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# Interdisciplinary Approaches to Financial Stability

University of Michigan Law School

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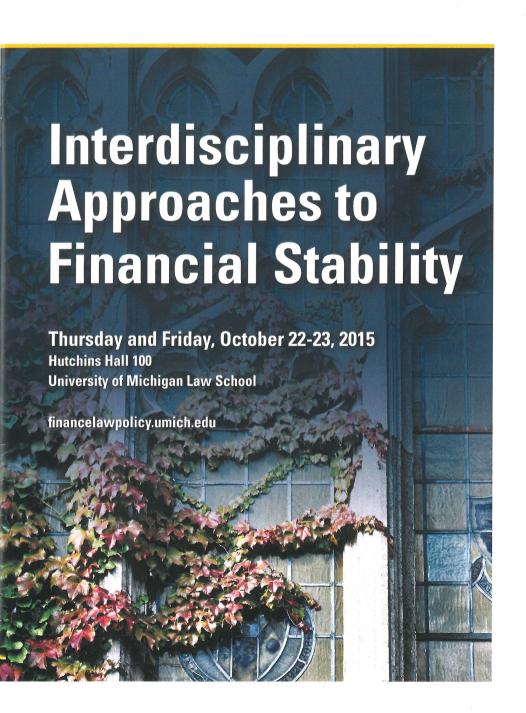
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# Interdisciplinary Approaches to Financial Stability

Thursday and Friday, October 22-23, 2015
Hutchins Hall 100
University of Michigan Law School

financelawpolicy.umich.edu/

- 6 Conference Schedule
- 10 Presenter Bios
- **22** About the Sponsors

#### WELCOME

It is our pleasure to welcome you to Interdisciplinary Approaches to Financial Stability, co-hosted by the Office of Financial Research and the University of Michigan Center on Finance, Law, and Policy.

The 2007-2009 financial crisis revealed the pressing need to develop better methods to understand and manage risk in the financial system. Since the crisis, financial regulators, scholars, and the financial industry have turned their attention to these issues, but they face serious challenges.

Over the course of the next two days, this conference will explore how methods from diverse fields—such as system analysis, agent-based modeling, and data visualization and security—can be used to better identify, measure, monitor, and mitigate risks to the financial system. The conference will draw on new perspectives from cross-sectoral research to examine approaches for making the financial system safer, fairer, and better harnessed to the real economy.

We would like to thank the Smith Richardson Foundation, the University of Michigan Law School, the University of Michigan College of Engineering, and the University of Michigan Stephen M. Ross School of Business, whose generous support helped make the conference possible. The Center on Finance, Law, and Policy also thanks Paul Lee, Bill Marcoux, Stefan Tucker, and Ron Glancz for their support.

We look forward to an engaging and productive conference.

Sincerely,

#### **Richard Berner**

Director Office of Financial Research

#### Michael S. Barr

Roy F. and Jean Humphrey Proffitt Professor of Law University of Michigan Law School

Faculty Director
University of Michigan Center on Finance, Law, and Policy

### **THURSDAY, OCTOBER 22**

All sessions will be held in Hutchins Hall 100, unless otherwise noted

8:00-8:30 AM	Registration and Continental Breakfast
8:30-8:45 am	Welcome and Conference Overview Michael S. Barr, University of Michigan
8:45—9:30 ам	<b>Keynote Address Richard Berner</b> , Office of Financial Research

#### PANEL I: NEW APPROACHES TO UNDERSTANDING RISK

9:30–11:00 AM Moderator, John R. Birge, University of Chicago

**Panelists** 

J. Doyne Farmer, University of Oxford Jeffrey Golden, London School of Economics Sendhil Mullainathan, Harvard University Susan M. Wachter, University of Pennsylvania

11:00-11:15 AM Break

#### PANEL II: RESPONDING TO FUNDAMENTAL CHALLENGES

11:15 AM-12:45 PM

Moderator, Michael S. Barr, University of Michigan

**Panelists** 

Jeremy I. Bulow, Stanford University

Lisa Donner, Americans for Financial Reform

Simon A. Levin, Princeton University

Hans Morris, Nyca Partners

Michael P. Wellman, University of Michigan

12:45-1:45 PM

Lunch

Lawyers Club Lounge, 551 South State Street

#### PANEL III: SHARING FINANCIAL DATA-CHALLENGES IN A NETWORKED WORLD

2:00-3:30 PM

Moderator, Mark D. Flood, Office of Financial Research

**Panelists** 

Douglas Burdick, IBM Research

**John Henry Clippinger,** Massachusetts Institute of Technology

H.V. Jagadish, University of Michigan David Saul. State Street Corporation

3:30-3:45 PM

Break

3:45-4:00 PM

Welcome

Mark D. West, Dean and Nippon Life Professor of Law,

University of Michigan Law School

4:00-5:00 PM

**Keynote Address** 

Sir Paul Tucker, Harvard University

#### FRIDAY, OCTOBER 23

All sessions will be held in Hutchins Hall 100, unless otherwise noted

8:00-8:30 AM

Continental Breakfast

8:30-8:45 AM

Welcome and Reconvene

#### PANEL IV: SYSTEMIC RISKS IN NON-FINANCIAL SYSTEMS

8:45-10:15 AM

Moderator, Sir Paul Tucker, Harvard University

**Panelists** 

Hung-po Chao, Energy Trading Analytics
Joshua M. Epstein, Johns Hopkins University

Sanjoy K. Mitter, Massachusetts Institute of Technology

Elisabeth Paté-Cornell, Stanford University

10:15-11:15 ам

**Keynote Conversation** 

**MACRO-PERSPECTIVES ON FINANCIAL RISK** 

AND THE GLOBAL ECONOMY

**Lawrence H. Summers, Harvard University** 

David Wessel, Brookings Institution

## PANEL V: MEASURING, ANTICIPATING, AND TESTING SYSTEMIC RISK IN FINANCIAL SYSTEMS

11:15 AM-12:45 PM

Moderator, Amiyatosh Purnanandam, University of Michigan

**Panelists** 

Sujit Kapadia, Bank of England

Caroline Liesegang, European Central Bank

Matthew Richardson, New York University

Til Schuermann, Oliver Wyman

12:45-2:00 PM

**Keynote Address and Lunch** 

Andrew G. Haldane, Bank of England

2:00-2:15 PM

Break

# BREAKOUT SESSIONS ON MITIGATING AND CONTROLLING SYSTEMIC RISK IN FINANCIAL SYSTEMS

Hutchins Hall 100, 120, 132, 218, 220, and 236

2:15-3:00 PM

Session Leaders

Michael S. Barr, University of Michigan
Diana Farrell, JPMorgan Chase Institute
Paul Glasserman, Columbia University
Stefan Nagel, University of Michigan
Uday Rajan, University of Michigan

Laurie S. Schaffer, Federal Reserve Board

#### PANEL VI: REPORT BACK ON BREAKOUT SESSIONS

3:00-3:45 PM

Moderator, Diana Farrell, JPMorgan Chase Institute

**Panelists** 

Michael S. Barr, University of Michigan Paul Glasserman, Columbia University Stefan Nagel, University of Michigan Uday Rajan, University of Michigan

Laurie S. Schaffer, Federal Reserve Board

3:45-4:00 PM

**Closing Remarks** 

Richard Berner, Office of Financial Research

**Michael S. Barr** is the Roy F. and Jean Humphrey Proffitt Professor of Law at the University of Michigan Law School. From 2009 to 2010, he served as the U.S. Department of the Treasury's assistant secretary for financial institutions and was a key architect of the Dodd-Frank Wall Street Reform and Consumer Protection Act. He is currently a nonresident senior fellow at the Center for American Progress and the Brookings Institution. Barr conducts large-scale empirical research regarding financial services and researches and writes about a wide range of issues in financial regulation. He previously served as Treasury Secretary Robert E. Rubin's special assistant, as deputy assistant secretary of the Treasury, as special adviser to President William J. Clinton, and as a special adviser and counselor on the policy planning staff at the U.S. Department of State.

**Richard Berner** has served as the director of the Office of Financial Research since January 2013. In this capacity, he leads the office that serves the Financial Stability Oversight Council, its member agencies, and the public by improving the quality, transparency, and accessibility of financial data and information; by conducting and sponsoring research related to financial stability; and by promoting best practices in risk management. Berner previously served as counselor to the U.S. Secretary of the Treasury. Before joining the U.S. Department of the Treasury, he was co-head of global economics at Morgan Stanley. He also has worked at Mellon Bank, Salomon Brothers, Morgan Guaranty Trust Company, Wharton Econometrics, and the Federal Reserve Board. Berner received his bachelor's degree from Harvard College and his PhD from the University of Pennsylvania.

**John R. Birge** is the Jerry W. and Carol Lee Levin Professor of Operations Management at the University of Chicago Booth School of Business. Previously, he was dean of the McCormick School of Engineering and Applied Science, professor of industrial engineering and management sciences at Northwestern University, and professor and chair of industrial and operations engineering and the Financial Engineering Program at the University of Michigan. His work focuses on application, theory, and computation for decision-making under uncertainty, including optimal asset allocation, risk management, and integration of operations and finance.

**Jeremy I. Bulow** is the Richard A. Stepp Professor of Economics at Stanford Business School. He served as the director of the Federal Trade Commission's Bureau of Economics from 1998 to 2001. Bulow was co-editor of the *American Economic Review* from 2005 to 2008. His research has covered a variety of topics including pension funds, sovereign debt, auctions, and tobacco. He has served as a consultant to government agencies including the Pension Benefit Guaranty Corporation, the World Bank, the British Radiocommunications Authority, and the Federal Reserve. In the private sector, he has consulted with companies in oil, telecoms, credit cards, software, and Internet search. Bulow is a fellow of the Econometric Society and of the American Academy of Arts and Sciences.

**Douglas Burdick** has been a researcher at IBM Research—Almaden in San Jose, Calif., since 2010. His research at IBM focuses on information extraction and entity integration, with application to the financial domain. Burdick also was an early contributor to SystemML, IBM's open source machine learning system. Prior to joining IBM Research, Burdick was a researcher at MITRE from 2007 to 2010 and focused on schema matching and cyber security. He received his PhD in computer science from the University of Wisconsin—Madison in 2007.

**Hung-po Chao** is the president of Energy Trading Analytics, LLC. Previously, he served as director of market monitoring and then director of market strategy and analysis at ISO New England. Before that, he held various research management positions at the Electric Power Research Institute and was a consulting professor at Stanford University. He received his PhD in operations research and economics (minor) from Stanford. He is the author, coauthor, or co-editor of three books, seven book-length reports, and more than 60 research and policy papers published in leading journals including *Operations Research, American Economic Review*, the *Journal of Regulatory Economics*, and the *Electricity Journal*.

John Henry Clippinger is a research scientist at the Massachusetts Institute of Technology Media Lab Human Dynamics Group, where he is conducting research on trust frameworks for protecting and sharing personal information. With MIT Professor Alex Pentland, he is the founder and executive director of the newly formed ID3 (Institute for Institutional Innovation and Data Driven Design), which is developing an open governance platform to support an ecosystem for data-driven services, infrastructures, and enterprises. Previously, he was founder and codirector of The Law Lab at the Berkman Center for Internet and Society at Harvard University. Clippinger also was a senior fellow at the Berkman Center, where he cofounded and supported the development of an open source, interoperable identity framework called Project Higgins to give users control over their personal information.

**Lisa Donner** is the executive director of Americans for Financial Reform (AFR), a coalition that brings together more than 200 national, state, and local groups to work together to reform the financial industry. Members of the coalition include consumer, civil rights, labor, community, faith-based, and business groups, as well as economists and other experts. AFR's goal is a financial system that is fairer for consumers, and that better serves an equitable and sustainable real economy, rather than putting it at risk. Prior to joining AFR, Donner was the executive director of the Half in Ten Campaign and the codirector of the Center for Working Families. In these roles she developed and promoted policy on fair taxes, work and family, anti-poverty measures, and green jobs. Before that, Donner was a union and community organizer and campaign strategist.

Joshua M. Epstein is a professor of emergency medicine at Johns Hopkins University, director of the Johns Hopkins Center for Advanced Modeling, and codirector of its Systems Institute. He holds joint appointments in applied mathematics, civil engineering, economics, environmental health sciences, biostatistics, and international health, and is an external professor at the Santa Fe Institute. A pioneer in agent-based modeling, Epstein has authored seminal books including *Growing Artificial Societies: Social Science from the Bottom Up*, with Robert Axtell (MIT Press, 1996); *Generative Social Science: Studies in Agent-Based Computational Modeling* (Princeton Press, 2006); and *Agent\_Zero: Toward Neurocognitive Foundations for Generative Social Science* (Princeton University Press, 2013). He holds a PhD from the Massachusetts Institute of Technology, has taught at Princeton University, and has lectured worldwide. In 2008, he received a National Institutes of Health Director's Pioneer Award and, in 2010, an honorary doctorate of science from Amherst College, his alma mater.

J. Doyne Farmer is the director of the complexity economics program at the Institute for New Economic Thinking at the Oxford Martin School, a professor in the Mathematical Institute at the University of Oxford, and an external professor at the Santa Fe Institute. His current research is in economics, including agent-based modeling, financial instability, and technological progress. He was a founder of Prediction Company, a quantitative automated trading firm that was sold to the United Bank of Switzerland in 2006. His past research includes complex systems, dynamical systems theory, time series analysis, and theoretical biology. During the 1980s, he was an Oppenheimer Fellow and the founder of the Complex Systems Group at Los Alamos National Laboratory. While a graduate student in the 1970s, he built the first wearable digital computer, which was successfully used to predict the game of roulette.

**Diana Farrell** is the founding president and chief executive officer of the JPMorgan Chase Institute. She previously was the global head of the McKinsey Center for Government and the McKinsey Global Institute. Farrell served in the White House as deputy director of the National Economic Council and deputy assistant to the president on economic policy from 2009 to 2011. During her tenure, she led interagency processes and stakeholder management on a broad portfolio of economic initiatives. Farrell also coordinated stakeholder engagement around the passage of the Dodd-Frank Act and served as a member of the President's Auto Recovery Task Force. She has a BA from Wesleyan University and an MBA from Harvard Business School.

Mark D. Flood completed his undergraduate work at Indiana University in Bloomington, where he majored in finance (BS, 1982), and German and economics (BA, 1983). In 1990, he earned his PhD in finance from the Graduate School of Business at the University of North Carolina at Chapel Hill. He has taught finance and business at universities in the United States and Canada, and worked as a financial economist on issues of regulatory policy and risk management at the Federal Reserve Bank of St. Louis, the Office of Thrift Supervision, the Federal Housing Finance Board, and the Federal Housing Finance Agency. He was a founding member of the Committee to Establish a National Institute of Finance. He is currently a research principal in the U.S. Department of the Treasury's Office of Financial Research. His research has appeared in a number of scholarly journals, including the Review of Financial Studies, the Annual Review of Financial Economics, Quantitative Finance, the Journal of International Money and Finance, and the Federal Reserve Bank of St. Louis Review, and in the two-volume Handbook of Financial Data and Risk Information.

**Paul Glasserman** is the Jack R. Anderson Professor of Business at Columbia Business School, where he serves as research director of the Program on Financial Studies. In 2011-2012, he was on leave from Columbia, working full-time at the Office of Financial Research (OFR) in the U.S. Department of the Treasury. He now serves as a part-time consultant to OFR. His work with the OFR has included research on stress testing, financial networks, systemic importance indicators, contingent capital, and counterparty risk. He previously has held visiting positions at the Federal Reserve Bank of New York, Princeton University, and New York University. Glasserman is the recipient of several research awards, including the INFORMS Lanchester Prize, the Erlang Prize in applied probability, and a Medallion from the Institute of Mathematical Statistics. He is also a recipient of *Risk* magazine's Quant of the Year Award. Glasserman served as senior vice dean of Columbia Business School from 2004 to 2008 and was interim director of its Sanford C. Bernstein Center for Leadership and Ethics from 2005 to 2007.

Jeffrey Golden is a visiting professor in the Law Department at the London School of Economics, and a director of MFX Solutions, Inc., an industry initiative providing currency hedging for microfinance. He recently retired from the international law firm Allen & Overy LLP, which he joined as a partner in 1994 after 15 years with the leading Wall Street practice of Cravath, Swaine & Moore. He was the founderpartner of Allen & Overy's U.S. law practice and senior partner in the firm's global derivatives practice and has extensive experience in a wide range of capital markets matters, including swaps and derivatives, international equity and debt offerings, U.S. private placements and listings, and mergers, acquisitions, and joint ventures. He acts for the International Swaps and Derivatives Association (ISDA), was a principal author of ISDA's master agreements, and has appeared as an expert witness in several high-profile derivatives cases.

**Andrew G. Haldane** is the chief economist at the Bank of England and executive director of monetary analysis and statistics. He is a member of the Bank's Monetary Policy Committee, and also has responsibility for research and statistics across the Bank. In 2014, *TIME* magazine named him one of the 100 most influential people in the world. Haldane has written extensively on domestic and international monetary and financial policy issues. He is the cofounder of Pro Bono Economics, a charity which brokers economists into charitable projects.

**H.V. Jagadish** is the Bernard A. Galler Collegiate Professor of Electrical Engineering and Computer Science and a distinguished scientist at the Institute for Data Science at the University of Michigan. Jagadish is well-known for his broad-ranging research on information management, integration, representation, and analysis. He has approximately 200 major papers and 37 patents. He is a fellow of the Association for Computing Machinery and serves on the board of the Computing Research Association. He is the editor of the data section of the *Handbook on Systemic Risk*, and is the instigator of www.bigdatadialog.com.

**Sujit Kapadia** is a senior manager in the Prudential Policy Division at the Bank of England, which he joined in 2005. His team is responsible for advising the Bank's Financial Policy Committee on the design and implementation of cyclical macro-prudential policies and leads the Bank's contributions to the international debate on reforming banking regulation in Basel and Europe. In previous roles, he made a leading contribution to the development of the Bank's stress testing model, RAMSI; led the Bank's input into the calibration of the Basel III capital requirements; and was a founding member of the Financial Policy Committee Secretariat. He also worked at the Reserve Bank of India in 2013, reviewing aspects of its monetary policy framework and assessing its financial literacy initiatives. Kapadia's research encompasses macro-prudential policy, banking regulation, stress testing, financial networks, and contagion. He holds a PhD in economics from the University of Oxford.

**Simon A. Levin** received his PhD in mathematics from the University of Maryland. After 27 years on the faculty of Cornell University, he moved to Princeton University, where he is currently the George M. Moffett Professor of Biology. Levin is a member of the U.S. National Academy of Sciences, among other organizations, and a former president of the Ecological Society of America and of the Society for Mathematical Biology. His international awards include the Heineken Prize for Environmental Sciences, the Kyoto Prize in Basic Sciences, the Tyler Prize for Environmental Achievement, the Margalef Prize in Ecology, and the Luca Pacioli Award.

Caroline Liesegang is the deputy head of a division in the European Central Bank (ECB) that designs and carries out quantitative analysis and methodologies across the European banking sector for banks indirectly supervised by the ECB. Before joining the ECB, Liesegang worked in the Risk Analysis Unit of the European Banking Authority (EBA) in London, which was responsible for EBA's European Union-wide stress test, and as an economist at the Deutsche Bundesbank, the German central bank. Her areas of expertise include system-wide risk analysis and financial research. She also has worked in both off-site supervision and on-site examinations of cross-border banking groups (credit risk, market risk, risk modeling) for several years. She holds a BSc from Bundesbank University and an MSc in international economics from Frankfurt University.

Sanjoy K. Mitter received his PhD from the Imperial College of Science and Technology in 1965. His current research is devoted to the unification of stochastic control and information theory and on the integrative organization of complex systems. He joined the Massachusetts Institute of Technology in 1969 and has been a professor of electrical engineering there since 1973. He was the director of the MIT Laboratory for Information and Decision Systems from 1981 to 1999. Mitter is a fellow of the International Federation of Accountants and the Institute of Electrical and Electronics Engineers (IEEE), and a foreign fellow of the Indian National Academy of Engineering. He is a recipient of both the Eric E. Sumner Award and the Control Systems Award from the IEEE, and of the Richard E. Bellman Control Heritage Award from the American Automatic Control Council. He is a foreign member of Istituto Veneto di Scienze, Lettere ed Arti and a member of the National Academy of Engineering.

Hans Morris is the managing partner of Nyca Partners, a venture capital and advisory firm in New York and San Francisco focusing on financial services technology. From 2010 to 2014, he was managing director and special adviser at General Atlantic, a global growth equity firm. He is a board member of Lending Club, KCG, AvidXchange, Payoneer, and Cardworks. From 2007 to 2010, he served as president of Visa Inc., the global payments company. Before joining Visa, he spent 27 years at Citigroup and its predecessor companies in several operating and management roles, including CFO and head of finance, technology, and operations for Citi Markets and Banking, the capital markets, investment banking, commercial banking, and transaction services business for Citigroup. Morris was also COO of the investment bank at Citigroup, and head of the financial services group for more than 10 years. He graduated from Dartmouth College.

**Sendhil Mullainathan** is a professor of economics at Harvard University. His real passion is behavioral economics. His work runs a wide gamut: the impact of poverty on mental bandwidth; whether CEO pay is excessive; using fictitious resumes to measure discrimination; showing that higher cigarette taxes makes smokers happier; modeling how competition affects media bias; and a model of coarse thinking. His latest research focuses on using machine learning and data mining techniques to better understand human behavior. He cofounded the nonprofit ideas42 and the Abdul Latif Jameel Poverty Action Lab, serves on the board of the MacArthur Foundation, and has worked in various government roles, including most recently as assistant director of research at the Consumer Financial Protection Bureau.

**Stefan Nagel** is a professor of economics and the Michael Stark Professor of Finance at the University of Michigan Stephen M. Ross School of Business. His research interests include empirical asset pricing, subjective beliefs and risk preferences in finance and macroeconomics, and financial crises. He is a research associate with the National Bureau for Economic Research and a research fellow with the Centre of Economic Policy Research in London. Nagel is co-editor of the *Review of Financial Studies* and an associate editor of the *Review of Asset Pricing Studies* and the *Review of Finance*. He has been a recipient of the Smith-Breeden and Fama-DFA best paper awards from the *Journal of Finance* and the *Journal of Financial Economics*.

Elisabeth Paté-Cornell is a professor of management science and engineering at Stanford University. Her field is engineering risk analysis applied to complex systems (space, medical, etc.). Her research includes game analysis (e.g., counterterrorism) and cybersecurity. She is a member of the National Academy of Engineering, and of several boards including Draper Laboratory and InQtel. She was a member of the President's Intelligence Advisory Board (2001-2008). She holds a BS in mathematics and physics (Marseilles), an engineering degree in applied math/CS (Grenoble), and an MS in operations research and a PhD in engineering-economic systems, both from Stanford.

Amiyatosh Purnanandam is a professor of finance at the University of Michigan Stephen M. Ross School of Business. His research focuses on corporate finance, banking, and credit risk. He has analyzed causes and consequences of risk-management decisions for both industrial firms and commercial banks. His research in banking deals with issues such as the effect of banks' health on real economy and pricing of bank loans. In his recent work, he has analyzed some of the key causes of the subprime mortgage crisis of 2007-2009. Purnanandam is also interested in examining the effect of corporate decisions and firm characteristics on short-term and long-term stock returns, and their implications for the rational and behavioral asset pricing theories.

**Uday Raian** is a professor of finance and chair of finance and real estate at the University of Michigan Stephen M. Ross School of Business. His research focuses on informational frictions such as adverse selection and moral hazard and their effect on market transactions, with recent work on the role of the board in the presence of activist investors and on the default behavior of subprime mortgages in the years before the financial crisis. Uday was a vice president of fixed income research at Drexel Burnham Lambert in the late 1980s, and received a PhD in economics from Stanford University in 1995. His research has been published in the American Economic Review, the Journal of Finance, the Journal of Financial Economics, and the Review of Financial Studies. He has received the Goldman Sachs Asset Management Award for best paper in the Review of Finance and the New York Stock Exchange Award for best paper on equity trading at the Western Finance Association meetings. He is an editor of the *Review of Corporate Finance* Studies and an associate editor of the Journal of Finance and Management Science. and has been an editorial review board member at Marketing Science. He is the president of the Finance Theory Group.

**Matthew Richardson** is the Charles E. Simon Professor of Applied Economics at the Leonard N. Stern School of Business at New York University. He currently holds the position of the Sidney Homer Director of the Salomon Center for the Study of Financial Institutions, a leading financial research center. Prior to being at NYU, Richardson was an assistant professor of finance at the Wharton School of the University of Pennsylvania. In addition, he is a research associate of the National Bureau of Economic Research. Richardson has done research in many areas of finance, including both theoretical and empirical work. His research has been published in the *American Economic Review*, the *Journal of Finance*, the *Review of Financial Studies*, and the *Journal of Financial Economics*, among other places.

**David Saul** is the senior vice president and chief scientist at the State Street Corporation. He is responsible for proposing and assessing new advanced technologies for the organization, as well as evaluating technologies already in use at State Street and their likely evolution in order to reinforce the organization's leadership position in financial services. Saul previously was chief information security officer, where he oversaw State Street's corporate information security program, controls, and technology. Prior to that, he managed State Street's Office of Architecture, where he was responsible for the overall enterprise technology, data, and security architecture of the corporation. Saul joined State Street in 1992 after 15 years with IBM's Cambridge Scientific Center, where he managed innovations in operating systems virtualization, multiprocessing, networking, and personal computers. In 2007, he was honored with a Computerworld Premier 100 IT Leader Award. *American Banker* named Saul as one of its Top Innovators of 2013 for his work on data semantics and standards. Saul holds bachelor's and master's degrees from the Massachusetts Institute of Technology.

Laurie S. Schaffer joined the Federal Reserve Board Legal Division in October 2011 as associate general counsel for special projects and legislation. Her portfolio includes implementation of many of the rules required by the Dodd-Frank Wall Street Reform and Consumer Protection Act and legislative matters. Prior to joining the Federal Reserve, Schaffer was the assistant general counsel for banking and finance at the U.S. Department of Treasury. While serving at the Treasury Department, Schaffer was responsible for supervising the lawyers supporting the Department's domestic finance functions. She was responsible for and supervised the legal team that drafted the administration's 2009 regulatory reform legislation and provided legal support to the Secretary and other senior Treasury officials during congressional consideration of the Dodd-Frank Act. In addition, she was responsible for supervising the legal team supporting the Troubled Asset Relief Program and the Temporary Guarantee Program for Money Market Funds. Before joining the Treasury Department legal team, Schaffer was general counsel of Charles Schwab Bank and vice president and associate general counsel of Charles Schwab & Co.

**Til Schuermann** rejoined Oliver Wyman in August 2011 as a partner in the Finance and Risk and Public Policy practices. He was previously with the firm from 1996 to 2001. His current focus is on stress testing, capital planning, enterprise-wide risk management, and corporate governance. Until March 2011, Schuermann was a senior vice president at the Federal Reserve Bank of New York, where he held numerous positions, including head of financial intermediation in research and head of credit risk in bank supervision. In spring 2009, he played a leadership role in the design and execution of the Supervisory Capital Assessment Program (bank stress test), and the subsequent Comprehensive Capital Analysis and Review (CCAR) programs. He testified before the TARP Congressional Oversight Panel in May 2009. In 2008, Schuermann led a team tasked to assess capital and liquidity adequacy of the four remaining large U.S. investment banks, where he helped develop and execute liquidity stress tests, as recently documented in the Valukas report. Schuermann received his PhD in economics from the University of Pennsylvania and his BA in economics from the University of California at Berkeley. From 1993 to 1996, he worked at Bell Laboratories. He has numerous publications in both academic and practitioner journals, is a member of the advisory board of the NYU Courant Institute Mathematical Finance program, has taught at Columbia University and at the Wharton School, where he is a research fellow, and is a member of the GARP FRM committee

Lawrence H. Summers is the Charles W. Eliot University Professor and president emeritus of Harvard University. He directs the University's Mossavar-Rahmani Center for Business and Government. During the past two decades, he has served in a series of senior policy positions in Washington, D.C., including the 71st Secretary of the Treasury for President William J. Clinton, director of the National Economic Council for President Barack Obama, and vice president of development economics and chief economist of the World Bank. He received a bachelor's degree from the Massachusetts Institute of Technology in 1975 and a PhD from Harvard University in 1982. In 1983, he became one of the youngest individuals in recent history to be named as a tenured member of the Harvard faculty. In 1987, Summers became the first social scientist ever to receive the annual Alan T. Waterman Award of the National Science Foundation and, in 1993, he was awarded the John Bates Clark Medal, given every two years to the outstanding American economist under the age of 40.

**Sir Paul Tucker** is a fellow at Harvard University's John F. Kennedy School of Government. He was deputy governor at the Bank of England from 2009 to October 2013, having joined the Bank in 1980. He was a member of all of the Bank of England's statutory policy committees: the Monetary Policy Committee, Financial Policy Committee (vice chair), Prudential Regulatory Authority Board (vice chair), as well as of the Court of Directors. Internationally, he was a member of the steering committee of the G20 Financial Stability Board, and chaired its Committee on the Resolution of Cross-Border Banks in order to solve the "too big to fail" problem. He was a member of the board of directors of the Bank for International Settlements, and was chair of the Basel Committee for Payment and Settlement Systems. He is a visiting fellow of Nuffield College, Oxford, and a governor of the Ditchley Foundation.

**Susan M. Wachter** is the Albert Sussman Professor of Real Estate and a professor of finance at The Wharton School of the University of Pennsylvania, the director of the Wharton GeoSpatial Initiative and Lab, and the codirector of the Penn Institute for Urban Research. She also codirects the Spatial Integration Laboratory for Urban Systems at the University of Pennsylvania. She was assistant secretary for policy development and research with the U.S. Department of Housing and Urban Development from 1998 to 2001.

Michael P. Wellman is a professor of computer science and engineering at the University of Michigan. He received a PhD from the Massachusetts Institute of Technology in 1988 for his work in qualitative probabilistic reasoning and decision-theoretic planning. For the past 20-plus years, his research has focused on computational market mechanisms and game-theoretic reasoning methods, with applications in electronic commerce, finance, and cyber-security. As chief market technologist for TradingDynamics, Inc., he designed configurable auction technology for dynamic business-to-business commerce. Wellman is a fellow of the Association for the Advancement of Artificial Intelligence and the Association for Computing Machinery.

**David Wessel** is the director of the Hutchins Center on Fiscal and Monetary Policy at the Brookings Institution, which seeks to improve the quality of fiscal and monetary policies and public understanding of them. He joined Brookings in December 2013 after 30 years on the staff of *The Wall Street Journal*. He is a contributing correspondent to *The Journal*, appears frequently on NPR's *Morning Edition*, and tweets at @davidmwessel. Wessel is the author of two *New York Times* bestsellers: *In Fed We Trust: Ben Bernanke's War on the Great Panic* (Crown Business, 2009) and *Red Ink: Inside the High Stakes Politics of the Federal Budget* (Crown Business, 2012.)



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