

# 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).


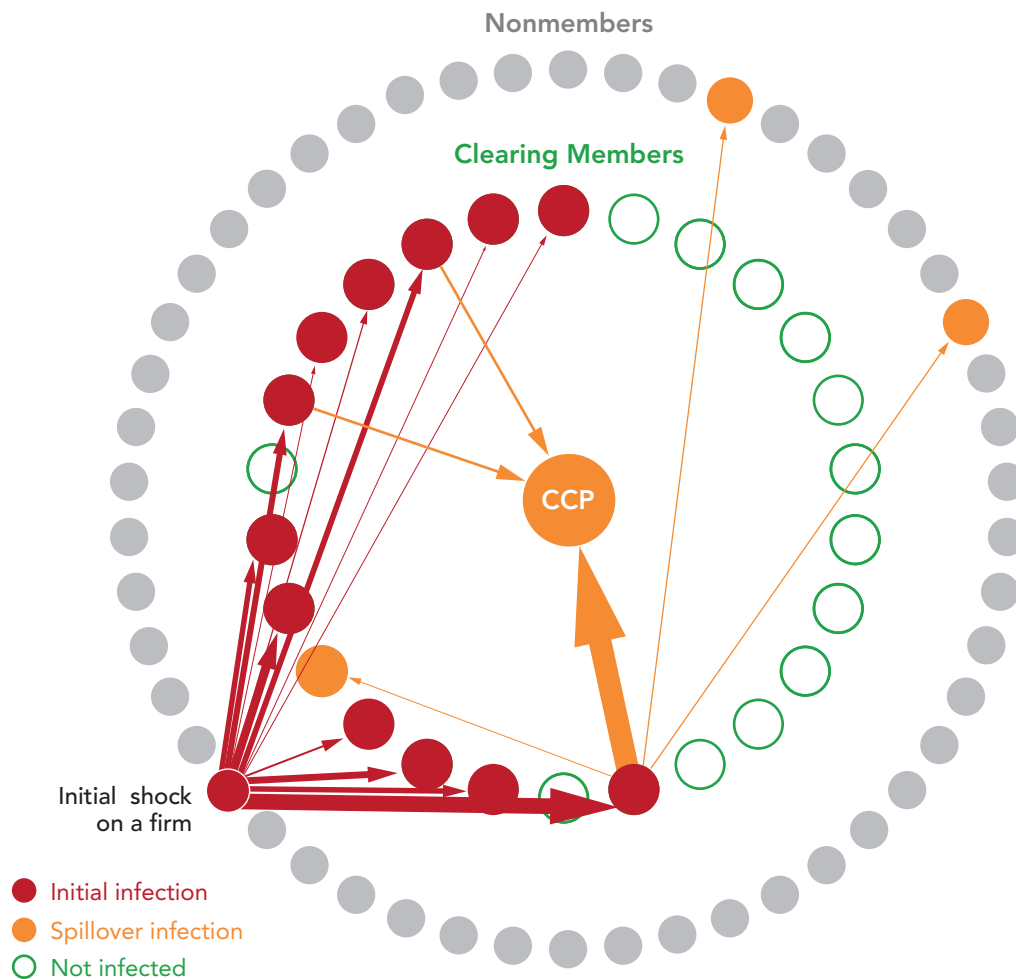
 Financial stability threats from cybersecurity vulnerabilities and operational risks should be studied across the entire financial system.

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.

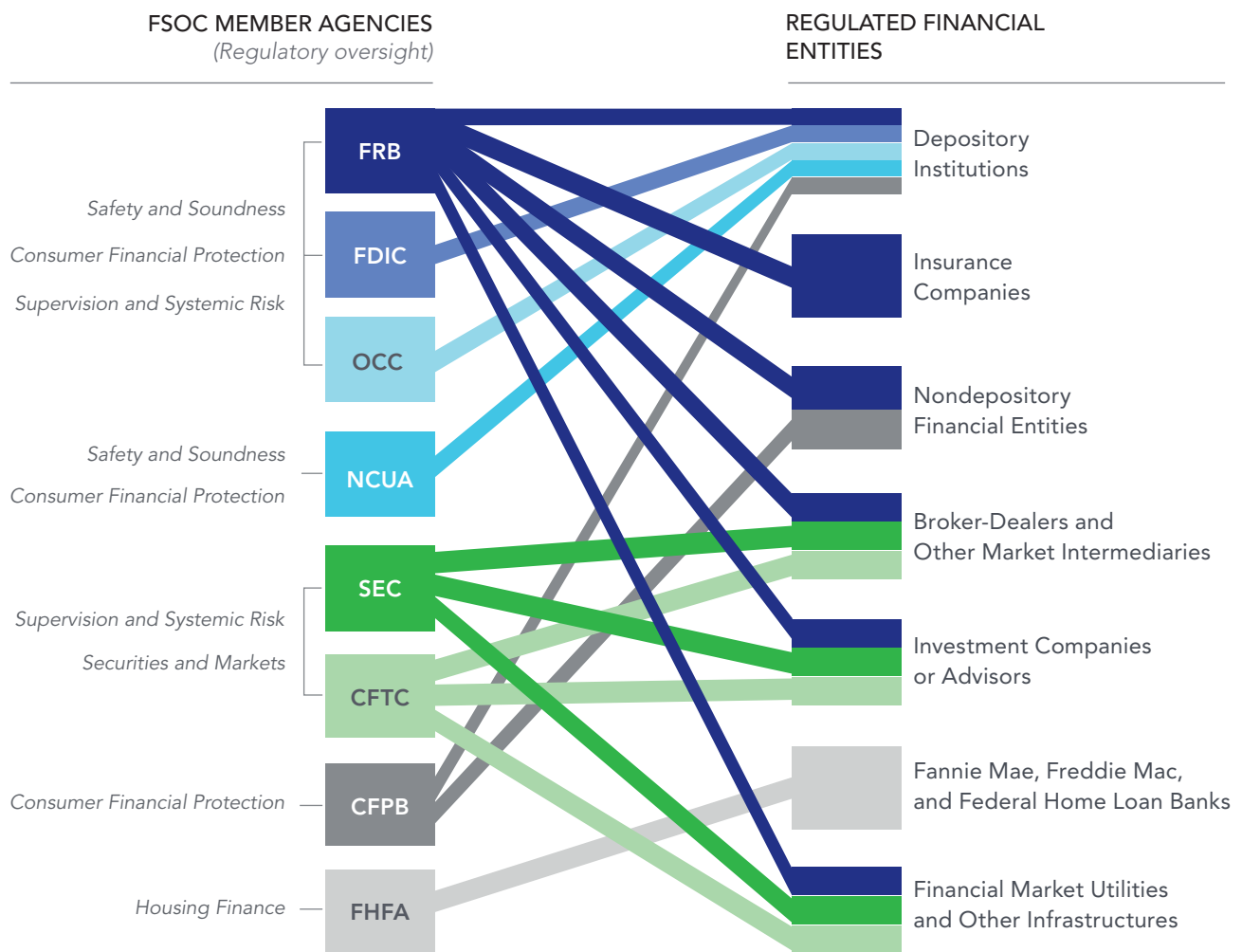
As real-world data is added to these maps, network analysis yields more valuable insights. The maps hold the potential to allow policymakers, market participants, and the public to see specific ways cybersecurity and operational risks could threaten the stability of the financial system. Those insights 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 |                                |
| <b>Global Systemically Important Bank (G-SIB)</b> |      |                       |                              |                                   |                        |                   |                      |                       |  |  |                               |                |                                |
| <b>Non-G-SIB</b>                                  |      |                       |                              |                                   |                        |                   |                      |                       |  |  |                               |                |                                |
| <b>Intermediate Holding Company</b>               |      |                       |                              |                                   |                        |                   |                      |                       |  |  |                               |                |                                |
| 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.

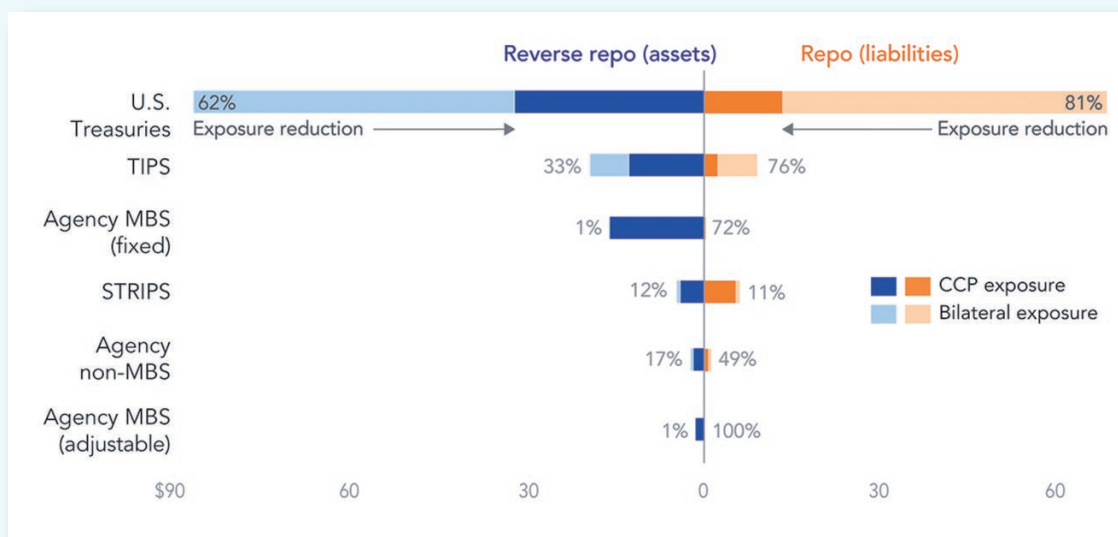
This detail is analogous to the column headings and formats in a spreadsheet. The heading displays the column name and each cell in the column is in a certain format, such as text, number, currency, or percentage.

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.

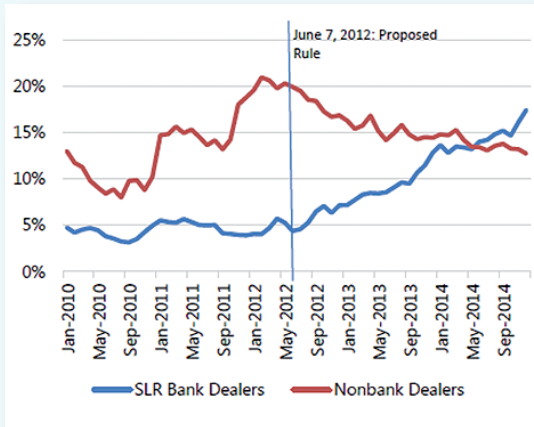
## Key Findings from 2017 Research Papers

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.

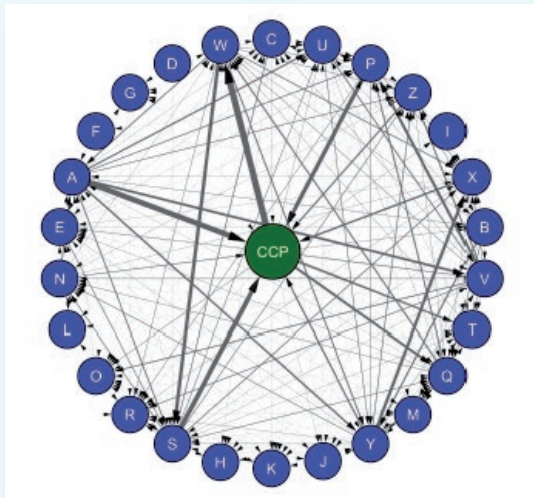
- Expanding central clearing in the repurchase agreement (repo) market could reduce risk exposures for dealers by 81 percent.** The repo market provides short-term financing for financial companies. After the financial crisis, rules made banks more resilient to stress, but also increased the cost of 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)



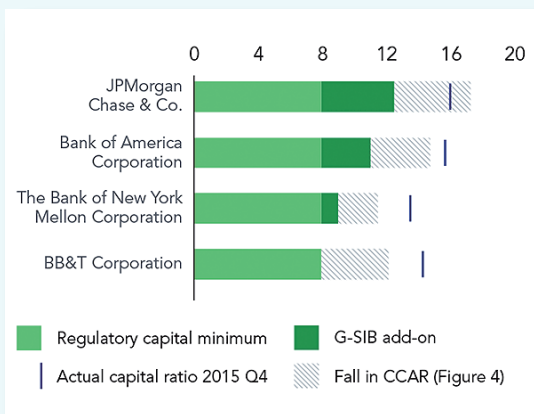
- New leverage rules have affected the repo market.** Bank-owned dealers subject to the rules now borrow less through repo but use lower-quality collateral. Higher bank capital requirements help protect banks against losses, but may have unintended consequences. Regulators use leverage ratios such as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



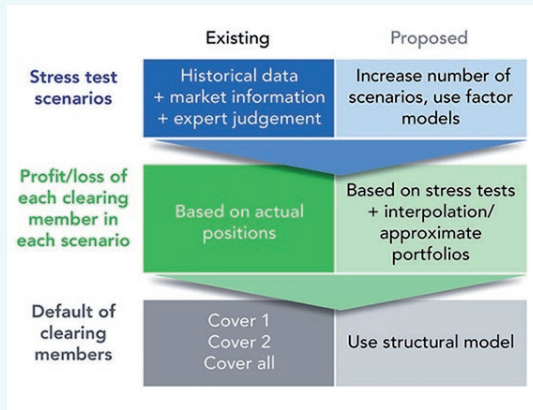
- Firms peripheral to a central counterparty (CCP) network that are net sellers of credit protection contribute more to systemic risk in the credit derivatives market than do central counterparties at the core of the market. A severe credit shock can trigger demands for large payments between counterparties 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)



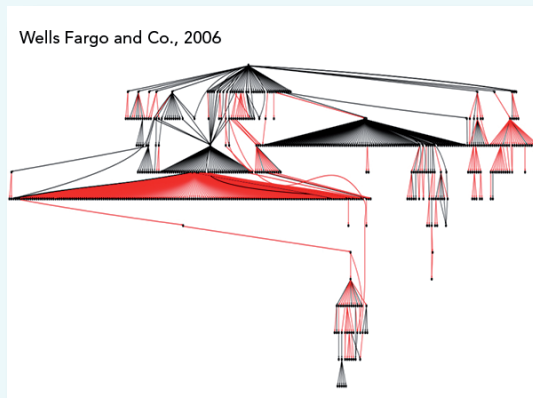
- If the Federal Reserve requires banks to leave their capital buffers untouched during stress tests, banks would be more resilient during a financial crisis but would be required to hold more capital during less-stressed times. U.S. bank regulators are phasing in new capital buffers, which are cushions 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)