCC's Heightened Standards require firms to have policies and supporting processes in their risk management framework that effectively identify, measure, monitor and control the firm's concentration of risk. Banks are expected to monitor a range of credit concentrations, including, but not limited to: single and related borrowers, product type, geographic, industry and collateral type. However, with the exception of Commercial Real Estate (CRE) Lending, these expectations are solely included in publicly available supervision manuals. The Interagency Statement on Prudent Risk Management for CRE Lending provides that

[25] While the OCC's Heightened Standards Guidelines provide that banks should have risk data aggregation and reporting capabilities sufficient to provide reporting on material risks, concentrations, and emerging risks in a timely manner to the board, no specific requirements have been defined in terms of accuracy, granularity and data availability.

[26] 12 CFR part 30, Appx. A (OCC), 12 CFR part 364, Appx A (FDIC), 12 CFR part 208 Appx D-1 (FRB).

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financial institutions should identify, measure, monitor, and manage concentration risk in their CRE lending activities. It is unclear whether the FBAs can still refer to the thresholds used to identify banks with significant CRE concentration risk (300 percent or more of a firm's total risk-based capital), as these criteria were introduced in non-binding guidance issued in 2006.

52. Supervision on credit risk is based on an overall robust process. The FBAs have taken a lot of efforts, through offsite surveillance and onsite examinations, to ensure accuracy of banks' loan classification and adequacy of allowance for loan and lease loss provisions. The CAMELS rating system has a specific component to rate asset quality, using quantitative metrics as well as qualitative evaluations. Under the FBAs' statutory examination authority, supervisors may review all books and records maintained by a bank (and its affiliates) subject to the FBAs' supervision. As already noted in the 2015 Detailed Assessment Report (DAR), the FBAs have a long-established and rigorous process for evaluating banks' approaches to problem assets and maintenance of an adequate level of provisioning. The FBAs conduct regular risk-focused onsite examinations that include an evaluation of internal credit risk management processes coupled with credit file review to assess the borrower's creditworthiness and ensure that internal risk management policies are adequately implemented. Methodologies used to validate the adequacy of loan provisions are described in detail in the relevant examination manual and handbook. Examiners routinely challenge loan classifications and require banks to increase provisions as necessary. Additionally, the FBAs conduct semi-annual Shared National Credit (SNC) onsite examinations to assess the largest and most complex credit facilities owned or agented by supervised institutions.[27] Lastly, FBAs issue a public report based on SNC findings on an annual basis. It is noted that the impact of the new approach on banks' CET1 capital has not been precisely quantified by the FBAs, but CECL is generally expected to require earlier provisioning of credit losses.[28]

53. Further enhancements are, however, necessary:

- The large exposures limits under the SCCL rule do not apply to U.S. BHCs that are not subject to Category I, II, or III standards or FBOs that are not subject to Category II or III standards or who otherwise have less than US$250 billion in total global consolidated assets. Considering the adverse effect of excessive concentration risk, regardless of size, the total absence of regulatory limits applied to other BHCs raises concerns (the smaller the bank, the less diversified the portfolio). Also, the new regulatory report under the SCCL rule was not finalized at the time of the first FSAP mission. The OCC's lending limits regime which applies only to national banks and savings association appears to be less rigorous, as loans to corporate groups can be as much as 50 percent of a bank's capital and surplus (comprising Tier 1 and Tier 2 capital), despite

[27] The SNC program run by the FBAs reviews on a biannual basis a selection of syndicated loans and assign to each sampled obligor a rating (the SNC rating) that is communicated to the firms forming the banking pool.

[28] The CECL standard will become effective for SEC-reporting firms for the fiscal year beginning after December 15, 2019. FASB proposed in July 2019 to delay the implementation until January 2023 for small reporting companies, non-SEC public companies and private companies. FBAs have adopted a final rule that provide an option to phase-in the Day one effect. One large regional bank [PNC] has indicated that aggregate reserve levels may increase by 15 to 25 percent as a result of the new accounting standard.

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generally limiting borrowers to 15 percent of a bank's capital and surplus, and the definition of these groups is narrower than that of connected borrowers.

- The FBAs argue that all banking organizations, regardless of size, should have the capacity to analyze the potential impact of adverse outcomes on their financial condition. Requirements are, however, necessarily weakened given that company-run stress tests requirements no longer apply to banks with less than US$250 billion in assets and less than $75 billion in cross-jurisdictional activity, nonbank assets, weighted short-term wholesale funding and off-balance sheet exposures.
- The existing report on concentration risks has limitations.[29] It collects information on a bank's exposure by broad categories (real estate, agricultural, commercial and industrial, municipals loans, etc.), but it does not provide a comprehensive bank-wide view of all significant sources of concentration risk, including market risk or other risk concentration where a bank is exposed to particular asset classes, products or collateral. Such a report could not be used, for example, to measure the size of a bank's direct and indirect exposures to leveraged corporates.[30]
- As already noted in the 2015 DAR, there are no requirements that credit risk exposure exceeding a certain amount or percentage are to be decided by the bank's board or senior management.
- Concerning exposures to OTC derivatives, banking organizations that are not subject to advanced approach capital requirements do not have to calculate capital charges for CVA risk.

Market and Operational Risk

54. The regulatory and supervisory framework for market risk is generally comprehensive but recent BCBS reforms remain to be implemented. Banks with aggregate trading assets and liabilities of at least US$1 billion or 10 percent of their total assets are subject to the market risk rule that is consistent with the BCBS' Revisions to the Basel II capital framework published in February 2011.[31] Like in other major jurisdictions, the revision to the market risk framework adopted by the BCBS in January 2019 has not yet been implemented. Additionally, banks subject to Category I, II, or III standards have to conduct company-run stress tests using scenarios provided by the FBAs that may include a market shock scenario. Also, under the CCAR, the FRB uses a "global market shock" scenario in its supervisory stress tests for banks with aggregate trading assets and liabilities of US$50 billion or more (or 10 percent or more of their total consolidated assets). FBAs rely on ongoing supervisory monitoring programs, targeted firm-specific inspections and common scope horizontal examinations to determine whether banks have comprehensive risk management policies and processes for identifying, evaluating, monitoring, and controlling or mitigating market risks. Guidance on effective model risk management have been provided and additional examinations

[29] FFIEC's Uniform Bank Performance Report (Analysis of Concentrations of Credit - Page 7B).

[30] Direct and indirect exposures may include, but are not limited to: leveraged loans originated and kept on their balance sheets; loans extended to non-banks which may in turn underwrite leveraged loans; collateralized loan obligations bought by banks; credit derivatives sold to counterparties which seek protection against leveraged loan (or CLO) defaults.

[31] These banks are using the advanced approaches to calculate capital requirements.

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procedures have been developed for bank market activities. For the largest banks with significant trading activities, the FBAs have indicated that examiners conduct in-depth reviews of independent price verification and perform sample testing of valuation adjustments. The FSAP team has not been provided with documentation to demonstrate that this process works effectively in practice.

55. Drawing on lessons learned, the FBAs have appropriately focused increasingly on operational risk issues. Operational failures, fraud, and non-compliance issues have resulted in major losses to U.S. banks. Banks are heavily reliant on IT technology and vulnerabilities have intensified (cyber risk). Under this heightened risk environment, banks are required to adhere to general risk management requirements complemented with tailored guidelines dealing more specifically with operational risk. In addition to the safety and soundness provisions that contain guidelines establishing information security standards, the FBAs have issued several new guidance documents and the OCC has issued its Heightened Standards Guidelines, emphasizing the importance of risk data aggregation processes. The FBAs have also issued detailed supervisory guidance on various aspects of operational risk management, including outsourcing of financial services, supervision of technology service providers, payment systems, internal audit, and business continuity planning. Internal risk management practices are expected to be commensurate with the size, complexity, and risk profile of the entity. Only Category I and Category II banks must hold capital against operational risk by using the Advanced Measurement Approach (AMA) (under the previous regime, all banks with total consolidated assets of US$250 billion or more, or at least US$10 billion in foreign exposure had calculate capital charges for operational risk). The FBAs are, in line with Basel III, considering a move away from such advanced approaches.

56. The FBAs assess operational risk through regular onsite review activities and have intensified outreach and communication efforts. FBA examiners evaluate, through on-site exams, whether banks have established appropriate policies and processes to assess, manage, and monitor operational risk. At larger and more complex institutions, horizontal reviews are conducted, and continuous monitoring maintained. Several individual handbooks provide detailed guidance to examiners on how to assess, inter alia, information security risks, IT governance issues and IT operations, the effectiveness of business continuity, retail payment systems and the risks associated with e-banking activities.[32] The FBAs have also increased their scrutiny of third-party service providers, and the OCC has created a dedicated examination team comprised of senior examiners who are solely focused on addressing the risks inherent in the operation of these service providers through ongoing monitoring and periodic examinations. [33] Further, communication to the industry and sharing of best practices constitute an essential component of the FBAs' actions: the FFIEC has issued a Cybersecurity Assessment Tool that institutions may use to evaluate their risks and cybersecurity preparedness; various statements to inform the industry of evolving cyber risks have been issued; the OCC issued supervisory letters to participating large banks to highlight the findings

[32] For example, FFIEC IT Examination Handbook Management Booklet.

[33] The Bank Service Company Act, 12 U.S.C. § 1861 et seq., allows the FBAs to examine third-parties that perform services for banks. FBA examinations serve to identify risks and operational issues inherent within the performance of these services.

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of the Large Bank Supervision's horizontal examination of Independent Operational Risk Management, etc. These are commendable efforts.

57. Despite substantial improvements, the regulatory framework for managing operational risks is, however, still fragmented and incomplete.

- No capital is explicitly required to be held against operational risk by regulation other than by those banks that have adopted the advanced approach under Basel. Most of the applicable qualitative standards have been provided through guidance.
- There are no general requirements for reporting operational risk related incidents to the FBAs.[34]
- A series of detailed, but somewhat disparate guidelines are available, but a guidance document setting out overarching principles for managing operational risk is clearly missing, especially with regards to the role of the board of directors, management, internal monitoring and reporting mechanisms, control environment, and loss data collection and analysis. This issue is particularly relevant for banking organizations and BHCs that are neither subject to the OCC's Heightened Standards Guidelines nor to the Interagency Guidance on the Advanced Measurement Approaches for Operational Risk.[35]

Liquidity Risk

58. The qualitative framework has been supplemented with quantitative requirements. The FBAs' historical approach to supervising liquidity risk had been qualitative in nature, focusing on sound practices and related estimates of liquidity needs by banks' instead of a standardized minimum quantitative standard. The adoption of the LCR rule in 2014 represented a very significant advance in enhancing quantitative liquidity requirements and mitigating risks by ensuring that banking organizations have liquid assets to withstand severe liquidity shocks. Under the LCR Rule, banking organizations and other institutions subject to the rule are required to implement and maintain appropriate policies and procedures and systems to enable them to exercise operational control over high-quality liquid assets to ensure that they are available for use by the banking organization to provide liquidity to withstand a 30-day stress period. The LCR rule complements the cash flow projections, contingency funding planning and liquidity stress testing requirements for covered firms under the FRB's Regulation YY. [36] The FBAs proposed in June 2016 to implement the NSFR. To date, the FBAs have not adopted a final NSFR and timing is uncertain.

[34] However, as required by the OCC Heightened Standards, national banks have to send appropriate reports to regulatory and law enforcement agency in the event of unauthorized access to customer information systems.

[35] High-level principles such as those defined by the Basel Committee (Principles for Sound Management of Operational Risk) are, at best, available in different guidance documents (interagency guidance on AMA, OCC's Heightened Standards, Federal Reserve SR 16-11) that need to be combined to understand supervisory expectations. The fact remains that the scope of application of these guidance documents differ and do not encompass all banks, irrespective of their size and their federal primary regulator.

[36] Regulation YY implements the enhanced prudential standards required under Section 165 of the DFA.

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59. The liquidity risk regime is robust for large banks. Category I and Category II banks are subject to full liquidity requirements (LCR and planned NSFR). Moreover, banking organizations with US$100 billion or more in total consolidated assets must meet enhanced liquidity standards in Regulation YY that contains several detailed provisions requiring banks to have a robust risk management framework, maintain a contingency funding plan, conduct internal liquidity stress tests and establish limits. The LISCC liquidity program assesses the quality of certain firms' liquidity position and liquidity risk-management practices though both horizontal reviews under the Comprehensive Liquidity Analysis and Review (CLAR), firm-specific examinations and ongoing monitoring. The regime is supported by extensive reporting that has improved the FBAs' monitoring of the firms' liquidity risk profile.[37]

60. But liquidity requirements have been reduced for other firms:

- The final tailoring rule issued in October 2019 eliminated or weakened the application of the LCR and planned NSFR for a significant part of the banking system (reduced quantitative requirements for Category III banks and no LCR and NSFR requirements for Category IV banks).[38]

- The FBAs have also adjusted the frequency of internal liquidity stress test (now on a quarterly basis for Category IV banking organizations), while maintaining liquidity reports on a monthly basis.

- Liquidity stress testing requirements will be maintained for banks with US$100 billion or more in assets, but these draw on internal models and cannot provide a substitute for the simplicity and transparency of the LCR or NSFR. According to the FRB, although the liquidity risk in the Regional Banking Organization Portfolio is considered low or moderate, examiners have observed some deterioration in liquidity positions (as noted in the November 2018 Supervision and Regulation Report). The FBAs have argued that (i) Category III and Category IV banking organizations remain subject to internal liquidity stress testing requirements, which helps avoid excessive risk taking and that (ii) a Horizontal Liquidity Review is conducted for all banks in the LFBO portfolio with total assets of US$100 billion or more. However, the requirements included in the Regulation YY are not very prescriptive, as banking organizations are free to choose the scenarios' assumptions with minimal regulatory constraints. The FSAP team was provided with a sample of onsite examination reports and supervisory files showing that supervisors periodically review banks liquidity stress tests and liquidity assumptions. However, the examinations were

[37] FR 2052a report collects very detailed and granular quantitative information on selected assets, liabilities, funding activities, and contingent liabilities. FBO LISCC firms and U.S. firms with US$700 billion or more in total consolidated assets or US$10 trillion or more in assets under custody must submit a report on each business day.

[38] As detailed in Box 3, given their size, Category IV and Category III banks are unlikely to reach the US$50 and US$75 billion thresholds for the *weighted* short-term wholesale funding indicator that would trigger higher LCR requirements.

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not comprehensive and covered a limited set of activities of the LFBO portfolio (e.g., broker dealer and securities firms' businesses in 2018, FBO branches in 2019).[39]

- Liquidity risk management requirements under Regulation YY have been significantly reduced for Category IV banking organizations.[40] Firms with less than US$100 billion in assets that are only expected to follow a statement of guidance issued in 2010 (Interagency Policy Statement on Funding and Liquidity Risk Management) that provides relatively high-level general considerations

61. In the evolving banking environment, liquidity risks should not be underestimated. Advances in technology may lead to an increase depositor mobility as has been seen in other jurisdictions. As a result, banks may experience unexpected, adverse and rapid shifts in their liability mix or increased costs that increase liquidity risk or impact earnings. Therefore, maintaining adequate supervisory scrutiny and well-calibrated prudential requirements is paramount. Where liquidity requirements are no longer applied, FBAs can only resort to supervisory tools such as enforcement measures that may occasionally be taken too late. It is also more difficult to identify outlier banks when supervisors cannot rely on standardized approaches and have to use banks' internal measures such (e.g., results of internal stress testing) that might not be consistent across banks.

Interest Rate Risk in the Banking Book

62. The FBA's approach toward interest rate risk in the banking book (IRRBB) is principles based. The FBAs define IRRBB to be the current or prospective risk to both earnings and capital arising from adverse interest rate movements that affect the bank's and holding company's banking book. Examination procedures follow the principles outlined in the 1996 Joint Agency Policy Statement on Interest Rate Risk and the 2010 Interagency Advisory on Interest Rate Risk Management. These guidance documents specify, inter alia, that the board of directors is responsible for setting the tolerance for interest rate risk, monitoring the overall interest rate risk profile and ensuring that the level of interest rate is maintained at prudent levels, while senior management is tasked with ensuring that interest rate risk is managed appropriately. The 2010 Advisory also reminds banks that internal stress testing, which includes both scenario and sensitivity analysis, is an integral part of interest rate risk management and highlights that the reasonableness of assumptions that underlie an institution's IRR exposure estimates should be regularly reassessed (asset prepayments, non-maturity deposit price sensitivity, etc.).

63. No material changes have occurred since the 2015 FSAP. The recommendation made by the FSAP team in 2015 to revise the 1996 guidance to include more quantitative guidelines

[39] The sample of files shared with the FSAP team also included the 2015 "Coordinated Liquidity review" for LBOs, but related documents did not include any assessment of internal liquidity stress test practices at LBOs.

[40] Lower frequency of internal liquidity stress tests (on a quarterly basis rather than a monthly basis), lower frequency of collateral valuation of collateral (monthly instead of a weekly calculation), no requirements to monitor the sources of liquidity risk and establish limits on liquidity risks.

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regarding interest rate risk in the banking book has not been implemented because it was determined by the FBAs to not be the preferred approach to IRRBB supervision. While sound principles and supervisory expectations for the identification, measurement, monitoring and control of IRRBB are clearly defined, no standardized methodologies have been defined to measure change in economic value of equity and change in net interest income. The base methodology to identify outlier banks have not been adopted. Nor have standardized disclosure requirements been defined. Moreover, banks are not required to hold capital against changes in interest rates under a Pillar 2 approach. Certainly, banks participating in the CCAR are required to hold capital for IRRBB as revenues and expenses projected vary based on changes in the economic conditions over the nine quarters of the planning horizon including changes in interest rates. However, the CCAR process is limited to 19 firms (albeit likely the most important ones) and earnings simulations have inherent limitations in quantifying interest rate risk exposure.[41] For that reason, the BCBS has recommended considering capital adequacy for IRBBB in relation to the risks to economic value.[42]

64. Off-site and onsite examination mainly rely on ad hoc information provided by firms on a non-standard basis. There is arguably a strong focus on interest rate risk management. When weaknesses are identified, FBAs formally recommend corrective action. Banks and BHCs are expected to have oversight programs commensurate with their size and complexity of operations. For large and complex banks, the assessment of IRR is achieved mainly through a combination of firm-specific and horizontal work that is conducted both onsite and offsite. Regular meetings are organized to understand changes in IRR profile, scenarios' assumptions, balance sheet strategies and risk tolerance. Detailed information is requested from banks to form a view on the adequacy of risk management (managements reports, model risk assessments, committees' minutes and background documents, etc.). For smaller firms, IRR-related information is obtained through onsite examinations. In all cases, the extent of regulatory data (submitted through supervisory returns on a routine basis) that can be used by offsite examiners to assess the IRR profile is limited. Supervisors have the authority to request any IRR information at any time.

65. However, there are limits to such an approach in the current economic and market environment. As noted by the OCC, increased competition for deposits may result in less stable deposits and/or increased costs, as technological advances make it easier for depositors to move funds quickly between institutions.[43] Therefore, it is essential to measure accurately the IRR exposure based on different scenarios, including different sensitivities regarding the stability of deposits, and identify banks with excessive IRR exposure. OCC Bulletin 2010-1 provides guidance on conducting scenario analysis and provides scenarios that banks should include in their model runs. That said, regard, relying on information solely provided by firms that can define the scenarios and the related assumptions may lead to possible inconsistencies when reviewing banks' IRR profile across the

[41] The economic-value approach focuses on a longer-term time horizon, captures all future cash flows expected from existing assets and liabilities, and is more effective in considering embedded options in a typical institution's portfolio, etc.

[42] BCBS standards on IRRBB, April 2016.

[43] OCC, Semiannual Risk Perspective from the National Risk Committee (Spring 2019).

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banking system (the risk being that excessive IRR might not be detected in due time). The risk is compounded when banks have limited expertise to conduct stress testing and sensitivity analysis. Introducing standardized approaches for measuring IRR and standardized disclosure would help identify "outlier" banks requiring heightened supervision.

Related Parties

66. The regulatory framework for related parties covers transactions with affiliates and insiders. Several legislative and regulatory provisions are designed to prevent the misuse of a bank's resources through preferential transactions with its affiliates and impose a number of restrictions on extensions of credit between a bank and its insiders and to insiders of its affiliates.[44]

67. The U.S. related-parties framework still exhibits gaps with the international standards, some of which persist from past FSAP assessments:

- **Limited scope of related parties and transactions.** The definition of "affiliate" excludes nonbank operational subsidiaries of the bank, and the definition of "related interest" of insiders does not explicitly include family members although, the definition of principal shareholder explicitly provides that shares owned or controlled by a member of an individual's immediate family are considered to be held by the individual. The definition of "covered transactions" does not include all claims and dealings, such as service and construction contracts, and lease agreements.

- **Insufficient banks' boards involvement.** While the regulation specifies that extensions of credit to an insider have to be reviewed and approved by the bank's board if the aggregate exposure to that insider would exceed the higher of US$25,000 or 5 percent of the bank's capital and surplus, or if the aggregate exposure would exceed US$500,000 upon consummation of the new credit facility, it does not require prior board approval of transactions with affiliated parties or of the write-off of related party exposures exceeding specified amounts. Similarly, the regulation does not require board oversight of related party transactions and exceptions to policies, processes and limits.

- **Limited regulatory powers to mitigate risks.** Regulatory limits applied to affiliates are generally stricter than those for other counterparties.[45] Insider transactions are, however, only subject to the single-borrower limits and aggregate amount of loans to insiders can go up to 100 percent of a bank's capital and surplus. For banks with deposits of less than US$100 million,

[44] Provisions are included in the Federal Reserve Act and implementing regulations (Regulation O and W). The term "affiliate" includes any entity that directly or indirectly controls, or is under common control with, the bank, but does not include nonbank operational subsidiaries of the bank. Insiders include executive officers, directors, and principal shareholders of a bank, as well as their related interests (companies controlled by such insiders). Insiders of affiliates are also subject to restrictions.

[45] The regulation applies a general limit of 10 percent of the bank's capital and surplus to the aggregate amount of covered transactions with any one affiliate and a limit of 20 percent of the bank's capital and surplus to the aggregate amount of covered transactions with all affiliates. Further, loans, extensions of credit, and credit exposures arising from derivative and securities borrowing and lending transactions are subject to strict collateral requirements.

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the limit is two times a bank's capital and surplus, if the bank is in satisfactory condition. Moreover, no regulatory limits apply to holding company transactions with their affiliates or insiders, as already noted in the 2010 and 2015 DARs. This may give rise to arbitrage, by booking exposures in the BHC to avoid limits.

D. Recommendations

68. Authorities are strongly encouraged to further enhance the prudential framework by:

- Streamlining and simplifying the regulatory framework by reducing the number of individual statements of guidance on the same topic, improving the consistency between all requirements and guidelines, and further developing interagency work, so that the same guidance could be adopted by all of the FBAs where appropriate.
- Ensuring that categories III and IV banks have capital requirements broadly consistent with the Basel standards.[46]
- Introducing rules on concentration risk management for BHCs and banking organizations, explicit requirements for board approval of loans exceeding a certain amount or percentage; and requiring banks to comply with appropriate large exposure limits.[47]
- Introducing harmonized approaches for measuring IRR, strengthen disclosure requirements, identify outlier banks, and ensure that all banks with material exposures hold capital against IRR.
- Enhancing the related-party framework. It is recommended to introduce the requirement for board approval for related party transactions and write-off of their loans exceeding specified amounts, widen the definition of "related interests," to include those mentioned in the CP 20, introduce limits for BHC transactions with affiliate or insiders, and review the aggregate limits for lending to insiders.
- Including a capital charge for operational risk for banks and BHCs using standardized approaches.[48] It is also recommended to consider expanding the scope of supervisory reporting of operational risk events and associated losses, and to consolidate and develop a comprehensive guidance on operational risk management in line with international standards to ensure that FBAs' supervisory expectations and minimum standards are well understood.
- Considering extending the scope of the LCR and the proposed NSFR to other large banks.

[46] See BCP 16, EC3 and AC1.

[47] See BCP 17, EC1; and BCP 19, EC1 and AC1.

[48] See BCP 16, EC3 and AC1.

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69. The authorities could further strengthen the corporate governance and risk management by:

- Introducing enhanced standards on the governance of large and complex BHCs while clarifying supervisory expectations around the role of the board of directors and senior management and strengthening the risk management requirements for smaller firms that are not subject to provisions such as those included in the OCC Heightened standards.
- Specifying requirements that banks inform promptly the supervisors about material developments that may affect the fitness and propriety of Board directors, introduce requirement for the removal of CROs, and strengthen regulations and supervisory processes to fully implement compensation principles in accordance with the BCPs (CP 15, EC 7).

STRESS TESTS AND CAPITAL PLANNING

70. The rigorous and comprehensive U.S. regulatory capital stress test program is a key tool for assessing bank's capital plans. Going forward authorities are encouraged to continue work on exploring second-round effects, possibly by integrating capital and liquidity stress tests, and consider leveraging the stress test framework to probe the prudential implications of longer-term structural issues in the banking industry. Considering that most banks subjected to the supervisory stress testing process consider it to be the main driver of their capital requirements, it is important to be mindful of the cumulative effects of changes to the program. Recent changes will likely result in lower regulatory capital requirements for several large banks, and possibly also for the GSIBs in the current stage of the economic cycle.

A. The Stress Test Program

71. The U.S. regulatory capital stress test program consists of the Dodd-Frank Act Stress Test (DFAST) and the CCAR. DFAST is a forward-looking quantitative evaluation of bank capital that evaluates how a hypothetical stress scenario developed by the FRB would affect the capital ratios of large banks. CCAR includes a quantitative assessment for all banks subject to the DFAST supervisory stress test plus a qualitative assessment of certain banks' capital planning practices.[49] Those exercises, or more precisely their Supervisory Capital Assessment Program predecessor, were introduced by the FRB in 2009 at the height of the global financial crisis to help restore confidence in the largest banks by providing public information on how those banks would fare in prescribed

[49] Under the capital plan rule (12 CFR 225.8), a subject bank must include in its annual capital plan an assessment of the expected sources and uses of capital over the planning horizon under expected and stressful conditions, a detailed description of the bank's processes for assessing capital adequacy, the bank's capital policy, and a discussion of any expected changes to the bank's business plan that are likely to have a material impact on the bank's capital adequacy or liquidity. Further details on the DFAST and CCAR programs can be found in: Board of Governors of the Federal Reserve System. July 2019. *Comprehensive Capital Analysis and Review 2019: Assessment Framework and Results.* Available at: https://www.federalreserve.gov/publications/files/2019-ccar-assessment-framework-results-20190627.pdf; and in the FRB's stress testing rules (12 CFR 252, subparts E and F).

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stress scenarios. Since then DFAST and CCAR have become well-established components of the FRB's supervision program for large banks.[50] Per the Dodd-Frank Act, the OCC and FDIC have also implemented DFAST requirements for covered institutions at the company (non-holding company) level.[51]

72. As part of the CCAR assessment, the FRB has the opportunity each year to publicly object to bank capital plans if it has concerns about the adequacy and appropriateness of those plans. The stress tests encompass the key risks to which large U.S. banks are exposed (Box 2). They are also independent in that the FRB runs its own stress tests using its own models and estimates so that its supervisors can formulate their own perspectives on the risks to which large banks are exposed and the losses that may accrue in a stress scenario without relying on the risk models used by individual banks. The OCC and FDIC implementations of DFAST do not include a public object/non-object component. Rather, any concerns with the submissions are discussed as part of the on-going supervisory process.

Box 2. Summary of the Stress Test Programs[1]

The DFAST and CCAR stress tests are conducted by the FRB staff using detailed portfolio data provided by banks. The FRB runs the stress tests using its own models and estimates so that it can formulate its own perspective on the risk exposures of banks and the losses that may accrue in response to stress scenarios of its own devising. This enables the FRB to compare results across banks using a common measurement system and provide the public and the banks it regulates with credible, independent assessments of each bank's capital adequacy under stress.

The stress tests are comprehensive, spanning credit risk, market risk, operational risk, interest rate risk, incremental default risk in the trading book, as well as probing potential losses in the event of failure of each bank's principal trading counterparties. The stress tests seek to capture how the balance sheet, risk-weighted assets (RWAs), and net income of banks would be affected by the macroeconomic and financial conditions described in the supervisory scenarios over a nine-quarter planning horizon,[2/] given the characteristics of each bank's loan and securities portfolios; trading, private equity, and counterparty exposures from derivatives and securities financing transactions (SFTs); business activities; and other relevant factors. Projected net income, adjusted for the effect of taxes, is combined with capital action assumptions and other components of regulatory capital to produce post-stress capital ratios. The FRB's approach to modeling post-stress capital ratios generally follows U.S. generally accepted accounting principles (GAAP) and the regulatory capital framework.

Stress tests are run using data collected from regulatory reports as well as proprietary third-party industry data. Projections rely on aggregate information from the Financial Accounts of the United States (Z.1) statistical release, which is a quarterly publication of national flow of funds, and additional data collected by the FRB, including the Consolidated Financial Statements for Holding Companies (FR Y-9C)

[50] Randall K. Quarles, "Refining the Stress Capital Buffer," Remarks at Program on International Financial Systems Conference; Frankfurt, Germany. September 5, 2019. Available at www.federalreserve.gov. As noted by the U.S. authorities, opinions of individual Board do not necessarily reflect the position of the FBAs.

[51] For the OCC see https://www.occ.gov/publications-and-resources/forms/dodd-frank-act-stress-test/index-dodd-frank-act-stress-test.html; for the FDIC see https://www.fdic.gov/regulations/laws/rules/2000-4400.html.

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Box 2. Summary of the Stress Test Programs (concluded)

regulatory report, which contains consolidated income statement and balance sheet information for each bank. The FR Y-9C also includes off-balance sheet items and other supporting schedules, such as the components of RWAs and regulatory capital. Most of the data used in the FRB's stress test projections are collected through the Capital Assessments and Stress Testing (FR Y-14) information collection, which include a set of annual, quarterly, and monthly schedules (FR Y-14A/Q/M). These reports collect detailed data on pre-provision net revenue (PPNR), loans, securities, trading and counterparty risk, losses related to operational-risk events, and business plan changes. Banks are required to submit detailed loan and securities information for all material portfolios.

[1] Board of Governors of the Federal Reserve System. *Dodd-Frank Act Stress Test 2019: Supervisory Stress Test Methodology March 2019*. Available at www.federalreserve.gov

[2] In the case of the trading book the stress tests assume that market prices react instantaneously to the stress scenario. As for the banking book, the projection of credit losses also takes account of provisions for credit losses that are expected to emerge in the subsequent four quarters. This effectively allows the stress tests to take account of potential credit losses that may emerge over a thirteen-quarter horizon.

73. Potential losses under stress are calculated independently by supervisors and banks. To avoid potential overreliance on supervisors' models, banks are required to estimate their potential losses in a stress scenario determined by the FRB. The highest loss between the supervisor's estimate and the bank's estimate becomes the binding constraint for the capital plan.[52] In addition, the CCAR and the broad supervisory examination processes actively probe the broader range of risks to which individual banks are exposed and more importantly the quality and integrity of bank capital planning processes. As a result of this process, supervisors routinely make recommendations for banks to improve their models and risk managements practices. However, as supervisors' models tend to be more conservative, they end up playing the decisive role in capital plans approval decisions. The OCC and FDIC do not estimate supervisory models as part of their DFAST implementation.

B. Recent Changes

74. U.S Authorities have been taking steps over the last couple of years to simplify the regulatory framework and tailor the stress test exercise to the systemic importance of the banks. The authorities claim that the changes that have been finalized have been mainly designed to reduce the administrative burden of the stress test exercises and qualitative reviews on banks that pose less systemic risk to the U.S. financial system and enhance the transparency of the stress test program itself without compromising the safety and soundness of the financial system or that of individual banks. Some of the more material changes which have been implemented include:

[52] The maximum amount of capital that can be distributed is driven by the higher amount of the stressed losses that are estimated (i) by the firm (when determining the distributions in the first place, a firm needs to keep enough capital to absorb the losses it has estimated) or (ii) by the supervisor (a firm that do not have enough capital to make the planned distributions and absorb losses based on supervisory models has to revise its capital plan).

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- ***Removal of the Qualitative Objection***. In February 2017, the FRB amended the capital plan rule to no longer subject banks considered large and noncomplex to provisions whereby the FRB could object to a capital plan due to qualitative deficiencies in the bank's capital planning processes ("qualitative objection"). In April 2019, the FRB amended the rule to remove the qualitative objection for any bank that has been subject to the qualitative objection for four consecutive years and that does not receive a qualitative objection in the fourth year of that period. Going forward, despite of the removal of the qualitative objection, the heightened supervisory expectations will be maintained and the capital planning practices of large bank holding companies will continue to be reviewed through the supervisory process.

- ***Scope and frequency:*** The EGRRCP Act eliminates the supervisory stress tests for BHC with less than US$100 billion in assets, requires periodic (rather than annual) supervisory stress test for firms in the US$100 to US$250 billion range, and removes the company-run stress tests requirements for banking organizations with less than US$250 billion in assets and other financial companies with US$250 billion in assets or less (see Box 1).

- **The *transparency of the stress test exercises has been significantly enhanced.*** In order to better balance the costs and benefits of disclosure, in February 2019, the FRB adopted changes which increased the transparency of its stress testing program.[53] [54]

75. The implementation of the Stress Capital Buffer (SCB) will lead to further significant changes to the stress testing program. The FRB finalized in March 2020 the rule creating the SCB. The FRB's objective is to simplify its large bank capital framework by integrating its forward-looking stress tests capital rules with its more traditional regulatory capital requirements (Box 3). Under the new rules, a bank whose capital buffers are below its minimum capital requirement plus its stress losses and any applicable GSIB surcharge and countercyclical capital buffer would be subject to automatic restrictions on capital distributions. While the addition of the GSIBs surcharge makes the stress testing programme more rigorous, other changes in assumptions and parameters might reduce the stringency of the capital requirement by:

[53] The changes included amendments to the FRB's Policy Statement on the Scenario Design Framework for Stress Testing along with the adoption of a new stress testing policy statement and a notification of enhanced disclosure of the models used in the supervisory stress test. Regarding the latter, in March 2019 the FRB published enhanced disclosures on two of the key models that it uses in stress testing. It also published estimated loss rates for groups of loans with distinct characteristics, to show how supervisory models treat specific assets under stress. The FRB has publicly committed to publishing disclosures about two additional models in 2020 and each year thereafter until it has provided more transparency for each of its stress test models.

[54] Commenters to the proposals for enhanced disclosure issued by the FRB in 2017 were divided in their views on the appropriate level of transparency. Some commenters recommended full disclosure of supervisory models published by the Board through the public notice and comment process, suggesting that this would result in more accurate models. Other commenters expressed the view that the FRB should fully disclose material aspects of the models such as underlying formulas, equations, model backtesting, validation outcomes, and limitations, to enable the public to evaluate the reliability of the Federal Reserve's results. However, other commenters opposed full transparency of supervisory models, indicating that it is important for the stress test to remain flexible and for it not to be perfectly predictable by the companies subject to it.

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- Removing the current assumption in CCAR that a bank will carry out all nine quarters of its planned capital actions (e.g., dividends, repurchases, and issuances) in the stress test and instead require banks to prefund only four quarters of planned common stock dividends.
- Modifying the current assumption in CCAR that effectively requires that a bank's balance sheet grows under stress to an assumption that the bank's balance sheet size remains constant under stress.[55]
- Removing the 30 percent dividend payout ratio that had been used as a threshold for heightened supervisory scrutiny.
- Removing the stress leverage buffer requirement**.** Under the SCB final rule, banks will no longer have to comply with any leverage buffer under stress conditions (i.e., the SLR and the U.S. leverage ratio will no longer be considered as post stress capital requirements).
- Allowing firms to increase their planned capital distributions in excess of the amount included in their capital plans without prior approval of the FRB.

76. Recent changes to the stress test program will likely reduce regulatory capital requirements for many large banks. While the consideration of the GSIBs surcharge in the stress capital rules off-set at least part of the impact for the GSIBs, the other banks that participate in the program have a meaningful reduction in regulatory requirements, albeit from a strong starting point. In addition, the new rules might become more procyclical. The prefund of dividends has the useful property of helping banks strengthen their capital positions when times are good. Requiring banks to prefund only four quarters of dividends, instead of nine, reduces this countercyclical feature. Finally, the removal of the post-stress leverage requirements substantially reduces tier 1 capital requirements (Table 3).

[55] It is also worth noting that credit risk-weight densities are assumed to be stable in the stress tests (as opposed to rising as credit conditions deteriorate, which would be the case in internal bank models of credit risk) because the tests are run using the U.S. standardized framework for credit risk in order to provide consistent results across banks. The latter applies stable risk weights for credit risk that are typically more conservative than the implicit credit risk-weights generated by bank internal models in normal times.

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Box 3. Overview of the Stress Capital Buffer

The main objective of the FRB's March 2020 stress capital buffer (SCB) rule is to simplify the regulatory capital framework by integrating the FRB's forward-looking stress tests capital rules with the current capital conservation buffer.

- Under the current capital rule, a bank is subject to restrictions on its capital distributions and certain discretionary bonus payments if the bank does not maintain a CET 1 capital conservation buffer of at least 2.5 percent of risk-weighted assets over and beyond the minimum CET 1 risk-based capital requirements of 4.5 percent. The capital conservation buffer is expanded by the applicable surcharge if a bank is a global systemically important bank (GSIB) plus any prevailing countercyclical capital buffer requirement.
- At the same time, the FRB may also restrict capital distributions if a bank has not demonstrated an ability to maintain capital levels above minimum regulatory capital requirements under stressful conditions (CCAR quantitative objection) assuming that the bank makes all planned distributions included in its capital plan.

Changes to the capital regime for GSIBs

The FRB's stress capital buffer rule seeks to integrate these two approaches. For example, under the SCB rule the total capital buffer requirement for a GSIB, above the minimum capital requirements would equal the sum of (i) the stress capital buffer, subject to a floor of 2.5 percent of risk-weighted assets; (ii) the GSIB surcharge, and (iii) the countercyclical buffer (if deployed).

Under the final rule, the GSIB surcharge will be added to the Stress Capital Buffer. This change is significant because, under the CCAR, a bank is currently required to have enough capital to absorb its peak-to-trough stress losses plus its planned capital distributions and meet its minimum capital requirements (i.e., a 4.5 percent CET1 risk-based capital ratio) on a post-stress basis without having to meet its GSIB surcharge. This approach will be more conservative for GSIB banks.

The final rule will also relax certain assumptions. Banks will no longer have to "pre-capitalize" all nine quarters of their planned capital distributions in their capital plans. Instead, they would only be expected to "capitalize" four quarters of planned common share dividends. In addition, the rule also eliminates the assumption of balance sheet growth over the stress testing horizon that is part of the current CCAR framework and replace it with a less onerous stable balance sheet assumption.

Source: FRB, IMF staff

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Table 3. United States: Impact of Stress Capital Buffer on Capital requirements.

	Average change (2013-2019)		Current 1/	
	US$ billion	Impact as a % of current requirement	US$ billion	Impact as a % of current requirement
Impact on CET1 capital				
GSIBs	46	7%	-6	-1%
Category II-IV	-35	-10%	-53	-15%
Total	**11**	**1%**	**-59**	**-5%**
Impact on Tier 1 capital				
GSIBs	0	0	-40	-5%
Category II-IV	-49	-12%	-62	-15%
Total	**-49**	**-4%**	**-102**	**-8%**

Source: Federal Reserve and statement by Governor Brainard on March 4, 2020 concerning the impact of the SCB on the Tier 1 capital requirements of GSIBs and Categories II-IV firms

1/ Based on high level of dividends such as those observed in 2019

C. Recommendations

77. The stress test framework is comprehensive and rigorous but could be further improved. The FRB has been evolving its stress test program over time as modeling practices and data sources improve. Potential improvements include:

- **More explicit recognition of second-round effects might help to further enhance the stress test exercises.** As presently designed, the FRB's stress tests do not explicitly take account of potentially material second-round effects that may emerge in response to adverse macroeconomic shocks. These effects can include macroeconomic disruptions arising from associated disruptions to bank funding markets; contagion effects that can spread from one bank to another when a bank encounters stress; and potential asset fire-sales that may emerge when multiple institutions seek to sell assets at the same time to boost their liquidity positions. U.S. authorities argue that these effects are already implicitly captured in the stress tests given the severity of the scenario chosen, which is largely based on events and correlations observed during the last financial crisis. However, the historically observed stress events also implicitly include the actions that were taken by the authorities during the period to contain the broader damage to the financial system and the broader economy. Stress tests should ideally explore additional mechanisms to understand how bank capital will behave under stress in the absence of such actions. Modelling second-round effects remains a work-in-progress in most jurisdictions. These effects are particularly relevant for macroprudential purposes but can also be informative to analyze the capital needs of individual banks. The U.S. authorities are encouraged to continue exploring how they might further enhance their supervisory stress testing program

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to identify and analyze these effects in a more explicit fashion. One possible way forward might be to begin by considering how best to integrate the solvency and liquidity stress testing.

- **Consider leveraging the stress test program to probe more structural issues.** In the future, the FRB may wish to consider leveraging their stress test program to explore the potential impact of longer-term structural issues on the safety and soundness of regulated banks. The UK's experience in using stress test exercises to probe potential prudential issues associated with climate risks or "low-for-long" interest rate scenario are examples of the type of analysis that might prove useful from a prudential perspective. Another topic that could be explored is the impact of the low levels of interest rates for a prolonged time on the banking sector.

78. In conjunction with finalizing any other reforms, it would be important to assess the combined impact of all recent reforms, including the regulatory tailoring, and ensure that they do not pose risks to the safety and soundness of banks. The FBAs usually prepare detailed impact assessments for each reform. The stress test proposals will interact with other changes, including the regulatory tailoring and SLR adjustments and need to be carefully assessed to ensure that the combined effect do not pose any undue risks to the safety and soundness of regulated firms.

79. Removing the CCAR qualitative objection places added pressure on bank supervision. The qualitative objection was included as part of the stress test program to help address shortcomings in bank capital planning practices and the supervision thereof that had existed prior to the crisis. The FRB has decided to set aside the qualitative objection process because it believes that banks have achieved significant progress in correcting the weaknesses that had previously existed in these practices. Going forward, banks will be given an opportunity to privately address any supervisory concerns expressed as Matters Requiring Attention before the issues are more formally escalated to the point where more public tools like enforcement actions need to be deployed to correct bank (mis)behavior. The main outstanding question is whether supervisors will be willing to escalate issues and deploy their more public tools on a timely basis in the absence of the CCAR qualitative objection process.

SUPERVISORY APPROACH AND PRACTICES

80. The FBAs have a well-developed and tailored supervisory approach in which stress tests play a key role on supervisory assessments of the resilience of the banking sector. Supervisors conduct on on-site and off-site analysis to develop a thorough understanding of the risk profile of each bank. Going forward, the easing of regulatory constraints for some categories of banks increases the importance of high quality and independent banking supervision to mitigate potential risks. In addition, as the memory of the GFC recedes, the challenge is to maintain supervisory intensity and intrusion in the face of stronger pressure and challenges by banks.

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A. Methods of Ongoing Supervision

81. The supervisory process is comprehensive, highly structured and risk-based. The FBAs utilize their authorities to develop and maintain a thorough understanding of the operations of individual banks and holding companies. During the supervisory cycle, the agencies formally assess the risk profile of each institution to determine the supervisory strategy. Risk assessments are updated on a regular basis through off-site monitoring programs and on-site examinations. These risk assessments include a forward-looking assessment of the risk profile of the banks, particularly in relation to safety and soundness, and the use of a uniform rating process that provides a consistent methodology and terminology for assessing and assigning risk ratings across banks. The supervisors have a framework in place for early intervention; and have plans to act to resolve banks in an orderly manner if they become non-viable.

82. Under U.S. law, the FBAs conduct full-scope on-site examinations of banks at least and holding companies. Banks that have assets of less than US$3 billion, have a composite CAMELS rating of outstanding or good, that are considered well-managed and well-capitalized, and meet certain other criteria may be eligible for an eighteen months cycle, while all other banks have a 12-month examination cycle. The full-scope examination addresses all key areas of a bank's operations, including capital adequacy, asset quality, management strength and quality of oversight from the bank's board of directors, quality and sustainability of earnings, adequacy of liquidity sources, and sensitivity to market risk. For many larger banks and holding companies, full scope examinations/inspections consist of a series of targeted reviews during the examination cycle which culminate in a roll-up process where ratings are assigned based upon the results of these targets and the continuous monitoring activities. Additionally, for many of the largest banks and holding companies, one or more of the banking agencies maintains a full-time examination staff on-site at the banks to monitor the banking organizations' condition and activities.

83. The Prompt Corrective Action (PCA) framework is the main plank of the early intervention framework and has clear triggers. The PCA statute provides the FBAs with authority to promptly resolve capital deficiencies at insured depository institutions, and thereby reduce bank failures. The PCA imposes mandatory and discretionary restrictions on an insured depository institution's capital position to ensure a minimum level of capital is maintained or, in the absence of appropriate capital, requires the chartering government agency to close or seize the bank. The FBAs also have informal and formal supervisory actions linked with the supervisory ratings of the institutions. While the corrective actions are not automatic, they are presumed when the ratings of the institutions are poor.

Tailoring of the Oversight Framework

84. The FBAs take a proportional approach to supervision which ensures additional focus and resources for weaker and more systemically important institutions. All FBAs divide the banks for examination purposes according to their size and complexity; although these categories are not aligned with the ones created for regulatory purposes. Generally, the supervisors use a US$10 billion threshold as a key dividing point in the intensity of supervision. Typically, this is the

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point where supervisors carry out continuous assessment of firms. These assessments are usually supported by resident examination teams for firms with more than US$100 billion, rather than a periodic examination (Appendix 4). Supervision intensity grows with the systemic importance of the institutions. The most intensive form of supervision is reserved for the U.S. GSIBs and a small group of foreign bank organizations (FBOs) with large and complex operations in the U.S. This proportional approach to supervision is clearly reflected in the number of supervision hours used for each type of institution (Figure 4).

Figure 4. United States: FRB Supervision Hours per Institution

The FRB, on average, spent the least amount of time supervising the holding companies of community banks without State member banks (SMB) whose primary federal regulator was either the OCC or FDIC. Among those institutions primarily supervised by the FRB, the average number of hours increase substantially with size.

LISCC firms, a group of 12 banks considered systemically important, are subject to the most rigorous supervision with the most supervisory resources per firm—over 55,000 hours on average.

Source: FRB Bank, Supervision and Regulation Report, May 2019. Includes only the supervision done by the FRB.

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85. New efforts to further tailor the supervisory framework focus on reducing the regulatory burden for small banks. The EGRRCPA directed the FBAs to tailor the oversight of banks. In response the FBAs have been increasing the emphasis on risk-focused examination activities for regional and community banks, conducting more in-depth examinations for banks with high-risk activities and less-intensive examinations for lower-risk banks. In addition, the FBAs have taken steps to reduce the information collection requirements for smaller banks and minimize the burden associated with their examinations by conducting larger portions of examinations away from bank premises (off-site). Specific examples of recent supervisory actions to further tailor the supervisory approach include:

- The FBAs, under the auspices of the FFIEC, implemented a new streamlined regulatory reporting for eligible small institutions.[56] This streamlined report resulted in 24 fewer pages and reduced data items required to be reported by small banks by 40 percent.
- The FRB increased the reporting asset threshold for holding companies from US$1 billion to US$3 billion. As a result, nearly 55 percent of holding companies are eligible to file a substantially shorter parent-company-only form semiannually (instead of quarterly).
- The FRB is conducting more supervisory activities off-site and simplifying pre-examination requests for documentation to ease the burden associated with community bank examinations. The Bank Exams Tailored to Risk (BETR) program relies upon regulatory reporting data and examiner judgement to classify areas of risk, allowing supervisors to direct their resources to areas of heightened risk and to minimize excessive burden on low-risk areas and institutions.
- Recognizing that banks are increasing use of digital loan files to manage their documents, in 2018, the FDIC began piloting a technology to facilitate off-site loan file review, aiming to enhance efficiency and reduce banks' burden.

Communication of Supervisory Concerns and Enforcement Action

86. Generally, the FBAs identify problems or deficiencies at a bank or holding company during on-site examinations. Many minor problems or deficiencies are resolved informally during the examination, when the bank or holding company immediately takes steps to correct or commits to promptly correct the deficiencies and address the regulatory concerns. At the end of the examination of a bank, supervisors send a written "Report of Examination" to the bank for review by all directors and senior officers. The report assesses the condition of the bank's capital, asset quality, management, earnings, liquidity and sensitivity to market risk (CAMELS); identifies violations of law; and addresses compliance with consumer laws and regulations, information technology, and the CRA. The narrative of the report of examination also calls attention to "concerns" or matters that need attention (MRAs and MRIAs/MRBAs).

[56] Call report FFIEC 051.

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87. However, there are many cases where banks take an excessive time to address the concerns of supervisors. The regulators employ progressive enforcement regimes to address supervisory concerns that arise during the examination cycle. If the institution does not respond to the concern in a timely manner, the regulators may take informal or formal enforcement action, depending on the severity of the circumstances. Informal enforcement actions include obtaining an institution's commitment to implement corrective measures under a memorandum of understanding. Formal enforcement actions include issuance of a cease-and-desist order or assessment of a monetary penalty, among others. Notwithstanding these procedures, in practice MRAs can take a long time to be closed and old MRAs/MRIAs are not uncommon.

88. There is room to improve communication with banks and ensure that their managements are more responsive in addressing supervisor concerns. A review of supervisory files revealed that the quality of correspondence with banks varies within and across agencies. There are areas for improvements, particularly on strategic level communication. Supervisors communication with banks does not always sufficiently prioritize MRAs and MRIAs and the findings from horizontal reviews take place throughout the year. Sometimes, the team found that supervisors seemed to settle back into prescribed formats that have a tendency of being excessively formulaic and compartmentalized. Key actions can be hidden in long texts and a nuanced and sometimes vague language that does not make clear what is the expected action by the banks. In addition, the procedures and terminology for notification of supervisory concerns is not harmonized across the FBAs, which might generate confusion.

89. The FBAs are aware of the communication challenges and have taken steps to improve them. It is important that the ongoing efforts continue. Communicating more clearly with banks where their action (or inaction) is giving rise to risks to safety and soundness is critical. Providing boards with a clear sense of priority could help them monitor whether deficiencies are fully addressed by management and ensure more timely corrective actions.

B. Potential Future Challenges

90. The new environment created by the regulatory tailoring and doubts as to the enforceability of guidance increases the importance of high-quality bank supervision. As supervisory stress tests become less frequent and capital and liquidity requirements less stringent for some banks, supervision needs to sharpen its tools and procedures to ensure that banks remain appropriately governed, controlled and financially resilient to the risks that the banks take and intend to take. While regulation and supervision are not perfect substitutes, the FBAs can mitigate the risks using the full gamut of their toolkit to effectively address them.

91. These new challenges are emerging at a time when supervisors might face additional push backs from the banking industry. The context in which supervision takes place is cyclical. As financial resilience for the largest U.S. banks moves away from a near and present threat one might expect that banks may push back against supervisory requirements that are costly and would impact their profitability. Discussions with the private sector made clear the intention of some institutions to challenge what they consider "excessive" or ungrounded requirements from supervisors. FBAs have

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been clear that a bank cannot "buy their way out of control weaknesses with high levels of capital and liquidity," but they recognize that the potential for push back is there. In addition, as discussed in the institutional setting section, the FBAs statement on the role of guidance seems to have potential to impact on supervisory corrective action, albeit FBA management believe that this is in areas where supervisors had either not made a sufficient link between the guidance and a rule or that they had sought to "enforce" the guidance on a line by line basis rather than looking at the totality.

92. Guidance is an important articulation by the FBAs of their consideration of how rules should be applied. This is very important when looking at such an overarching rule as a safety and soundness, but it applies throughout the regulations. The FSAP team reviewed SR 13-13 / CA 13-10: Supervisory Considerations for the Communication of Supervisory Findings, which was the FRB's key statement on communicating findings. It sets clear expectations of supervisors that they will use the following language when communicating an MRIA – "*The board of directors (or executive-level committee of the board), or banking organization is required to immediately...*". This guidance appears to remain valid in relation to the criteria used in that SR; specifically that (1) matters that have the potential to pose significant risk to the safety and soundness of the banking organization; (2) matters that represent significant noncompliance with applicable laws or regulations; and (3) in the case of consumer compliance examinations, matters that have the potential to cause significant consumer harm. To the extent that the third criteria (repeat criticisms that have escalated in importance due to insufficient attention or inaction by the banking organization) do not qualify under any of the other three criteria, it will be incumbent on supervisors to make a clear and strong link between the inaction and rules such as safety and soundness.

93. Ratings are an important part of the communication to banks. There are different rating methodologies used by the FBAs for banks and by the FRB for BHCs. The changes brought about by the FRB for rating large holding companies (SR 19-3 / CA 19-2: Large Financial Institution (LFI) Rating System), while overall useful, does create a transitional challenge for the FRB. The LFI is still in its very earliest days of implementation and typically ratings models take some time to bed down. The FSAP team felt that there were three challenges in particular, that should receive focus: (i) preventing the "Conditionally Meets Expectations" rating being a default rather than transitory, which is the intention. This will involve a clear articulation of risk appetite between the rating of "broadly meets expectations" (itself encapsulating that there can be some minor deficiencies) and "Deficient-1"; (ii) the guidance on ratings has been written at a very broad level of aggregation and consequently it may be difficult to see how the much more granular work carried out by supervisors is related to the ratings (creating a further communication challenge); and (iii) the loss of a composite rating presents a significant operating shift and there is a risk that one of the three LFI ratings is perceived to be the natural successor to the composite.

94. In addition, risks less familiar to bank supervisors are coming to the fore. Rapid technological progress in financial services, cyber risks and transition risks to a low carbon economy are gaining prominence due their potential systemic implications. The FBAs have a supervisory approach that is effective in tackling traditional risks and have taken steps to include some of these

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new challenges. To continue being effective it is key to develop processes which allow the necessary agility tackling new risks. The team noted the commitment by the FBAs to try and develop a common and shared supervisory approach to cyber. This initiative is still in its early stages and the team was not able to review any material.

95. Finally, as the memory of the GFC recedes, it is key to fight complacency and maintain supervisory intensity and intrusiveness. The number of on-site examinations has declined considerably for both large and small banks. FRB's examinations of the 12 most systemic banks in the United States have fallen from 468 in 2015 to 301 in 2018 (Figure 6). FDIC total on site examinations decreased about 29 percent between 2014 and 2018 while OCC's examination decreased 13 percent (Figure 5). The number of MRAs and MRIAs declined even more: above 30 percent in most portfolios and above 50 percent for the large bank holding companies (LISCC and LBO). These indicators can be partly explained by the effectiveness of supervisors that have increased the resilience of the financial institutions over the last decade and the consolidation of the sector. However, it is key that at this stage of the business cycle, considering the buoyant market sentiment and the continued buildup of market vulnerabilities, supervisors do not back-off from new issues and risks, and do not scale back scrutiny of banks practices.

Figure 5. United States: OCC and FDIC Examinations

OCC number of on-site examinations decreased about 13 percent between 2014 and 2018. The decrease in supervisory notifications was over 30 percent.

The number of on-site examinations conducted by the FDIC decreased from 29 percent between 2014 and 2018.

Source: OCC, FDIC, IMF Staff calculation

C. Recommendations

96. The FBAs are encouraged to consider further actions to tackle aging resolution of matters requiring attention (MRAs). The long period taken by banks to solve supervisory concerns represent an unnecessary risk to financial stability and might contribute to undermine the authority of supervisors. The FBAs could consider:

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- Actions to further improve communication such as (i) harmonizing the procedures and terminology for notifications; (ii) providing streamlined letters to banks using more candid and clear language; and (iii) enhancing the prioritization of the supervisory concerns.
- Introducing more explicit rules and processes to escalate supervisory actions in the absence of timely and appropriate responses from banks to aging MRAs/MRIAs. The lack of specific and measurable guidelines for escalation of supervisory concerns, in some cases, leads to excessive reliance on the judgment of examiners, which can result in inconsistent escalation practices.

97. The FBAs could consider further developing the framework for promoting early action for other issues than bank capital and liquidity. The PCA framework is the main plank of the early intervention framework and has clear triggers. The authorities could consider enhancing the prudential framework by developing policy limits for other issues such as concentration and interest rate risks. These limits could work as a red-flags for further examinations and potential, but not always necessary, corrective actions. Such policy limits would provide a signal as to what authorities' regard as acceptable and, as such, it can have a powerful preventative effect. They would also provide a useful reference point for offsite and continuous monitoring and can indicate when a bank might need to be reviewed by on-site supervision. Finally, they could help shortening the time gap between breaking a threshold and action.

98. Maintain supervisory intensity and intrusiveness and continue adapting the supervisory approach to new challenges and risks. The FBAs have been very successful fulfilling their mandate and enhancing the resilience of the banking sector since the GFC. To effectively face new challenges arising from regulatory changes, renewed industry pressure against supervisory actions, shifts in the balance of risks and vulnerabilities that continue to build in a maturing credit cycle it is key to maintain the intensity of supervisory scrutiny and being agile in responding to new threats to financial stability.

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Figure 6. United States: FRB Examinations Per Year

Source: FRB. IMF staff

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Appendix I. Tailoring Rule and Indicator-based Approach

Consistent with the EGRRCP Act, the FBAs introduced a new round of changes to applicability thresholds for the more stringent regulatory requirements (See Table below).

Fewer banking organizations will have to comply with all full Basel standards. This will accentuate differences between the U.S. regime and the Basel framework that already exist, which will further complicate any comparative exercise. The Collins Amendment to the DFA imposes a prudent permanent capital floor on banks based on the standardized approach risk-based capital rules[1], but the U.S. standardized approach excludes capital charges for operational risk and for Credit Value Adjustment (CVA) risk. Whilst the GSIB surcharge is more conservative than international standards, no D-SIBs has been identified in the United States.

Taken together, these changes may impact large banks:

- **Banking organizations with assets of at least US$100 billion are considered as "large financial institutions" by the Federal Reserve**.[2] Fourteen of 20 largest banks in the United States are in the US$100 to US$700 billion range.[3]

- **Potential impact on risk taking.** Reduced prudential standards could, in turn, facilitate increased risk taking by these large but not GSIB firms without the countervailing regulatory constraints that was provided by the previous regime. Quantitative liquidity rules requiring banks to hold liquid assets to deal with unpredictable events do reduce the probability of runs and help avoid destabilizing bank failures or high liquidation cost of assets that would occur in the absence of high-quality liquid assets. Simulation exercises have shown that liquidity requirements such as the LCR can be as effective as capital requirements in mitigating contagion risk arising from fire sales across the banking system. Empirical evidences suggest that the LCR is associated with a lower individual bank's marginal contribution to systemic risk and is a useful indicator in predicting *ex ante* which banks are most exposed to a crisis.[4]

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[1] Currently, a banking organization using the advanced approaches calculates risk-based capital ratio under both the standardized and advanced approaches and uses the lower of the two ratios as its operative capital ratio. This 100 percent floor is more conservative than the output floor introduced in the Basel framework (set at 72.5 percent of the RWA calculated under the standardized approach).

[2] According to the Federal Reserve, "Large financial institutions generally pose the greatest risk to the financial system as a result of their size, complexity, and interconnectedness. [...] These institutions fall into two primary categories. The largest, most complex bank holding companies and nonbank financial companies--designated by the Financial Stability Oversight Council for Federal Reserve supervision--are considered the institutions posing the greatest systemic risk to the U.S. economy. A second category of institutions are those with total consolidated assets of at least US$100 billion, which are not considered to be systemically important. [...]".

[3] Also, it is worth noting that 58 of the world's 100 largest banks have less than US$750 billion in assets.

[4] See for example: Charles W. Calomiris, Florian Heider, Marie Hoerova, 2015. "A Theory of Bank Liquidity Requirements". Hyun Song Shin, 2004. "Liquidity Risk and Contagion". Douglas W. Diamond and Anil K Kashyap, 2016. "Liquidity requirements, liquidity choice, and Financial Stability". Brian Du, 2019. "How Useful Is Basel III's Liquidity Coverage Ratio? Evidence from U.S. Bank Holding Companies".

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- **Potential impact on financial stability.** Both in terms of risk profile, scope of activities, complexity of internal organization and information systems, large banks including regional banks are very different from small community banks that, even collectively, cannot pose systemic threats to financial stability. Experience in the United States as well as in other jurisdictions has shown that the distress of large institutions that would not qualify today as GSIBs (Countrywide, Indymac, Wachovia, Washington Mutual for example) may pose a significant risk to financial stability in certain situations where their business models are closely associated with broader financial system vulnerabilities. It is worth mentioning that, based on the new four-tier framework, the most stringent prudential standards such as the full LCR requirements and the most stringent regulatory adjustments to CET1 capital would have not applied to Washington Mutual (i.e., the largest bank failure in the U.S. history and the sixth-largest FDIC-insured institution in 2008) that held US$307 billion in assets when it was resolved by the FDIC in 2008. As noted by the former chairman of the FDIC, M. Gruenberg, regional banks "*pose very significant resolution challenges to the FDIC distinct from those posed by GSIBs and by smaller banks. Their size, complexity, and reliance on market funding and uninsured deposits would present very substantial risks in resolution, with potential systemic consequences.*"[5]

The tailoring approach is somewhat complex and largely driven by the size of the banks:

- **Key features of the approach.** Relying on different metrics, thresholds, and ways to combine them, the indicator-based approach is relatively complex, which somehow contradicts the primary objective of simplifying the regulatory framework and reducing compliance costs. Paradoxically though, only one domestic bank would be placed in a different category than what would simply result from its size. Further, the approach is subject to cliff or threshold effects, with banks having to meet more (or less) stringent prudential requirements and bear higher (or lower) compliance costs when they move, even temporarily, to another category. Conversely, a banking organization that would manage to keep the cross-jurisdictional activity, short-term wholesale funding, nonbank assets and off-balance sheet exposures indicators below their respective thresholds could grow up to US$700 billion in assets without having to (i) meet prudential requirements fully consistent with all Basel standards[6] and to (ii) hold additional capital reflecting their systemic importance, as no D-SIBs have been identified by the FBAs.[7]

[5] As noted by the U.S. FBAs, opinions of individual Board do not necessarily reflect the position of the FBAs.

[6] For example, a firm (i) with US$680 billion in assets (including derivatives—exclusively contracted with foreign counterparties—representing a net exposure of US$100 billion), (ii) with wholesale funding of US$300 billion (secured by Level 1 assets), and (iii) with off-balance sheet exposures of US$70 billion (representing the potential future exposure of the derivative contracts) would fall in Category III despite an extremely aggressive risk profile. In that case, the weighted short-term funding indicator would be US$75 billion, and the off-balance exposure (that excludes derivatives) would amount to US$70 billion. Assuming that no transactions other than the derivatives are concluded with foreign banks, the cross-jurisdictional activity indicator would be 0.

[7] As indicated in the BCBS RCAP (June 2016), the Federal Reserve replicated the GSIB assessment methodology in the U.S. D-SIB framework, which includes a measurement of cross-jurisdictional activity. Based on the results, no additional D-SIB has been identified (beyond those already designated as GSIBs).

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- **Size is the main driver.** Apart from the designation of firms as GSIBs (falling by construction into Category I) that reflects their systemic importance in accordance with the BCBS methodology, the classification is essentially driven by the size (total assets) and size-related indicators (off-balance sheet exposures, size of the of the portfolio of investment in nonbanking assets) and not by the risk profile and/or the complexity of activities.[8] Indeed, other measures of systemic importance such as interconnectedness, complexity and substitutability are not captured by the indicators-based approach. The cross-jurisdictional activity indicator excludes assets and liabilities from derivatives exposures, which is questionable considering the role played by derivatives in spreading distress across countries in 2008-09. Similarly, the use of nonbank assets that are simply defined as assets held by nonbank subsidiaries regardless of their characteristics does not capture any risk component. The importance of short-term wholesale funding (arguably a risk-based indicator) is solely used to classify banks with less than US$700 billion in assets between category III and category IV and potentially impose higher LCR requirements in these two categories. Overall, size remains a crude measure of complexity and does not reflect the risk profile. As noted in an FRBNY staff report, "*complexity cannot be equated with institution size.*"[9]

- **Limited impact on supervision.** There seems to be a slight disconnect between the broad categories used for regulatory purposes (i.e., identifying which rules are applicable to a given regulated firm) and the supervisory practices, which suggests that these categories might be somewhat "artificial" or insufficiently risk-based. Concerning the supervision of banks with more than US$100 billion in assets, there is a clear and important distinction between the banks supervised under the LISCC program, on the one hand, and the Large Banks Organizations on the other hand (i.e., other large banks with more than US$100 billion in assets that are not GSIBs). The distinction between Category II, Category III, and Category IV has not yet been translated into distinct supervisory practices.

[8] As a matter of fact, in order to distinguish between complex and noncomplex holding companies, the Federal Reserve evaluates a number of relevant factors which are not taken into consideration in the tiering system: structure of the company; the extent of intercompany transactions between IDI subsidiaries and the holding company or its non-depository subsidiaries; the risk, scale, and complexity of activities of any non-depository subsidiaries; and the degree of leverage at the holding company, including the extent of debt outstanding to the public. Companies are also designated "complex" if material risk management processes for the holding company and its affiliates are consolidated at the parent company (SR 16-4). Complex BHCs are subject to more intense supervision than noncomplex BHCs.

[9] Complexity in Large U.S. Banks, FRBNY Staff Report, 2019.

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Table I.1. United States: Regulatory Tailoring

Applicable regulation	Before EGRRCPA					After EGRRCPA, considering final tailoring rules						
	G-SIBs	$250b +	$50-$250b	$10-$50b	<$10b	Category 1 U.S. G-SIBs	Category 2 >$700bi	Category 3 >$250bi	Category 4 >$100bi	$50-$100b	$10-$50b	<$10b
Comprehensive Capital Analysis & Review (CCAR)												
Qualitative Fed-run process review	yes	yes	yes	no	no	yes	yes	yes	no	no	no	no
Quantitative Fed-run stress tests	yes	yes	yes	no	no	yes	yes	yes	every other	no	no	no
Dodd-Frank Act Stress Tests (DFAST)												
Quantitative Fed-run stress tests	yes	yes	yes	no	no	yes	yes	yes	every other	no	no	no
Company run stress tests	yes	yes	yes	yes	no	yes	yes	every other	no	no	no	no
Capital Standards												
Risk-based												
G-SIB capital buffers	yes	no	no	no	no	yes	no	no	no	no	no	no
Countercyclical capital buffer	yes	yes	no	no	no	yes	yes	yes	no	no	no	no
Advanced Approaches	yes	yes	no	no	no	yes	yes	no	no	no	no	no
Risk-based (i.e., Basel III)*	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	no
Leverage ratio												
Enhanced Suplementary LR (eSLR)	yes	no	no	no	no	yes	no	no	no	no	no	no
Suplementary LR (SLR) of 3%	yes	yes	yes	no	no	yes	yes	yes	no	no	no	no
U.S. Leverage ratio	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	no
Option for 9 percent everage ratio	no	no	no	no	no	no	no	no	no	no	no	yes
TLAC	yes	no	no	no	no	yes	no	no	no	no	no	no
Liquidity Requirements												
Liquidity Coverage Ratio (LCR)	yes	yes	reduced	no	no	yes	yes	reduced	no reduced	no	no	no
Net stable funding ratio (NSFR), proposal	yes	yes	reduced	no	no	yes	yes	reduced	no	no	no	no
Concentration limits	yes	yes	yes	no	no	yes	yes	yes	no	no	no	no
Resolution plans	yes	yes	yes	no	no	yes	yes	every six ye	no	no	no	no
Establishment of Risk Committee	yes	yes	yes	yes	no	yes	yes	yes	yes	yes	no	no

*Requirement does not include a capital charge for Operational Risk and CVA

Source: FBAs, IMF staff

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Table I.2. Comparison between U.S. and Basel standards.

	Basel standards	U.S. standards				
		Category I (U.S. GSIBs)	Category II (*)	Category III (*)	Category IV (*)	Other firms
Capital rules						
GSIB surcharge	From 1% to 3.5%	From 1% to 5.5%	N/A			
DSIB surcharge	Principle-based approach	N/A	**No surchage as no D-SIBs have been identified in the US**		N/A	
Banks operate above the minimum regulatory capital ratios (to reflect banks' risk profile and changes in economic conditions)	Pillar 2 (**)	Stressed risk-based capital requirements (**)				No Pillar 2 and no stressed risk-based capital requirements
Countercyclical capital buffer (CCyB)	From 0% to 2.5%	In line with Basel			No CCyB	
Higher leverage ratio requirements for GSIBs (eSLR in the US)	3% + leverage buffer (50% of the GSIB surcharge) Leverage buffer in the 0.5-1.75% range	3% + leverage buffer (50% of the US GSIB surcharge) Leverage buffer in the 0.5-2.75% range	N/A			
Leverage ratio (SLR in the US)	3%	N/A	3% (SLR is aligned with Basel)		No SLR	
Regulatory adjustments to CET1	- For DTAs, MSRs and investments in unconsolidated financial entities: limited recognition in capital capped at 10% of CET1 for each category - The amount of the three items that remains recognized cannot exceed 15% of CET1 - Limited recognition of minority interests	In line with Basel	In line with Basel	- Limited recognition capped at 25% of CET1 for each category - The amount of the three items that remains recognized after the application of all regulatory adjustments is not capped - Banking organizations can include minority interest up to 10 percent of the parent banking organization's CET1 capital		
Impact of unrealized gains and losses	Unrealized gains and losses are included in regulatory capital	Unrealized gains and losses are included in regulatory capital	Unrealized gains and losses are included in regulatory capital	Firms have the possiblity to exclude gains and losses from regulatory capital (i.e., unrealized losses are not deducted from capital). This is less conservative under stressful conditions when firms are likely to accumulate underlying losses		
Calculation of RWAs						
Floor for firms using internal model approache	72.50%	100% (***)	100% (***)	N/A		
Operational risk	Standardized approach (Business Indicators)	AMA (****)	AMA (****)	No capital charge	No capital charge	No capital charge
Market risk	Framework applies to all banks regarless of the size of the trading book	Framework applies to banks with significant market risk exposures (with aggregated trading assets and liabilities of at least US$ 1 bn or 10% of total assets). Given scoping criteria, all		Framework applies to banks with significant market risk exposures (with aggregated trading assets and liabilities of at least US$ 1 bn or 10% of total assets)		
CVA risk	Yes	Yes	Yes	No capital charge	No capital charge	No capital charge
Liquidity rules						
LCR	Full LCR requirements	Full LCR requirements	Full LCR requirements	Reduced LCR	No LCR	No LCR
NSFR	Full NSFR requirements	Full NSFR requirements if implemented (*****)	Full NSFR requirements if implemented (*****)	Reduced NSFR if implemented (*****)	No NSFR	No NSFR

(*) Category II firms: ≥ US$700 bn in total assets or ≥ in cross-Jurisdictional activity. Category III: US$250 bn total assets or US$75 bn ≥ in nonbank assets, short-term funding, or off-balance sheet exposure. Category IV: Other firms with US$100 to 250 bn in assets

(**) Comparing the Pillar 2 approach in the Basel framework and the CCAR process in the US is extremely difficult -if not impossible- given the conceptual differences. It is all about implementation.

(***) A prudent permanent capital floor on banks based on the standardized approach risk-based capital rules (100%) is implemented, but the U.S. standardized approach excludes capital charges for operational risk and for Credit Value Adjustment (CVA) risk

(****) The FBAs are considering introducing a standardized approach

(*****) The NSFR rule has not been finalized and timing is uncertain

More conservative than Basel standards	Less conservative than Basel standards

The objective was not to assess whether banks in each segment are internationally active or not, but rather to make a comparison between the Basel standards and the U.S. standards. As this is not an RCAP exercise, the materiality of the differences has not been measured. Standards that apply to noninternationally banks (Categories III and IV) should be broadly compliant with the Basel framework

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Appendix II. Federal Reserve Stress Test Models Updates

The FRB strives to ensure that its stress test models keep pace with best practices. This has resulted in an ongoing program of model changes since the last FSAP. The most significant changes are as follows.

2015

- Modest changes to accrual loan loss models.
- Refinement of risk factors used in selected securities models.
- Simpler approach to reduce volatility in noninterest income and expenses.
- Interest expense on subordinated debt now based on more granular instrument-level information
- Model used to project regulatory capital and capital ratios enhanced to incorporate more detailed data from regulatory reports so that it better aligns with revised regulatory framework and related accounting guidance.

2016

- An average of the historical simulation and panel regression models introduced to project operational risk losses.
- Operational risk projections for each bank holding company (BHC) incorporated large historical losses (in terms of severity and frequency) observed across all BHCs, scaled to bank size, rather than an individual bank's own historical data. Additionally, projections of losses from the historical simulation model were set at percentiles of the loss distribution that correspond to the severity of the supervisory scenarios.
- Models used to estimate several components of MRWA were modified in order to better differentiate the sensitivity of each component to scenario variables and to align the estimation more closely to the market risk rule in the Board's Regulation Q.
- Several changes to the supervisory capital calculation were introduced to improve precision. The main model enhancements include: Incorporating greater precision in the adjustments to the regulatory capital ratio denominators; and modifying assumptions regarding the relationship between mortgage servicing assets (MSAs) and associated deferred tax liabilities (DTLs).

2017

- Operational risk model enhanced to capture losses from operational risk events and mortgage repurchase expenses, and the use of the mortgage repurchase model used in prior years was discontinued.
- An enhanced regression-based model was introduced that forecasts total losses for operational risk at the industry level and then distributes those losses to each bank based on its asset size.
- Models that estimate certain components of Pre-Provision Net Revenue (PPNR)—such as net interest income, noninterest income, and noninterest expense—were enhanced to better account for differences in post-crisis performance across banks.
- Estimation process for commercial real estate loan loss models was streamlined by combining two datasets before model estimation. In addition, in the process of re-estimating the model, the model's macroeconomic variables were updated to better capture loan losses under stress.
- Supplementary leverage ratio added to the calculation of projected capital.

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2018

- Models that project other-than-temporary impairments (OTTI) for debt securities and losses on auto loans, first-lien mortgages, home equity loans, and credit cards were enhanced.
- Phase-in of material enhancements to the model that estimates certain components of pre-provision net revenue (PPNR) was completed; the PPNR model was updated to include a more granular model of deposit expenses; and changes were made to the calculation of projected post-stress capital to account for the passage of the Tax Cuts and Jobs Act.

2019

- The probability of default (PD) and loss given default (LGD) components of the auto loan model were enhanced. These refinements include changes to the way certain risk drivers are captured in the model, which reduces volatility from historical macroeconomic movements, and an adjustment to newly originated accounts to better reflect their higher credit risk compared to otherwise similar accounts.
- The way in which the credit card model treats uncollected interest and fees in the exposure at default (EAD) component of the model was refined. Data from more recent periods that include a larger set of banks supported a slight reduction in the assumed percentage of uncollected interest and fee income.
- Treatment of missing data in the corporate loan portfolio was refined to align with that of other portfolios. Under the refined treatment, the FRB assigns a conservative loss rate for an entire portfolio when a certain proportion of the loans are missing required model inputs. Analysis suggests the refined treatment remains appropriately conservative.
- Certain models used to project fair value for debt securities were enhanced to increase modeling flexibility and better align with historical trends. The risk drivers for agency mortgage-backed securities (MBS), such as option-adjusted spread (OAS), now flexibly vary over the planning horizon. A new model was also adopted to project the OAS for sovereign bonds. In DFAST 2018, the OAS was projected using a scenario-based regression model. The new model projects the OAS based on high-percentile historical movements in sovereign bond spreads.
- Commercial real estate (CRE) Loss-Given-Default (LGD) model was refined and a number of other minor changes to the CRE loan-loss model were introduced. The previous LGD model relied on reported charge-off and loan reserve data, which led to idiosyncratic reporting differences across banks. The change improves consistency by using a common data source and framework for the projection of LGD. Additionally, the process for calculating auxiliary risk drivers was simplified. A single conceptual framework is now used to project auxiliary risk drivers, which increases consistency and decreases complexity.
- PPNR models were re-estimated with more data to better reflect recent performance in PPNR while keeping the structure of the model unchanged. Additionally, longer time-series data for new intermediate holding companies (IHCs) and historical data revisions changed the estimation data.

Source: *Dodd-Frank Act Stress Test: Supervisory Stress Test Methodology and Results*
(This is an annual publication. Above details are for years 2015 through 2019; model changes each year are summarized in a box in the chapter on supervisory stress test framework and model methodology. Details presented here have been condensed for sake of brevity).
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Appendix III. Evolution of Federal Reserve Stress Test Procedures

The FRB has been taking steps over the last couple of years to streamline the regulatory burden associated with its stress test exercises. The following is a summary of the changes that have been proposed or implemented to date.

Date	Status	Change	Rationale	FRB Impact Assessment
February 2017	Implemented	Qualitative objection removed for banks defined as large and noncomplex (those with total consolidated assets of at least US$50 billion but less than US$250 billion, nonbank assets of less than US$75 billion, and that are not US global systemically important bank holding companies)	Better tailor the Board's regulatory requirements with the risk of large and noncomplex banks Note: In November 2018 Governor Quarles publicly indicated in speeches that improvements in bank risk management and capital levels combined with introduction of the LFI supervisory system enable the FRB to migrate the qualitative objection to the supervisory system	None provided Note: In principle, there should not be any material impact on regulatory capital or liquidity requirements if the supervisory system turns out to be at least as effective as the qualitative objection process
April 25, 2018	Proposed rule (finalized March 2020)	Capital conservation buffer to be replaced with stress capital buffer tied to stress test results Stress capital buffer to incorporate four quarters of planned common stock dividends instead of all planned capital distributions over stress test horizon In September 2019, Governor Quarles gave a speech outlining his vision of the stress capital buffer that would abolish that and introducing instead either a higher floor or a more stringent countercyclical buffer requirement	Simplify capital regime	Cumulative impact assessments contained in the proposal indicated: CET 1 regulatory capital requirements for GSIB banks estimated increase of US$10 to US$50 billion (15–75 basis points of risk-weighted assets) CET 1 regulatory capital requirements for non-GSIB banks with assets exceeding US$50 billion estimated decline of US$10 to US$45 billion (27–121 basis points of risk-weighted assets)

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Date	Status	Change	Rationale	FRB Impact Assessment
		SCB would also be based on a constant risk-weighted asset assumption over the stress horizon rather than the previous assumption that credit supplied would not contract Removal of 30 percent dividend payout threshold that would otherwise trigger heightened supervisory scrutiny Proposal also included establishment of a stress leverage buffer sized by a bank's stress losses that would sit on top of the 4 percent U.S. leverage ratio. In his September 2019 speech, Governor Quarles mentioned that he would support removing the stress leverage buffer requirement. Note: Under the April 2018 proposal, the stress capital buffer still subject to a 2.5 percent CCB floor though, as indicated above, Governor Quarles noted the potential for this floor being increased		
May 24, 2018	Economic Growth, Regulatory Relief and Consumer Protection (EGRRCP) Act passed into law	Asset threshold for automatic application of enhanced prudential standards raised from US$50 to US$250 billion. FRB allowed to apply enhanced prudential standards to bank holding companies with consolidated assets of US$100– 250 billion.	Smaller less complex banks should have requirements tailored to their risk profile. Note: Governor Quarles speech in July 2019 also suggested that stress testing less useful for smaller less complex banks.	No impact assessment available

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Date	Status	Change	Rationale	FRB Impact Assessment
		EGRRCP Act requires FRB to conduct a supervisory stress test on a periodic basis to all bank holding companies with assets of between US$100 billion and US$250 billion		
October 10, 2018	Implemented	Stress test threshold for state member banks raised from US$10 billion to US$250 billion Frequency of stress tests for state member banks reduced from annually to once every other year except for state member bank subsidiaries of more systemic holding companies Removal of "Adverse" scenario throughout the FRB's stress test rules	Implement section 401 of EGRRCP Act	Not expected to have a significant economic impact on affected banks
February 2019	Implemented	Board action to exempt certain less complex banks with assets less than US$250 billion in assets from stress test requirements and CCAR for the 2019 cycle		No material impact on regulatory capital requirements expected
February 2019	Implemented	FRB updated its scenario design framework to make it less pro-cyclical and more transparent by introducing a guide to determine house price shocks and further clarify its process for selecting the annual increase in the unemployment rate (within its previously defined range of 3 to 5 percentage points to a minimum of 10 percent)	Reduce pro-cyclicality in bank capital requirements	No material impact expected to severity of economic scenarios used in stress test framework Greater transparency may increase risk of gaming of the exercise by banks, which will need to be managed through the supervisory process
February 2019	Implemented	FRB published policy statement on stress test principles	Enhance transparency of stress test process	No material impact on regulatory capital requirements

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Date	Status	Change	Rationale	FRB Impact Assessment
March 13, 2019	Rule issued in final form / Implementation in progress	Qualitative objections to bank capital plans removed for all banks subject to a potential qualitative objection for four consecutive years, and the bank did not receive a qualitative objection in the fourth year of that period. In addition, except for certain banks that have received a qualitative objection in the immediately prior year, the Board will no longer issue a qualitative objection to any bank effective January 1, 2021	Improvements in bank risk management and capital levels combined with introduction of LFI supervisory system enable the FRB to migrate the qualitative objection to the supervisory system	No quantifiable impact on regulatory capital requirements
March 2019	Implemented	FRB published inaugural report outlining details on stress test methodology Details of other models used for stress testing to be published annually in coming years	Enhance transparency of stress test process	No quantifiable impact on regulatory capital requirements
July 2019	Implemented	FRB hosts conference on stress testing program	Enhance transparency of stress test process and gather feedback on possible enhancements	
October 10, 2019	Final Rule / Implemented	Four categories to allocate large banks based on their systemic importance and safety and soundness risks Removed mid-cycle stress test requirements for all banks Banks subject to Category IV requirements migrated to an extended supervisory stress test cycle (i.e., once every two years). These banks also no longer required to run company-run stress tests	Implement section 401 of EGRRCP Act & tailor enhanced prudential requirements in accordance with systemic risks posed by large banks	No material change in regulatory capital requirements for Category I and II banks CET 1 regulatory capital requirements for Category III and IV banks estimated to decline by about 60 basis points of risk-weighted assets
March 2020	Final rule	The SCB requirement is the difference between the bank starting and	Integrate capital rule and CCAR	The impact of the final rule on CET1 capital requirements ranges from a

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Date	Status	Change	Rationale	FRB Impact Assessment
		minimum projected CET1 capital ratios under the severely adverse scenario in the supervisory stress test plus four quarter of dividends as a percentage of RWAs. The GSIB surcharge and the CCyB (if activated) are added. It will be assumed that firms maintain a constant level of assets over the planning horizon. SCB requirement cannot be lower than 2.5 percent of RWAs		decline of US$59 billion to an increase of US$78 billion

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Appendix IV. Application of Proportionality in Supervision

Portfolio	Number of institutions (Total assets)	Supervisory approach
FRB		
LISCC – Large Institution Supervision Coordinating Committee. Eight U.S. GSIBs and four FBO with large and complex operations in the U.S.	12 (US$12.1 trillions)	• National program that uses both horizontal and firm-specific supervisory activities to assess the financial resiliency and risk-management practices. • Supervision conducts a continuous assessment of firms supported by firm-specific examination teams. • This group is subject to heightened supervisory expectations and the most rigorous supervision with the most supervisory resources per firm.
LFBO – Large and Foreign Banking Organizations. Non-LISCC U.S. firms with total assets US$100 billion and greater and non-LISCC FBOs	179 (US$7.3 trillions)	• Supervision includes some horizontal elements, but firm-specific teams at the local Reserve Bank conduct most of the supervisory work, subject to oversight by the Board. • Supervision conduct a continuous assessment of firms supported by firm-specific examination teams.
RBO – Regional Banking Organizations. Total assets between US$10 billion and US$100 billion	82 (US$1.8 trillions)	• The Board of Governors establishes the program and policies and the Reserve Banks execute the program. The supervision model is decentralized with greater flexibility provided to local Reserve Banks. • Central Point of Contact (CPC) assigned to oversee supervision of each company (develops supervisory plan, risk assessment, exam plan and directs examination process and serves as a liaison between the company and FRB). • Full-scope on-site exam every 12 months; usually fulfilled by aggregating several targets (some work can be completed off-site). The bank is subject to continuous monitoring, and off-site surveillance. Exam activities are intensified based on the complexity of the organization, risk profile and severity of issues at the bank.
CBO – Community Banking Organizations. Total assets less than US$10 billion	3980 (US$2.4 trillions)	• The Board of Governors establishes the program and policies and the Reserve Banks execute the program. The supervision model is decentralized with greater flexibility provided to local Reserve Banks. • Periodic full scope assessments considering cycle of 12 or 18 months and the companies are subject to periodic surveillance. • State banks rated CAMELS composite "1" and "2" may be eligible for an AEP which allow exams conducted in alternating years or alternating 18-month periods, as appropriate, to be conducted by the state banking agency.

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Portfolio	Number of institutions (Total assets)	Supervisory approach
OCC (as of June 30, 2019)		
Large Banks Firms with total assets US$50 billion and greater (asset size not sole criterion); and Federal branches and agencies of FBOs	Large Banks: 20 Federal Branches and Agencies: 47 ($11.2 trillion)	• An examiner-in-charge is assigned full time to each large bank to provide day-to-day supervision with the help of an on-site team of examiners determined by bank's risk profile. • The full scope examination requirement is fulfilled by aggregating several ongoing supervision and target exams activities through annual supervisory cycle. • Examinations typically use the highest amount of resources and expertise. • Supervision of most federal branches is similar to the community bank model, with an assigned portfolio manager and a combination of off-site monitoring and on-site exams typically conducted every 12 or 18 months. • A small number of large, complex federal branches have resident examiners assigned.
Midsize Banks Total assets between US$8 billion and US$60 billion (asset size not sole criterion)	48 ($916 billion)	• An examiner-in-charge is assigned full time to each midsize bank to provide day-to-day supervision with the help of general and specialist examiners. • The full scope examination requirement is fulfilled by aggregating several supervisory activities. • Dedicated supervision staff assigned to each institution conduct both off-site and on-site supervisory activities. • The amount of resources and expertise of examiners are higher for midsize than community banks, due to their complexity.
Community Banks Total assets less than US$8 billion	1,061 ($728 billion)	• Each community bank is assigned a portfolio manager who serves as the OCC's primary contact for bank management and the board on an ongoing basis. • Banks must receive a full-scope, on-site examination every 12 or 18 months which is usually fulfilled in one examination.
FDIC		
Large Banks Total assets greater than US$10 billion	38	• Banks are subject to a continuous examination program. • Conducted by regional staff embedded on-site at the institutions with support from the Regional Office and Washington Office • Procedures require an annual risk assessment that aids in determining a supervisory plan tailored to each institution that combines on-site examination work and ongoing monitoring. • Exam activities are intensified based on the severity of issues at the bank.
Community banks Total assets less than US$10 billion		• Periodic full scope assessments considering cycle of 12 or 18 months. • Can be complemented by limited scope reviews.

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Portfolio	Number of institutions (Total assets)	Supervisory approach
		• Some state banks rated CAMELS composite "1" and "2" may be eligible for an AEP which allow exams conducted in alternating years or alternating 18-month periods, as appropriate, to be conducted by the state banking agency.
Source: FBAs, IMF Staff. . Data as of June 30, 2019.		

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Appendix V. Status of the Recommendations of the 2015 FSAP

CP	Recommendations of the U.S. FSAP 2015 for Banking Supervision	Status
1.	FBAs revisit their "mission and vision" statements to ensure they give primacy to safety and soundness and to clarify that the pursuit of other objectives must be consistent with, and if necessary, subordinate to, that goal.	No change since 2015.
	FBAs and the CFPB explore ways to reduce duplication of effort, in matters such as risk reviews, and over time look to pursue opportunities for a more coherent division of responsibilities between safety and soundness, and consumer protection.	Ongoing. Coordination efforts with significant improvements. Division of responsibilities remain the same.
2.	The Federal Reserve further assure the independence of its supervisory role by making the governance rules for the boards of Federal Reserve district banks consistent with emerging global good practice.	The FRB has adopted bright-line restrictions on the roles of directors of the Federal Reserve district banks in order to address any potential for the appearance of conflicts of interest.
3.	FBAs ensure that the preparation of supervisory plans is on the same cycle, if practicable, and consider other ways of ensuring that collaboration becomes fully engrained in the *modus operandi* of each agency.	Coordination between agencies with signs of clear improvements. Supervisory plans not fully aligned.
5.	Incorporate handover "protocols" that would discourage inappropriate regime shopping in the FFIEC Statement on Regulatory Conversions.	No change since 2015.
6.	Introduce explicit requirement for banks to immediately report if they find that a major shareholder is no longer suitable.	No change since 2015.
8.	Develop interagency approach to communicate issues of supervisory important to banks (MRAs, MRIAs, MRBAs).	Each of the FBAs employ guidance that differentiate between levels of severity for supervisory concerns and specify when to communicate them to boards of directors at the depository institutions. Approach not fully align across agencies.
8.	Develop interagency method of prioritization of such matters requiring attention.	Ongoing. The FBAs are making efforts to improve communication, but further improvements are needed.
8.	Introduce requirements for banks to report developments to the supervisor, in particular for banks under less intensive supervision.	No change since 2015. There is no explicit regulatory requirement for banks to immediately report if they find that a major shareholder is no longer suitable.
8.	Develop guidance to clearly distinguish, in supervisory recommendations and matters requiring attention, which are of Boards responsibility and which are the responsibility of senior management.	Ongoing. The FBAs making efforts to improve communication, but further improvements are needed.

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CP	Recommendations of the U.S. FSAP 2015 for Banking Supervision	Status
8.	Implement interagency guidance with more clarity regarding aging of MRAs.	Aging MRAs remain an issue despite efforts done by the agencies.
8.	Carry out a combined interagency planning process for individual firms	Ongoing. The FBAs making efforts to improve communication, but further improvements are needed. Planning cycles are still not aligned.
8.	Develop a supervisory best practice approach for horizontal reviews, which includes initial statements of expected minimum standards and the expected process of feedback to those that participate and the feedback to the wider population of firms to which it might be relevant.	After the horizontal review, findings are vetted by the horizontal team and shared with the individual firms.
11.	Implement rules/policies promoting early action also for other issues than bank capital and liquidity.	Ongoing. The FBAs have also developed presumed corrective actions associated with ratings, but the PCA framework remains the main plank for supervisory corrective actions.
11.	Implement more explicit rules for supervisory action, such as setting timelines for completion, partially or fully, of remedial action and requiring regular reporting of progress.	No change since 2015. Explicit rules and processes to escalate supervisory actions in the absence of timely and appropriate responses from banks to aging MRAs have not been introduced.
12.	Develop and implement regulatory and supervisory rules, guidance, and a formal rating system for SLHCs.	(1) The guidance documents that are applicable to SHLCs have been precisely identified; (2) The FRB issued an advance notice of proposed rulemaking inviting comment on conceptual frameworks for capital standards that could apply to insurance company SLHCs in June 2016; and (3) The FRB adopted a final rule to apply the RFI rating system on a fully implemented basis to non-insurance and non-commercial SLHCs with total consolidated assets less than US$100 billion, and the LFI rating system for non-insurance or non-commercial SLHCs with total consolidated assets of US$100 billion or more in November 2018. The FRB will continue to assign an indicative RFI rating to SLHCs engaged in significant insurance or commercial activities, regardless of asset size.
14.	Introduce clearer expectations and requirements for corporate governance also for banks not subject to heightened standards.	While the FRB' guidance (SR 16-11) clarifies risk management expectations for institutions with total consolidated assets of less than US$50 billion, enhanced standards have not yet been defined for larger firms (with assets of US$50 billion or more) supervised by the FRB.
14.	On issues where still lacking, clarify supervisory expectations and requirements on the role and responsibilities of the bank board versus those of the bank management.	The FRB's guidance (SR 16-11) that provides clarification on and distinguishes supervisory expectations for the roles and responsibilities of the board of directors and senior management for an institution's risk management only apply to institutions with total consolidated assets of less than US$50 billion.
14.	Introduce explicit requirement that banks inform the supervisors promptly about material developments that affect the fitness and propriety of Board directors or senior management.	No change since 2015.

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CP	Recommendations of the U.S. FSAP 2015 for Banking Supervision	Status
15.	Introduce clear expectations and requirements regarding risk management standards applicable to banks with less than US$10 billion of assets.	No requirements have been introduced since 2015 regarding risk management standards applicable to banks with less than US$10 billion of assets.
15.	Introduce clear guidance on responsibilities of the Board with regards to risk management.	The OCC issued Heightened Standards prescribing operational and managerial standards for national banks and updated guidance relating to the responsibilities of boards of directors and senior management of banks. While the FRB' guidance (SR 16-11) clarifies risk management expectations for institutions with total consolidated assets of less than US$50 billion, enhanced standards have not yet been defined for larger firms (with assets of US$50 billion or more) supervised by the FRB.
15.	Introduce clear requirements on the arrangements for the removal of CROs.	Clear requirements on the arrangement for the removal of Chief Risk Officers (CROs) have not been introduced by all FBAs. Only the OCC through its Heightened Standards prescribes that a bank's board or its risk committee have to approve the removal of the CRO.
15.	Introduce clearer supervisory guidance on the severity of scenarios for stress tests run by the firms.	The FRB publishes on a yearly basis the supervisory scenarios that firms have to use when conducting company-run stress tests.
15.	Introduce clearer feedback mechanisms to firms on the components of supervisory run stress tests.	Ongoing. Significant achievements, but improvements needed.
16.	Introduce a comprehensive capital framework for savings and loan holding companies with substantial insurance or commercial activities.	Ongoing. The FRB has issued a proposal but has not finalized capital standards that would apply to insurance company SLHCs.
16.	Clarify requirements for capital to be held against operational risk by non-AMA banks.	No change since 2015.
16.	Clarify supervisory expectations for capital to be held against interest rate risk in the banking book.	No change since 2015.
17.	Introduce specific requirements that major credit risk exposures exceeding a certain amount or percentage of the bank's capital are to be decided by the bank's Board or senior management.	No change since 2015.
17.	Introduce specific requirements that credit risk exposures that are especially risky or otherwise not in line with the mainstream of the bank's activities must be decided by the bank's board or senior management.	No change since 2015.
19.	Reassess the supervisory force of the thresholds for commercial real estate exposures.	No change since 2015.
	Develop a robust supervisory framework and supervisory guidance for other risk concentrations comparable to that for credit concentration risk.	No change since 2015.
	Review the separate and additional limits for money market investments and security holdings by banks, with a view to including them within the 15 plus 10 limits.	No change since 2015.

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CP	Recommendations of the U.S. FSAP 2015 for Banking Supervision	Status
	Review the 50 percent limit on exposures to a corporate group, which could result in excessive risk concentrations.	No change since 2015.
	The Federal Reserve complete the development of its large exposures' framework, with limits, for large bank holding companies and foreign banking organizations.	Only applies to U.S. GSIBs, BHCs subject to Category II or III standards, and FBOs subject to Category II or III standards or that otherwise have total global consolidated assets of US$250 billion or more. Limits those firms to a single counterparty to 25 percent of CET1 capital.
20.	Introduce formal requirements for prior board approval of transactions with affiliated parties and the write-off of related party exposures exceeding specified amounts.	No change since 2015.
	Introduce formal requirements for board oversight of related party transactions and exceptions to policies, processes and limits on an ongoing basis.	No change since 2015.
	Amend the coverage and details of the "related party" regime to bring it into line with this CP.	No change since 2015.
	Introduce limits for holding company transactions with their affiliates or insiders	No change since 2015.
	Review the aggregate limit for lending to insiders of 100 percent of a bank's capital and surplus (and 200 percent for smaller banks).	No change since 2015.
21.	Introduce *de minimis* regime to be applied to all categories of banks and include savings associations.	The FSAP team did not review CP 21.
21.	Introduce explicit reference to country risk in guidance and rules on stress tests guided by the authorities.	The FSAP team did not review CP 21.
23.	Revise the 1996 guidance to include more quantitative guidelines regarding interest rate risk in the banking book.	No change since 2015.
25.	Introduce guidance on operational risk management and supervisory expectations applicable to non-AMA banks. Introduce appropriate reporting regime regarding operational risk.	Several statements of guidance have been issued, but a guidance document setting out overarching principles for managing operational risk is clearly missing. There are no general requirements for reporting operational risk related incidents to the FBAs.
27.	Introduce requirements for all banks to issue full financial statements in accordance with agreed accounting standards that are reviewed by an independent accountant in accordance with independent audit requirements.	The FSAP team did not review CP 27.
27.	Introduce requirement for external auditor to report immediately directly to the supervisor, should they identify matters of significant importance.	The FSAP team did not review CP 27.
27.	Review supervisory powers to allow the supervisor to set the scope of the external audit.	The FSAP team did not review CP 27.

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CP	Recommendations of the U.S. FSAP 2015 for Banking Supervision	Status
27.	Introduce a requirement for non-public banks to rotate their external auditors.	The FSAP team did not review CP 27.
29.	Supervisors should explicitly require, rather than "expect", that a bank's decision to enter into relationships with high-risk accounts and countries, including with foreign and domestic PEPs, should be escalated to the senior management level.	The FSAP team did not review CP 29.
29.	Current legal and regulatory framework does not require the identification of the ultimate beneficiary owner of legal entity clients. Proposed amendments open for public consultation will introduce requirements to address this deficiency. Assessors welcome the proposed rule and understand its approval and implementation will improve compliance with this CP.	The FSAP team did not review CP 29.

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