



OFFICE OF FINANCIAL RESEARCH

ANNUAL REPORT TO CONGRESS

2017



FROM THE DIRECTOR

I am pleased to present this *2017 Annual Report to Congress*. It fulfills our statutory requirement to assess the state of the United States financial system, including analyzing potential threats to financial stability, documenting our progress in meeting our mission, and describing our key findings.

We assess threats to financial stability by weighing vulnerabilities in the financial system against its resilience. Our overall risk assessment is unchanged from last year: Threats to financial stability are moderate. But underneath that assessment are changes in the balance between financial-system vulnerabilities and resilience.

We judge that three vulnerabilities are newly important: (1) those arising from cybersecurity incidents; (2) obstacles to resolving large, complex financial institutions; and (3) those arising from changes in financial market structure.

However, we also judge that the system's resilience has improved over the past year, as government officials and market participants continue to implement efforts to enhance resilience globally.

Our 2017 Financial Stability Report complements this annual report with a more deeply analytical assessment of threats to financial stability.

These reports and the ones we published previously reflect the views of the OFR, but we continue to benefit from input from and collaboration with the member organizations of the Financial Stability Oversight Council and their staffs.

Collaboration is a critical ingredient in fostering what we call a virtual research-and-data community — one that extends the reach and impact of what our staff can accomplish alone. Our collaboration includes interaction with our Financial Research Advisory Committee and our domestic and global counterparts.

Such input and collaboration have facilitated the progress we've made during the year toward meeting our mission. For example:

- In collaboration with the Federal Reserve, we advanced plans to begin collecting data on bilateral repurchase agreements and to publish new reference rates that are alternatives to LIBOR.
- We developed new tools to assess and monitor vulnerabilities and resilience in the financial system. Our Financial System Vulnerabilities Monitor and Financial Stress Index expand the risk-assessment toolkit for the benefit of officials and the public.

- We evaluated alternative methodologies to set regulatory thresholds for U.S. banks based on risk rather than size alone.
- We assessed resilience in central clearing counterparties.

Over the past six years, policymakers globally have increased financial-system resilience by improving capital and liquidity, and performing regular stress tests at banking firms; instituting new resolution regimes to restore market discipline; and strengthening derivatives markets.

Now is an appropriate time to take stock of whether such reforms effectively balance the vibrancy of the financial system with its resilience. The first three reports from the Treasury Department on the Executive Order on Core Principles for Regulating the United States Financial System are important steps in that stocktaking, and the OFR stands ready to deploy our data and analytical tools to evaluate that balance in support of the effort.

Likewise, over the past six years, the OFR has filled gaps in our understanding of the functioning of the financial system both in normal and stressful times. And we have filled gaps in financial data and taken steps to improve their quality and accessibility.

Now is an appropriate time to take stock of the OFR as an organization — one that started with a handful of people when I arrived in 2011, and must effectively balance achieving an extraordinarily broad mission with efficiency and agility. Over the past two years, we have embarked on that path through initiatives to reconfigure and streamline our functions. I am convinced we can do that while maintaining the objectivity, integrity, and quality that are hallmarks of our work.

During nearly five years as Director of the OFR, I have had the honor of leading an extraordinary group of public servants, united in their passion for our mission and their shared commitment to succeed. I am extraordinarily proud of the OFR team and grateful for the privilege of working with this diverse group of dedicated and talented professionals.

Although I will be leaving the OFR at year end, I am confident that the OFR staff will keep that passion burning and strive as “One OFR” to build on the progress we have achieved together toward a strong and vibrant organization. This year’s accomplishments demonstrate that teamwork brings success, and OFR team members will continue to work together and collaborate with our stakeholders to produce outstanding results.

A handwritten signature in black ink that reads "Richard Berner". The signature is written in a cursive, flowing style.

Richard Berner
Director, Office of Financial Research

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ANALYSIS OF
THREATS TO
THE **FINANCIAL**
STABILITY OF THE
UNITED STATES
KEY FINDINGS
FROM THE OFR'S
RESEARCH AND
ANALYSIS OF THE
FINANCIAL
SYSTEM STATUS
OF THE EFFORTS
OF THE OFR IN
MEETING ITS
MISSION

2017 Annual Report to Congress

We prepared this *2017 Annual Report to Congress* to meet the statutory requirement for the Office of Financial Research (OFR) to prepare and submit a report to Congress within 120 days after the end of each fiscal year.

As in previous years, the report's three main chapters assess the state of the United States financial system as required by the Dodd-Frank Wall Street Reform and Consumer Protection Act of 2010, including:



1 Analysis of Threats to the Financial Stability of the United States



2 Key Findings from the OFR's Research and Analysis of the Financial System



3 Status of the Efforts of the OFR in Meeting Its Mission



1 Analysis of Threats to the Financial Stability of the United States

Overall risks to financial stability remain in the medium range. We reached this assessment by weighing the financial system's resilience against its vulnerabilities.

The system is far more resilient than it was when the financial crisis loomed a decade ago, but new vulnerabilities have emerged, including in the last fiscal year.

For example, vulnerabilities from excessive leverage (when resources are low relative to investment exposures) could be exploited by risks that are high and rising from the potential for a sudden drop in prices of assets in financial markets, particularly stock markets and bond markets.

The chapter highlights three key threats to the U.S. financial system:

1. **Vulnerabilities to Cybersecurity Incidents**
2. **Obstacles to Resolving Failing Systemically Important Financial Institutions**
3. **Structural Changes in Markets and Industry**

We chose these key threats based on their potential impact, probability of occurring, proximity (could they happen soon?), and the preparedness of industry and government to manage them.

We also introduce new risk-assessment tools developed by the OFR — our Financial System Vulnerabilities Monitor and our Financial Stress Index — and discuss the insights from them that contribute to our assessment of financial stability.

We base our overall assessment of U.S. financial stability on many inputs, including an evaluation of the six categories of risk in the vulnerabilities monitor and our research, analysis, and surveillance of the financial system.



2 Key Findings from the OFR's Research and Analysis of the Financial System

This chapter discusses key findings in six areas, plus findings contained in selected research papers during the fiscal year:

1. **Network Analysis to Identify Cybersecurity Vulnerabilities and Operational Risk** – Network analysis combined with maps of the financial system populated by real-world data may help identify potential systemic vulnerabilities to cybersecurity threats.
2. **Reducing Regulatory Reporting Burdens** – Preliminary OFR analysis indicates that examples cited by industry about duplicative, conflicting, and inconsistent regulatory reporting requirements merit further exploration.

3. **LIBOR Alternative** – Alternatives to LIBOR are needed. One milestone for achieving a smooth transition to any alternative is that officials and market participants must help develop active derivatives markets that use the new rate. LIBOR, formerly known as the London Interbank Offered Rate, but now called ICE LIBOR (Intercontinental Exchange LIBOR), is an interest rate benchmark.
4. **Legal Entity Identifier** – To realize the full potential of the Legal Entity Identifier (LEI), a financial data standard, strategic regulatory mandating of the LEI is required, according to industry advocates. The LEI is like a bar code for precisely identifying parties to financial transactions.
5. **Assessing the Systemic Importance of Banks** – A multifactor approach that captures risk is superior to using asset size alone to determine the systemic footprint of U.S. banks. The asset-size threshold could subject some large U.S. banks with traditional business models to costs for complying with regulations that are not aligned with their risks.
6. **Financial Data Services Initiatives** – The Financial Stability Oversight Council (FSOC) and its member agencies could increase efficiency by adopting initiatives to facilitate appropriate data sharing and reduce the indirect and potentially direct costs of financial data acquisition.



3 Status of the Efforts of the OFR in Meeting Its Mission

This chapter discusses how we are serving our stakeholders: the FSOC, FSOC members, the Treasury Department, Congress, the financial services industry, and the public. It also describes our efforts to continue adjusting our focus on meeting the needs of those key stakeholders.

In addition, the chapter discusses our national and international collaboration over the past fiscal year, current staffing levels, our budget, and information technology projects.

OFR staff experts and leaders participate in a wide variety of events related to financial stability research, data, and analysis. Collaboration with researchers, regulators, and industry experts domestically and abroad is crucial to our success. We also receive valuable suggestions and recommendations from our Financial Research Advisory Committee, a group of 29 experienced professionals with experience in business, economics, finance, data science, risk management, and information technology. Committee members are drawn from industry, academia, and the policy community.

Our research and data agenda requires advanced and secure information technology tools. We bring large quantities of data into our analytical environment, which was designed and built specifically for the OFR to securely support computing-intensive work with large datasets. The need to keep these data secure and safeguard against breaches drives much of our security work.



VULNERABILITIES
TO CYBER
SECURITY
INCIDENTS
OBSTACLES
TO RESOLVING
FAILING
SYSTEMICALLY
IMPORTANT
FINANCIAL
INSTITUTIONS
STRUCTURAL
CHANGES IN
MARKETS AND
INDUSTRY

Analysis of Threats to the Financial Stability of the United States



Overall risks to financial stability remain in the medium range. We reached this assessment by weighing the financial system’s resilience against its vulnerabilities. Thanks to actions taken after the financial crisis, the system is far more resilient than it was when the crisis loomed a decade ago, but vulnerabilities have emerged, including in the last fiscal year.

Although our overall assessment is moderate, market risks are high and rising from the potential for a sudden drop in the prices of assets in financial markets, particularly the stock markets and bond markets. Such a decline could exploit vulnerabilities from excessive leverage, when resources are too low in relation to investment exposures.

The chapter highlights three key threats to the U.S. financial system:

1. **Vulnerabilities to Cybersecurity Incidents**
2. **Obstacles to Resolving Failing Systemically Important Financial Institutions**
3. **Structural Changes in Markets and Industry**

We also introduce new risk-assessment tools developed by the OFR — our Financial System Vulnerabilities Monitor and our Financial Stress Index — and discuss the insights we glean from them about financial stability.

The new monitor and index can be found on the OFR website

The new monitor and index, which are both on the OFR website, financialresearch.gov, are part of the OFR's quantitative monitoring toolkit. They signal where potential vulnerabilities might require further investigation. We conduct those investigations using a wider set of data, qualitative information, and expert analysis. The OFR's *2017 Financial Stability Report* contains a more in-depth analysis of the threats and our overall assessment of financial stability.

Financial Stability Threats

Shocks that cause widespread losses or loan defaults can expose underlying vulnerabilities and turn them into threats that can potentially disrupt the financial system with adverse consequences for the economy.

We selected the key threats to U.S. financial stability based on their potential impact, probability of occurring, probability of happening soon, and the preparedness of industry and government to manage them. The key threats are:

1. Vulnerabilities to Cybersecurity Incidents

The financial system is vulnerable to cybersecurity incidents because of its interconnectedness and heavy reliance on information technology.

A large-scale cyberattack, accident, or other cybersecurity incident could disrupt the operations of one or more financial companies and markets and spread through financial networks and operational connections to the entire system, threatening financial stability and the broader economy.

The financial system is an attractive target for cyber thieves and other hackers because financial companies manage the nation's wealth and handle trillions of dollars in transactions every day that underlie the U.S. economy.

The hack of consumer information at the consumer credit reporting firm Equifax, disclosed in September 2017, highlighted the vulnerability of some financial companies and the absence of regulatory guidance on how consumer credit reporting companies should manage cybersecurity risks. The attackers reportedly accessed personal information for 145 million Americans, including Social Security numbers and driver's license information.

A cybersecurity incident could pose a financial stability risk if it caused a loss of confidence in financial institutions, if it damaged the integrity of consumer financial data, or if the victimized company provided unique services that could not easily be replaced.

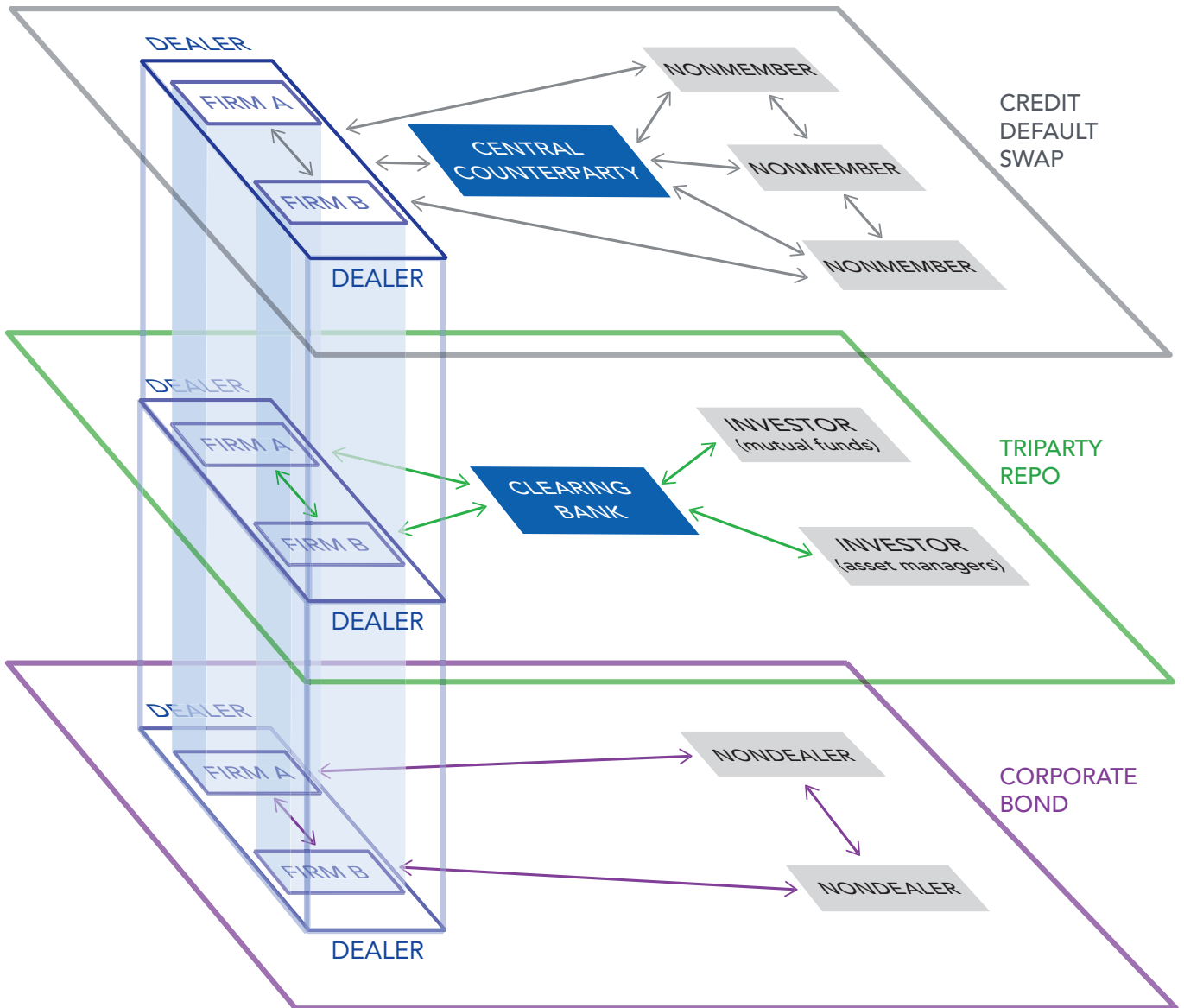
In such a scenario, customers and other financial companies might sever their connections to a victimized company to avoid exposure and protect themselves

from losses. They might also sever ties to similar companies for fear they are also vulnerable. Finally, they might limit their risks by pulling back from certain types of financial activities.

Three factors increase vulnerabilities to cybersecurity incidents for any type of company and industry:

1. The open structure of the Internet allows malicious actors to target companies across the globe.

Figure 1. Example of Financial System Network Mapping



Source: OFR analysis

2. The availability of encrypted digital currencies or "cryptocurrencies" makes evading detection easier for criminals because they can move and hold funds under assumed names.
3. Product liability laws do not generally apply to computer software, creating potential incentives to rush products to market and fix or "patch" problems later, including cybersecurity vulnerabilities.

Financial companies can help protect themselves and the overall system by investing in strong defenses and increasing their ability to recover from cybersecurity incidents. Regulators must work with the industry to ensure the resilience of the financial system, even if individual companies do not recognize that the benefits of protecting the overall system are worth their cost of increased resilience.

In the insurance industry, the National Association of Insurance Commissioners adopted a model law in October for protecting insurance data from hackers. But for the model law to take effect, U.S. states would need to adopt it.

In October 2016, federal banking regulators proposed rules to enhance risk management standards to combat cybersecurity threats.

As the OFR researches cybersecurity risks, we analyze past breaches, evaluate the effectiveness of regulations and policies, and draw lessons from "tabletop exercises" — simulated cybersecurity incidents — industry and regulators hold.

We are also applying network analysis and using detailed datasets to develop maps to learn how cybersecurity incidents can spread through the financial system (see **Network Analysis to Identify Cybersecurity Vulnerabilities and Operational Risk**). For example, such network analysis could focus on interconnections within markets and how shocks are transmitted — analysis that can be applied to shocks from cybersecurity incidents (see **Figure 1** for a representative multilayer view of work that could be done on three markets: credit default swaps, triparty repurchase agreements, and corporate bonds).

2. Obstacles to Resolving Failing Systemically Important Financial Institutions

Resolution is the process of restructuring or liquidating a failing financial company through bankruptcy or regulatory mechanism. The failure of a large, complex financial company could transmit distress to other firms and possibly trigger another financial crisis.

After the financial crisis of 2007-09, regulators developed important tools for resolving failing U.S. bank holding companies that are systemically important, but orderly resolution still may be difficult in some scenarios. Tools to enable an orderly resolution process for nonbanks are still works in progress.

Tabletop exercises are simulated cybersecurity incidents industry and regulators hold

There are two paths for the resolution of a failing systemically important financial institution (SIFI) that is not an insured depository institution. The first path is bankruptcy.

The second path, created by the Dodd-Frank Act, is the “orderly liquidation authority” when bankruptcy may not be the best alternative. On the recommendation of regulators and in consultation with the President, the Secretary of the Treasury could place the failing SIFI into receivership for the Federal Deposit Insurance Corporation (FDIC) to liquidate. The Act created this second path as a backstop to the bankruptcy process for the FDIC to address financial stability concerns and for better cross-border coordination among regulators.

In some scenarios, the first and second paths have shortcomings for handling the failure of the largest and most complex bank holding companies, known as global systemically important banks (G-SIBs). For example, if more than one G-SIB was failing, the FDIC might not be able to use the orderly liquidation authority to restructure the banks and release them from oversight quickly enough to stabilize the U.S. financial system.

Some proposals would strengthen bankruptcy provisions for financial companies but also would eliminate orderly liquidation authority. However, obstacles to handling a G-SIB failure through the bankruptcy process may remain. For example, the bankruptcy trustee might not have near-immediate access to short-term liquidity needed to stabilize the failing company or the cooperation of international regulators.

Finally, tools for successfully resolving systemically important nonbank financial firms are still being developed, despite problems among such firms during the crisis, such as the collapse of Lehman Brothers and near-failure of insurer American International Group, and the increasing importance of nonbanks such as central counterparties (CCPs).

Unlike G-SIBs, CCPs are not required to submit “living wills” to their primary federal regulators with plans for their rapid and orderly resolution in the event of their material financial distress or failure. CCPs are required to develop recovery and orderly wind-down plans for extreme events that could threaten their viability and financial strength before insolvency is reached. But CCPs are not subject to sanctions if regulators deem their plans unsatisfactory.

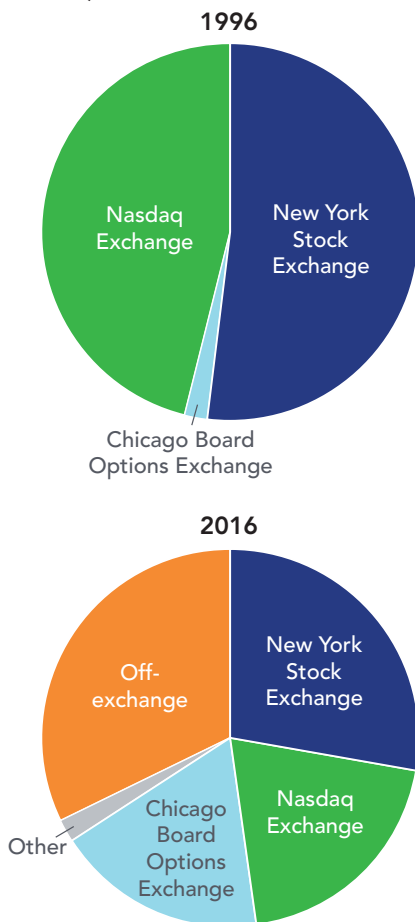
In 2016, the Commodity Futures Trading Commission (CFTC) issued guidance requiring more detailed wind-down planning. The Securities and Exchange Commission (SEC) is requiring CCPs under its supervision to submit initial plans by the end of 2017.

3. Structural Changes in Markets and Industry

Three aspects of market structure pose threats: (1) lack of substitutability, which is the ability to replace essential services if a provider fails or drops that line of business; (2) fragmentation of trading activities through multiple channels and products; and (3) the danger of a difficult transition to a new reference rate to replace the London Interbank Offered Rate (LIBOR).

A lack of substitutability is an aspect of market structure that can pose a threat. Some markets depend on one or a few financial institutions whose services may be difficult to replace under stress. For example, the increasing reliance on a single institution for settlement of Treasury securities and related repurchase agreements (repos) is a key vulnerability. An interruption in Treasury settlement services would disrupt the Treasury market and potentially a range of other markets.

Figure 2. Market Share by Exchanges and Their Affiliates, 1996 and 2016 (percent)



Fragmentation in markets can also pose threats. As electronic trading has escalated, the number of trading channels has grown (see Figure 2). This growth can increase flexibility for risk managers who want to hedge by diversifying their risks and for corporate treasurers and portfolio managers to reallocate assets quickly under stress. But fragmentation also introduces risks by reducing liquidity because resources of market makers are stretched thinner across more exchanges and products.

Some markets are also becoming more fragmented among products, raising concerns about the availability of liquidity also becoming more fragmented.

Another potential threat comes from the transition from LIBOR to an alternative. The risks and costs of using LIBOR make the move essential, but failure to make a timely and smooth transition could impair the functioning of markets that now rely on LIBOR. LIBOR reflects transactions in a shrinking market. Most of the responses by traders to the LIBOR survey are based on judgment rather than actual trades. LIBOR tracks unsecured transactions, which represent a small share of banks' wholesale funding.

The new U.S. benchmark rate, the Secured Overnight Financing Rate, will be produced by the Federal Reserve Bank of New York in cooperation with the OFR. It will be based on trading activity in repos backed by Treasury securities, not bank surveys (see LIBOR Alternative in next chapter).

Source: Muzan Trade and Quote

The Alternative Reference Rates Committee, made up of banks active in the derivatives market, informed the process and selected the Secured Overnight Financing Rate as its preferred LIBOR alternative. The new rate promises to be more reliable.

Despite these improvements, the transition from LIBOR carries additional risks. Obtaining widespread market acceptance and reliance could take years. Officials and market participants must develop active derivatives markets that use the new rate.

Financial Stability Assessment

We base our overall assessment of U.S. financial stability in part on an evaluation of the six categories of risk in our new Financial System Vulnerabilities Monitor and on our research, analysis, and surveillance of the financial system.

This new monitor improves on and replaces the OFR's Financial Stability Monitor. When we introduced the prototype of the Financial Stability Monitor in 2013, we noted that we planned to update and fine tune it. We made improvements in 2014 and 2015, then began a project in fiscal year (FY) 2017 to make fundamental changes.

The previous version of the monitor combined signals of vulnerability and stress, which prevented an accurate assessment of risk.

A vulnerability is a factor that can originate, amplify, or transmit disruptions in the financial system

As its name indicates, the new Financial System Vulnerabilities Monitor gives early warning signals of potential vulnerabilities. A vulnerability is a factor that can originate, amplify, or transmit disruptions in the financial system.

When the Financial System Vulnerabilities Monitor shows high or rising vulnerabilities, it indicates a high or rising risk of disruptions in the future. Vulnerabilities typically lead to additional stress when shocks hit, such as when widespread losses or loan defaults strike the financial system. The additional stress can feed a downward cycle.

A second new tool, the OFR Financial Stress Index, is a daily snapshot of current stress in global financial markets. Stress can be minor; for example, it can surface in a brief period of uncertainty and price volatility in the equity market. Or it can be major, like the stress precipitated by the runs on Lehman Brothers and other broker-dealers in 2008.

The distinction between stress and vulnerabilities means that the two should be measured separately. Both of these complementary tools factor into our overall assessment that risks to U.S. financial stability remain in the medium range.

Financial System Vulnerabilities Monitor

The Financial System Vulnerabilities Monitor is a heat map of 58 indicators of potential vulnerabilities organized into six risk categories: (1) macroeconomic, (2) market, (3) credit, (4) solvency and leverage, (5) funding and liquidity, and (6) contagion. These categories reflect key types of risks that have contributed to financial instability in the past.

The stress index and vulnerabilities monitor each have a category for credit, but the two tools are measuring different aspects of the financial system, so the same or similar categories or indicators

are not contradictory. For example, high stock valuations generally indicate low stress now, but such high valuations can be a potential vulnerability for the future.

The new monitor, which we will update quarterly, includes a category for solvency and leverage that was not in the earlier monitor. New underlying indicators provide additional information (see **Figure 3**).

The colors of the heat map mark the position of each indicator in its long-term range. For example, red signals that a potential vulnerability is high relative to its past. Orange signals that it is elevated. Movement toward red indicates that a potential vulnerability is building.

Figure 3. Financial System Vulnerabilities Annual Comparison, Second Quarters of 2016 and 2017

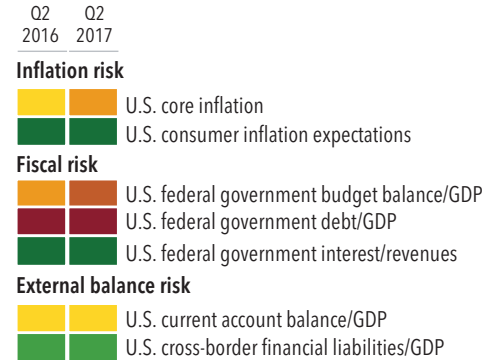


Note: Data available as of Oct. 4, 2017. The colors reported here and in past editions are subject to change because of newly reported data, data revisions, or changes in the historical range due to new observations.

Sources: Bloomberg Finance L.P., Compustat, Federal Financial Institutions Examination Council call reports, Federal Reserve Form Y-9C, Haver Analytics, Morningstar, SNL Financial LC, the Volatility Laboratory of the NYU Stern Volatility Institute (<https://vlab.stern.nyu.edu>), OFR analysis

Macroeconomic risk

Risk from inflation, government borrowing, and cross-border financing



Macroeconomic risks to U.S. financial stability are moderate. The U.S. economy continues to expand at a modest pace. The current U.S. economic expansion is the third longest since 1850. Inflation is low, and investors are not expecting major changes.

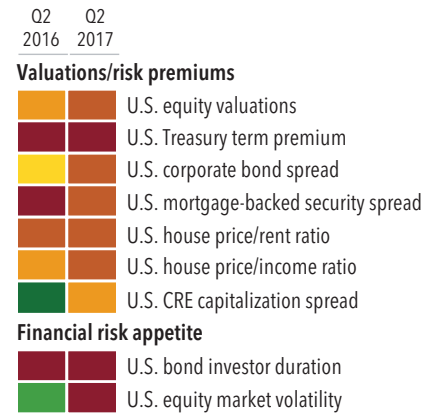
U.S. government debt as a percent of gross domestic product (GDP) is at its highest level in decades. Very low interest rates are currently mitigating this vulnerability because they make debt more affordable.

China's elevated level of debt hampers additional borrowing and is high by world standards, although credit growth has slowed over the past year. Direct U.S. financial claims on China are small relative to the size of the U.S. financial system, but the Chinese government is a major holder of U.S. government debt. Indirect exposures through other Asian markets and through the global economy are more significant.

Potential negative spillovers still exist from Brexit, the United Kingdom's planned exit from the European Union. If the exit does not go smoothly, the disruptions would most affect U.S. financial institutions with large direct financial exposures to the United Kingdom and potentially spread to other U.S. financial firms and markets.

Market risk

Risk to financial stability from movements in asset prices



Market risks from a sharp change in the prices of assets in financial markets are high and rising.

Rising prices and falling risk premiums may leave some markets vulnerable to big changes. Risk premiums are returns in excess of returns on risk-free investments.

Such market corrections can trigger financial instability when the assets are held by entities that have excessive leverage and rely on short-term debt and other liabilities.

Each of our annual reports has highlighted the risk that low volatility in

market prices and persistently low interest rates may promote excessive risk-taking by investors and create future vulnerabilities. In 2017, strong earnings growth, steady economic growth, and increased expectations for a U.S. fiscal policy that stimulates economic growth have fueled the rise in asset prices.

Stock market valuations are at historic highs, according to several metrics.

Prices are also elevated in bond markets, suppressing yields. Risk premiums for corporate bonds have nearly fallen to the lowest point since the financial crisis. At the same time, long-term interest rates in the United States remain low, despite a long span of steady economic growth, low unemployment, and gradual increases in benchmark interest rates by the Federal Reserve.

The low rates have increased the risk of loss by bond investors if interest rates rise, but two factors mitigate the potential systemic risk from rising rates. First, investors such as pension funds and insurance companies have long-term liabilities, including pension obligations and life insurance coverage that allow them to tolerate any short-term market losses on bonds. Second, the Federal Reserve has clearly stated its intention to raise interest rates gradually.

Credit risk

Risk of borrowers or counterparties not meeting financial obligations such as business loans and mortgages

Q2 2016 Q2 2017

Household credit risk

U.S. consumer debt/income	U.S. mortgage debt/income
U.S. consumer debt/GDP growth	U.S. mortgage debt/GDP growth
U.S. consumer debt service ratio	U.S. mortgage debt service ratio

Nonfinancial business credit risk

U.S. nonfinancial business debt/GDP	U.S. nonfinancial business earnings/interest
U.S. nonfinancial business debt/GDP growth	
U.S. nonfinancial business debt/assets	
U.S. nonfinancial business debt/earnings	

Real economy borrowing levels and terms

Lending standards for nonfinancial business	Lending standards for residential mortgages
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Some measures of credit risk have moderated since last year, reflecting crosscurrents of positive and negative developments. Credit risk from debt by nonfinancial corporations remains elevated. Nonfinancial corporate debt continues to grow, although at a slower pace than in 2016. Measures of firms' debt-to-assets and debt-to-earnings ratios are red on the monitor heat map.

In addition, the quality of covenants may be weakening. Covenants are terms in financial contracts meant to protect investors. For example, covenants may limit a borrower's total debt or restrict business activities. Weaker covenants historically accompany buildups of debt and may signal lower credit quality.

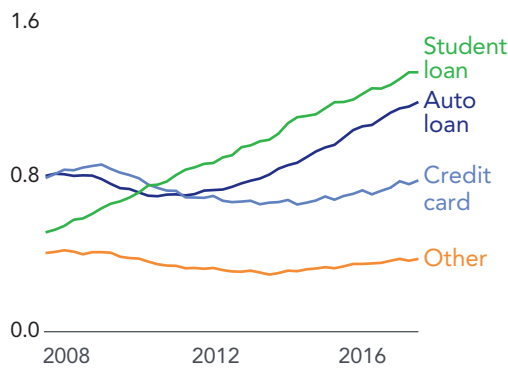
However, the growing economy and rising profits are reducing the risk of

defaults. Many companies have rolled over their existing debt at lower interest rates and with longer repayment timetables.

Household credit risks are rising, but appear to be concentrated in the nonmortgage segment of the market. Total household debt, including mortgages, hit a record \$12.8 trillion in the second quarter of 2017, surpassing its 2008 peak. Mortgage risks remain moderate after the drop in such debt after the financial crisis.

Auto loans and student loans bear watching. They account for much of the recent growth in household debt (see Figure 4). Delinquencies of student loans have been high since 2012. Auto loan delinquencies have declined from their post-recession peak in 2011 but have been rising since 2015.

Figure 4. U.S. Nonmortgage Household Debt (\$ trillions)



Note: Data as of June 30, 2017. "Other" includes consumer finance and retail loans
Sources: Federal Reserve Bank of New York, OFR analysis

Solvency and leverage risk

Risk of reduced ability to repay debts or borrow funds

Q2 2016 Q2 2017

Financial institution solvency

■	U.S. BHC risk-based capital (median)
■	U.S. BHC risk-based capital (aggregate)
■	U.S. commercial bank risk-based capital (median)
■	U.S. commercial bank risk-based capital (aggregate)

Financial institution leverage

■	U.S. BHC leverage (median)
■	U.S. BHC leverage (aggregate)
■	U.S. commercial bank leverage (median)
■	U.S. commercial bank leverage (aggregate)
■	U.S. life insurer leverage (median)
■	U.S. non-life insurer leverage (median)

The failure or near-failure of large financial institutions has been a common source of stress during financial crises in the past, including the crisis of 2007-09. For this reason, the OFR's new monitor includes measures of solvency and leverage risk. These measures signal low risk in banks.

Large banks have more capital to serve as a cushion against losses than before the crisis. The eight U.S. G-SIBs have significant buffers of capital and liquidity above the minimum required, which bolsters their solvency. Bank profits are gradually starting to improve as interest rates rise but remain relatively low. Return on equity for U.S. G-SIBs has been stagnant at about 10 percent, compared with 12 percent to 17 percent before the crisis.

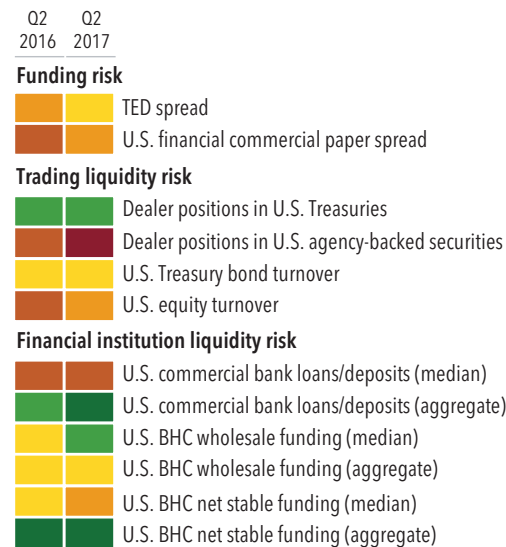
Insurance company leverage is moderate. Since the crisis, insurers have used less leverage. Leverage is high when the company resources needed as a buffer against losses are low relative to

investment exposure. Some life insurers make substantial use of derivatives; this indicator captures only the current market value of these exposures and may understate future risks.

Leverage among nonbank broker-dealers, which are not reflected in the monitor, deserves monitoring. Most of the largest U.S. broker-dealers are affiliated with banks. However, changes in bank regulation may fuel an increase in broker-dealers not affiliated with banks. The largest nonbank broker-dealers — each with more than \$10 billion in assets — have substantially more leverage than their bank-affiliated peers.

Funding and liquidity risk

Risk that investors will lose confidence and pull their funding from a firm or market and market participants won't be able to sell securities without creating a downward price spiral.



Market liquidity, the ability of a market participant to buy or sell an asset in a timely manner at relatively low cost, remains a concern. Market liquidity is vulnerable to the risk of asset fire sales — the risk that market participants will not be able to sell securities without creating a downward spiral in prices.

Funding liquidity (the availability of credit to buy assets) is also subject to run risk — the risk that investors will lose confidence and pull their funding from a firm.

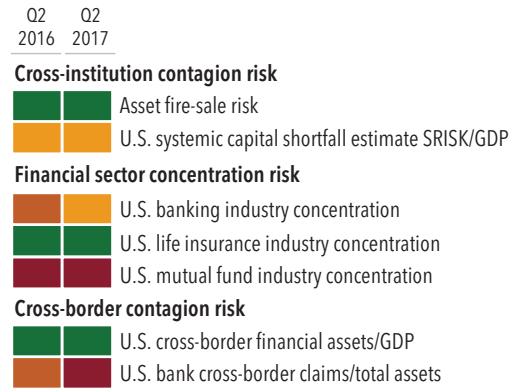
In the past several years, U.S. G-SIBs have steadily increased their reliance on "runnable liabilities," liabilities that are vulnerable to runs.

Indicators of market liquidity are mixed. Some indicators suggest that conditions are moderate, while others suggest lower risk. Two measures of market liquidity signaled extraordinary stress during the crisis but have since eased:

1. **Bid-ask spreads** – the difference between the average price at which customers buy from dealers and the average price at which customers sell to dealers; and
2. **Price-impact measures** – the price change after a large trade is completed.

Contagion risk

Risk that stress at a financial institution or market spills over to others



Contagion risk is the danger that stress at a financial institution or market spills over to others. OFR research suggests that the financial system remains highly interconnected. Of the many factors contributing to the financial crisis, contagion is one of the most difficult to measure (see **The Contagion Index and Agent-based Models**).

The monitor includes measures of concentration in the financial system. Concentration makes the financial industry more vulnerable to the spread of disruptions from distress at individual

The Contagion Index and Agent-based Models

In the search for new ways to measure contagion risk, OFR researchers have developed a contagion index to assess the potential spillovers to the broader financial system when a bank defaults. The contagion index has been declining in recent years for most G-SIBs (see **Figure 5**).

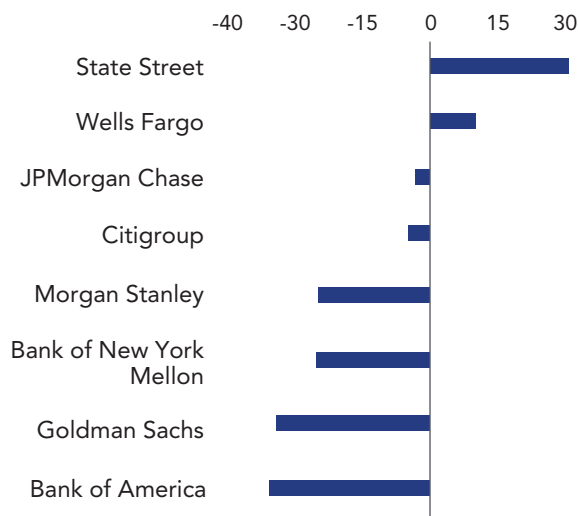
The contagion index is not included in the monitor because it can only be calculated since 2013. The index combines measures of a bank's leverage, size, and connectivity.

$$\text{Contagion Index} = \text{Financial Connectivity} \times \text{Net Worth} \times (\text{Outside Leverage} - 1)$$

Connectivity is measured as the portion of a bank's liabilities held by other financial institutions.

OFR researchers also continue to use agent-based models to analyze how risks can spread among firms during a crisis. Agent-based models simulate behaviors of different types of financial firms and the complexity of behavior among firms as they react to the actions of other firms. These models help us understand the way risks propagate across the financial system and the impacts of shocks and changes in regulatory policies. The OFR cosponsored a conference on the topic with the Bank of England and Brandeis University in September 2017.

Figure 5. Percent Change in Contagion Scores for FY 2016



Sources: Federal Reserve Form Y-15, OFR analysis

firms. The monitor shows that these signals are mixed. Concentration in the U.S. mutual fund industry is high. Concentration in the U.S. banking industry is moderately elevated; the heights reached after the crisis have subsided. Concentration in the life insurance industry is low.

The monitor also includes the SRISK measure. SRISK — short for systemic risk — reflects the capital a firm is expected to need to remain solvent during a crisis. SRISK and two other metrics offer insights on the contribution that individual firms make to systemic risk (see **Figure 6**).

In addition, the monitor now contains an index of fire-sale risk, the chance that a self-reinforcing cycle will develop when liquidations of bank assets push down prices in a falling market. This risk has also been low in recent years.

Financial Stress Index

The Financial Stress Index is a daily market-based snapshot of stress in global financial markets. It is constructed from 33 financial market indicators. The indicators are organized into five categories: (1) credit, (2) equity valuation, (3) funding, (4) safe assets, and (5) volatility.

The index is positive when stress levels are above average and negative when stress levels are below average.

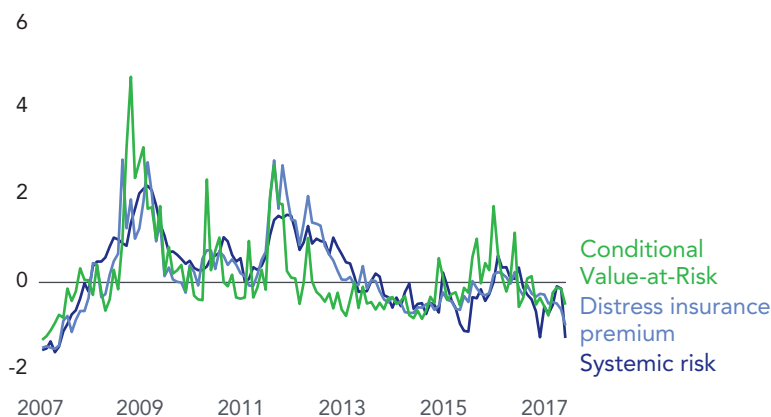
The index shows that overall stress is near its lowest level since the financial crisis, primarily because of low volatility. However, this low volatility may be leading investors to take big risks, making the financial system more fragile and vulnerable to shocks.

The OFR index can be broken down so users can view each of the five categories separately or in combination. It also can be broken down by the region generating the stress.

Analysis of the categories can reveal the drivers of financial stress, guiding the interpretation of market events by cutting through the clutter of market chatter. For example, if we examine the index during the 2013 “Taper Tantrum” event, we find that the index shows increased levels of stress in the credit and volatility categories (see **Figure 7**).

The methodology for the index uses a dynamic process to account for changing relationships among the variables in the index. No two stress events are exactly the same, and the relative importance of drivers of financial stress varies over time.

Figure 6. Systemic Risk Measures of Joint Distress for the Six Largest U.S. Bank Holding Companies (z-scores)

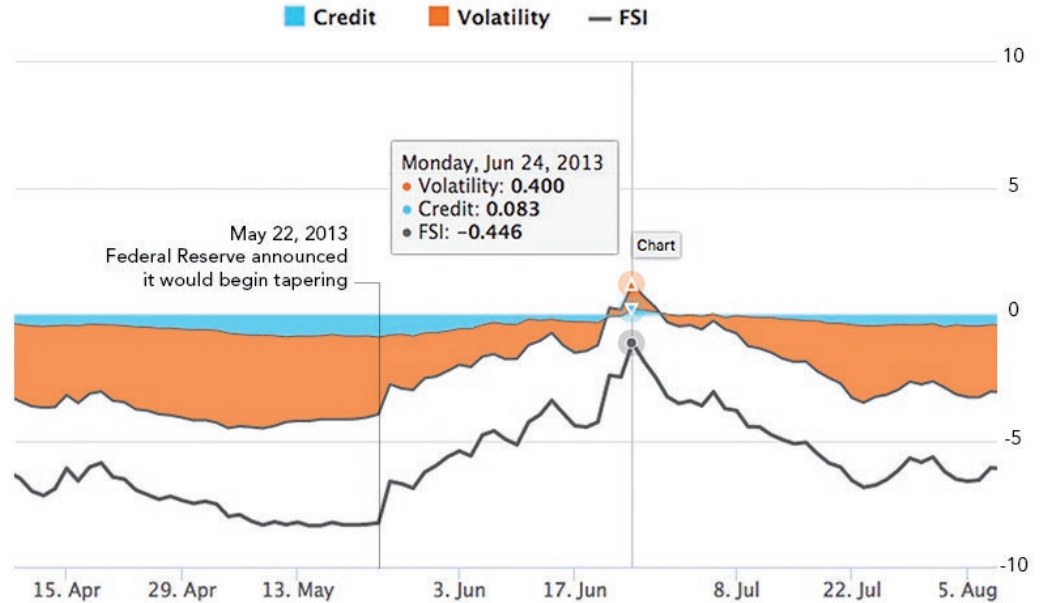


Note: Equal-weighted average. The six largest bank holding companies are Bank of America, Citigroup, Goldman Sachs, JPMorgan Chase, Morgan Stanley, and Wells Fargo. Z-score represents the distance from the average, expressed in standard deviations.

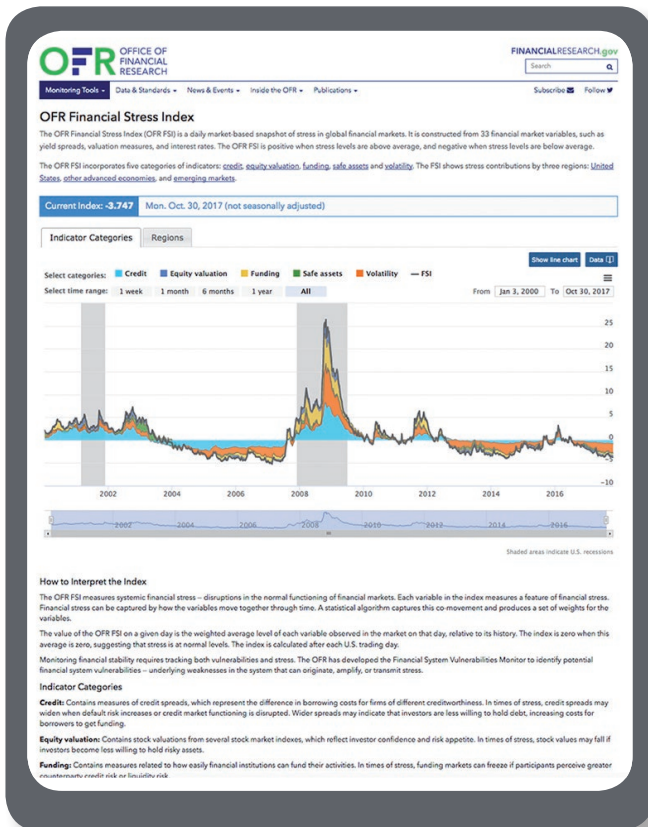
Sources: Bloomberg Finance L.P., the Volatility Laboratory of the NYU Stern Volatility Institute, OFR analysis

Figure 7. OFR Financial Stress Index - 2013 Taper Tantrum Period

Financial stress refers to a breakdown in the normal functioning of financial markets



Sources: Bloomberg Financial L.P., Haver Analytics, OFR analysis



OFR Financial Stress Index can be found at www.financialresearch.gov/financial-stress-index/

The OFR's innovative methodology is dynamic but remains accessible to policymakers.

The daily frequency of the OFR's index improves upon the weekly or monthly frequency of other indexes.

Financial stress refers to a breakdown in the normal functioning of financial markets. High levels of financial stress can precede declines in economic activity. These episodes can be severe. For example, the OFR index shows stress peaking during the financial crisis. Policymakers need accurate, clear, and timely signals of market stress to effectively manage the effects.



SYSTEMIC
IMPORTANCE
OF BANKS
CYBERSECURITY
AND OPERATING
RISKS LEGAL
ENTITY IDENTIFIER
FINANCIAL DATA
SERVICES
INITIATIVES
REDUCING
REGULATORY
REPORTING
BURDENS LIBOR
ALTERNATIVE

Key Findings from the OFR's Research and Analysis of the Financial System



The OFR has continued to work throughout the year on data and research projects to fulfill its mission. This chapter describes key findings from our research and analysis. The chapter focuses on cybersecurity and operational risk, reducing regulatory reporting burdens, an alternative reference rate, the Legal Entity Identifier (LEI) data standard, a multifactor approach to assessing the systemic importance of banks, and financial data services initiatives. The chapter also discusses selected findings in our research papers during the fiscal year.

Network Analysis to Identify Cybersecurity and Operational Risk

Cybersecurity incidents and other operational risks are growing threats to financial stability. Financial firms are connected through complex, interconnected networks. Disruptions to the operations of a key institution in the financial system could be transmitted through these networks and lead to a systemic crisis (see **Financial Stability Threats**).



To understand this threat, officials can combine network analysis with maps of the financial system to identify cybersecurity vulnerabilities and other operational risks. Networks can be mapped out in a visualization of

financial entities such as firms, markets, trading desks, financial market utilities (nodes), and the connections between these entities (links). Network analysis of these connections increases the understanding of potential vulnerabilities to shocks and helps in evaluating and developing policies to enhance the stability and resilience of the financial system (see Figure 8).


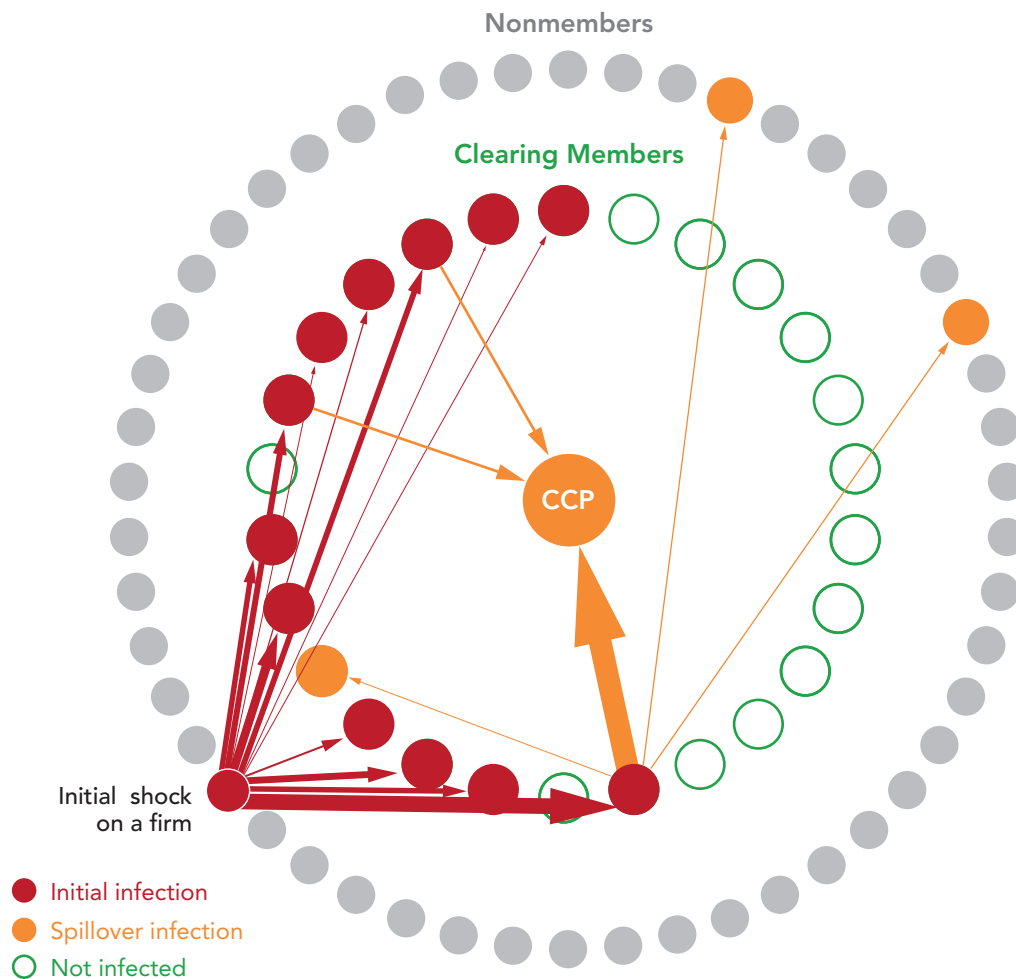
 Financial stability threats from cybersecurity vulnerabilities and operational risks should be studied across the entire financial system.

Figure 8. Interconnections in the Credit Default Swaps Market Illustrate How Shocks Can Spread



Note: Arrows signify direction of payment and the thickness of the line indicates the size of payment disruption. CCP stands for central counterparty.

Source: OFR analysis

The OFR's broad financial stability mandate gives us a unique perspective for studying threats to the financial system from cybersecurity risks and other operational risks. The OFR has the authority to collect data from federal financial regulators and market participants. This authority allows the OFR to analyze a wide range of detailed transaction-level datasets. Using these data, researchers can develop detailed maps that show the financial transactions among market participants and identify the participants most important to a particular part of the U.S. financial system.

The OFR's current research on cybersecurity and other operational risks is in two main areas. The first analyzes past operational and cybersecurity incidents involving financial entities. We review event studies, recent experiences, and other information to understand events and how they might threaten the financial system. Researchers evaluate the efficacy and scope of regulations and gaps in policy that could affect the financial system's resilience. We draw lessons from tabletop exercises, which bring together industry participants and regulators to examine potential scenarios.

The second major area of OFR research focuses on applying network analysis to potential cybersecurity risks and other operational risks. The OFR is developing maps that highlight connections throughout the financial sector. We use these maps to identify key vulnerabilities and critical institutions across different markets.



Network analysis combined with maps of the financial system populated by real-world data may help identify potential vulnerabilities to cybersecurity threats.

Network analysis of these maps identifies the most centrally connected companies in a financial market. This analysis offers several key lessons for improving defenses. One lesson is that a network's resilience can vary greatly against different types of threats. Targeted attacks by sophisticated adversaries can cause much more damage than random failures, and these attacks necessitate a much higher level of network resilience. Another lesson is that coordinating defense strategies among network participants is vital in preventing weaknesses in defense systems. A lack of coordination between market participants and regulators can compromise network stability and leave key institutions under-defended.

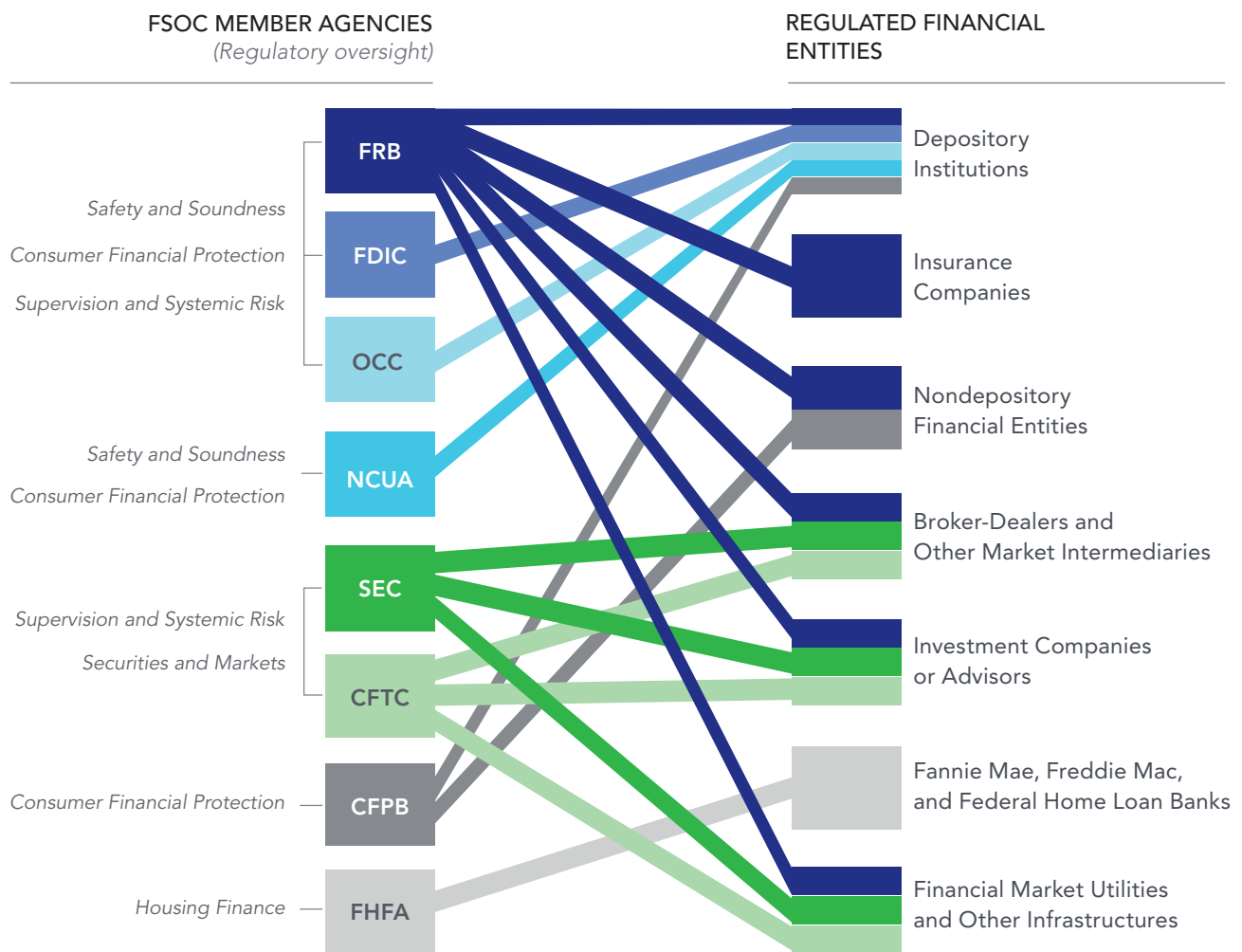
As real-world data is added to these maps, network analysis yields more valuable insights. The maps hold the potential to allow policymakers, market participants, and the public to see specific ways cybersecurity and operational risks could threaten the stability of the financial system. Those insights help bolster network defenses.

Reducing Regulatory Reporting Burdens

Regulation and oversight of financial institutions and markets is divided among federal and state agencies. Banks, brokers, and other U.S. financial institutions and markets are governed

on the federal level by nine independent regulators and three self-regulatory organizations. (Insurance companies and some banks are also regulated at the state level). Firms engaged in multiple financial activities are governed by more than one regulator. Sometimes a single activity is governed by multiple regulators (see Figure 9).

Figure 9. Current Oversight by Federal Financial Regulators



Note: Financial Stability Oversight Council member agencies (from top to bottom) are: Federal Reserve Board of Governors (FRB), Federal Deposit Insurance Corporation (FDIC), Office of the Comptroller of the Currency (OCC), National Credit Union Administration (NCUA), Securities and Exchange Commission (SEC), Commodity Futures Trading Commission (CFTC), Consumer Financial Protection Bureau (CFPB), Federal Housing Finance Agency (FHFA).

Sources: Government Accountability Office (GAO), Financial Regulation, GAO-16-175, February 2016, Figure 2, OFR analysis

This fragmented approach enables tailored regulation and enforcement, but can also result in inefficient oversight and reporting. The current regulatory structure has led to inconsistencies in agencies' data collection activities. U.S. financial institutions report that they are often required to submit the same data to more than one U.S. regulator using different calculations, classifications, and formats.

Duplicative, conflicting, or inconsistent reporting requirements have the potential to increase costs, undermine the efficiency and quality of data collections, and impede data comparison and integration. Duplicative, conflicting, or inconsistent reporting requirements can also misalign regulatory reports from the data that firms use for their risk management. Likewise, these requirements could impair the ability of government officials to assess and monitor threats to financial stability and assure the functionality and integrity of financial markets. Finally, duplicative and inconsistent requirements can erode public confidence in government.



Preliminary OFR analysis indicates that examples cited by industry about duplicative, conflicting, and inconsistent regulatory reporting requirements merit further exploration.

To better understand this issue, we asked a handful of financial institutions and industry groups for examples. During these initial discussions, firms focused on reports to member agencies of the Financial Stability Oversight Council. Information came from asset managers, banks, and financial services trade associations.

We analyzed a selection of these examples identified by industry to determine the general validity of industry concerns about regulatory burden and identify ways the OFR might help address these issues. For each example, we compared multiple data fields to identify duplicative, conflicting, or inconsistent data requirements and found that the industry's concerns warrant further analysis, as discussed in the next section.

Private Fund Reporting

Preliminary OFR analysis found validity in the assertions from industry about duplicative, conflicting, or inconsistent reporting requirements. Discrepancies generally fell into three categories:

1. identical information sought in different data formats or classifications,
2. similar information sought using different methodologies or metrics, and
3. different information sought for similarly situated filers or scenarios.



The OFR found evidence of duplicative, conflicting, and inconsistent requirements between the two forms that investment advisors use to report information about private funds to federal agencies.

For example, the reporting requirements of Forms PF and CPO-PQR demonstrate at least some of these characteristics. The Dodd-Frank Act directed the SEC to establish reporting requirements for investment advisors to private funds. The law requires that the reports include data such as counterparty credit risk exposure, trading and investment exposures, and types of assets held.

To collect the data, the SEC and the CFTC jointly implemented a rule requiring certain private fund advisors and commodity pool operators (CPOs) to submit information through Form PF. Separately, the CFTC implemented Form CPO-PQR. Large CPOs, as members of the National Futures Association, must also submit the association's Form PQR, an abbreviated version of the CFTC form. These forms require CPOs to file confidential reports on holdings, transactions, and certain trading strategies and characteristics. Based on size, certain pools file more frequently and file more information than others.

These reporting forms contain examples of identical information being sought. By filing Form PF or CPO-PQR, a respondent might not be required to file all or part of the other forms or schedules of forms. CPOs whose pools qualify as hedge funds might report quarterly on Form PF, exempting themselves from filing all but one year-end CPO-PQR schedule. However, large CPOs are still required to report quarterly on Schedule A of the association's Form PQR. The association's Form PQR contains a subset of the information in the CFTC's Form CPO-PQR. As a result, the large CPOs might be required to file Form PF, an abbreviated but duplicative Form CPO-PQR, and a duplicative association Form PQR at the end of the year.

Although the agencies and association attempt to limit reporting duplication, the attempts fall short of preventing all overlap.

In another example, both forms request information on assets under management but have different definitions. Form CPO-PQR defines assets under management as the amount of all assets under the control of the CPO. The SEC defines regulatory assets under management to include securities portfolios that receive supervisory or management services from the report filer. The difference in the definitions could require CPOs to calculate separate types of assets under management for reporting on each of the forms.

Findings and Next Steps

The OFR's initial analysis found that concerns raised by the industry may be justified. Further analysis is necessary to better understand the reasons for the discrepancies. Future analysis should consider whether individual discrepancies cause burden, or burden exists only in the aggregate.

If further analysis confirms that these concerns are justified, we will work to ease these burdens through the FSOC and its member agencies and by pursuing our data-related mandates.

Approaches to improve data quality and reduce reporting burden include:

- helping agencies agree on common standards for definitions, identifiers, and formats;
- using statutory authority to impose common standards by brokering agreements between industry and regulators on essential data elements;
- promoting and adhering to best practices in data collection; and
- facilitating effective data sharing among regulators.

LIBOR Alternative

For years, the LIBOR interest rate benchmark has played a central role in global financial markets and the economy. U.S. dollar LIBOR has been used to set interest rates on trillions of dollars of retail mortgages, private student loans, corporate loans, derivatives, and other financial products. LIBOR, formerly the London Interbank Offered Rate, is now known as ICE LIBOR (Intercontinental Exchange LIBOR).



A new interest rate benchmark would be more reliable and viable than LIBOR.

The LIBOR benchmark's past reliance on survey submissions rather than transactions led to widespread manipulation. Traders submitted responses to the LIBOR survey intending to increase returns on derivatives positions, and during the 2007-09 financial crisis, intending to minimize appearances of riskiness of their banks.

Although reforms to LIBOR have made manipulation less likely, a shift in sentiment among banks about the advantages of LIBOR and increasing reluctance by banks to participate in LIBOR surveys, along with the longer-term trend from unsecured to secured funding markets, have raised serious questions about the viability of LIBOR as a benchmark.

Doubts about LIBOR's future prompted the Federal Reserve to begin an effort to identify an alternative benchmark for funding costs in U.S. financial markets.

Key Benchmarks for Alternative Rates

Triparty General Collateral Rate

This rate would be calculated based on overnight repurchase agreement (repo) transactions against Treasury securities in the triparty repo market. The market is called triparty because each transaction between a security seller and buyer also involves a clearing bank. The Federal Reserve Bank of New York collects data about repo transactions from the two clearing banks in this market.

Broad General Collateral Rate

This rate would be a broader benchmark based on trades in triparty repo and the general collateral financing (GCF) overnight repo market. Trades in the GCF repo market are made against a pool of general collateral rather than a specific security. The market is run by the Fixed Income Clearing Corporation (FICC), which acts as a central counterparty. To calculate daily rates, data will be obtained about interest rates and the value of funds borrowed in GCF repo.

Secured Overnight Financing Rate

This rate would be the broadest measure of the repo-based rates. It covers the two markets included in the broad general collateral rate, plus centrally cleared bilateral repo transactions. Bilateral transactions are arranged and settled between borrower and lender. Bilateral repo transactions generally fall into two categories: (1) trades cleared through FICC's service, and (2) uncleared trades completed without a third party. Because not much data about uncleared bilateral trades is available, this benchmark would be calculated with data about interest rates and the value of funds borrowed in trades cleared through the FICC service.

The OFR joined the effort, and we have worked closely with the Federal Reserve to create a set of benchmarks based on data on overnight repurchase agreements, or repos.

The Federal Reserve Board and the Federal Reserve Bank of New York convened the Alternative Reference Rates Committee, made up of banks active in the derivatives market, to inform the process.

The repo market is a key source of secured short-term funding for the financial system. In a repo transaction, a security owner sells a security to raise cash. The agreement requires the seller of the security to repurchase it on a specific date for a prearranged price. If the seller is unable to repurchase the security, the cash provider is entitled to liquidate the security for repayment.

In late August 2017, the Federal Reserve sought public comment on three daily rates based on repo transactions with U.S. Treasury securities that would be published by the Federal Reserve Bank of New York in cooperation with the OFR (see **Key Benchmarks for Alternative Rates**).

The Alternative Reference Rates Committee selected the Secured Overnight Financing Rate in June 2017 as its preferred alternative to U.S. dollar LIBOR.

The new benchmarks would be more reliable and viable than LIBOR because they are based on actual secured transactions, rather than quotes, and would bring necessary transparency to the repo market.

The OFR plans to establish an ongoing data collection covering some repo transactions. Some of these data might be useful in calculating these rates. This work builds on the OFR's 2015 pilot project conducted with the Federal Reserve and the SEC to collect data on bilateral repo transactions.



The OFR is uniquely situated to collect data across multiple markets that may lie beyond the reach of other regulators.

We expect to begin with cleared trades so the data can support calculation of the Secured Overnight Financing Rate. Currently, data to support that rate are provided on a voluntary basis — not suitable for establishing a rate on which potentially trillions of dollars in contracts are based.

Selection of the preferred LIBOR alternative is only a first step. The transition period brings risks. New benchmarks will require broad market acceptance. For example, to achieve a smooth transition, officials and market participants must help develop active derivatives markets that use the new rate. Market participants say substantial time might pass before all types of financial contracts now using LIBOR make the transition to a new benchmark rate. Even then, some existing contracts do not specifically allow an alternative reference rate to be selected, so amending their terms could be difficult. In some cases, amending a financial contract may require the agreement of all bondholders.

Legal Entity Identifier

The global LEI system is a cornerstone for financial data standards that benefits industry and government. Like a bar code for precisely identifying parties to financial transactions, the LEI helps make the vast amounts of data in the financial system more comparable. The LEI can generate efficiencies for financial companies in internal reporting and in collecting, cleaning, and aggregating data.

The LEI can ease companies' regulatory reporting burdens by reducing overlap and duplication. Many financial firms report data to more than one government regulator, and different regulators have different reporting requirements and data identifiers. This lack of uniformity can lead to inefficient, costly, and overlapping requirements for reporting and data management that create costs for industry. Estimated costs for industry of managing data without common standards run into the billions of dollars.

The OFR's goal is adoption of the LEI broad enough to serve the needs of the OFR, the FSOC, and FSOC member agencies to conduct financial stability monitoring and analysis. To achieve such a network effect, private firms must voluntarily adopt the LEI.



When broadly adopted, the LEI will drive efficiency and gains in data quality for industry and government.

Because of these problems, industry groups have called on regulators to broadly adopt the LEI. The same case can be made for adopting other uniform standards for regulatory reporting, especially about common metrics for instruments and accounting.

Organizations reap substantial direct benefits from adopting the LEI, including reductions in manual processes to check identifiers, efficiency gains when integrating data sources, and improvements in data quality. These benefits can save man-hours and reduce costs. Broad adoption of LEIs for client onboarding and client documentation could produce operational efficiencies for individual banks and clients as well as entire markets.

The LEI can also help industry, regulators, and policymakers trace exposures and connections across the financial system. If the LEI system had been in place during the financial crisis, the breadth and depth of exposures to the failing Lehman Brothers would have been easier to assess and potentially manage.

The OFR led the design and deployment of the global LEI system. The system is now complete, with a three-tier governance structure, more than 700,000 LEIs assigned, and reliance on the LEI in scores of regulations in the United States and abroad.

But full adoption of the LEI — necessary for the LEI to produce the most efficiencies for government and the private sector and to keep the system self-sustaining — has not yet happened. The OFR's goal is adoption of the LEI broad enough to serve the needs of the OFR, the FSOC, and FSOC member agencies to conduct financial stability monitoring and analysis.

To achieve such a network effect, private firms must voluntarily adopt the LEI. Recent discussions and surveys show that mandating the LEI in appropriate cases also remains necessary.

At its February 2017 meeting, the OFR's Financial Research Advisory Committee recommended that the OFR hold discussions with industry executives and government officials about the current and future benefits of the LEI, associated costs, and barriers to broader adoption. The committee also recommended that the OFR share the results of its inquiry with selected industry executives who could help identify practical ways to overcome the barriers. Finally, the committee suggested meetings between regulators, industry, and the OFR to further explore potential solutions.



Strategic regulatory mandating of the LEI is required, according to industry advocates.

The OFR has determined that regulations requiring use of the LEI (as opposed to making LEI use optional) are effective and necessary to drive adoption. For example, the Markets in Financial

The OFR has determined that regulations that require use of the LEI are effective and necessary to drive adoption.

Instruments Regulation in Europe, set to take effect in January 2018, requires LEIs for all counterparties to all trades under a rule known as “no LEI, no trade.” This rule helped drive LEI adoption in Europe, and notable increases in LEI issuance have occurred in the run-up to the compliance deadline.

In Europe, regulators concluded that the benefits justified requiring the LEI in this way. In the United States, many market participants will not obtain an LEI unless it is mandated.

Our fact-gathering found that regulators are reluctant to mandate use of the LEI if they already have an identifier that serves the needs of their own reporting, even if they would benefit from increased interoperability of their data with data from other regulators.

Regulators also view the \$75 cost of obtaining an LEI as a burden on smaller businesses without more compelling and direct benefits. Smaller organizations are often reluctant to obtain LEIs, claiming that LEI acquisition would be an additive regulatory burden without a clear, direct benefit. These organizations may not have data operations, do not appreciate the potential for productivity gains, do not appreciate the indirect benefits, or do not believe their organizations affect financial stability.

Although the cost of obtaining an LEI is low, the administrative costs of maintaining LEIs in internal systems can be a factor, especially systems with more complex data.

Larger firms have more hurdles to clear in changing their processes to obtain, maintain, and renew their LEIs. Firms with internal databases that rely on proprietary identifiers also incur costs to map their databases to the LEI. However, some firms have already made infrastructure investments and implemented database improvements to use LEIs.

The next step in the evolution of the LEI standard, the introduction of corporate hierarchy data (also known as level 2 data), can create challenges because of the complexity of many organizational structures. These data answer the question of “who owns whom” in the financial system and offer insights about the full risk exposures of large, complex financial entities.

Consistent with statements several years ago by the FSOC and G-20 (the Group of 20, a forum of finance ministers and heads of central banks from 19 countries and the European Union), the OFR has found that the LEI offers indirect benefits relating to market stability. Repeated confirmation of these benefits by government regulators remains critical to reach the number of adopters needed to make the system self-sustaining and achieve the network effects necessary to conduct dynamic and effective financial stability monitoring and analysis. So does the identification of quantifiable cost savings and efficiency gains, as cited by recent industry reports.

Assessing Systemic Importance of Banks

What is the best way to determine the systemic importance of a U.S. bank? Many U.S. regulations categorize banks based on asset size. However, size alone does not fully capture the risks a bank may pose to financial stability.



A multifactor approach that captures risk is superior to using asset size alone to determine the systemic footprint of U.S. banks.

OFR research supports an alternative approach that relies on multiple factors, not just asset size.

The Dodd-Frank Act created an asset-size threshold of \$50 billion to identify banks to be subject to enhanced regulation. That threshold could subject some large U.S. banks with traditional business models to enhanced regulation that creates compliance costs unaligned with their risks. It could also exclude some U.S. operations of foreign banks.

As of the end of 2015, a total of 34 U.S. banks each had more than \$50 billion in assets. Eight of those are banks identified as global systemically important banks (G-SIBs), banks whose distress or disorderly failure would cause significant disruption to the global financial system (see Figure 10).

A multifactor approach could replace the \$50 billion asset-size threshold used in some U.S. bank regulations. A multifactor

approach would be similar to the approach used internationally to identify G-SIBs.

G-SIB identification is currently based on an evaluation of five factors: (1) size, (2) complexity, (3) interconnectedness to other financial companies, (4) foreign activities, and (5) lack of substitutability (providing important services that customers would have difficulty replacing if the bank failed).

For identifying systemically important U.S. banks, the G-SIB methodology could be extended and applied to identify large U.S. banks that are not G-SIBs, but merit extra regulatory scrutiny.



For U.S. banks with traditional business models, an asset-size threshold for determining whether to apply heightened regulatory standards could create misaligned regulatory compliance costs.

The first improvement would be to better incorporate risks arising from a lack of substitutes, particularly for banks that provide payments, settlement, custody, and other unique services central to the functioning of financial markets.

The second improvement would better account for the complexity of some foreign banking organizations operating in the United States. The U.S. operations of foreign banks tend to be more active in U.S. capital markets and rely more on wholesale funding than comparably sized domestic banks.

Substitutability means providing important services that customers would have difficulty replacing if the bank failed.

Figure 10. Systemic Importance Scores Under the Basel Methodology (basis points)

Bank Holding Company	Size	Interconnectedness			Substitutability			Complexity			Cross-Jurisdictional Activity		2015 Systemic Importance Score
		Total exposures score	Intrafinancial system assets	Intrafinancial system liabilities	Securities outstanding	Payments activity	Assets under custody	Underwriting activity	Amount of over the counter derivatives	Adjusted trading and available for sale securities	Level 3 assets	Foreign claims	
Global Systemically Important Bank (G-SIB)													
Non-G-SIB													
Intermediate Holding Company													
JPMorgan Chase	394	363	415	425	1160	1413	699	798	839	489	278	353	464
Citigroup	300	338	414	336	1107	831	536	735	465	512	409	426	430
Bank of America	354	291	185	359	444	8	730	659	647	284	185	158	345
Goldman Sachs	170	329	130	249	50	74	498	702	314	410	182	162	252
Wells Fargo	271	215	160	419	143	147	669	95	442	434	62	79	250
Morgan Stanley	140	247	62	172	47	106	512	427	453	253	136	182	212
Bank of NY Mellon	51	91	278	50	801	1686	11	17	77	0	47	112	160
State Street	32	34	174	63	320	1521	0	21	123	39	42	75	148
Northern Trust	17	53	19	13	169	435	0	6	21	0	15	31	56
HSBC North America	57	50	65	46	11	2	84	110	25	62	20	0	44
U.S. Bancorp	65	17	14	105	33	86	36	3	36	58	2	19	41
PNC Financial Services	53	24	14	58	11	6	27	5	60	140	4	2	34
Charles Schwab	24	18	0	35	1	178	0	0	68	0	4	2	25
Deutsche Bank Trust	7	13	38	0	268	0	0	0	0	0	1	0	23
Capital One Financial	47	25	2	83	3	0	4	2	24	15	5	1	20
TD Group U.S. Holdings	37	16	5	5	2	1	0	3	82	19	15	1	18
American Express	24	9	8	97	1	0	0	1	9	0	13	7	15
BB&T	30	2	5	50	3	3	17	1	15	28	1	0	14
SunTrust Banks	29	3	3	31	3	4	25	3	8	35	1	1	14
BMO Financial	18	28	16	18	22	10	13	0	18	1	3	4	13
Ally Financial	20	8	11	83	1	0	0	1	23	1	1	0	13
MUFG Americas Holdings	17	15	10	15	4	9	0	2	22	29	2	1	11
Fifth Third Bancorp	21	3	4	28	5	17	11	1	19	7	2	0	11
Santander Holdings USA	18	3	25	19	0	0	0	1	19	29	1	0	10
M&T Bank	17	3	5	29	7	6	1	0	4	1	0	0	7
KeyCorp	16	2	2	20	4	6	13	1	5	5	1	0	7
Discover Financial	13	11	0	54	1	0	0	0	1	0	0	0	7
Huntington Bancshares	10	2	2	14	2	6	2	1	11	35	1	0	7
Regions Financial	18	1	3	18	3	1	3	1	13	5	0	0	7
Citizens Financial	20	5	5	14	8	0	0	1	2	0	1	1	7
BBVA Compass	13	1	4	12	1	0	9	1	9	1	1	1	5
Comerica	11	7	6	10	1	4	2	0	3	1	1	1	5
BancWest	13	2	3	9	2	0	0	0	3	1	0	1	4
Zions Bancorp	8	2	3	7	2	0	0	0	2	2	0	0	3

Note: Data as of December 31, 2015. Entries are sorted from highest to lowest systemic importance score.

Sources: Basel Committee on Banking Supervision, Federal Reserve Form Y-15, OFR analysis

During the financial crisis in 2007-09, stress on foreign banks spilled into the U.S. financial system and the U.S. operations of some of these banks were large beneficiaries of Federal Reserve credit programs.

Financial Data Services Initiatives

The OFR has a statutory mandate to standardize the types and formats of financial data, expand the scope of data suitable for financial stability analysis, foster appropriate data sharing, and make data accessible while protecting data security.



Financial data services initiatives could reduce regulatory reporting burdens.

One of the OFR's challenges is to achieve this mandate while serving the needs of the FSOC, FSOC members, and other stakeholders. To meet this challenge, the OFR is considering financial data services initiatives the FSOC could adopt to streamline financial data purchasing, collection, integration, and access.

One potential financial data services initiative could offer one-stop shopping for detailed information — like an index or card catalog — about the data held by FSOC member agencies.

Another initiative would foster data sharing among FSOC member agencies by helping stakeholders apply standard formats to financial data and access

analytic tools and related code, while protecting data security.



Financial data services initiatives could serve the FSOC and its member agencies by increasing efficiency, facilitating appropriate data sharing, and reducing the indirect and direct costs of financial data acquisition.

A repository of metadata, the detailed descriptions of the data regulators collect, will enable linking of financial datasets. In collaboration with FSOC member agencies, the OFR maintains a limited version of this repository today, the Interagency Data Inventory.

A third financial data services initiative would expand on the current inventory by including richer detail on the descriptions of regulatory data collections, down to the granular data-element level.

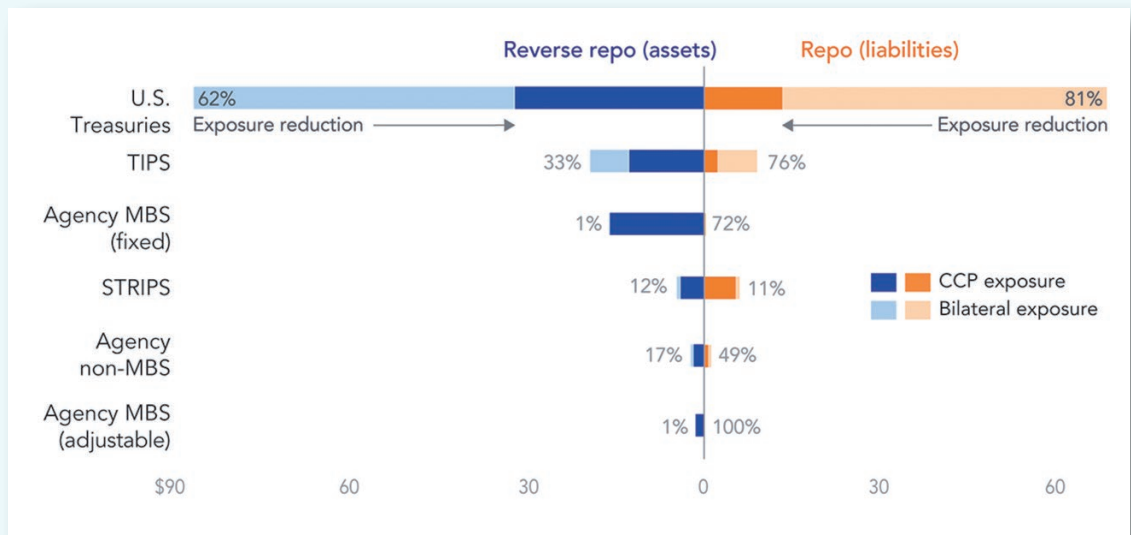
This detail is analogous to the column headings and formats in a spreadsheet. The heading displays the column name and each cell in the column is in a certain format, such as text, number, currency, or percentage.

A metadata repository captures these types of descriptive details. By comparing the details in a catalog of metadata, we can address questions of duplication, overlap, and inconsistencies among FSOC members' datasets — an essential step toward reducing regulatory reporting burdens.

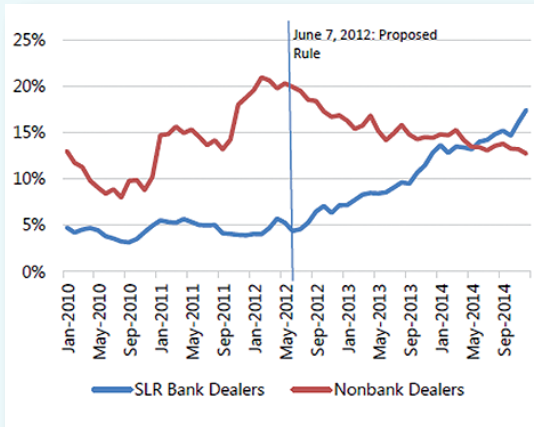
Key Findings from 2017 Research Papers

The OFR’s published research focuses on financial stability issues central to our mission. Here are key findings from selected OFR briefs and working papers during fiscal year (FY) 2017.

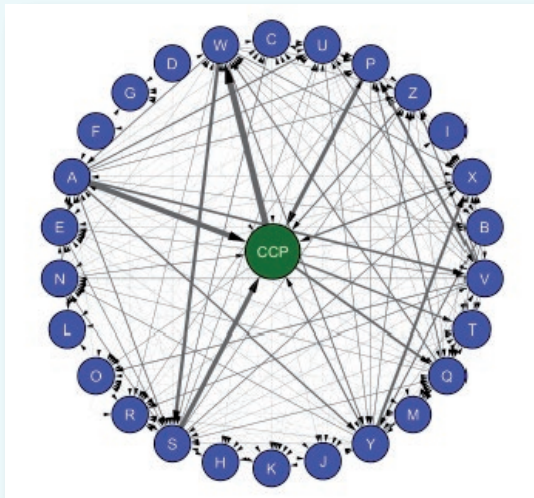
- Expanding central clearing in the repurchase agreement (repo) market could reduce risk exposures for dealers by 81 percent.** The repo market provides short-term financing for financial companies. After the financial crisis, rules made banks more resilient to stress, but also increased the cost of repo trading for bank-owned dealers. These costs are mostly related to the 2012 introduction of the supplementary leverage ratio, which the OFR has explored in other papers. Today, dealer-to-dealer bilateral repo transactions backed by government securities can be centrally cleared, but transactions between dealers and clients are not centrally cleared. Expanding repo central clearing to transactions between dealers and clients could reduce costs related to the supplementary leverage ratio, improve market access, and support financial stability. (“Benefits and Risks of Central Clearing in the Repo Market,” by Viktoria Baklanova, Ocean Dalton, and Stathis Tompaidis)



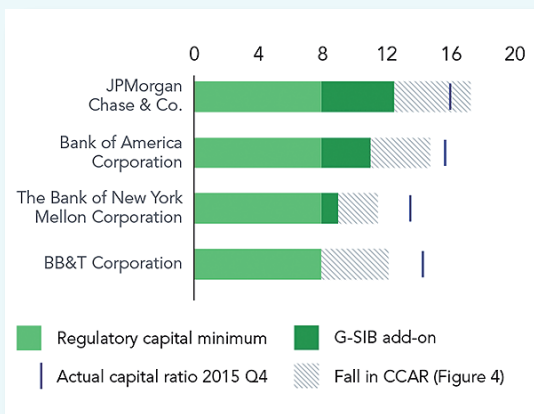
- New leverage rules have affected the repo market.** Bank-owned dealers subject to the rules now borrow less through repo but use lower-quality collateral. Higher bank capital requirements help protect banks against losses, but may have unintended consequences. Regulators use leverage ratios such as the supplementary leverage



ratio to backstop risk-based capital standards. Risk-based standards require banks to hold more capital against more risky assets. Leverage ratios do not draw distinctions based on risk. After the supplementary leverage ratio was introduced in the United States in 2012, dealers owned by U.S. bank holding companies and covered by the new regulation borrowed less in the repo market, but used riskier collateral. Dealers not owned by banks increased their repo borrowing as bank-affiliated dealers pulled back. This change suggests risks may be shifting outside the banking sector. (“Do Higher Capital Standards Always Reduce Bank Risk? The Impact of the Basel Leverage Ratio on the U.S. Triparty Repo Market,” by Meraj Allahrakha, Jill Cetina, and Benjamin Munyan)

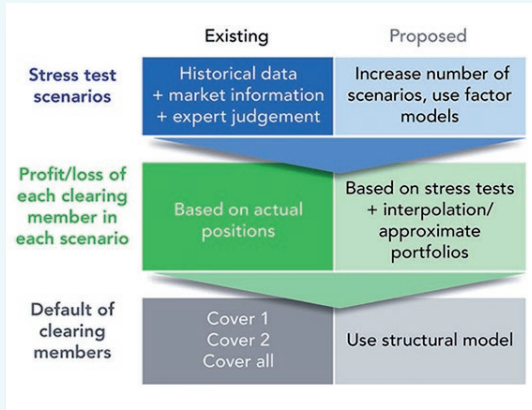


- Firms peripheral to a central counterparty (CCP) network that are net sellers of credit protection contribute more to systemic risk in the credit derivatives market than do central counterparties at the core of the market. A severe credit shock can trigger demands for large payments between counterparties in the U.S. credit default swaps (CDS) market. Researchers used anonymized market data to build a model of the CDS payment network. Under stress, the central counterparty contributes less to contagion than peripheral firms that are large net sellers of CDS protection. During a credit shock, these firms can suffer large shortfalls that create shortfalls for their counterparties, amplifying the initial shock. (“Contagion in the CDS Market,” by Mark Paddrik, Sriram Rajan, and H. Peyton Young)

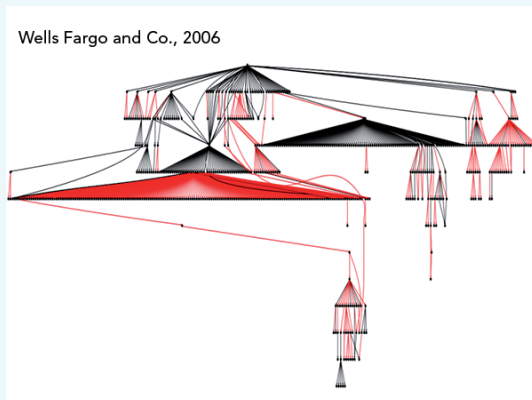


- If the Federal Reserve requires banks to leave their capital buffers untouched during stress tests, banks would be more resilient during a financial crisis but would be required to hold more capital during less-stressed times. U.S. bank regulators are phasing in new capital buffers, which are cushions of capital banks hold to absorb losses under stress. The Federal Reserve has not announced how stress tests will treat these new capital buffers. Should the tests require banks to leave buffers untouched? Or should banks be allowed to draw down buffers to pass stress tests? If a bank can't draw down its

buffer, the U.S. G-SIBs would have to hold more capital. Without the change, however, stress tests could affect less-systemic banks more than G-SIBs. (“Capital Buffers and the Future of Bank Stress Tests,” by Jill Cetina, Bert Loudis, and Charles Taylor)



- Regulators could create systemwide stress tests of CCPs at minimal cost to companies by building on existing stress test results at individual CCPs. A better U.S. systemwide stress test could be built to measure the strength of all CCPs based on existing stress tests by U.S. and European regulators. Models that combine existing data with statistical techniques and computer modeling would broaden and deepen the tests. Regulators would get a clearer view of systemwide risks from banks that work through multiple CCPs. This approach would require regulators to collaborate in sharing and analyzing data. (“Measuring Systemwide Resilience of Central Counterparties,” by Stathis Tompaidis)



- A new way of measuring complexity can support the resolution process after a bank holding company fails. An approach for measuring the complexity of bank holding companies is based on the number, diversity, and geographic distribution of bank holding company subsidiaries. The approach combines network analysis and graph theory to measure complexity by identifying bank holding company subsidiaries that share a common property, such as business activity or geographical location, and then calculating how many ownership and control links must be disentangled to unwind the company if it fails. (“The Complexity of Bank Holding Companies: A New Measurement Approach” by Mark D. Flood, Dror Y. Kenett, Robin L. Lumsdaine, and Jonathan K. Simon, Sept. 29, 2017)



SUPPORT
OF OUR KEY
STAKEHOLDERS
COLLABORATION
FINANCIAL
RESEARCH
ADVISORY
COMMITTEE
ORGANIZATION
STAFFING AND
OFFICES
INFORMATION
TECHNOLOGY

Status of the Efforts of the OFR in Meeting Its Mission



This chapter discusses OFR support for our key stakeholders, our national and international collaborations over the past year, current staffing levels, our budget, and information technology projects.

The OFR was created when the financial system and the economy were beginning to recover from the financial crisis, and regulators were beginning to implement regulations and policies to make the financial system more resilient.

The environment and stakeholders' needs have evolved since then. In the future, we plan to continue adjusting our focus on meeting the needs of our key stakeholders — the FSOC, FSOC members, the Treasury Department, Congress, the financial services industry, and the public — as their priorities evolve.

As a service organization, the OFR stands ready to respond quickly to stakeholders' needs and collaborate with stakeholders to achieve them.

The OFR will be a:

- **Trusted resource for meeting stakeholder needs.** We aim to fill gaps in stakeholder capabilities, give objective advice, and act as a sounding board for making difficult decisions.
- **Key source for financial data.** High-quality financial data that are secure, fit for their intended purpose, easy to access and compare, and inexpensive are essential for making good policy decisions.
- **Key source for research and analysis on financial stability.** On behalf of the FSOC, we conduct applied and essential long-term research on the causes of financial crises, develop tools for measuring and monitoring financial stability risks, and analyze the impact of policies related to financial stability.
- **Source for supplemental expertise.** The Dodd-Frank Act requires the OFR to maintain expertise to support the FSOC and its members. The OFR has this expertise in the fields of finance, regulation, economics, law, policy, data, and technology.

Support of Key Stakeholders

Financial Stability Oversight Council

The OFR meets the Dodd-Frank Act mandate of supporting the FSOC and FSOC members in a number of ways. The Office provides data, research, and analysis to the FSOC, its members, Congress, and the public. We are also charged with looking throughout the financial system to collect and standardize financial data, monitor and analyze risks, and perform policy research and analysis.

The FSOC obtains data from nonbank financial companies through the OFR.

Our Director is a nonvoting member of the FSOC, and members of the OFR staff work on a wide variety of FSOC activities and initiatives.

The OFR supports the FSOC and its members by:

- supplying monthly data and analysis on market trends;
- presenting updates of our monitors and delivering ongoing threat assessments to the FSOC Systemic Risk Committee;
- presenting to FSOC principals and deputies to inform their discussions of market events and potential policy steps;
- making presentations and participating in discussions for other FSOC working committees and groups, including the Regulation and

Resolution Committee and Financial Market Utilities Committee;

- assisting the FSOC in developing its annual report through analysis and writing support;
- leading the FSOC Data Committee and co-leading the committee's working group that updates the Interagency Data Inventory; and
- providing data and analysis to support the FSOC's nonbank designation process as the FSOC identifies nonbank financial companies that meet thresholds in the FSOC's initial quantitative metrics.

The FSOC Data Committee is a forum for sharing information and coordinating action on data-related topics that affect member agencies. The OFR leads the committee, which has overseen the development of the FSOC Interagency Data Inventory, designed as an initial step toward avoiding duplication and burden in regulatory reporting. The inventory, the catalog of data being collected by the FSOC member agencies, helps identify data that can be shared by serving as a common reference of regulatory datasets. It can also serve as a best-practices framework for categorizing information security levels, sharing data, and improving reporting efficiency.

We also co-chair the working group of the Data Committee that updates the inventory. Maintenance of the inventory is increasingly important as we strive to identify financial regulatory burdens on industry that can be reduced.

In addition, we serve the FSOC and its staff by collecting, maintaining, and appropriately sharing supervisory and commercial datasets. The OFR has purchased and maintains more than 65 datasets used by the FSOC staff. The OFR develops procedures and protocols for securely sharing data among the FSOC, its member agencies, and the OFR.

We regularly respond to requests by the FSOC and its staff for objective research and analysis. In addition, we have worked to determine the best methods for identifying systemically important banks. In this effort, we built on our earlier research to show how a multifactor approach for assessing systemic importance is superior to making determinations based solely on bank size.

Our research also helps the FSOC identify and prioritize threats to financial stability.

FSOC Members

The OFR offers objective evaluation of financial stability risks and the effectiveness of regulatory policies to FSOC members. The OFR has partnered with FSOC member agencies on a number of research and data projects, some at the specific direction of the FSOC or its member agencies, and others in a less formal response to concerns discussed.

Our work to meet the needs of the FSOC member agencies includes a project with the Federal Reserve to collect and analyze data in support of a reference interest rate as an alternative to LIBOR, an interest rate benchmark formerly known as the London Interbank

Offered Rate, but now called ICE LIBOR (Intercontinental Exchange LIBOR). We are also collaborating with the Federal Reserve on a project to fill critical data gaps in repurchase agreement (repo) transactions, which could support the reference rate project.

During fiscal year 2017, we improved our U.S. Money Market Fund Monitor, which tracks the investment portfolios of money market funds and shows trends and developments across the money market fund industry. The monitor uses data converted from the SEC Form N-MFP and presents the information in a graphic, user-friendly format on the OFR website. It makes the underlying data freely available for download by the industry and public for monitoring and analysis. The monitor is one of the most viewed items on the OFR website, with more than 14,000 page views in the year after its launch.

To improve data sharing among the FSOC member agencies, we are continuing to work with them to streamline the process of developing memorandums of understanding by developing best practices and a set of common provisions.

We anticipate that our ongoing work with standards organizations on identifiers and other data standards will benefit the FSOC member agencies as the quality and interoperability of financial data improves.

The OFR led the U.S. delegation on the global Legal Entity Identifier (LEI) initiative so the LEI could be developed to meet regulatory needs, including swap data repository collection requirements. This foundational standard was the result

of a global effort that the OFR spearheaded, as Treasury's representative to the international initiative through the Financial Stability Board.

The LEI system now is routinely considered by others as a way to meet additional needs. For example, the LEI code has become the preferred identifier for parties engaged in swaps activities, and the International Standards Organization asked the foundation that runs the LEI system to maintain the international standard for "entity legal form" (such as a corporation).

Treasury

Because the OFR is an office of the Treasury Department and the Secretary is the FSOC chair, we regard Treasury as a key stakeholder. We share expertise and staff time on projects with the Department, consistent with the law, as we do with other FSOC members.

In addition to supporting the FSOC annual report project, the OFR has lent employees with special expertise to the Department on work details of up to six months.

We also provide Treasury offices access to purchased data on a reimbursable basis, generating significant cost savings compared with those offices obtaining the data directly (because they avoid administrative costs and pay only for the services they need).

To support efforts to make the financial system more resilient to cyber threats, we are assisting Treasury's Office of Critical Infrastructure Protection and Compliance Policy in maintaining and

updating their maps of the financial system. The goal of our network analysis of the maps is to gauge the resilience of U.S. financial markets to shocks.

In addition, through our regulatory reporting burden initiative, the OFR is addressing broad Treasury, Congressional, and industry interest in identifying areas of duplication, overlap, and inefficiency in regulatory reporting. We have identified, on a pilot basis, areas of potential overlap in regulatory reports relating to private funds (see **Reducing Regulatory Reporting Burdens**). This work, if expanded, could aid the FSOC in identifying and brokering the implementation of common data standards that would alleviate reporting burdens on firms and improve the quality of financial data for regulators.

Congress

The Dodd-Frank Act requires the OFR to report to Congress annually on our progress in meeting our dual data and research mandates. We do so through this report, and our Director testifies before Congress when invited. The OFR also submits quarterly reports to Congress as required by the Consolidated Appropriations Act. These reports describe the OFR's use of funds, staffing levels, and actions to achieve its goals and objectives.

In addition, our Government and Industry Affairs liaisons routinely interact with key members of Congress, their staffs, and committee staffs to respond to questions, address concerns, and share insights on issues related to financial stability.

Key members of the House Financial Services Committee and Senate Banking Committee have referenced OFR research during public proceedings, including our research on identifying systemically important banks. The OFR also has made presentations to staff members of the House Financial Services Committee and the Senate Banking Committee on the OFR's U.S. Money Market Fund Monitor and on issues including financial stability considerations related to bond market liquidity.

In addition, we are working with other agencies to respond to Congressional inquiries about assessing the benefits of cross-market surveillance for market oversight and financial stability monitoring, and the potential impact for financial firms of a new Chapter 14 of the Bankruptcy Code.

Industry

The OFR has had an industry outreach function since the early days of its existence. Our Government and Industry Affairs team meets with leaders of financial service companies on a regular basis, learning what issues concern financial experts to further inform our agenda.

Our pilot work to collect and anonymize repo data to produce reports about the bilateral repo market has been widely cited by market participants as a success. In addition, the industry Alternative Reference Rates Committee has expressed support for the repo-based reference rate (to replace LIBOR) that the OFR and the Federal Reserve Bank of New York would produce.

We also are working on a regulatory reporting burden project that would benefit industry and promote more efficient regulation by exposing expensive, duplicative, and inefficient regulatory reporting.

Industry trade groups have noted favorably the OFR's ongoing objective analysis on regulatory reform, including OFR analysis of bank stress tests, the approach for identifying systemically important banks, and the regulation of central counterparties.

The Public

The stability of the U.S. financial system is essential to the welfare of all Americans and their financial well-being. As a result, the American public is a beneficiary of OFR efforts to assess and report on vulnerabilities in the system. Our service stems from our critical function as both a research and data institution, our ability to look across the entire financial system to spot emerging threats to financial stability, and our unique data-related mandate.

Results of our work are made public on the OFR website, financialresearch.gov. In publishing our findings and monitoring tools, we support market discipline by making the vulnerabilities of the financial system more transparent.

Another channel for informing the public about the OFR and its work is our Twitter site, where we highlight key OFR activities and products, including graphics. We also send e-mail alerts to the more than 30,000 subscribers who subscribed through our website.

Our research is regularly cited in the media. We maintain working relationships with members of the news media and answer reporters' questions about the OFR.

To further meet the needs of the public, we have projects underway to enrich the information on the OFR website and to make it more usable and accessible by applying usability best practices. We are also working to expand our offerings of downloadable data and interactive monitors for members of the public and news media to understand the importance of OFR work and topics related to the stability of the financial system.

Collaboration

OFR staff experts and leaders participate in a wide variety of events related to financial stability research, data, and analysis. Collaboration with other researchers and regulators, as well industry experts domestically and abroad, is crucial to our success. The OFR has created a virtual research-and-data community to extend our reach and impact by collaborating with colleagues in government, industry, and academia in the United States and around the globe. Collaboration with others helps us to maximize our resources, support financial stability research, and promote standards that lead to high-quality data on the global financial system.

We regularly reach out to academic and financial industry groups for their input on current and emerging financial stability issues. We also collaborate with colleagues around the world on research

and data projects by speaking at conferences and events and maintaining our involvement with global organizations. In addition, we hold and cosponsor conferences and other events to promote awareness and discussion about issues related to financial stability.

Our outreach includes remarks, presentations, and appearances in panel discussions by OFR Director Richard Berner and other members of the OFR staff. They speak at conferences and meetings sponsored by industry groups, government regulators, academic institutions, and others.

In addition, the OFR sponsors a Research Seminar Series for OFR employees to engage in discussion and debate with outside experts from government agencies, academic institutions, and international organizations. More than two dozen outside experts appeared at

these seminars during the fiscal year.

Presentations included:

- “Liquidity Requirements, Liquidity Choice, and Financial Stability”
- “Competition and Stability in Banking: The Role of Regulation and Competition Policy”
- “Do Bank Bailouts Reduce or Increase Systemic Risk? The Effects of TARP on Financial System Stability”
- “Liquidity Regulation and Unintended Financial Transformation in China”

Financial Research Advisory Committee

The OFR Financial Research Advisory Committee, a group of 29 experienced professionals with experience in business, economics, finance, data science, risk management, and information

2017 Financial Research Advisory Committee Meetings

February 23
Department of
Treasury

The ninth meeting of the committee included discussions of financial stability risks identified by the OFR, the OFR initiative to develop a financial instrument reference database, adoption of the Legal Entity Identifier, and the research agendas of OFR programs on central counterparties and risks in financial institutions. The OFR also received updates from the committee’s Financial Instrument Reference Database Viewpoint Working Group, Data Standards Working Group, and Financial Innovation Working Group.

July 20
Federal Reserve
Bank of New
York

This meeting included a presentation on improvements to the Financial Stability Monitor; a demonstration of the OFR’s newest monitoring tool, the Financial Stress Index; an update on the OFR’s efforts to identify obstacles to broader adoption of the Legal Entity Identifier; and a discussion of the OFR’s work to monitor and analyze operational risks and cybersecurity risks. At the meeting, the OFR also received updates from the committee’s Financial Innovation Working Group.

technology, enhances our annual research-and-data agendas with recommendations that help ensure the OFR is focusing on the most important and timely issues. Committee members are drawn from industry, academia, and the policy community.

The committee, established in 2012, gives the OFR the benefit of industry experts who bring diverse perspectives to inform our work and help the OFR to fulfill its mission. Under the governance of the Federal Advisory Committee Act, the full committee meets semiannually. The OFR makes the minutes and webcasts of the meetings available to the public.

The three subcommittees — Research, Data and Technology, and Financial Services and Risk Management — meet at different times during the year to develop committee work.

Developing Standards for Reporting Financial Data

The OFR's commitment to setting global standards — ranging from identifiers such as the LEI to mortgage standards — is integral to our mandates under the Dodd-Frank Act. To that end, the OFR provides analytical assistance on data standards, and promotes their development and use among the FSOC member organizations, in global regulatory forums, and through standards-setting bodies.

Our collaboration with public and private stakeholders during the past year reaffirmed that the time is right to establish clear, internationally mandated and coordinated standards for reporting

financial data and metadata (the data describing data).

Implementation requires the use of standards for the design of data collections, either through coordinated global action or implementation of technical guidance. At its meeting in February, the OFR's Financial Research Advisory Committee recommended that the OFR engage key stakeholders of the LEI to identify obstacles to more complete adoption of the standard. The OFR is following that recommendation as it continues to lead the process of building implementation strategies and coordinating adoption plans with industry and regulatory colleagues in the United States and abroad.

Memorandums of Understanding

Memorandums of understanding (MOUs) are key to the OFR's strategy to promote data sharing, particularly among regulators. In May, the OFR and the European Central Bank signed an MOU that formalizes the processes for the staffs of the OFR and the bank to share analyses and information about emerging financial market risks in the United States and the eurozone.

This MOU is the OFR's second on cross-border cooperation. In April 2015, the OFR signed a similar information-sharing arrangement with the Bank of England, the United Kingdom Prudential Regulation Authority and the United Kingdom Financial Conduct Authority.

These types of cross-border agreements on information sharing are important

tools for the OFR to meet its statutory mandate by monitoring global financial market risk, while potentially lowering regulatory reporting costs for firms that operate in the United States and abroad.

The OFR also has scores of MOUs with other agencies in the United States.

Standards for Derivatives Data

The OFR contributes to the global Working Group for Harmonization of Over-the-Counter Derivatives Data Elements. The group, sponsored by the Committee on Payments and Market Infrastructures – International Organization of Securities Commissions (CPMI-IOSCO), is focused on three distinct efforts: (1) a unique product identifier, (2) unique transaction identifier, and (3) standardizing critical data elements.

We collaborated with industry participants about the product identifier during meetings in January, April, and July of 2017. The identifier will enable unique identification of financial products for easier aggregation of data and analysis of potential asset-specific risks.

The transaction identifier will enable identification of unique individual over-the-counter derivative transactions to facilitate aggregation of transactions and enhance analysis. We contributed to the publication, Technical Guidance for the Harmonization of the UTI (unique transaction identifier). We also reviewed the industry's consultative responses and drafted the final recommendations of the guidance, published in February 2017.

The technical guidance outlines the definition, format, and use of the transaction identifier.

We participate in the Financial Stability Board's working group on governance for both identifiers. Strong global governance is necessary for effective implementation and continued relevance of global standards.

In April 2017, the OFR took leadership of the governance assessment work stream for the unique transaction identifier. The final proposed governance arrangements for the transaction identifier were published for public comment in March 2017.

The work on critical data elements is aimed at producing clear guidance to authorities on definitions, format, and use of critical data elements (other than the transaction and product identifiers) for consistent and effective global aggregation of over-the-counter derivative contracts. Under OFR leadership, this work continued to focus on the potential for the International Organization for Standardization to manage data elements.

As co-chair of the work stream on critical data elements, the OFR continues to lead the revision of the Batch 1 CDE (critical data elements) Consultative Report, consisting of 14 data elements, as well as the analysis, finalization, and revision of the 27 data elements for the Batch 2 CDE Consultative Report. The Batch 3 CDE Consultative Report was published in June 2017.

Mortgage Standards

The OFR staff worked with the industry and global standards bodies during the year to develop standards that would affect a broad array of processes in the mortgage industry.

For example, we held a two-day workshop to align data fields and definitions between messaging standards by the International Organization for Standardization and the Mortgage Industry Standards Maintenance Organization.

The mortgage industry relies on electronic payments to transfer money between participants in mortgage financing, guarantee, and securitization processes. We worked with the mortgage industry to help its stakeholders (such as mortgage issuers and servicers) understand the potential impact of adopting the International Organization for Standardization's standard in the U.S. electronic payments system.

The OFR also continued to collaborate with industry and regulators to advance the adoption of a universal loan identifier. Such an identifier would help regulators and the industry assess risk by linking first and second liens, such as first mortgages and related home-equity loans — without revealing the personally identifiable information of borrowers. But without an industry-wide requirement to adopt a universal loan identifier, adoption has been slow.

As an example of voluntary adoption, government-sponsored enterprises Fannie Mae and Freddie Mac have committed to begin collecting the universal loan identifier for all applicable loans delivered to them. This new data collection becomes mandatory for loan delivery to these government-sponsored enterprises by May 2019.

Working Groups

Oct. - Nov. 2016 OFR Associate Director of Data Strategy and Standards and Acting Associate Director for Strategic Data Support attended a meeting on Oct. 28 of the Legal Entity Identifier Regulatory Oversight Committee's Executive Committee. They also attended meetings Nov. 1-2 of the Data Harmonization Working Group of CPMI-IOSCO.

FY 2017 OFR Acting Associate Director for Current Analysis participated in the Financial Stability Board's Data Experts Group, which is responsible for developing standards for a global data collection on securities financing transactions and implementing the collection. The group met to develop the implementation guidelines for the collection.

FY 2017	OFR staff members represented the Treasury Department at several meetings of the global LEI system and led or participated in several work streams.
FY 2017	OFR staff members represented the Treasury Department in an initiative to establish a governance structure for sharing aggregated and anonymized data on securities financing transactions with financial authorities overseas through a secure data center hosted by the Financial Stability Board and Bank for International Settlements.
FY 2017	OFR senior researchers contributed to the Financial Stability Board's working groups on the over-the-counter derivatives market, contributing to a review of effectiveness of market reforms.
FY 2017	OFR staff members represented the Treasury Department in the Financial Stability Board's Financial Innovation Network. The events included a case study on artificial intelligence and machine learning in financial services. The OFR contributed to drafting a report analyzing potential benefits and risks for financial stability stemming from applications of artificial intelligence and machine learning.
April 2017	OFR staff members acted as U.S. government observers of the Joint Expert Group on Interconnectedness at the invitation of the European Systemic Risk Board. The group meets to share data and analyses on financial stability issues in the European Union. The OFR participation allowed the staff members to share views about financial stability concerns with their European counterparts.
April 2017	OFR Associate Director for Data Strategy and Standards, a Senior Standards Specialist, and a Policy Advisor attended the quarterly meeting of CPMI-IOSCO sponsored by the Data Harmonization Working Group.
July 2017	OFR Associate Director for Data Strategy and Standards, a Senior Standards Specialist, and a Policy Advisor attended the quarterly meeting of the Financial Stability Board's Working Group on the Unique Transaction Identifier & the Unique Product Identifier and the CPMI-IOSCO Data Harmonization Working Group.

OFR Speeches, Conferences, and Events

Speeches

OFR Director Richard Berner made remarks at the following events:

Oct. 2016 **New Pedagogy of Financial Regulation** conference at the Columbia Law School on “The Interdisciplinary Approach to Financial Stability Analysis.”

Jan. 2017 **Power of Transparency Speaker Series** hosted by the Atlantic Council and Thomson Reuters.

March 2017 **Financial Data Summit** hosted by the Data Transparency Coalition on “Reducing the Regulatory Reporting Burden.”

OFR staff members made public remarks and presentations at many events, including:

Oct. 2016 **American Society of International Law and the Institute of International Economic Law Biennial Conference**
OFR’s Senior Advisor for International Affairs spoke on the “Systemic Risk Aspects of International Financial Law.”

Oct. 2016 **Securities Lending** conference and **Securities Finance**
Jan.- Feb. 2017 **Collateral Management** conference
An OFR Senior Financial Analyst gave presentations about the OFR’s securities lending data pilot during events sponsored by the Risk Management Association and the Information Management Network.

April 2017 **Enterprise Data World** conference
An OFR Senior Standards Specialist shared her ontology expertise and how the use of ontologies are helpful when managing information from disparate data sources in varied formats.

April 2017 **Eurofi High Level Seminar**
The OFR Deputy Director for Research and Analysis participated in a panel on “Emerging Risks in Global & EU Financial Markets.”

May 2017 **Financial Information Management** conference
The OFR Deputy Director and Chief Data Officer spoke about OFR initiatives to improve data quality through collaborative standards development efforts with regulators and industry.

July 2017 **Society for Economic Measurement 4th Annual Symposium**
An OFR Senior Advisor participated in a panel highlighting the benefits FinTech and RegTech can provide to the financial industry. He discussed evolving analytical approaches in response to explosive growth in data volumes.

FY 2017 Conferences and Events

Oct. 2016 **Big Data: Improving the Scope, Quality, and Accessibility of Financial Market Data**
The OFR and the Center on Finance, Law, and Policy at the University of Michigan hosted a conference that explored ways to make data more useful, accessible, and secure.

Dec. 2016 **Conference on Innovation, Market Structure, and Financial Stability**
The OFR and the Federal Reserve Bank of Cleveland cosponsored this event. It brought together academics, policymakers, and market participants to discuss financial and technological innovations and their impact on financial stability.

March 2017 **Setting Global Standards for Granular Data: Sharing the Challenge** workshop
The third workshop cosponsored by the OFR, Bank of England, and European Central Bank brought together policymakers, international organizations, and financial industry practitioners from around the world. The three sponsoring institutions are continuing their work along with other organizations under the theme "Sharing the Challenge." OFR Director Richard Berner and representatives of the OFR's Data and Research Centers participated in various panels.

Sept. 2017 **Conference on Heterogeneous Agents and Agent-based Modeling**
The OFR, Brandeis University, and Bank of England cosponsored this event. It highlighted research on the impact of individual heterogeneity for financial system stability and economic outcomes.

Organization, Staffing, and Offices

Organization

To achieve the goals set by the Dodd-Frank Act, the OFR has three centers (see Figure 11):

1. The **Data Center** acquires and manages data and leads global initiatives to develop standards for efficiencies in data reporting and analysis.
2. The **Research and Analysis Center** conducts research, performs analysis, and evaluates policies related to the stability of the U.S. financial system.
3. The **Technology Center** is responsible for OFR information technology systems and system security, including an information technology platform to support analysis with large datasets.

Three divisions support the centers:

1. The **Operations Division** provides expertise, program management, implementation, policy, and oversight for budgeting, travel, human resources, procurement, and facilities.
2. The **External Affairs Division** produces OFR publications and graphics and maintains relationships and communicates with a broad array of stakeholders, including Congress, industry, the news media, and the OFR workforce.

3. The **Office of the Chief Counsel**, part of the Treasury Department's Office of General Counsel, offers legal guidance on policy initiatives, analysis and research, data acquisition and usage, procurements, and agreements with other organizations. It also oversees risk management work and audits.

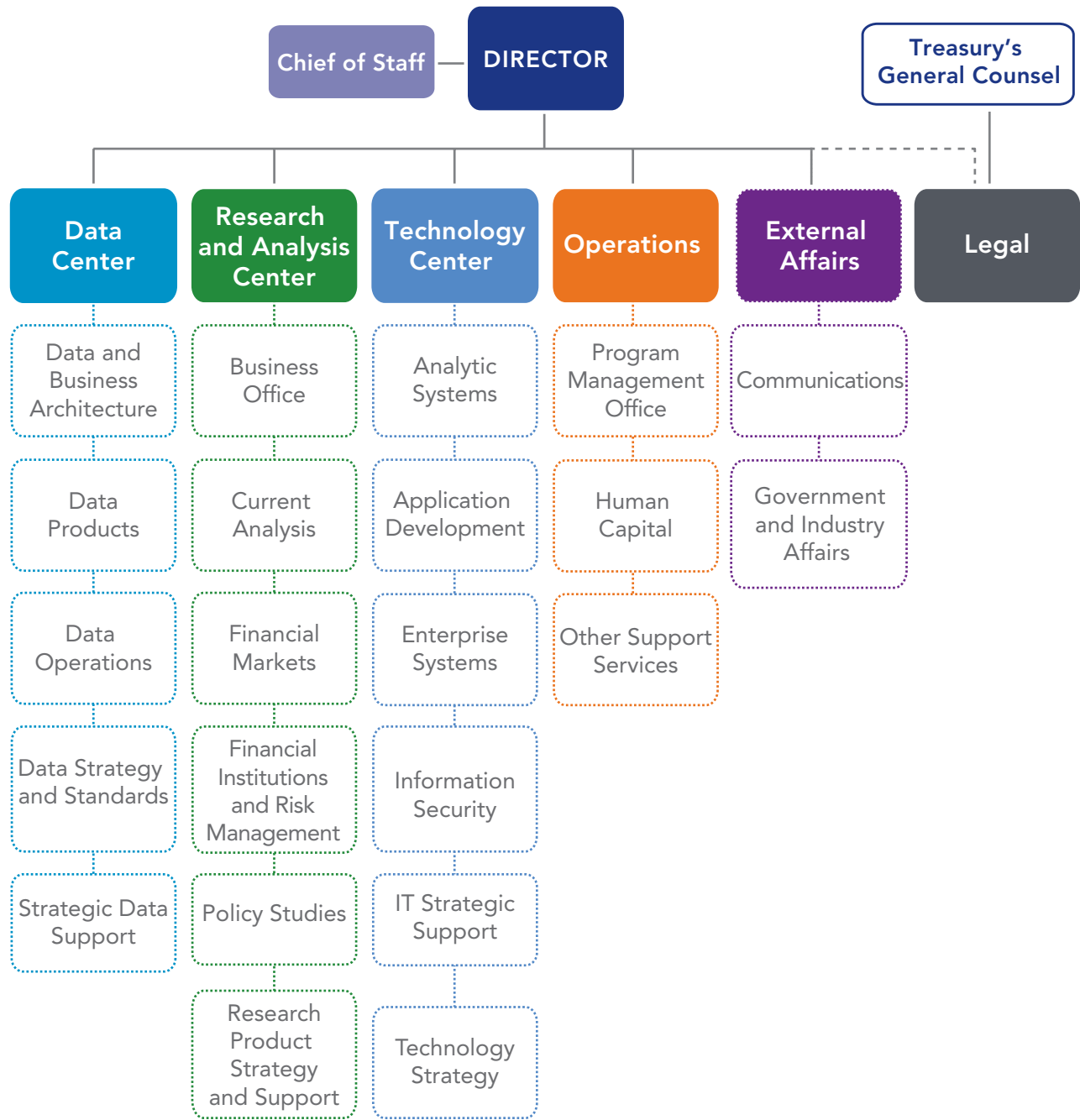
Staffing

The OFR's work was supported during the fiscal year by 210 employees: 203 permanent, six term, and one temporary. (This count does not include employees on detail from other agencies or serving under the Intergovernmental Personnel Act of 1970.) Only the Director is a political appointee.

Two leadership groups govern the OFR. The Director and seven deputy directors and chiefs make up the senior management team. The leadership group includes those eight senior managers plus 20 associate directors who lead the teams under the senior managers.

In consultation with the FSOC, FSOC members, and other stakeholders, the OFR developed an FY 2017 plan that reflects our mission, five-year strategic plan, key stakeholder needs, critical infrastructure needs, and budget parameters. The FY 2017 plan was a roadmap for the OFR to meet the needs of key stakeholders within the President's Budget parameters. All OFR employees were assigned work that contributed to meeting stakeholder needs, statutory requirements, and the building and operating of critical infrastructure.

Figure 11. OFR Organizational Chart



OFR Budget and Accountability

OFR funds obligated in FY 2017 were \$92.9 million — 54 percent for labor and 46 percent for other expenses (see Figure 12). This ratio differs significantly from the two-thirds labor, one-third nonlabor split in the budgets of most agencies, largely due to significant OFR expenses for data acquisitions (\$8.8 million) and technology software and hardware (\$13 million) to support the OFR’s unique mandates.

The OFR is an office within the U.S. Department of the Treasury, overseen by Congress and government auditors. Since its establishment, the OFR has answered four audit requests from the Government Accountability Office, and interviewed for another five; six audits

by the Treasury Inspector General; and one audit by the Council of Inspectors General on Financial Oversight. OFR leaders have testified before Congress on four occasions: Director Richard Berner has testified three times as Director, and a former Chief Operating Officer testified once before the Director’s confirmation.

Though part of the Treasury Department, the OFR is not funded by annual Congressional appropriations, but by semiannual assessments from bank holding companies with total consolidated assets of \$50 billion or more each and nonbank financial companies supervised by the Board of Governors of the Federal Reserve System.

The OFR pays the Treasury Department nearly \$10 million per year for support

Figure 12. OFR Funds Obligated in Fiscal Years, 2013 - 2017 (\$ thousands)

	2013	2014	2015	2016	2017
Compensation	15,339	24,168	29,036	32,485	37,379
Benefits	4,885	7,968	9,507	11,322	13,054
Labor Total	20,224	32,136	38,543	43,807	50,434
Travel	246	296	453	556	447
Communication and Utilities	4,717	5,332	3,811	62	179
Printing and Reproduction	24	27	31	26	22
Other Services	22,683	23,558	25,033	35,794	31,823
Supplies and Materials	3,916	4,947	8,060	8,312	6,508
Equipment	13,495	16,970	8,785	5,997	3,459
Grants				320	
Nonlabor Total	45,081	51,130	46,173	51,067	42,439
TOTAL	65,305	83,266	84,716	94,874	92,873

Note: Other services include rent and administrative support for human resources, conferences and events, facilities, and procurement.

Source: OFR analysis

for OFR human resources, budget, travel, and acquisitions activities. In addition, the Office pays Treasury more than \$6 million annually for information technology circuits; payroll services; and agency-wide systems for training, performance management, and human resources management. The OFR Director must consult with the Treasury Secretary in establishing the OFR budget and workforce.

Information Technology

Information Security

Information security is one of the OFR's highest priorities, and we have built a strong security and privacy awareness program over the past several years dedicated to ensuring that our systems and our data are secure and will remain secure. All OFR employees take annual security and privacy training, and employees who have access to nonpublic data are subject to heightened post-employment restrictions.

The OFR brings large quantities of data into its analytical environment, which was designed and built specifically for the OFR to securely support computing-intensive work with large datasets. In FY 2017, we renewed our commitment to maintaining the confidentiality, integrity, and availability of our systems and the information they hold. We conducted our annual internal and external "penetration tests," which were completed by an independent third party, with no major

findings identified. We also deployed several additional controls and tools that strengthened our security posture.

The OFR operates two storage systems. One system is used exclusively for analytics; the other system is for general purposes. One of our projects during FY 2017 involved enabling the encryption of data not being used (referred to as "data at rest") on both systems to boost our security.

The OFR follows the National Institute of Standards and Technology guidance for the implementation and operation of a government information security program.

Disaster Recovery and Web Infrastructure Security

We also reassessed our business needs for disaster recovery in FY 2017. The OFR has an alternate processing center and disaster recovery center outside of Washington, D.C. We conducted a number of tests using several scenarios to determine that the center would be ready in the event of an emergency, and we put additional technology and controls in place to ensure its readiness.

The OFR uses this disaster recovery data center as an alternate processing center and not just as a standby. When not in disaster-recovery mode, we maximize our investment in this resource by using it for additional computing power for the OFR's day-to-day operations.

During the year, we also assessed our public website, financialresearch.gov, and determined that we needed to increase the security level of the site's

infrastructure to handle new requirements. In anticipation of creating a restricted, password-protected area on the website in the future, we built a platform that would allow researchers or other approved stakeholders from outside the OFR (such as the FSOC and FSOC members) to have access to certain protected resources. This project also required creating an authentication mechanism and process to ensure only selected users approved for access and having user accounts and passwords will be allowed.

Finally, we upgraded the OFR's mobile-device-management platform, increasing the security of our mobile phones, while enabling capabilities that allow OFR employees to securely use on-site services, such as our time-and-attendance system.

Technology Projects

When we launched the OFR analytic systems at the end of 2013, we decided not to use external "cloud" services. Cloud services allow organizations to pay only for the computing and storage capacity they use, instead of procuring, creating, and maintaining entire in-house systems. Over the past four years, rapid technology development and improvements, coupled with improvements in security, have advanced external cloud options significantly.

Now, our analytic systems are nearing the point of requiring significant investment in new machinery and hardware. After extensive research and work to determine the most cost-effective way

forward, we launched a project in FY 2017 to begin to migrate a number of our systems to the cloud. Consequently, the eventual cloud migration of key services guided many decisions we made during the year about architecture, new investments, ongoing maintenance and support arrangements, and our existing product portfolio.

To support a cloud migration, we also developed a new system architecture that effectively and efficiently ties internal systems with cloud and Web-based systems, and we made prudent investments in new technology for internal systems.

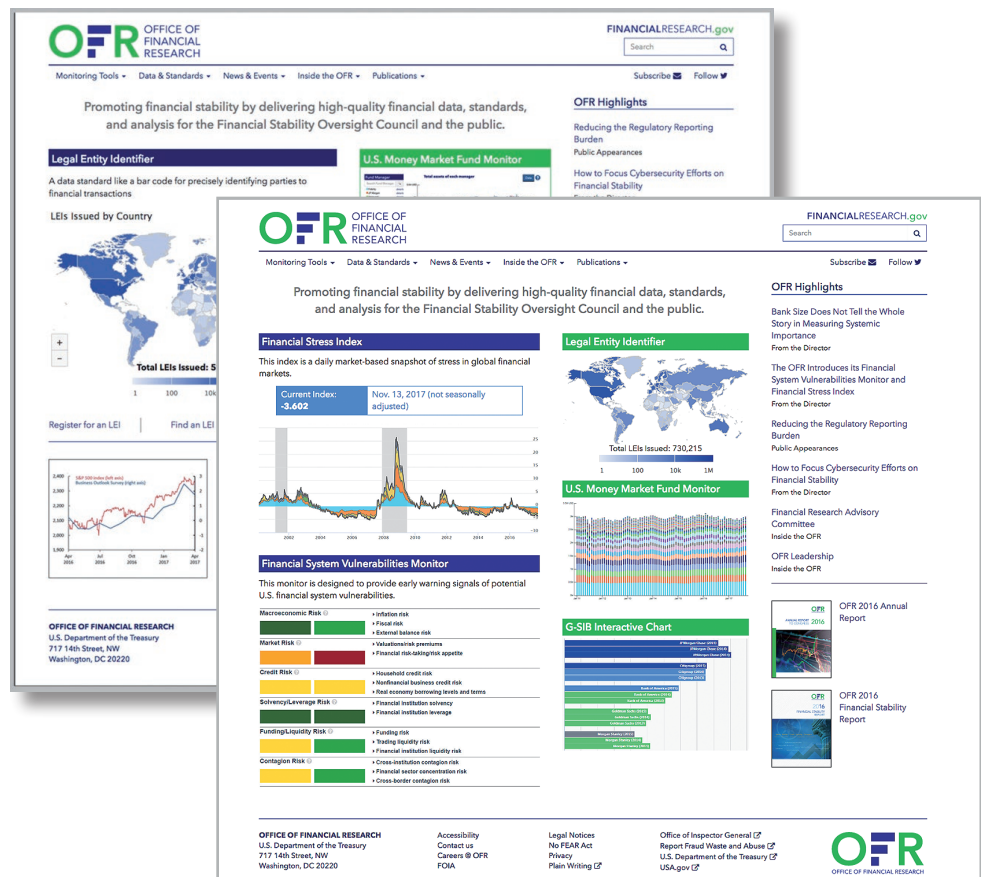
As a result, we decommissioned several systems and discontinued certain products in favor of better and more cost-effective alternatives. We also found opportunities to reduce or eliminate some unused or less-needed services and capabilities, develop a streamlined review process for new system and software requests, and reduce our dependency on less-effective traditional database management systems.

We are taking the steps necessary to ensure that our cloud infrastructure will provide the same level of protections as our internal infrastructure, and will comply with all federal security guidance.

Other Initiatives

The OFR Technology Center supported a number of other projects during FY 2017, including:

- redesigning www.financialresearch.gov, our public website;
- developing publicly available monitoring tools;
- enhancing our internal knowledge catalog and metadata repository;
- helping OFR researchers and analysts make the best use of the power of our analytic systems, reducing the processing time of models that require high-performance or high-volume computing;
- upgrading our internal collaboration and workflow automation platform; and
- expanding use of our chart and data automation systems.



2017 redesign of the OFR website, FINANCIALRESEARCH.gov



SUPPORT
ALTERNATIVE
REFERENCE RATES

COLLECT REPO
DATA EVALUATE

BANKRUPTCY
CHANGES

CROSS-MARKET
SURVEILLANCE

BROADEN LEI
ADOPTION MAP

EFFECTS OF
CYBERSECURITY

THREATS

We are basing our agenda for FY 2018 on the needs of our key stakeholders. To implement this agenda, we have identified our key stakeholders and their needs and mapped out strategies for determining and serving those needs during the year.

Our priorities include:

- **Support alternative reference rates and collect bilateral repo data** – We have been collaborating with the Federal Reserve and Federal Reserve Bank of New York to develop an alternative to LIBOR, an interest rate benchmark that was formerly known as the London Interbank Offered Rate but is now called ICE LIBOR (Intercontinental Exchange LIBOR). We also collaborated with the Federal Reserve and the SEC on two voluntary pilot projects in 2015 to explore how to collect data about bilateral repurchase (repo) agreements and securities lending transactions. In FY 2018, we plan to undertake a rulemaking to establish an ongoing data collection covering some repo transactions. These data might be useful in calculating the selected LIBOR alternative, called the Secured Overnight Financing Rate.
- **Evaluate potential bankruptcy changes** – The OFR and the Government Accountability Office are evaluating whether potential changes to bankruptcy laws could improve the resolution — successful restructuring or liquidation — of a failing systemically important financial institution. As we said in Chapter 1, the failure of large and complex financial companies could transmit distress to other firms, with potentially adverse consequences for the economy.
- **Evaluate the value of cross-market surveillance** – To understand the vulnerabilities in the financial system that could be exposed by shocks, we are studying the interconnectedness of financial markets in cooperation with the SEC and the CFTC. This project to assess the cross-market connections arising from the positions of key market participants will help us understand how these connections could spread risk through the financial system.

- **Map systemic effects of cybersecurity threats and operational shocks** – We plan to continue analyzing the threat to financial stability that cybersecurity incidents and other operational failures can pose. We described this threat in Chapter 1. We also discussed in Chapter 2 our project to combine network analysis with maps (loaded with real-world data) of the financial system to identify cybersecurity threats and other operational vulnerabilities.
- **Bring about broader adoption of the Legal Entity Identifier (LEI)** – We support a recent recommendation from our Financial Research Advisory Committee to spur wider adoption of the LEI — and achieve the full benefits of this essential data standard. We are following the recommendation by brokering a series of discussions with financial industry executives and government officials to explore costs and benefits and identify hurdles that impede widespread adoption. The next step will be to find ways to overcome these hurdles.

In the next fiscal year, we also plan to explore financial data services initiatives that the FSOC could adopt to increase efficiency by reducing the time and resources expended for financial data acquisitions. We are already working with the Treasury Department’s Bureau of the Fiscal Service on pilot data acquisition contracts with selected FSOC member agencies. These contracts are for procuring financial data more efficiently and, potentially, at lower cost.

To increase efficiency, maximize performance, and reduce costs, our Technology Center will begin moving our analytic services to the cloud in FY 2018, following the plan developed during and after FY 2017. Using cloud services, organizations pay only for the capacity they use, rather than developing and maintaining complete in-house systems.

We will also relocate our OFR Web infrastructure to a new provider in fiscal 2018. The architecture we developed will allow Web and internal and external cloud systems to be seamlessly and securely integrated. This new architecture will be the foundation of the data-centric capabilities the OFR plans to develop to support FSOC members.



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