Remarks by OFR Director Richard Berner at the Third Annual Workshop on Financial Interconnectedness

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The Bank for International Settlements, the Netherlands Bank, the Deutsche Bundesbank, and the Review of Finance hosted the workshop.

Thank you to the organizers and BIS for the opportunity to address this research conference on "Global Financial Interconnectedness." The OFR was established to identify, monitor, and assess threats to financial stability, so improving our collective understanding of the interconnectedness of the global financial system is essential for achieving the OFR mission.

The financial crisis exposed critical gaps in our analysis and understanding of the financial system, in the data used to measure and monitor financial activities, and in the policy tools available to mitigate potential threats to financial stability. These gaps — in analysis, data, and policy tools — contributed to the crisis and hampered efforts to contain it.

Interconnectedness loomed large among those gaps. The pre-crisis growth of finance was plainly evident and still is much analyzed, especially here in Basel.[1] But until the crisis, the parallel increase in the connections and complexity of the global financial system was less well-understood. Neither regulators nor market participants appreciated fully the relationships among interconnectedness, risk-taking, and financial stability. Nor did they possess much information on firms' indirect exposures to one another and the risks involved. These gaps in analysis and data hindered efforts to assess which tools might make the financial system more resilient.

This research conference and the papers presented here show that we are making progress in closing these gaps. But I am sure the discussions here will also underscore how much more there is still to do. In that context, I'll frame some of the issues, explain what we at the OFR are doing to address them, and conclude with an agenda for future research.

Specifically, I'll try to answer three questions:

1. How do we define, analyze, and monitor the vulnerabilities that arise from interconnectedness?
2. Do we have the data we need to monitor and evaluate those vulnerabilities?
3. What policy tools are needed to mitigate them and how should we calibrate them?

How should we analyze vulnerabilities that arise from interconnectedness? Complex and diverse links among financial market participants across financial activities and borders are perhaps the defining characteristic of the modern financial system. Indeed, they are what make it a system, rather than merely a collection of individual firms and markets. Connections can be direct, indirect, or both. For example, firms are directly connected through mutual counterparty exposures and indirectly connected to other firms who are counterparties of their counterparty. Similarly, firms are indirectly connected through holdings of correlated portfolios of assets.

Interconnectedness creates both economic benefits and financial vulnerabilities. The process of financial intermediation can be simple, but to satisfy complex client needs, firms may innovate, turn to new products, and connect to specialized firms to obtain them. The rapid growth of securitization and the derivatives markets before the crisis was a good example. Such services reduced the costs of intermediation and helped to diversify or share risks. Other services provide the processing required for completing financial transactions. In these ways, connections can contribute to a more efficient and resilient financial system.

However, interconnections can also act as channels for transmitting or amplifying financial shocks. Liquidity or credit shocks in one part of the financial system may spread to other parts, resulting in runs and fire sales. Interconnected systems or networks tend to be more opaque. The opacity of exposures among firms and markets can trigger individually rational but collectively procyclical behavior, amplifying the effects of an initial shock. And more concentrated, highly interconnected systems with a few key players can be particularly vulnerable to shocks.[2]

Three aspects of interconnectedness illustrate these benefits and costs. Linkages involved in systems for payments, clearing, and settlement offer clear benefits for efficiency and risk management. Recognizing those benefits, financial reforms required central clearing of over-the-counter — or OTC — derivatives in centrally cleared counterparties, or CCPs, and minimum margin standards. But there are also costs: Such requirements apply only to standardized derivatives contracts, so bilateral counterparty exposures persist in bespoke products. Equally, central clearing creates a single point of vulnerability for the failure of the system — the CCP — that must be managed carefully.

Second, interconnectedness among different types of financial firms and markets and across borders can create an uneven playing field among market participants and jurisdictions that may have different laws and regulatory frameworks.

Finally, interconnections within the corporate structures of large, complex financial firms may also entail benefits and costs. For example, a large, complex financial firm may pool — and thus conserve — liquidity or capital across legal entities with different regulatory

requirements. Or it may manage the risk of different legal entities individually. One approach may involve more risk than the other.

Analyzing and monitoring interconnectedness, and the benefits and vulnerabilities it creates requires a system-wide, granular approach. The literature contains two broad methodologies. One relies on estimation of models from market price data and perhaps some details on quantities. Such a non-network approach relies on the validity of the model and its applicability to stress events. Examples include the development of so-called cross-sectional measures like CoVar, the default insurance premium (DIP), Co-risk, and marginal expected shortfall.[3] The other approach considers financial networks that account for possible concentrations in both direct and indirect exposures. These methodologies may be combined with models to illustrate behavior. Of course, networks typically require a substantial volume of consistent, granular data.[4] At the OFR, we are pursuing both approaches in a variety of ways.

The OFR Financial Stability Monitor is an example of the non-network approach. It is a framework that allows us to look across the system at five categories of risk: macroeconomic, market, credit, funding and liquidity, and contagion. With this functional taxonomy of risks, the monitor enables us to measure and track risks in each category wherever they occur in the financial system — in banks, shadow banks, other nonbanks, and markets — and to examine the interplay among the categories. We update this monitor and supporting data semi-annually on our website.

Interconnectedness is reflected in our monitor's assessment of contagion risk, finding expression in three indicators. We use sovereign credit/bank feedback and potential fire sale risks in the banking system to consider contagion via changes in asset values. We look at U.S. banks' foreign claims to consider direct linkages, which can transmit or amplify spillovers from one jurisdiction to another.

Constructing and analyzing financial networks is more complicated, but we have taken two related approaches to network analysis. First, we are mapping significant portions of the financial system to understand real-world interconnections among institutions and markets. Such mapping exercises are similar to that of researchers at the Federal Reserve Bank of New York in mapping the shadow banking system.[5] Financial maps help tie institutional and analytic features to the relevant part of the financial system and the phenomena in question. For example, we have mapped sources and uses for liquidity and funding in securities financing transactions, highlighting the roles of broker-dealers, hedge funds, and other borrowers, and the roles of lenders such as money funds and asset managers.[6][7] We are developing, or will use, analogous maps for collateral use and payments, clearing and settlement systems to track operational and other risks.

Our second approach is to develop analytical techniques to animate the networks. For example, an OFR paper develops an agent-based model based on the previously mentioned map of funding and collateral flows to analyze the financial system's vulnerability to fire sales and runs.[8] A second paper estimates the extent to which interconnections increase expected losses and defaults under a wide range of shock distributions.[9] The innovation in this setup is that analysis of network risks is possible even without highly detailed knowledge of the network structure.

Two other OFR papers focus on potential risks in central clearing of OTC derivative transactions. In one, the authors show that concentration risks to the CCP posed by large clearing members can grow over time.[10] The concentration increases the exposure of a CCP to the failure of its largest clearing members. A second shows that CCP margin charges collectively create incentives for swap dealers to split their positions among multiple CCPs, effectively "hiding" potential liquidation costs from each CCP.[11] Absent sharing of information among CCPs, the result could be a "race to the bottom" in which the CCP with the most optimistic view of liquidation costs drives competitors out of the market.

These analyses of interconnectedness are critical for our policy judgments. Equally important, researchers and policymakers need detailed, consistent data on derivatives transactions and counterparty exposures to assess and monitor interconnectedness and related threats to financial stability. Regulators across jurisdictions and countries must also share data consistently and regularly. Yet challenges remain in collecting granular data, in assuring the confidentiality and security of those data, and in developing methodologies to reconstruct the full network from partial information, when full data are unavailable.

To fill these needs, we at the OFR have several initiatives underway:

- Vulnerabilities and data gaps persist in so-called securities financing transactions, including repo, and securities lending. The markets for these critical short-term funding instruments remain vulnerable to runs and asset fire sales. As already noted, we've mapped the sources and uses of such funds to help us look holistically at these markets, assess risks, and identify gaps in available data. The OFR's recently published "Reference Guide to U.S. Repo and Securities Lending Markets" employs a comprehensive framework to demonstrate the similarities and interactions between these markets.[12] And the paper draws a roadmap for OFR projects to collect critical, transaction-level data on bilateral repo and securities lending activities.

- We are helping the Commodity Futures Trading Commission and other regulators improve data quality in registered swap data repositories. These repositories are designed to be high-quality, low-cost collection points for data that are critical to understand exposures and connections across the financial system. The OFR and the CFTC are collaborating to enhance the quality, types, and formats of data collected.

To ensure global consistency in these data, we are also collaborating with our counterparts at the Bank of England and the European Central Bank, and through work organized by the Committee on Payments and Market Infrastructures and the International Organization of Securities Commissions, known collectively as CPMI-IOSCO.

- We are also improving the quality of financial data by developing and promoting the use of data standards. We have led a foundational initiative among governments and private industry worldwide to establish a global Legal Entity Identifier or LEI — a data standard that is like a bar code for precisely and uniquely identifying parties to financial transactions. If the LEI system had been in place in 2008, the industry, regulators, and policymakers would have been better able to trace the exposures and connections of Lehman Brothers and others across the financial system. The LEI initiative has become fully operational in just a few years. But ubiquity is needed to realize its full benefits, so I have called for mandating its use for regulatory reporting.
- Improving the quality of data available to evaluate risks in CCP operations is also critical. With the notable exception of the BIS' Redbook collection,[13] existing data collections have been limited in scope. Following a recommendation from our Financial Research Advisory Committee, we will engage relevant authorities to plan ways to improve the quality and scope of such data. We intend to build on existing plans from CPMI-IOSCO and the Federal Reserve Bank of New York. Our advisory committee recommended collecting data on a clearing-service basis and including details related to markets and jurisdictions of operation, resources, collateral structure, settlement relationships, initial margin and guaranty fund sizing, stress testing, and recovery tools.

I have outlined some ingredients for good data and good analysis. Of course, the ultimate goal is good policy. What interconnectedness tools should we put into the macroprudential toolkit and how should we calibrate them?

In the past five years, the policy toolkit to address vulnerabilities arising from interconnectedness has improved substantially. The adoption of new rules for capital and liquidity strengthened banking systems globally, and policymakers have sought to incorporate interconnectedness in the development of the banking rule book.

Examples of new banking rules that consider interconnectedness are methodologies by the Basel Committee on Banking Supervision and International Association of Insurance Supervisors that place 20 percent and 40 percent weights, respectively, on interconnectedness in determining the size of the capital add-ons for global systemically banks and insurers. These policies are intended to create incentives for reducing interconnectedness and increasing the resilience of large entities within the financial system.

However, there is much more to do, especially outside banks and across the rest of the financial system. Vulnerabilities can arise in nonbank financial intermediaries and in markets. Both micro- and macroprudential tools will likely be needed to address them.

Work to identify risks in nonbank entities should identify the activities that can give rise to vulnerabilities. Use of derivatives, secured funding, illiquid asset concentrations, counterparty credit concentrations, and obligations of CCP membership may all contribute to the interconnectedness of these firms in ways that could be relevant to financial stability. An activities-based approach will also help target policy measures — such as counterparty concentration limits, large position monitoring, and liquidity tools to manage redemption risks. Finally, an activities-based approach may require policy tools aimed at markets rather than at entities, such as minimum floors for repo haircuts to reduce excessive reliance on short-term, wholesale funding.

The tools needed to manage the concentrated risk in CCPs are relatively well known, including risk management, appropriate default waterfalls, skin in the game, and recovery and resolution tools. But there is debate over how such tools should be implemented. And margin proposals for non-centrally cleared derivatives, especially for initial margin, are still controversial.

In my view, regular stress testing is one of the best tools available for assessing potential sources of vulnerabilities and for calibrating microprudential requirements, such as for capital based on firms' idiosyncratic risks. I think stress tests might also be used to calibrate macroprudential tools, including those aimed at building resilience across the system. At the OFR, we are required by statute to evaluate stress tests and similar tools. A key area of stress-testing-related research is risk-propagation or contagion in stress testing. In this regard, network approaches and agent-based modeling can be helpful in moving stress testing toward a system-wide framework. One example is a recent OFR working paper that presents a dynamic macroprudential stress testing framework.[14] Our contributions to a forthcoming Basel Committee working paper suggest that second-round effects using network methods materially affect their assessment of risks.

I'll conclude by looking ahead. Although research on interconnectedness in the financial system has grown substantially since the crisis, several challenges must be addressed to advance our understanding. I'll name three: Can we develop metrics and tools to quantify and analyze operational risks, including cybersecurity threats? How can we sort out benefits and costs from interconnectedness? And how can we better share data securely and appropriately for the benefit of policymakers and researchers?

Interconnectedness can be a source of resilience and efficiency. And alone, risks that connections create may not threaten financial stability. Yet, combined with other vulnerabilities like leverage and concentration, they may pose financial stability risks and

thus requires monitoring. We need granular data to assess and monitor risk. Finally, we need to evaluate the macroprudential toolkit regularly, because static policies won't keep up with financial innovation and the migration of financial activity to less-overseen and potentially less-resilient parts of the financial system.

My hope is that we can collaborate to translate better data and better research into better policy decisions to improve the global regulatory framework.

Thank you again for the opportunity to be here today and for your attention. I'll be happy to take some questions.

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1. "Why does financial sector growth crowd out real economic growth?" by Stephen G Cecchetti and Enisse Kharroubi, BIS Working Papers No. 490, February 2015 ↩
2. Then Fed Vice-Chair Yellen provided an excellent discussion in "Interconnectedness and Systemic Risk: Lessons from the Financial Crisis and Policy Implications," at the American Economic Association/American Finance Association Joint Luncheon, San Diego, California, January 4, 2013 ↩
3. For a discussion of these and other indicators, see Dimitrios Bisias, Mark Flood, Andrew W. Lo, Stavros Valavanis, "A Survey of Systemic Risk Analytics," OFR Working Paper #1, January 2012. ↩
4. For a discussion of the pros and cons of each approach, see Gazi Kara, Mary Tian, and Margaret Yellen, "Taxonomy of Studies on Interconnectedness," FEDS Notes, July 31, 2015. ↩
5. See Zoltan Poszar, Tobias Adrian, Adam Ashcraft and Hayley Boesky, "Shadow Banking," Federal Reserve Bank of New York, Economic Policy Review, December 2013↩
6. See Andrea Aguiar, Richard Bookstaber and Thomas Wipf, "A Map of Funding Durability and Risk," OFR Working Paper 14-03, May 2014. ↩
7. Such detailed financial maps dovetail with the Federal Reserve's initiative to enhance the financial accounts of the United States with more detailed, more timely, and higher-frequency information than in the current quarterly framework. See Paul Smith, "Launching the Enhanced Financial Accounts," FEDS Notes, August 28, 2015. ↩
8. See Richard Bookstaber, Mark Paddrik and Brian Tivnan, "An Agent-Based Model for Financial Vulnerability," OFR Working Paper 14-05,September 10, 2014 ↩
9. See Paul Glasserman and Peyton Young, "How Likely is Contagion in Financial Networks," OFR Working Paper #9 2013 and Journal of Banking and Finance 2014. ↩

10. See Agostino Capponi, W. Allen Cheng, and Sriram Rajan, "Systemic Risk: The Dynamics under Central Clearing." OFR Working Paper 15-08, May 2015 ↩

11. See Paul Glasserman, Ciamac C. Moallemi, and Kai Yuan, "Hidden Illiquidity with Multiple Central Counterparties," OFR Working Paper 15-07, May 2015 ↩

12. Viktoria Baklanova, Adam Copeland, and Rebecca McCaughrin, "Reference Guide to U.S. Repo and Securities Lending Markets," OFR Working Paper 15-17, September 9, 2015 ↩

13. http://www.bis.org/list/cpmi/tid_57/index.html ↩

14. See Dror Y. Kenett, Sary Levy-Carciente, Adam Avakian, H. Eugene Stanley, and Shlomo Havlin "Dynamical Macroprudential Stress Testing Using Network Theory," OFR Working Paper 15-12, 2015. ↩