Interdisciplinary Approaches to Financial Stability

CENTER ON FINANCE, LAW, AND POLICY
UNIVERSITY OF MICHIGAN

OFR OFFICE OF FINANCIAL RESEARCH

Panel 1: New Approaches to Understanding Risk
Thursday, October 22, 2015 at 9:30 a.m.
Hutchins Hall 100

Moderator:
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Panelists:
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Overview

Recent advances in the availability of information, processing capabilities, and the understanding of agents' behavior provide new opportunities for describing and managing risk in the financial system. In addition, new constructions, such as smart contracts and flexible responses to absorb system shocks, offer mechanisms with the potential to ensure the security and reliability of transactions and to maintain overall system structure and functionality even under severe stress. While promising many benefits, these new developments present multiple challenges for ensuring successful implementation. They raise issues concerning security, privacy, susceptibility to manipulation, and incentives for socially beneficial behavior that threaten to undermine the advances. This session will address the variety of new data sources, methods of analysis, their impact on our understanding of human behavior, and our organization of the institutional mechanisms to ensure resilient handling of risks and resolution of issues of disagreement.

Data and Information

Rapid expansion of our ability to collect, store, disseminate, and analyze information at detailed time, space, and other characteristic scales has led to the Big Data movement and efforts to capture value from ubiquitous large and generally unstructured datasets. In financial markets, such data proliferation enables detailed analysis of counter-party risk, identification of transaction flows and relationships, and integrated analyses of the impact of multiple sources of risk. These expanded capabilities also, however, require new analytical processes to guard

against invalid extrapolation, malicious exploitation, and threats to privacy and protection of individual expression.

Integrated models of data on lending rates in different markets (e.g., mortgages, deposits, and short-term debt), default rates, and collateral values (e.g., commercial and residential real estate) provides an example of analyses possible with current information systems and analytical methods (see [1]). These analyses demonstrate how rates and collateral values are interrelated across time and that simple models do not capture their complex dynamics. They show how policies based on simplified assumptions can lead to significant underestimates of risk, motivating policies based on adaptive capital allocation (see [2] and [3]).

Identifying relationships among different market rates and asset prices can also help explain the systemic risk effects of distortions in different market segments. As shown in [4], [5], and [6], for example, underpricing of default risk in the mortgage market and the proliferation of opaque securitization instruments led to an over-expansion of credit and the housing bubble that collapsed in unleashing the Great Recession. By understanding how forces across the financial system led to these conditions, we can explore alternative policies and regulations that can mitigate aggravators of systemic risk and help avoid such pernicious outcomes in the future.

Computation and Processing

In addition to new insights from data analysis about the variety of interactive effects that occur in the financial market, current methodologies also enable a variety of computational procedures that can capture the complex behavior of multiple agents interacting across time. Agent-based modeling of financial systems has evolved to address questions that are beyond the scope of reduced form models ([7]). By capturing how individuals, firms, and regulatory bodies act in following their specific goals, they can provide informative counter-factual assessments of a wide variety of policy and regulatory alternatives.

As an example of the capabilities of agent-based model, [8] considers alternatives for banking system regulation in which a government might decide whether to close a distressed institution, to bail it out with taxpayer funding, or to "bail-in" the institution by converting debt to equity. The analysis of this model reveals that the alternatives of closure and "bail-in" may each be dominant depending on the economy's overall employment and productivity level, but that bail-outs never appear favored. In a similar analysis, [9] investigates the use of Value-at-Risk (VaR) constraints on bank leverage decisions and finds that constant VaR constraints give rise to leverage cycles in which markets experience price collapses. Agent-based models described in [9] and [10] also demonstrate how flexible leverage regulations and fixed leverage limits can remove oscillations and control the cycle.

Modeling Behavior

Agent-based models represent an alternative for policy analysis, but they depend critically on consistent models of the agents' behavior in response to multiple stimuli, all of which are not fully observed in retrospective analyses. In many cases, policy experiments can be used to assess these responses and the impact of alternative policy actions ([11]). If these experiments

can identify behavioral mechanisms that lead to favorable outcomes, the results can inform policy decisions even when the experiments do not correspond precisely to an actual implementation. Experiments on the effects of scarcity (see [12]) can, for example, explain how individuals at reduced wealth levels differ in their attention levels to immediate concerns and tendency to over-borrowing, providing insight into policies affecting credit activity across income groups.

Behavioral models can also be valuable in policy analysis even when specific psychological mechanisms are not precisely known. The framework in [13] shows, for example, how to apply this methodology in a reduced-form approach to examine the impact of behavioral biases on issues in public finance. This process then allows for the evaluation of policies that affect systemic risk through the collective actions of individuals and can inform detailed models of activity as in agent-based simulations.

Judicial Mechanisms and Contracting

In addition to the actions of individual borrowers, lenders, and regulatory agencies, courts and judicial interpretations also play a critical role in the control and management of risk across the financial system. These issues concerning judges' actions are of particular concern because of the complexities involved in modern financial instruments and increased inter-connections across markets and regions that tie risks and judgments together. As argued in [14] and [15], while regulatory policy may act as a deterrent to excessive risk taking, forecasting behavioral changes across all market participants in response to those policies requires an assessment of judicial action. These judgments can in turn have greater consequences than in the past as they increasingly have the opportunity to break new ground on innovative instruments and contractual arrangements.

A particular question that arises in the resolution of disputes and the interpretation of court action is how market practice should be interpreted in the application of standard form relational contracts (see [16]). While the standard of market practice may be highly relevant in such situations in which contracts are necessarily incomplete, the relevant time frame for the definition of market practice is often ambiguous. Given the rapid rate of innovation and practice changes in financial markets and the long-term nature of many standard form agreements, resolving this question becomes critical for rendering judgment and for others to interpret the outcomes.

The complexity and dynamics of the financial system coupled with increased computational capabilities and data provision have also led to increased interest in the use of smart contracts (see, e.g., [17]) that provide enforceable terms through secure cryptographic protocols with a goal of reducing transaction costs, contentious disputes, and general reliance on trust. Cryptocurrencies, such as Bitcoin, have developed to implement such protocols ([18]). While promising ease of execution, security, and privacy protection that should tend to reduce systemic risk in the financial system, such protocols are susceptible to criminal manipulation ([19]), requiring external policy or regulatory controls to protect against abuse and ensure the beneficial effects of increasing computation and information capabilities.

Summary

New sources of information and computational capabilities can bring deeper understanding of risk in the financial system, but these advances have also exposed new levels of interdependence and greater levels of complexity. Expanded tools, such as agent-based modeling, can provide insights even when the nature and persistence of interactions are not fully known, but they inherently require understanding of the agents' behavioral motivations. Recent approaches in behavioral modeling can provide the necessary insights for policy evaluations in such contexts, but they in turn require a comprehensive view of all agents including the judicial system. The results of these multiple levels of understanding of the entire systems are critical components for harnessing the power of Big Data in the financial system and enabling new forms of secure and productive market interactions.

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