

Annual Research Review

Fiscal 2016



Annual Research Review

This first *OFR Annual Research Review* showcases the publications of the Office of Financial Research. The OFR is an independent office within the Department of the Treasury. We are mandated to study and report on potential risks to U.S. financial stability; assess the causes and consequences of financial crises; assess financial stability policy; and improve the accessibility, quality, and scope of financial data.

The OFR's research follows a programmatic approach. The eight program areas are data accessibility, data quality, data scope, central counterparties, market structure, monitors, risks in financial institutions, and stress testing. Each publication described in this research review supports one of these programs. All OFR publications are on our website at financialresearch.gov.

Our FY 2016 body of work includes 14 working papers, 7 briefs, and our first viewpoint. The three series have different goals and ambitions.

Working papers allow members of the OFR staff to disseminate preliminary research findings in a format intended to generate discussion and critical comments. OFR working papers also support the OFR's goal to help build a virtual community of financial stability expertise. Working papers are frequently coauthored with outside experts from academia, industry, and other federal agencies. They are typically written for an academic audience and are often bound for leading economic, finance, and other journals.

Briefs are designed for a broader audience than OFR working papers. They analyze the financial stability implications of financial and regulatory policy and recent developments in the financial system. As in working papers, views and opinions expressed in the OFR Brief Series are those of the authors and do not necessarily represent official positions or policy of the OFR or Treasury.

Viewpoint papers offer the views and opinions of the OFR, unlike other OFR publication series. They may

discuss OFR research, financial stability policies, and data initiatives. Viewpoints are designed for a broad audience, like OFR briefs.

The first viewpoint paper, "Developing Best Practices for Regulatory Data Collections," was published in May 2016. This paper identified pitfalls for financial regulators seeking to collect data from private firms. The OFR, regulators, and the private sector all need comprehensive, high quality, and interoperable data. The paper offered guidelines to regulators to minimize the burden on industry through collaboration and sharing.

Two key themes emerge from our FY 2016 work. First is the importance of our independent voice. The OFR does not make policy, which frees us to take an independent view. Several working papers and briefs in FY16 analyzed the trade-offs and possible unintended consequences of policies that promote financial stability. OFR publications underscore that the financial system has become more resilient because of recent policy changes. But our research has also pointed out other potential consequences of regulations. In some cases, these consequences reflect known trade-offs. In other cases, the consequences appear to be unexpected or unintended.

Second, our recent publications illustrated the importance of our mission to improve financial data. Two reports described the two data collection pilot surveys that the OFR completed in 2016, from participants in the bilateral repurchase agreement and securities lending markets. We plan to proceed shortly with a permanent data collection from the bilateral repo market, with strong support from industry. Critical analysis of the costs and benefits of using central counterparties was made possible by confidential data that the OFR has obtained on the credit default swap market.

To automatically receive new OFR briefs, viewpoints, and working papers, visit our website and subscribe to our e-mail notification service.

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Developing Best Practices for Regulatory Data Collections

By the Office of Financial Research

Published: May 10, 2016

OFR Program: Data Quality

OFR Viewpoint no. 16-01

https://www.financialresearch.gov/viewpoint-papers/files/OFRvp-2016-01_Best-Practices-Data-Collection.pdf

Regulators collect a significant amount of data for supervision, market monitoring, financial stability analysis, and policymaking, and their data needs are increasing. Financial firms use the same or similar data to assess enterprise risks. Their needs also are growing.

The OFR has a unique mandate to serve both needs by improving the scope, quality, and availability of financial data. In this paper, the OFR puts forth a set of best practices for regulatory data collections based on its experience in fulfilling that mandate. The paper offers guidelines for collecting comprehensive, high quality, and interoperable data. It also identifies pitfalls financial regulators may encounter. It concludes that the public and private sectors must collaborate to minimize costs and to get the most out of financial data.

Best practices begin with preparation. The paper describes factors regulators should take into account before beginning a data collection. They should first (1) define the collection's business purpose, (2) design a template, (3) ensure key terms are clear and precise, and (4) prepare collection specifications, so data reporters understand what they must do.

While preparing to collect data, regulators should keep transmission processes in mind. Collecting structured data and following transmission standards will improve collection.

Regulators can use pilot collections and test periods to improve the likelihood that quality data are collected.

Automated validation controls can help identify problems in the collection process. So can feedback on the process from the private-sector entities providing the data.

Regulators should also be aware of common pitfalls in data collection. Those include failure to use an industry data standard when one exists; missing or incomplete data requirements; inaccurate instructions and lack of resources to support data reporters; focus on collecting reports rather than data; inadequate preparation; and ignoring data quality.

Many best practices and common pitfalls apply to both industry and government. However, some concerns are unique to government. Regulators need to think about ways to make the best of existing collections or to work with other agencies.

The paper concludes that regulators need to approach each step in the collection process with attention to detail, while striving for simplicity to build a solid foundation. Also, regulators should remember that analytical needs change frequently and therefore they should build flexibility into the collection system. Finally, more collaboration among regulators should be explored to maximize the value of current requirements for data reporting.

The paper is the first in the OFR's Viewpoint series, designed to present the Office's institutional view on a subject or issue.

The U.S. Bilateral Repo Market: Lessons from a New Survey

By Viktoria Baklanova, Cecilia Caglio, Marco Cipriani, and Adam Copeland

Published: January 13, 2016

OFR Program: Data Scope

OFR Brief no. 16-01

https://www.financialresearch.gov/briefs/files/OFRbr-2016-01_US-Bilateral-Repo-Market-Lessons-from-Survey.pdf

In this brief, the authors describe the first aggregate statistics on the U.S. market for bilateral repurchase agreements (repos), a critical part of the financial system. They estimate the size of the market at \$1.8 trillion in repos and \$3 trillion in reverse repos. In repo transactions, dealers sell securities and receive cash. In reverse repo deals, dealers deliver cash and receive securities.

The repo market is important to the financial system because it provides short-term funding for financial companies and supports market liquidity. During the financial crisis, a run on the repo market stressed liquidity for many firms. Oversight has since improved, but the market remains opaque to regulators and market participants.

In early 2015, the OFR and Federal Reserve, with input from the Securities and Exchange Commission (SEC), surveyed dealers affiliated with nine bank holding companies. Survey respondents accounted for about half of both repos and reverse repos. On average, the survey respondents financed about \$960 billion in the bilateral repo market and provided about \$1.6 trillion in funding to their clients.

The survey focused on bilateral repo trades, and it also included dealers' securities lending trades collateralized by cash. These trades are similar to repo trades in that market participants lend securities for a fee, using cash as collateral.

Because the survey was voluntary, it relied on firms' internal reporting systems and did not impose data standards. This may have affected the quality of the data. The survey also revealed weaknesses in those reporting systems.

The survey was a pilot. The authors conclude that a permanent data collection would encourage firms to improve data quality and provide a fuller picture of the market. U.S. regulators are working with international groups such as the Financial Stability Board to establish data reporting definitions and requirements.

The OFR, Federal Reserve, and SEC conducted a second pilot data collection in the securities lending market. Results of that survey were published in [OFR Working Paper no. 16-08](#) in August 2016.

Note: The OFR plans to proceed shortly with a permanent data collection from the bilateral repo market.

Mind the Gaps: What Do New Disclosures Tell Us About Life Insurers' Use of Off-Balance-Sheet Captives?

By Jill Cetina, Arthur Fliegelman, Jonathan Glicoes, and Ruth Leung

Published: March 17, 2016

OFR Program: Risks in Financial Institutions

OFR Brief no. 16-02

https://www.financialresearch.gov/briefs/files/OFRbr_2016-02_Captive-Insurers.pdf

Some U.S. life insurance companies use wholly owned reinsurers to transfer risk. These captive reinsurers can be an integral part of a life insurer's operations. They can also allow an insurer to reduce regulatory requirements. Use of captives has increased rapidly since 2002.

The authors of this Brief, all from the OFR, analyze data that insurers began to file in 2015 about their captives and the quality of the assets they hold. Public disclosures on captives were limited before then. The authors show that U.S. life insurers' use of captives totaled \$213 billion in reserve credit at the end of 2014. Reserve credit is the dollar amount of credit the insurer receives by using reinsurance. Reinsurance reserve credit reduces the insurer's required reserves by the same amount. While captives were originally used to reduce reserve requirements for lower-risk term life insurance products, they eventually were used for a broader range of higher-risk insurance products, such as variable annuities and long-term care insurance. The authors show that less than a third of total reserve credits are now for lower-risk products.

The filings indicate that 42 U.S. life insurance and reinsurance firms use captives. A number of large firms, generally mutual life insurers, do not use captives. Four of the five top users of captives are reinsurers. The analysis showed asset quality varied among captives, even those captives of the same life insurer. Some captives hold mostly high-quality investments. Others hold what are classified as "other assets." Just four states and Bermuda are home to

the overwhelming majority of captives. The four states have fewer regulators per insurance company than the national average.

The authors conclude that two features of the publicly available data make them insufficient to fully analyze the risks and the impact of captives on insurers' financial condition. First, insurers were not required to disclose the quality of assets for many captives. Only one third of captives, by reserve credit, were required to disclose assets. About one third were outside the scope of the filings because they were not for term life or universal life with secondary guarantees. Another third were excluded due to exemptions. Second, insurers were not required to report the impact of captives on their risk-based capital ratios in 2014. The risk-based capital ratio is an important metric for evaluating an insurer's financial health. The National Association of Insurance Commissioners made changes for 2015 year-end disclosures, but some captive transactions may continue to be exempt.

Still, the authors suggest that the scope and depth of the filings could be expanded to increase transparency about captives. Specifically, it would be useful to have information about the effect of captives on insurers' capital and how insurers use captives for other higher-risk product lines, such as variable annuities and long-term care insurance.

Systemic Importance Data Shed Light on Global Banking Risks

By Bert Loudis and Meraj Allahrakha

Published: April 13, 2016

OFR Program: Risks in Financial Institutions

OFR Brief no. 16-03

https://www.financialresearch.gov/briefs/files/OFRbr_2016-03_Systemic-Importance-Data-Shed-Light-on-Global-Banking-Risks.pdf

During the 2007-09 financial crisis, some of the largest financial institutions in the world failed or survived only with government support. Since then, regulators have put in place tougher standards for banks whose failure could pose a threat to financial stability. Global systemically important banks (G-SIBs) now are required to hold more capital. Once the rules are fully phased-in, the required capital for some U.S. G-SIBs will nearly double.

In this Brief, authors Loudis and Allahrakha, both of the OFR, analyze newly released data for 2014 from the Basel Committee on Banking Supervision on the G-SIBs and other large banks. Regulators use the data to identify G-SIBs. The identification of G-SIBs is based on a systemic importance score for each bank based on its size, interconnectedness, complexity, global activity, and dominance in certain customer services (known as “substitutability”). The authors calculate the scores by applying the Basel Committee’s scoring system to data that companies disclose on their websites. Along with the Brief, the OFR introduced an online interactive chart to help users analyze the data themselves.

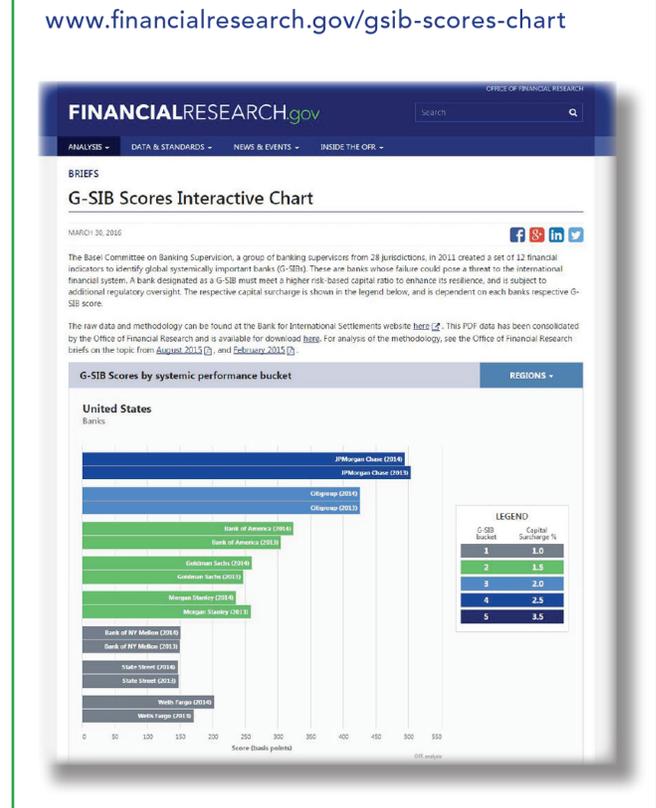
According to the authors, the latest data show that U.S. banks remained among the most systemically important. The systemic importance scores for most U.S. banks changed little since the previous year. Wells Fargo & Co. was a notable exception — its score increased 18 percent. The authors conclude that many of the largest U.S. banks continue to be highly interconnected and lack substitutes for the financial services they offer.

The authors also find that Chinese banks had some of the largest increases in annual systemic importance scores

OFR’s G-SIB Scores Interactive Chart

The OFR has launched an online interactive chart that uses G-SIB data to compare banks’ systemic importance and tracks changes in the 12 underlying financial indicators. Go to:

www.financialresearch.gov/gsib-scores-chart



between 2013 and 2014. Three of the five G-SIBs whose scores increased the most are Chinese banks, and China Construction Bank was added to the list of G-SIBs.

The 2014 data also include for the first time data on banks that filed disclosures but did not meet the threshold to be classified as a G-SIB. The authors report that G-SIBs and non-G-SIBs generally have very different characteristics, with the exception of a handful of borderline banks. Borderline non-G-SIBs are similar to G-SIBs on some systemic importance indicators, but starkly different on others.

Note: The OFR updated the online tool with 2015 data in December 2016.

Credit Ratings in Financial Regulation: What's Changed Since the Dodd-Frank Act?

By John Soroushian

Published: April 21, 2016

OFR Program: Risks in Financial Institutions

OFR Brief no. 16-04

https://www.financialresearch.gov/briefs/files/OFRbr_2016-04_Credit-Ratings.pdf

During the 2007-09 financial crisis, many securities that had received high ratings from credit rating agencies lost a lot of their value. Analysts blamed the agencies for inflating ratings to expand their business. To address this concern, the Dodd-Frank Act required regulators to replace credit ratings with other ways to evaluate credit quality. Credit ratings had become common in rules that set investment standards and determined how much capital banks needed to hold.

In this Brief, author Soroushian of the OFR finds that regulators have turned to three alternatives in response to the Dodd-Frank mandate. Each approach has weaknesses.

In the most common approach, regulators define what makes a security creditworthy, and companies determine whether the securities they hold meet those definitions. The author notes that this approach cedes much of the discretion to the companies, which have an incentive to overstate the quality of their assets to reduce regulatory requirements. Soroushian also notes that these definitions may result in less detailed distinctions among risk levels.

In the second approach, regulators provide models to determine credit quality. Those models can be inaccurate. Market participants also have a strong incentive to game these models, as they did with the rating agencies' models in the lead-up to the crisis.

In the third approach, regulators rely on third parties other than credit rating agencies to set credit standards. This approach may create perverse incentives. Like credit rating agencies, such third parties have an incentive to set standards that benefit their own financial interests.

In addition to mandating regulators to replace credit ratings in regulations, Dodd-Frank required the Securities and Exchange Commission to monitor credit rating agencies, required new disclosures by rating agencies, and increased the agencies' legal liability.

Regulators Introduced Three Types of Alternatives for Credit Ratings

Alternative	Market Participant	Regulation Type
Definitions	Banks Broker-Dealers Money Market Mutual Funds	Asset restrictions
	Banks	Capital requirements when setting criteria for eligible guarantors and collateral
Regulatory Models	Banks	Capital requirements for structured products
Third-Party Classification	Banks	Capital requirements for sovereign and depository institution debt
	Insurance Companies	Capital requirements for residential mortgage-backed securities and commercial mortgage-backed securities

Source: Author's analysis

What Can We Learn from Publicly Available Data in Banks' Living Wills?

By Steve Bright, Paul Glasserman, Christopher Gregg, and Hashim Hamandi

Published: May 25, 2016

OFR Program: Risks in Financial Institutions

OFR Brief no. 16-05

https://www.financialresearch.gov/briefs/files/OFRbr_2016-05_Living-Wills.pdf

The largest U.S. banks submit plans to regulators detailing how they could be wound down after a potential failure without disrupting the financial system. These are called resolution plans or living wills. Can the public tell from those plans what would happen if a large U.S. bank were to fail? That is the question authors Bright, Gregg, and Hamandi of the OFR and Glasserman of Columbia University and the OFR ask in this Brief.

The authors analyzed the public portions of 2014 and 2015 living wills from the eight U.S. bank holding companies identified as global systemically important banks (G-SIBs).

Overall, the authors find that the public information does not provide enough detail to determine if a failing bank could be unwound without government aid. However, even the limited information available appears to confirm regulators' concerns about the quality of living wills and the progress toward making these institutions more resolvable. The Federal Reserve and Federal Deposit Insurance Corporation in April 2016 rejected most of the U.S. G-SIBs' 2015 living wills.

The authors focus on four key attributes of the banks: complexity, interconnectedness, cross-border activities, and a clean parent-company balance sheet.

- **Complexity.** The authors find that the eight banks have not simplified their structures overall. This matters because a simpler organization is easier to resolve. The authors find that differences in how banks describe critical operations, core business lines, and material legal entities make it difficult to compare complexity across firms. The living wills also offer only rough information about how banks would manage complexity in a failure.

- **Interconnectedness.** The public living wills generally contain inconsistent information about links among legal entities within and across firms. The available information is mostly qualitative rather than quantitative. That means that for some banks, there is not enough information to precisely count interconnections.
- **Cross-border activities.** Businesses that operate in multiple countries are harder to resolve, and resolution would require coordination across the various supervisory authorities. Banks are expected to report material supervisory authorities in the public sections of their living wills. The authors find those reports to be uneven and generally nondescript.
- **Parent company balance sheet.** A “clean” balance sheet supports resolvability. A clean balance sheet is one where the parent's assets are limited to investments in the subsidiaries and liquid assets. High levels of capital and liquidity at the parent make the company less likely to fail.

The public portions of living wills are meant to help the public assess the process for managing the failure of a large U.S. bank. The authors conclude that they do not yet serve that purpose because data they contain are limited.

The public filings do, however, provide enough information to show that the largest banks remain complex organizations. They have hundreds of legal entities. The filings provide only rough indications of how the banks would manage that complexity in a failure. The authors say more standardization and consistency in reporting are needed when the G-SIBs submit their next living wills on July 1, 2017.

Looking Deeper, Seeing More: A Multilayer Map of the Financial System

By Richard Bookstaber and Dror Y. Kenett

Published: July 14, 2016

OFR Program: Market Structure

OFR Brief no. 16-06

https://www.financialresearch.gov/briefs/files/OFRbr_2016-06_Multilayer-Map.pdf

Epidemiologists have long used network analysis to track and contain the spread of disease. Authors Bookstaber and Kenett use a similar approach to create a network map that can identify potential paths of contagion in the U.S. financial system.

The network map has three layers. Each layer — short-term funding, collateral, and assets — represents a key function of the financial system (see figure, next page). Layers are linked by the relationships of large banks, central counterparties, and other market participants. By focusing on these relationships, network analysis can help show the resilience of individual counterparties and their impact on the financial system.

The Brief builds on two earlier OFR papers that analyzed a single-layer funding map and a single-layer collateral map. The multilayer map reveals new potential channels of contagion that are not visible in these maps. The authors use the map to understand impacts from the 2007 collapse of two Bear Stearns hedge funds and the later problems of the parent company. Bear Stearns is a good example because its activities spanned all three layers.

Problems began in the asset layer when the value of a benchmark index of securities held by two Bear Stearns hedge funds began falling (see #1 on accompanying figure). Investors in the two hedge funds withdrew money in the funding layer. Lenders to the funds marked down the value of their assets and demanded more collateral (see #2).

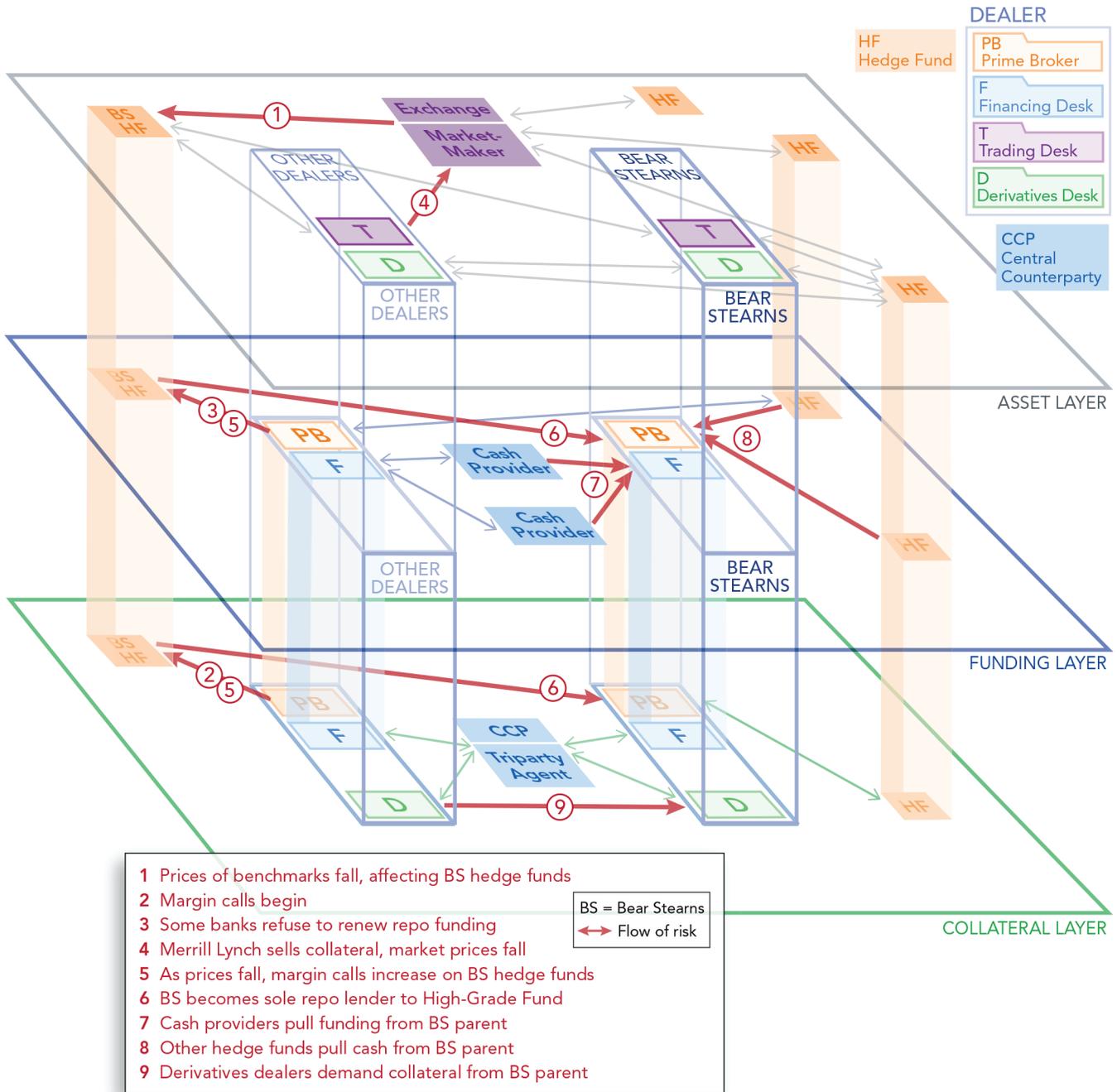
Some lenders refused to renew repurchase agreement (repo) funding with the two hedge funds (see #3). One of the repo lenders seized about \$850 million in subprime securities collateral posted by the Bear Stearns hedge funds, and then began to liquidate the collateral (see #4).

The liquidation drove down the market price for similar securities held by other banks and funds, spreading the impact to other market participants, or nodes, in the asset layer. The contagion quickly spread through the collateral and funding layers (see #5).

Both Bear Stearns funds sold assets at distressed prices to raise cash and eventually collapsed (see #6). In the months that followed in 2008, repo lenders demanded more collateral (see #7). Hedge funds that were customers of Bear Stearns' prime broker pulled out their cash (see #8). Derivatives counterparties shown on the collateral layer of the map demanded more collateral (see #9).

As the example shows, the multilayer map is a promising new tool to analyze financial firms and the relationships among them as potential sources of instability. However, the authors find such analysis requires detailed data about current counterparty exposures and holdings for each layer of the map. U.S. regulators have improved data collections since the financial crisis. The authors argue that these datasets should be expanded and linked to build a clear picture of potential contagion scenarios.

Three-Dimensional Multilayer Network



Source: Authors' analysis

Reference Guide to the OFR's U.S. Money Market Fund Monitor

By Viktoria Baklanova and Daniel Stemp

Published: July 20, 2016

OFR Program: Monitors

OFR Brief no. 16-07

https://www.financialresearch.gov/briefs/files/OFRbr_2016-07_Money-Market-Fund-Monitor.pdf

Money market funds (MMFs) have been popular with investors for decades. They can give investors better returns than bank accounts with low risk. Institutional investors began using MMFs for professional cash management in the 1990s.

During the 2007-09 financial crisis, regulators were unable to see vulnerabilities in MMFs because of a lack of detailed data about fund holdings. Since 2010, MMFs have been required to hold more liquid assets and report detailed data about their holdings to the Securities and Exchange Commission on Form N-MFP.

To make those data more accessible, the OFR developed the [U.S. Money Market Fund Monitor](#). The monitor combines more than four million records of monthly data on the holdings of about 500 funds over five years.

This Brief by authors Baklanova and Stemp, both of the OFR, describes how the monitor can be used to track industry trends and the activities of fund managers. It also explains how the monitor charts the types of assets held, investments by country, and connections between money market funds and securities issuers.

The OFR Money Market Fund Monitor has six interactive and customizable charts.

The first chart, “Investments by Any U.S. MMF,” allows users to find specific funds and track investments. Users can drill down to see details about specific funds, such as the funds’ exposure by country, the names of debt issuers, and the types of assets in the funds’ portfolio.

The “Investments by Fund Category” chart provides a view of industry-wide risks. Users can track investments in each category of MMF by region, country, sector, credit, and asset type.

OFR's U.S. Money Market Fund Monitor

The OFR has launched an online tool for monitoring U.S. money market funds. Go to: www.financialresearch.gov/money-market-funds

U.S. Money Market Fund Monitor

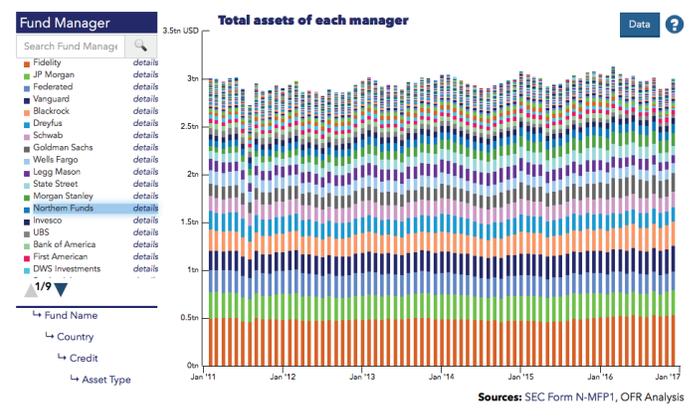
This monitor is designed to track the investment portfolios of money market funds by funds asset types, investments in different countries, counterparties, and other characteristics. Users can view trends and developments across the MMF industry. Data are downloadable and displayed in six interactive charts. The [reference guide](#) contains examples of how to use the monitor and additional information.

Select a chart to display:

Investments by any U.S. MMF

Investments by any U.S. MMF

This chart shows the investments made by each U.S. MMF manager and their individual funds. Start by observing the market shares of all fund managers or search for a single manager. Click on ‘details’ to choose one fund manager and drill down to see its funds. Continue to drill down to see its investments, which are grouped by country, credit exposure, and asset type.



The “Investments by U.S. Prime MMFs” chart tracks the exposures of prime funds to securities issuers. Users can find prime funds’ exposures by region, country, sector, credit, and fund manager.

The “Investments in the Repo Market” chart offers insight into the repurchase agreement or repo market. Users can drill down into the data by repo type, counterparty, fund manager, and fund name.

The “Repos with the Federal Reserve” chart tracks investments by specific funds in the Federal Reserve’s reverse repo facility. The facility pays banks interest on excess reserves held at the central bank. Users of the online tool can view data by fund manager and fund name.

The “Federal Reserve Repo Facility Total Utilization and MMFs’ Participation” chart shows MMFs’ investment in the Federal Reserve’s reverse repo facility by fund type. This chart helps regulators and other users analyze historical trends of fund participation against total use of the reverse repo.

Measuring the Unmeasurable: An Application of Uncertainty Quantification to Financial Portfolios

By Jingnan Chen, Mark D. Flood, and Richard B. Sowers

Published: October 1, 2015

OFR Program: Stress Testing

OFR Working Paper no. 15-19

https://www.financialresearch.gov/working-papers/files/OFRwp-2015-19_Measuring-the-Unmeasurable.pdf

In finance, risk and uncertainty are related but different concepts. Risks exist when different events can occur with measurable probabilities. Uncertainty exists when the probability of the events or the events themselves are not known. For example, risk managers can calculate the risk that stock prices will fall 1 percent on a given day by looking at historical experience. It is much harder to evaluate the probability that such a price decline will result in a systemic crisis because the routes by which a crisis can occur are not all known and do not have known odds. Understanding this type of uncertainty is crucial to financial stability analysis.

In this working paper, authors Chen, Flood, and Sowers use engineering techniques to quantify financial uncertainty. They apply their method to stress test a hypothetical laddered portfolio of Treasury bonds. Stress tests can gauge how a portfolio would theoretically fare in often-harsh scenarios. Since the financial crisis, stress tests have become a key tool for supervisors. In essence, testing lets regulators reduce uncertainty by “certifying” that in certain bounds, a bank or portfolio is probably safe.

The paper’s new measure of economic uncertainty is based on McDiarmid’s distance, a mathematical method for optimal uncertainty quantification (OUQ). Engineers

use OUQ to estimate the probability of a system failure, such as a bridge collapse. It can be applied when the set of events is known, and their probabilities are not known, but can be bounded.

With this technique, the authors first measure economic uncertainty from prices in the Treasury yield curve. They then apply the measure to stress test the Treasury bond portfolio from 2006-2014. The OUQ approach lets them certify the probability that losses from an interest-rate shock will fall within a given range.

The application of McDiarmid’s distance and OUQ techniques require that certain conditions hold. They appear to hold for the authors’ hypothetical portfolio, and the authors make assumptions in conducting their stress test consistent with those requirements. The necessary conditions may not hold in general.

The research supports two conclusions. First, OUQ techniques as applied to the Treasury yield curve allow a new measure of macroeconomic uncertainty. Second, there are challenges to viewing stress tests as a certification of safety, because uncertainty spiked in 2008, just when such certification would have been most useful.

The Difficult Business of Measuring Banks' Liquidity: Understanding the Liquidity Coverage Ratio

By Jill Cetina and Katherine Gleason

Published: October 7, 2015

OFR Program: Risks in Financial Institutions

OFR Working Paper no. 15-20

https://www.financialresearch.gov/working-papers/files/OFRwp-2015-20_Measuring-Banks-Liquidity.pdf

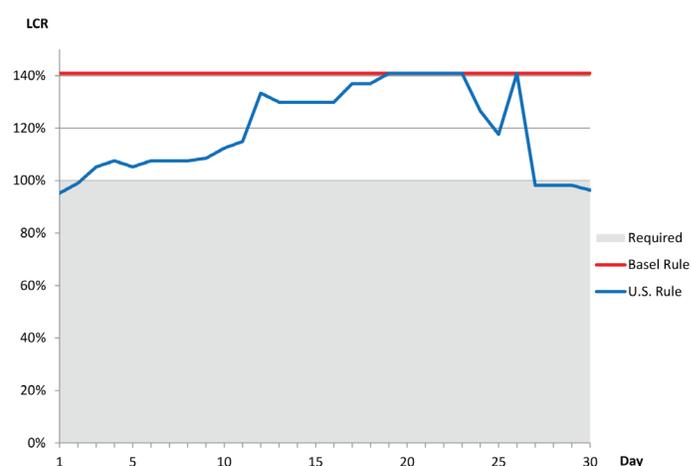
In the wake of the financial crisis of 2007-09, the Basel Committee on Banking Supervision recommended bank regulators adopt a new short-term liquidity requirement, the liquidity coverage ratio (LCR). The goal was to ensure banks could weather another severe liquidity stress. But is the LCR an effective gauge of liquidity risk? That is the question authors Cetina and Gleason, both of the OFR, ask.

The LCR, in simplified form, is calculated as a bank's high-quality liquid assets (HQLA) divided by its net cash outflows over a 30-day stress scenario. The ratio must be at least 100 percent. That is, the bank must have enough HQLA to meet all demands for cash under stress for 30 days. The calculation of HQLA and cash outflows can be complex, involving more than 300 inputs.

European and U.S. regulators have put in place different versions of the LCR. In this working paper, the authors examine the complexities of calculating the ratio under the U.S. definition and the Basel definition. They use examples of those calculations to highlight complexities in interpreting LCRs when banks undertake secured funding transactions that affect both the LCR numerator and denominator, and thus the ratio.

First, the authors describe how the LCR is defined and calculated under the Basel rule. The rule uses adjustments to remove the effects of secured funding transactions. Next, they show that even with those adjustments, there is room for banks to manipulate the ratio under the Basel rule. The U.S. rule addresses that manipulation, but adds the potential for significant divergence from the Basel standard, reducing comparability across banks operating under the two standards.

Volatility of LCR Under the U.S. Rule



Sources: Federal Register, authors' analysis

The authors also show how the formula for calculating the LCR can make interpreting changes in the metric difficult. For example, caps on the numerator and denominator in the ratio introduce nonlinearities that complicate the interpretation. In addition, the U.S. rule includes a measure of maturity mismatch in the denominator to account for the peak one-day net cash outflow during the 30-day window. That adjustment makes a bank's reported LCR more volatile over time and harder to interpret than the Basel LCR.

The authors conclude that LCRs can vary in complex ways unrelated to underlying liquidity risk. They propose a complementary approach to measuring liquidity risk using the gap between HQLA and net cash outflows over a 30-day stress scenario. Regulators could require that HQLA always exceeds net cash outflows, so the gap is positive over the period. They also suggest that liquidity stress testing of banks could address some of the issues with the LCR.

Contagion in Financial Networks

By Paul Glasserman and H. Peyton Young

Published: October 20, 2015

OFR Program: Market Structure

OFR Working Paper no. 15-21

https://www.financialresearch.gov/working-papers/files/OFRwp-2015-21_Contagion-in-Financial-Networks.pdf

How do financial shocks turn into panics and crises? The 2007-09 financial crisis provides several case studies. The failure of Lehman Brothers led investors to pull short-term funding from other firms, creating a broader run that was quelled only with market-wide government guarantees. The American International Group, Inc., for example, was rescued to prevent its failure from creating losses and defaults across the financial system.

There has been a surge in academic research on contagion since the crisis. Much of that research treats the financial system as a network. Firms are connected in the network through financial obligations. Researchers have developed numerous theories to explain how connections in the financial network can make the system more vulnerable to contagion.

This working paper surveys that growing body of literature, synthesizing more than 100 published works. A key issue, according to authors Glasserman of the OFR and Columbia University and Young of the OFR, is how the network of obligations relates to other sources of contagion, such as the leverage and liquidity of individual firms. The tradeoffs these obligations present is also critical to understanding contagion. Obligations among firms can amplify systemic risks by creating channels through which shocks can spread. They can also dampen shocks by diversifying risk.

The authors describe how various network models work. They also describe the practical challenge of assessing the potential contagiousness of individual firms. One approach focuses on the firm's individual characteristics,

such as size, leverage, and asset quality. Another focuses on the firm's position in the financial network. The authors argue that some useful conclusions can be drawn from data about individual firms without knowing the details of the firm's position in the network.

The authors discuss how to measure the tradeoff between connectivity as a channel of contagion and as a way to diversify risk. They argue for models that distinguish between connections within the financial system and connections between financial and nonfinancial firms. They also briefly survey research on contagion caused by common exposures that firms have to similar risks, as opposed to obligations among firms.

Across these topics, the authors point out the problems that a lack of information causes. They argue this is not merely a problem for regulators and analysts. It also creates uncertainty for market participants, which can become particularly acute in times of crisis. The opacity of the network may lead to default cascades and funding runs that would not occur if the network of obligations were better known.

The authors conclude that it is impossible to determine whether connections help or hurt financial stability without weighing other factors that contribute to contagion. They recommend more study of how to measure the size of a systemic event, how to develop more comprehensive accounts of mechanisms that cause contagion, and how to understand the ways opacity may add to contagion.

Regulatory Arbitrage in Repo Markets

By Benjamin Munyan

Published: October 29, 2015

OFR Program: Market Structure

OFR Working Paper no. 15-22

https://www.financialresearch.gov/working-papers/files/OFRwp-2015-22_Repo-Arbitrage.pdf

Regulators have tightened bank capital standards since the 2007-09 financial crisis to ensure banks can stay solvent in the next downturn. But the design of those standards can have unintended consequences.

This working paper finds that foreign banks remove an average of \$170 billion from the U.S. market for triparty repurchase agreements (repos) before each quarter-end in order to appear safer. This activity, called window dressing, reduces their capital requirements under the regulatory leverage ratio, the ratio of a bank's capital to total assets and off-balance sheet exposures.

Author Munyan of the OFR and Vanderbilt University notes that this window-dressing activity results from a difference in how U.S. and overseas bank regulators measure assets to calculate the leverage ratio. European and Japanese regulators calculate the ratio based on quarter-end holdings. U.S. regulators, in contrast, calculate the ratio based on quarterly averages. As a result, U.S. banks don't face the same incentive to window-dress, and the paper finds no evidence that they do.

Repo markets are a key source of short-term funding in the financial system. In a repo transaction, one party sells securities for cash with an agreement to repurchase them at a set time, usually the next day. In a triparty repo, the transaction is cleared through a custodian bank. That contrasts with a bilateral repo, where the parties deal directly. Several studies have suggested that instability in the repo market contributed to the financial crisis.

Munyan uses confidential regulatory data on daily triparty repo transactions since July 2008, provided by the Federal Reserve Board of Governors. This dataset covers the entire triparty repo market. It includes details on how much a dealer (a "cash borrower") borrows. Munyan also uses data since January 2011 on the network of daily repo

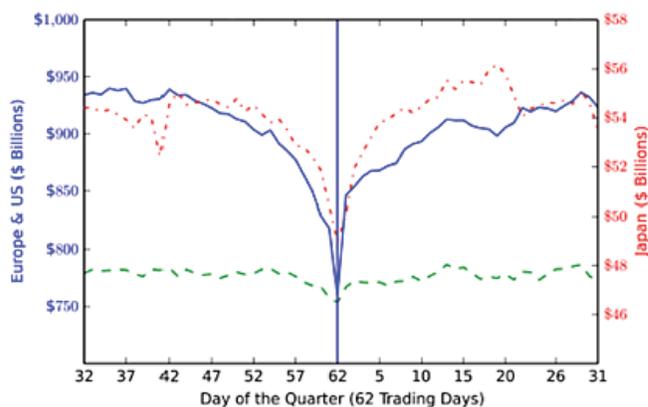
borrowing between dealers and their counterparties ("cash lenders").

It can be hard to pinpoint whether a change in the repo market is due to window dressing or to normal changes in supply and demand. To solve this problem, Munyan uses data sources for both supply and demand. He shows that window dressing has occurred among non-U.S. bank dealers each quarter since the financial crisis.

This window dressing creates spillover effects in other markets, especially the agency bond markets and money market funds. It is a significant effect. The average \$170 billion of window-dressing that Munyan identifies at each quarter-end is more than double the \$76 billion drop in triparty repo during the financial crisis.

The author concludes that using quarter-end measures, as the non-U.S. banks do, creates incentives to window dress that can understate systemic risk. The findings support a policy recommendation that capital requirements should be based on quarter averages.

Repo Outstanding Each Day of a Quarter by Dealer Region



Source: Federal Reserve Board of Governors

Safe Assets as Commodity Money

By Maya Eden and Benjamin Kay

Published: November 25, 2015

OFR Program: Risks in Financial Institutions

OFR Working Paper no. 15-23

https://www.financialresearch.gov/working-papers/files/OFRwp-2015-23_Safe-Assets-Commodity-Money.pdf

When safe financial assets such as Treasury bills are viewed as so liquid that they can serve as a type of money, how does that affect financial markets? One view of the 2007-09 financial crisis holds that a contraction in the supply of money-like assets was among the causes. Securities that until then were seen as very safe and liquid suddenly appeared risky. They then became illiquid.

In this working paper, authors Eden of the World Bank and OFR and Kay of the OFR examine the systemic implications of the supply of liquid safe assets. The authors develop a mathematical model to explore how liquid safe assets facilitate trading of risky assets by serving as a medium of exchange for those assets. They find that financial markets may be remarkably resilient to changes in the stock of liquid assets.

The authors argue that, because the production of safe assets requires real resources and because safe assets carry coupon payments that are valued regardless of their use as a medium of exchange, it is appropriate to view such assets as commodity rather than fiat money. A commodity money, such as gold, has value in and of itself, because of purposes it can serve other than as money, or value

derived from assets backing it. In contrast, a fiat money has value because governments require its acceptance in certain trades. Economists have long studied the properties of these two kinds of money.

The paper's model yields several implications of safe assets serving as a medium of exchange for risky assets. First, changes in the quantity of safe assets can have real effects on the volume of trading of risky assets. When safe assets are scarce, as in a liquidity crisis, increasing the supply of safe assets increases trading in risky assets and economic welfare. Second, when agents can produce safe assets, they overproduce them compared to what is optimal. However, when the model is calibrated assuming reasonable liquidity premia, the inefficiency from that overproduction is small. The overproduction has little impact on the allocation of resources and the cost of producing safe assets is small.

The authors conclude that a monetary system that relies on safe assets as a medium of exchange is relatively efficient, unlike a system relying on commodity money. That safe assets are valued independently from their use as a medium of exchange means that, when such assets are abundant, the economy can have enough liquidity.

Stressed to the Core: Counterparty Concentrations and Systemic Losses in CDS Markets

By Jill Cetina, Mark Paddrik, and Sriram Rajan

Published: March 8, 2016

OFR Program: Stress Testing

OFR Working Paper no. 16-01

https://www.financialresearch.gov/working-papers/files/OFRwp-2016-01_Stressed-to-the-Core.pdf

What would happen to a bank if its largest counterparty defaulted on its debts?

Bank regulators have been interested in this for some time, and the Federal Reserve has built the question into its Comprehensive Capital Analysis and Review (CCAR) stress tests of bank holding companies (BHCs). In the CCAR, banks must consider the default of the counterparty that would owe the bank the most money on credit default swaps (CDS) during a stress event. Such a scenario is relevant given events like those involving American International Group, Inc. (AIG) during the financial crisis. AIG had written hundreds of billions of dollars in CDS protection to banks, and a failure to pay would have resulted in losses for those firms.

It turns out that direct effects of such a counterparty default are only part of the story. Banks' indirect exposures to the same counterparties are often even larger than their direct exposures: in some instances up to nine times larger.

In this working paper, authors Cetina, Paddrik, and Rajan of the OFR looked at detailed data about the CDS market to evaluate the impact on banks from default of their largest counterparties. These counterparties could be connected to other counterparties so that a default would have effects throughout the system. In the credit default swap market, banks' exposures are actually concentrated in a small number of counterparties. As a result, indirect effects matter, and in some cases the source of the largest indirect effects might not be a BHC's largest counterparty.

To assess direct and indirect effects, the authors use the same stress test scenarios that the Federal Reserve used for its stress tests in 2013, 2014, and 2015. Using data on the full U.S. CDS market, the authors stress CDS positions for both BHCs and other financial institutions. The authors compare the direct impact of the default of a BHC's largest counterparty with the impact of indirect losses of the largest counterparty on the BHC's other counterparties.

The authors compare the risks that BHCs face individually to what they face as a group, using a concentration index that quantifies how much each counterparty would owe to the banking system as a whole under the 2015 CCAR stress scenario. They find those payoffs to be highly concentrated. The index reading is similar to a market exposed to just three counterparties.

The U.S. CDS market has been changing and evolving. Between 2013 and 2015, BHCs have moved from being net sellers of credit protection to net buyers. This change suggests a shift of risk from the banking sector to nonbanks. The authors show that the concentration of banks' counterparty exposures increased during that time.

These findings inform the evaluation of stress tests. By using granular contractual information, the OFR researchers provide new insights on economic loss by BHCs under financial distress. By considering the banking system as a whole, they highlight a macroprudential perspective on stress testing. By analyzing the full financial network, they identify areas where losses may be large and systemic risk concerns may develop.

Form PF and Hedge Funds: Risk-measurement Precision for Option Portfolios

By Mark D. Flood and Phillip Monin

Published: March 23, 2016

OFR Program: Risks in Financial Institutions

OFR Working Paper no. 16-02

https://www.financialresearch.gov/working-papers/files/OFRwp-2016-02_Form-PF-and-Hedge-Funds.pdf

How much risk do hedge funds pose to the financial system? This has long been a difficult question to answer because, until recently, hedge funds had limited regulatory reporting requirements.

That changed in November 2011, when the Securities and Exchange Commission and Commodity Futures Trading Commission announced a rule mandating that hedge funds file Form PF. Through Form PF, hedge funds confidentially report their risk profiles, key counterparties, and large positions, among other things. Advisors submitted their first reports in 2012.

Authors Flood and Monin of the OFR ask whether these new data have made the question easier to answer. They find there is room for improvement in how well the statistics reported reflect the actual risks in hedge fund portfolios.

Because the Form PF data are confidential, the authors simulated thousands of fund portfolios with long and short positions in equities and equity options. The weights were set so all simulated portfolios would appear identical on Form PF with regard to market risk. In other words, based on Form PF information, regulators might expect all funds to be equally risky. The authors then evaluated the risk in the simulated portfolios in ways other than what is reported on the form.

The analysis shows that funds with identical Form PF filings could have very different actual risk exposures. The range was especially large among portfolio managers who used options but did not report value-at-risk on Form PF. According to the authors, Form PF is an imprecise tool for measuring hedge fund risk. Regulators could make the form more precise by requiring funds to report certain specific risk statistics, such as value-at-risk.

Stopping Contagion with Bailouts: Microevidence from Pennsylvania Bank Networks During the Panic of 1884

By John Bluedorn and Haelim Park

Published: March 30, 2016

OFR Program: Risks in Financial Institutions

OFR Working Paper no. 16-03

https://www.financialresearch.gov/working-papers/files/OFRwp-2016-03_Stopping_Contagion_in_the_1884_Panic.pdf

How might a bailout of a systemically important bank prevent a full-scale banking panic? Authors Park of the OFR and Bluedorn of the International Monetary Fund look back in time to see more clearly today. They construct a new dataset on Pennsylvania state banks from around the United States' Panic of 1884 to study that question.

In the Panic of 1884, a run ensued on Metropolitan National Bank, a large New York City correspondent bank for many banks outside the city. The run led to its temporary closure. The authors find that banks outside the city felt some effects from the run. However, a bailout orchestrated by New York Clearinghouse member banks prevented the problems with Metropolitan from spreading and becoming a broad, systemic event.

To study the Panic, the authors traced amounts due from each Pennsylvania state bank to other banks. That let the authors pinpoint the Pennsylvania banks' use of correspondent banks in New York City and calculate their exposure to the city banks (see figure).

In those days, local banks deposited their reserves either in banks in regional reserve cities or in central reserve banks in New York. That connected the New York banks to banks from all over the country. Like today's systemically important banks, these New York City banks were large and interconnected. Banks also were connected to each other by clearinghouses — regional groups that settled balances among member banks.

The authors study the dynamics of deposit and lending growth before and after the panic at the Pennsylvania banks. They find that Pennsylvania banks with greater

exposure to New York City banks had statistically significant declines in equity capital growth and increases in nonperforming assets in the quarters after the panic. There also is some evidence the banks held more liquid assets and were more dependent on deposits as a financing source. But, over the longer term, those differences disappear. The only longer-term impact found is that the more highly exposed Pennsylvania banks during the Panic reduced the use of correspondent deposits afterwards.

This paper makes three key contributions to the literature on bailouts. First, it provides the first microeconomic analysis of the effects of the 1884 bailout on banks outside New York. Second, it shows how financial shocks run through networks. Third, it shows empirically that collective support mechanisms can stabilize the financial sector during a crisis.

Correspondent Bank Network of Pennsylvania, 1883



Source: State bank reports (1883)

Does Unusual News Forecast Market Stress?

By Harry Mamaysky and Paul Glasserman

Published: April 20, 2016

OFR Program: Monitors

OFR Working Paper no. 16-04

https://www.financialresearch.gov/working-papers/files/OFRwp-2016-04_Does-Unusual-News-Forecast-Stress.pdf

Does today's news predict future stress in financial markets? This working paper addresses this question using natural language processing, a technique for analyzing text in documents such as news articles. Authors Mamaysky of Columbia University and Glasserman of Columbia and the OFR find that market sentiment, together with the "unusualness" of news, helps to explain volatility in stock prices several months later. Volatility is a common measure of market stress.

Their result is interesting for at least two reasons. First, it demonstrates that textual information can have predictive power. Second, it predicts stress several months out, which could give regulators another way to monitor markets.

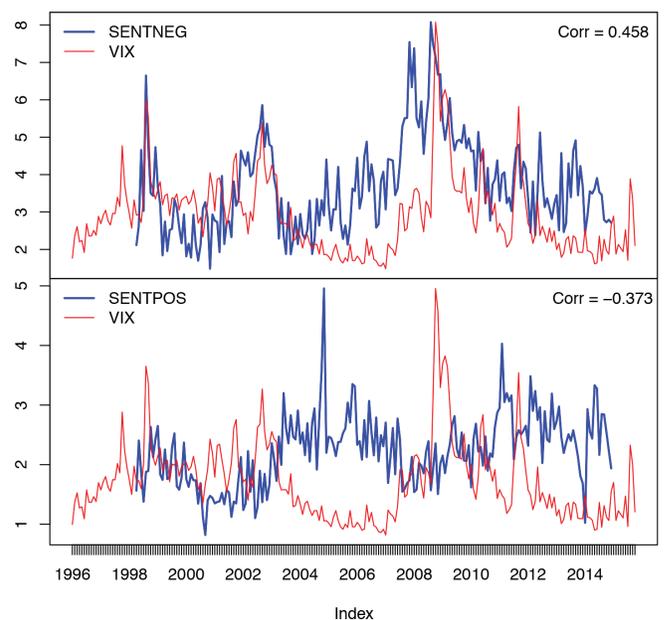
The authors analyzed 367,331 news articles from 1996 through 2014 about the world's biggest banks, insurance companies, and real estate firms. They looked at whether phrases in the articles could be seen as positive or negative. They also measured whether those phrases were unusual compared with past use. For example, the phrase "cut its price target" could be seen as negative, but in the context of financial news, it is routine. The phrase "the collapse of Lehman," which became common in September 2008 amid the financial crisis, is not only negative but also unusual in the context of previous news. It is this unusualness that the authors find to predict volatility for both individual company stocks and for the stock market as a whole.

The results suggest that markets do not absorb news instantly (see figure). It can take four to six months for markets to process the news. The authors theorize that an unusual news item may need to appear in the press repeatedly over a period of time before the public reacts to it and

it generates market stress. They also show that investors need time to hedge against such stress.

The findings have implications for financial stability monitoring. Regulators and others could monitor the news for unusual items that could predict future financial stress.

Aggregate Sentiment and Market Volatility (VIX)



Note: SENTNEG stands for negative sentiment; SENTPOS stands for positive sentiment. VIX is a measure of market volatility. Each series computes the proportion of all n-grams in a month that are classified as negative or positive sentiment. Correlation between sentiment and VIX is in the upper right-hand corner of each chart.

Sources: Bloomberg L.P., Thomson Reuters Corp., authors' analysis

The Real Consequences of Bank Mortgage Lending Standards

By Cindy M. Vojtech, Benjamin S. Kay, and John C. Driscoll

Published: May 11, 2016

OFR Program: Risks in Financial Institutions

Working Paper no. 16-05

https://www.financialresearch.gov/working-papers/files/OFRwp-2016-05_Real-Consequences-of-Bank-Mortgage-Lending-Standards.pdf

Do changes in banks' standards for mortgage lending matter? Authors Vojtech and Driscoll of the Federal Reserve Board and Kay of the OFR find they do in this working paper.

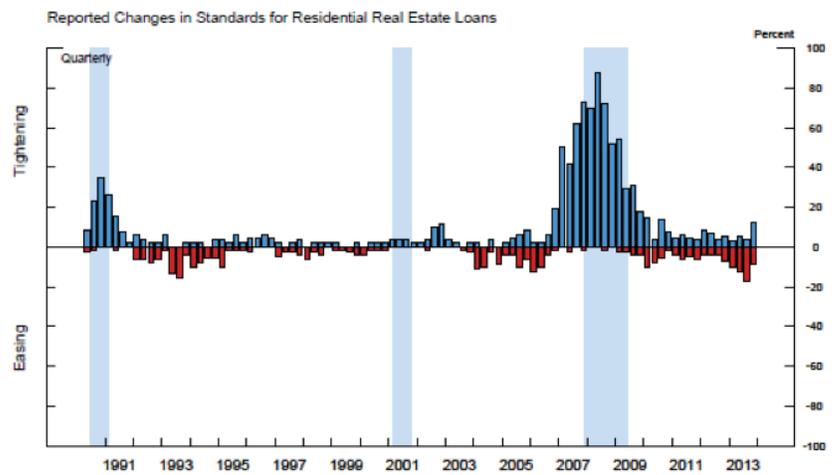
To answer this question, the authors match two long-running datasets about the mortgage market. One provides information about individual loan applications, collected under the Home Mortgage Disclosure Act (HMDA).

The other provides bank loan officers' own views about whether their bank has eased or tightened lending standards during the past quarter, collected in the Federal Reserve's Senior Loan Officer Opinion Survey (see figure). The authors analyze the survey data at the bank level, allowing a more detailed view of how lending standards affect loan denial rates than is possible with the aggregated data available publicly.

The authors find that when banks reported they had tightened their lending standards from the previous quarter, their loan-denial rates increased by about 1 percentage point. That translated to a drop in total mortgage approvals of about 4,420 loans, or \$690 million, for the quarter. Reports of an easing of standards led to a similar-size decline in denial rates, and thus more loans approved.

The authors also look at whether denial rates were affected by a bank's decision to hold the loan in their portfolio or sell it in a pool of mortgages through a process known as

Reported Changes in Standards for Residential Real Estate Loans



Note: Figure shows percentage of senior loan officers reporting their bank had tightened or loosened mortgage standards.

Source: Senior Loan Officer Opinion Survey

securitization. The data show that when standards tightened, denial rates rose less at banks that securitized their loans than they did at banks that held the loans. In other words, loan standards had less of an impact on denial rates for securitizing banks.

Approvals of high-interest-rate loans — which the authors use as a proxy for subprime and nontraditional mortgages — were between 14 percent and 20 percent lower when bankers reported tighter standards.

The authors also find that banks reporting tighter standards showed lower delinquency rates two years later. This suggests the change in lending standards led to better loan performance. In turn, this means that reports of changing standards can serve as a leading indicator of banking industry vulnerability to shocks.

Finally, the authors find that house prices fall in areas where banks tighten standards. This may happen because higher denial rates reduce housing demand.

A Map of Collateral Uses and Flows

By Andrea Aguiar, Richard Bookstaber, Dror Y. Kenett, and Thomas Wipf

Published: May 26, 2016

OFR Program: Market Structure

OFR Working Paper no. 16-06

https://www.financialresearch.gov/working-papers/files/OFRwp-2016-06_Map-of-Collateral-Uses.pdf

Collateral arrangements can spread a stress event in the financial markets. Those arrangements are with bilateral counterparties, triparty banks, and central counterparties. But financial market participants typically do not have a clear understanding of the movements and transformation of collateral that occur.

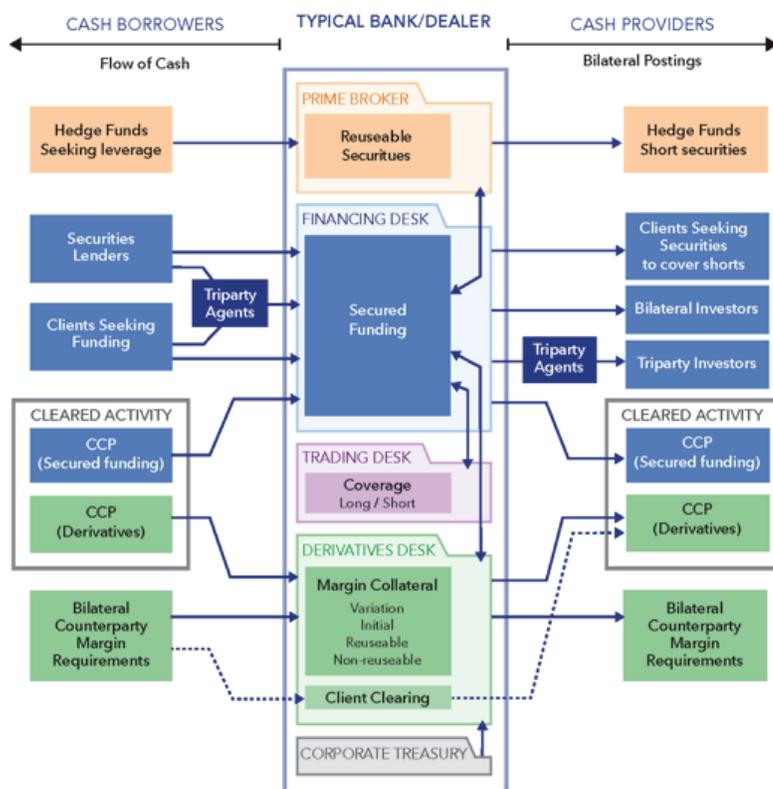
In this working paper, authors Kenett of the OFR, Bookstaber of the OFR and the University of California, and Aguiar and Wipf of Morgan Stanley, present a collateral map of the financial network (see figure). The map shows the links among the network's collateral, derivatives, and funding components. Collateral fuels secured funding, and secured funding fuels market-makers' ability to buy and sell assets. Buying and selling assets, in turn, creates market risk. Investors can hedge that risk with derivatives transactions. And derivatives positions once again bring collateral into play. Collateral is exchanged to reduce exposures, alleviate counterparty credit concerns, and protect clearing members from counterparty defaults.

Collateral changes hands for different reasons. It can be pledged to obtain secured funding, borrowed for short-selling, loaned to earn incremental revenue, or exchanged to obtain higher quality securities. The map shows the main channels of collateral flows are bilateral, triparty, and through central clearing parties (CCPs).

The authors give examples showing how the map can be used to see financial system vulnerabilities. One example is the 2011 escalation in the European debt crisis when a CCP nearly doubled margin requirements for Spanish

and Italian sovereign debt. Another example concerns how some clearing brokers exited the business because of stricter capital rules. The rule change led some of the remaining clearing brokers to request noncash collateral from clients.

The Collateral Map: Critical Agents and Flows



CCP = Central Counterparty
Source: Authors' analysis

Does OTC Derivatives Reform Incentivize Central Clearing?

By Samim Ghamami and Paul Glasserman

Published: July 26, 2016

OFR Program: Central Counterparties

OFR Working Paper no. 16-07

https://www.financialresearch.gov/working-papers/files/OFRwp-2016-07_Does-OTC-Derivatives%20-Reform-Incentivize-Central-Clearing.pdf

Since 2009, G-20 countries have sought to reduce systemic risk by requiring banks to clear standardized, over-the-counter (OTC) derivatives contracts through central counterparties (CCPs). To encourage that shift, regulators set higher capital and collateral requirements for banks that continue to trade derivatives bilaterally (see figure, next page).

In this working paper, Ghamami of the OFR and Glasserman of the OFR and Columbia University develop a model of OTC clearing to compare the total capital and collateral costs of derivatives traded bilaterally and those cleared through a CCP.

The cost comparison is key. Without a cost advantage to use a CCP, market participants may customize contracts to trade them bilaterally and may be less inclined to move legacy trades to CCPs. The paper does not address client clearing.

To analyze the cost incentives, the authors use supervisory Federal Reserve data from five large bank holding companies. The dataset includes the interbank OTC derivatives markets and banks' direct exposures to derivatives CCPs. The authors find that clearing through a CCP is sometimes more expensive for banks.

The analysis identifies three factors that drive the costs in favor of central clearing or bilateral netting. The first factor is the tradeoff between bilateral netting versus multilateral

netting through a CCP. The authors show that CCPs' multilateral netting does not necessarily reduce exposures more than bilateral trading.

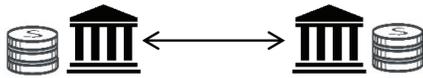
The second factor is margin period of risk. This is the length of time from a counterparty's default until a derivatives position is closed out. The margin period of risk helps set initial margin and capital requirements. This interval is now set at five days for centrally cleared OTC derivatives and 10 days for bilateral trading. With all else equal, this difference favors central clearing.

The third factor is a bank's required contribution to a CCP guarantee fund. The fund is held by a CCP for protection if a clearinghouse member defaults. CCP regulations leave substantial ambiguity about the appropriate size of guarantee funds. Guarantee funds carry both a collateral and capital cost. The authors conclude the costs of guarantee funds are a significant factor in banks' decisions whether to use central clearing. The research finds that cost incentives are not necessarily in favor of central clearing, and when they are it might be due to insufficient guarantee fund requirements.

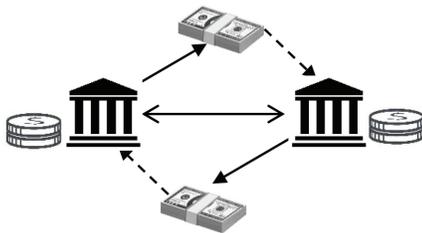
The authors note their analysis was limited by shortcomings in the Federal Reserve dataset. Such gaps may limit regulators' efforts to monitor the impact of OTC derivatives reform.

Bilateral Market

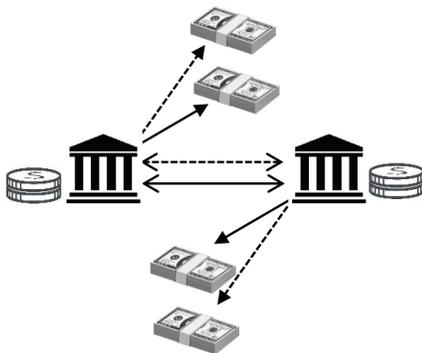
In a bilateral transaction, two banks enter into a swap. Each bank holds capital to absorb potential losses if the other party fails to make promised payments.



Under new rules, each bank is required to set aside initial margin, which is collateral that guarantees required payments.



Collateral reduces each bank's exposure to the other party and therefore reduces the amount of capital each bank must hold.

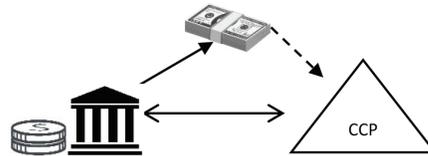


Without netting, separate initial margin must be calculated for different types of trades. Netting allows pooling of collateral and reduces collateral costs.

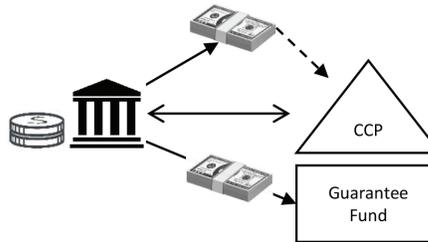
Source: Authors' analysis

Centrally Cleared Market

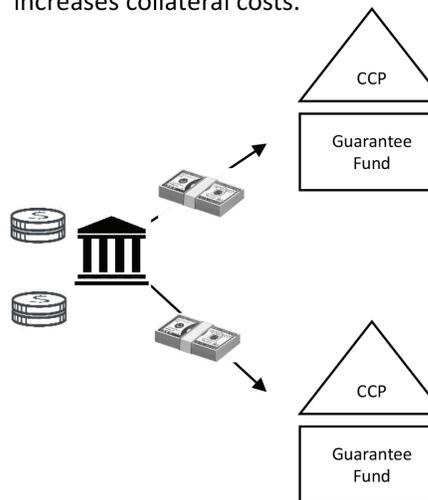
With central clearing, the bank posts initial margin to the CCP. The CCP does not post initial margin to the bank.



The bank also contributes to the CCP's guarantee fund and holds capital against the risk of loss from the CCP.



When a bank trades through multiple CCPs, it posts separate initial margin and guarantee fund contributions to each CCP. The loss of netting opportunities increases collateral costs.



A Pilot Survey of Agent Securities Lending Activity

By Viktoria Baklanova, Cecilia Caglio, Frank Keane, and Burt Porter

Published: August 23, 2016

OFR Program: Data Scope

Working Paper no. 16-08

https://www.financialresearch.gov/working-papers/files/OFRwp-2016-08_Pilot-Survey-of-Securities-Lending.pdf

Securities lending is critical to market functioning. Securities lending provides a temporary addition to the supply of stocks, corporate bonds, U.S. Treasuries, and other securities on demand. But that lending also has risks. Some securities lenders had losses during the 2007-09 financial crisis from reinvesting cash collateral in risky securities.

Data about securities lending are scant. In partnership with the Federal Reserve and Securities and Exchange Commission (SEC), the OFR conducted a pilot survey to fill some of the gaps. The voluntary survey, reported on in this working paper, gathered loan-level data from seven securities lending agents. Agents help match up lenders and borrowers. They also help manage the loan collateral.

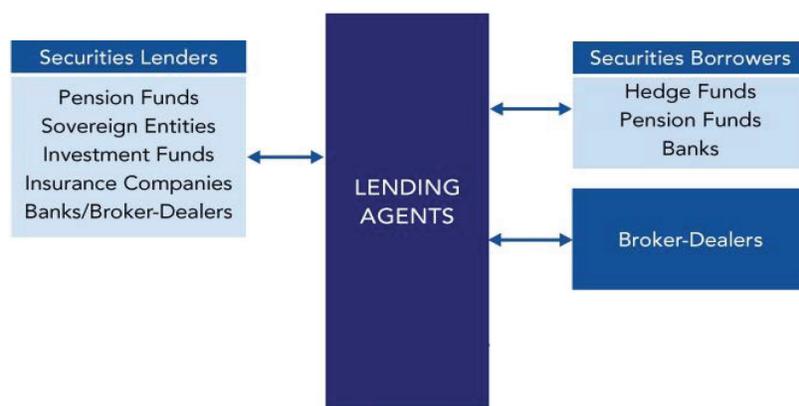
The survey captured a significant share of total U.S. securities lending activity but did not include all lending agents or lending conducted without agents. Respondents reported their available securities inventory, outstanding securities loans, and collateral details at the close of three business days in 2015: Oct. 9, Nov. 10, and Dec. 31.

Authors Baklanova of the OFR, Caglio of the Federal Reserve Board, Keane of the Federal Reserve Bank of New York, and Porter of the SEC found that the aggregate market value of securities available for lending averaged \$9.4 trillion over the three dates. An average \$1 trillion in securities loans were outstanding, or about 11 percent of the lendable assets. Collateral backing the loans was nearly evenly split between cash (\$532 billion) and noncash (\$487 billion).

Borrowers most often sought U.S. stocks, which accounted for an average \$315 billion of the securities loans. A close second were U.S. Treasuries and government agency securities at around \$302 billion. The biggest group of borrowers was broker-dealers. They borrowed an average of \$869 million worth of securities. Banks were a distant second and borrowed \$142 million in securities.

The survey also sheds light on who is most active in the market. The largest lenders were pension funds and governmental entities, each with about \$330 billion on loan. The authors note that securities lending may introduce risks to the financial system if a lender reinvests cash collateral in higher yielding, but less liquid securities. They conclude comprehensive data are needed to help regulators identify and address potential systemic risks.

Main Securities Lending Participants



Source: Authors' analysis

Interconnectedness in the Global Market

By Dror Y. Kenett and Matthias Raddant

Published: September 27, 2016

OFR Program: Market Structure

OFR Working Paper no. 16-09

https://www.financialresearch.gov/working-papers/files/OFRwp-2016-09_Interconnectedness-in-the-Global-Financial-Market.pdf

The global financial system is complex, with many cross-border connections among companies and markets. These connections play a dual role. On the one hand, they can absorb shocks and lead to greater robustness. On the other hand, they can propagate shocks and create fragility.

Authors Kenett of the OFR and Raddant of Kiel University study the statistical interconnections among stock markets globally. They investigate if there is a global stock market and through what channels a shock to stock prices in one market can be transmitted across markets.

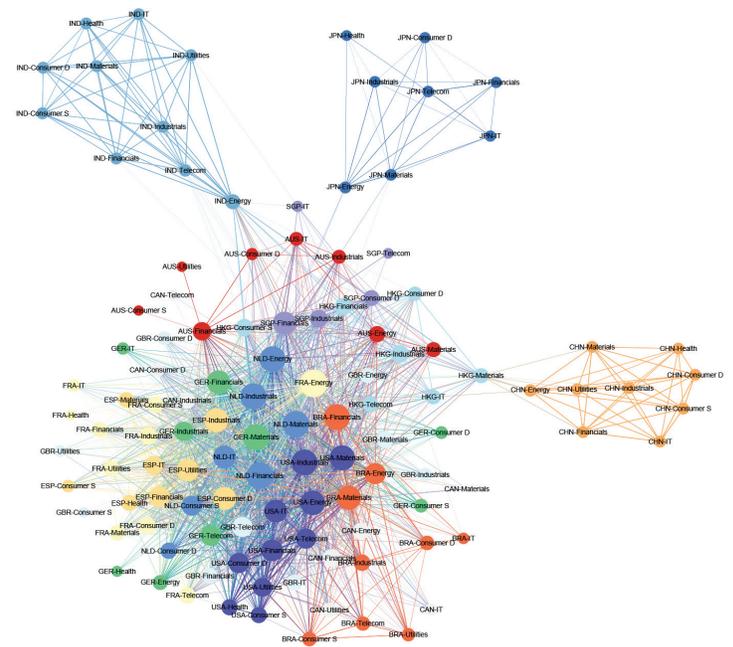
The authors analyze daily and weekly closing prices of nearly 4,000 stocks in 15 countries from 2006 to 2013. They choose stocks that were included in a country's benchmark index, such as the S&P 500 Index, or had significant market capitalization and trading volume. They normalize the stock returns and estimate the statistical relationship across pairs of stocks.

The authors represent the estimated stock relationships in terms of country and sector networks. Each stock is a node. Its interdependencies are links to other nodes. The network structure shows whether and how strongly stocks are linked. The number of links between stocks determines the network structure.

The evolution of the network structure — the comovements of stock returns across markets — is revealing. Countries like the U.S. and Germany routinely are core nodes, with more interconnections. Stock returns usually are more closely connected within than across regions. In crises, this pattern fades, and stocks globally move more in sync.

For example, before the 2007-09 financial crisis, American stock returns generally were linked to each other, not to other countries' returns, forming an independent group

Network Based on Averaged, Estimated Dependencies from Weekly Stock Prices



Source: Standard & Poor's Compustat, Thomson Reuters Datastream, authors' analysis

in the network. The same was true for European stocks. Some Asian stock markets were loosely linked to Europe's. Chinese stocks were interconnected, but largely independent of other countries' stocks. During this period, the financial services sector was the driving force for the network structure.

In sharp contrast, in the financial crisis, all developed markets' stocks were closely connected. The markets of South Korea, China, and India were weakly connected satellites in the network. Links among energy and materials stocks were more dominant during the crisis. By 2012, the network structure had normalized and resembled its pre-2008 levels.

A key finding is that the frequency of stock market data matters for the results. The analysis of weekly closing prices shows that financial services stocks have the most links, followed by industrial stocks. Analysis of daily closing prices instead shows more links for energy and materials stocks. The difference may indicate that fast-moving commodity prices influence stocks in their sectors, while slow-moving factors drive comovements in the financial services and industrial sectors.