



# Journal of Financial Economics

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## Introduction

### Market institutions, financial market risks, and the financial crisis

In 2008, the National Bureau of Economic Research (NBER) decided to launch a research project to explore why the financial crisis was so virulent and so damaging to the economy. James Poterba, the chief executive officer of the NBER, obtained generous funding from the Sloan Foundation to support the project. He asked us to organize the project, with a focus on how interactions between financial institutions, markets, and regulations affected the crisis; how such interactions could (or should) change; and how internal incentives and pressures might have affected the behavior of financial institutions.

We started by creating a list of questions that we thought should be answered in order for the financial crisis to be better understood. That list is in the Appendix that follows this introduction. We launched a call for proposals and selected a number of papers for short presentations at the NBER Summer Institute in 2009. After that meeting, we chose twelve papers, which were presented at a conference in June 2010. This issue of the *Journal of Financial Economics* collects six of those papers. All six went through the *Journal's* normal refereeing process and were treated like any other paper submitted to the *Journal*.

While the papers address different aspects of the financial crisis, and while some are empirical and others theoretical in nature, there are common threads running through many of them. First, a number of papers point to the tremendous dislocation that arises in the financial system when assets that were thought to be liquid and safe turn out to be illiquid and risky. Several papers further note that this dislocation is exacerbated when many of the participants in the financial sector depend on short-term funding, which in turn is reliable only when assets constitute liquid and safe collateral. A third thread is that disruptions and mispricing are transmitted across markets by financial institutions and trades that straddle markets—that is, markets that are seemingly unconnected in normal times become connected in times of financial stress. And finally, systemic liquidity and institutional solvency are fundamentally inseparable in the modern financial system.

After the reforms instituted in the aftermath of the Great Depression in the 1930s, financial economists generally thought that bank runs were a historical curiosity in

industrial countries, of current relevance perhaps only in emerging-market nations. The reasoning was that deposit guarantees removed much of the rationale for depositors to commence a bank run, because their deposits were not at risk. Little attention was paid to the possibility that there could be a different type of run on banks, namely a run on their wholesale funding rather than on their deposit funding. Runs were at the heart of the 2008–2009 financial crisis, but they were runs on wholesale funding and were not always directed at commercial banks.

The first paper in this issue, by Gary Gorton and Andrew Metrick, provides evidence on how the run on wholesale funding took place. The authors trace how, following the early problems in the subprime market, credit spreads on securitized bonds increased across a wide range of bonds that were unrelated to the subprime market. Throughout the crisis, enormous attention was paid to the LIBOR-OIS spread as a barometer of the intensity of the crisis. This spread measures not only counterparty risk posed by major international banks but also liquidity in the market for interbank loans. Gorton and Metrick show that changes in the LIBOR-OIS spread were closely related to changes in credit spreads on securitized bonds. They suggest that increases in credit spreads on securitized bonds led to losses at banks and hence greater counterparty risk—and were further associated with decreases in the liquidity of the market for these bonds and greater uncertainty about their value. These changes, the authors argue, made lenders less willing to lend against collateral on repo contracts. As a result, many securitized bonds could no longer be used as collateral, which caused financing problems for leveraged holders of securitized bonds and led to fire sales of such bonds, further depressing their value.

Securitization grew at a spectacular rate before the start of the financial crisis—and then crashed. Issuance in 2006 exceeded \$1 trillion but fell to almost nothing in late 2008. A key question is why securitization activity increased so dramatically, only to collapse so rapidly. One explanation is that unexpected shocks changed the value of the assets being securitized and hence the profitability of securitization. Nicola Gennaioli, Andrei Shleifer, and Robert Vishny offer a different explanation that stresses the role of behavioral

factors in risk assessment. They construct a model in which market participants fail to consider all the risks (particularly certain low-probability risks) associated with some types of securities and therefore perceive highly rated bonds, including highly rated tranches of securitizations, to be less risky than they actually are. Moreover, since they value safety, these market participants demand too many (relative to what they would demand if they fully understood the risks) of the apparently safe securities. This greater demand creates incentives for financial intermediaries to generate securities that appear safe, so that the supply of securities with some neglected risks increases. Eventually, however, the neglected risks manifest themselves and the value of the securities falls sharply as the now wiser investors dump them. Market participants who used such securities as collateral for borrowing not only suffer a decline in their net worth but also experience more difficulty in financing their portfolios. The model developed by Gennaioli, Shleifer, and Vishny therefore offers a possible explanation for the repo run documented by Gorton and Metrick.

The run on wholesale funding, the increase in credit spreads on securitized bonds, and the associated fire sales reached a dramatic stage after the failure of Lehman in September 2008. At that point, market participants and observers became worried about the ability of the financial system to function at all. Part of the problem was that uncertainty about losses created concerns about counterparty risk, which constrained financial institutions' ability to fund their trading activities. As a result of these developments, the markets for many types of securities and financial instruments failed to work normally. The concept of arbitrage that is at the heart of much of modern finance broke down in the sense that many arbitrage relations that had long been taken for granted by financial economists stopped working. Before the crisis, most (if not all) financial economists subscribed to the view that arbitrage failures are equivalent to hundred dollar bills lying on the street—free money—but any observer in the months after the failure of Lehman could see that arbitrage failures were widespread and that many market participants who specialized in taking advantage of arbitrage failures were being sidelined.

Mark Mitchell and Todd Pulvino provide an analysis of these arbitrage failures for several asset classes. They focus on strategies used by hedge funds and hence do not investigate pure arbitrage strategies that have absolutely no risk. However, the near-arbitrage opportunities that they examine are situations in which two reasonably equivalent assets trade at very different prices. They consider strategies involving convertible debenture arbitrage, credit-default swap arbitrage, closed-end fund arbitrage, merger arbitrage, and special-purpose acquisition company arbitrage. They find mispricings of 10–15% (relative to normal pricing relations) during the crisis as a result of hedge funds losing their debt financing—and even higher relative mispricings in some markets.

While the run on wholesale funding played a critical role, the drop in the value of securitized bonds and the sudden halt in their issuance had pervasive effects in the economy. As these bonds became illiquid, it became harder to determine their value. With so few transactions, market participants had to rely on models to assess valuations—but the

models had been developed during a time of buoyant markets and had not been tested in adverse conditions, casting doubt on the accuracy of their valuation estimates. Market participants who held securitized bonds and needed to sell assets had to either sell other securities or sell the securitized bonds at deep discounts.

Alberto Manconi, Massimo Massa, and Ayako Yasuda use novel data on the bond portfolios of institutional investors to show that as securitized bonds lost value and became illiquid, mutual funds adjusted their portfolios by selling corporate bonds rather than securitized bonds. This portfolio readjustment was more urgent for mutual funds that had larger net outflows or greater liquidity needs. As these funds sold more corporate bonds, the prices of corporate bonds fell. Strikingly, the performance of individual corporate bonds during the crisis differed depending on whether or not they were held by mutual funds that had invested heavily in securitized bonds. In the same spirit as the results of Mitchell and Pulvino, Manconi, Massa, and Yasuda find that among different bonds from the same issuer, those held to a greater extent by mutual funds that were more heavily invested in securitized bonds experienced greater declines in value. In normal markets, such an outcome would not persist because investors would scoop up the anomalously cheap bonds.

Not only did financial markets stop working normally, but the financial system as a whole was teetering on the edge of the abyss after the failure of Lehman. Why was systemic risk so high? Why did the weakening or collapse of some financial institutions lead to the weakening of other institutions in a way that endangered the entire financial system? Franklin Allen, Ana Babus, and Elena Carletti show that the type of credit risk management at the bank level that was increasingly prevalent before the crisis and that was lauded by regulators as lowering systemic risk can actually *increase* systemic risk. In this model, banks structure their loan portfolios to be more diversified, a widespread feature of modern credit risk management. However, while such diversification reduces risk at the bank level when the bank is viewed as a standalone institution, it also causes banks to have more assets in common because they have similar obligors. As a result, while each individual bank is more diversified, the banks look more alike and become correspondingly more cosensitive to systemic risk.

In the model of Allen, Babus, and Carletti, systemic risk increases when portfolio diversification is accompanied by short-term funding, because a bank's lenders are less likely to roll over its short-term funding if they observe adverse signals about the bank's assets—and when banks have assets in common, adverse signals about one bank are informative about other banks, leading to widespread funding freezes. The resulting lack of funding can cause many banks to have to liquidate inefficiently or even to have to be bailed out. The paper shows how important it is to understand the systemic implications of changes in bank regulations. Regulatory changes that appear to improve safety at the bank level can perversely make the financial system more fragile.

The paper by Allen, Babus, and Carletti highlights the importance of connections among banks. In their paper, banks are connected because they have common obligors.

In the wake of the crisis, much effort has been devoted to developing measures of systemic risk and analyzing connections among financial institutions. The literature has focused not only on how to measure the contribution of an institution to systemic risk—i.e., the degree to which an institution makes the financial system riskier—but also on the exposure of an institution to systemic risk, or how severely the institution is affected by a systemic crisis. Monica Billio, Mila Getmansky, Andrew Lo, and Lioriana Pelizzon provide several new approaches to measuring the connectedness of financial institutions, including measures based on principal-component analysis and Granger-causality networks. Their study focuses on four types of financial institutions: hedge funds, banks, broker/dealers, and insurance companies. It includes the 25 largest institutions for each of these four types. Their measures show that the financial system became increasingly interconnected before the financial crisis. However, this interconnectedness is asymmetric in that banks play a much more important role in transmitting shocks than other financial institutions.

The papers in this issue of the *Journal* make important contributions to our understanding of the financial crisis in particular and of financial markets and institutions in general. They help answer some of the questions we posed when we started this effort. However, many questions remain unanswered. For instance, why did perceptions about the credit risk of asset-backed securities move in such a nonlinear way? Is it because there is an enormous difference between safe and near-safe instruments, as suggested by Gennaioli, Shleifer, and Vishny? Why, as Manconi, Massa, and Yasuda find, did mutual funds sell more junk bonds than investment grade bonds, even while they avoided selling securitized instruments? Why did the “smart” money take so long to take advantage of the mispricings that Mitchell and Pulvino document? There are obviously many areas for further research.

In addition, though, there are also many questions for policy makers. How should policy makers intervene to reduce risk in the system? When does diversification cross the line from a useful reduction of idiosyncratic risk to a problematic systemic risk buildup, as in Allen, Babus, and Carletti? How can regulators use the information from normal correlations across time, as in Billio, Getmansky, Lo, and Pelizzon, in assessing and monitoring interconnections? The papers in this issue show how important and productive it is to use scientific methods to understand the financial crisis and the financial system in general.

#### **Appendix. List of topics from the original call for proposals**

- How and why were moderate prospective credit losses amplified into systemic problems?
- How important was uncertainty about the true value of bank assets? Why did this uncertainty seem to persist? What were the implications of this uncertainty for the financial system?
- Did financial innovations contribute to the crisis? If so, how? For which type of innovations do long-term welfare gains exceed crisis-related welfare losses?
- How should financial institution liquidity postures be measured, managed, and regulated?
- A primary stated rationale for the diversion of Bear Stearns from a Chapter 11 bankruptcy was the interconnectedness of major financial institutions caused by OTC derivative transactions, repo transactions, and other counterparty relationships. Why are large international financial institutions so interconnected? Why did market solutions not emerge to an extent that would have avoided concerns about this interconnectedness? Why did market forces fail to make Lehman less interconnected during the six months after Bear failed?
- Some have proposed that OTC interlinks be reduced by forcing derivatives into more standardized, exchange-traded forms with associated clearinghouse intermediation and risk management. Would that make the financial system more resilient, and what would be the efficiency costs? Why is it that these financial instruments were not traded on exchanges? Why is it that there was no centralized clearing-counterparty? Did the absence of a central clearinghouse counterparty worsen the crisis?
- Was there a credit boom in the large corporate syndicated loan market that involved mispricing of credit and inefficient lending? If so, why did investors participate, given that such booms appear to occur repeatedly?
- Can central banks stop or “manage” credit booms? What would be the costs and benefits if they attempted to do so?
- Was there a global savings glut and did it play a role in the credit boom?
- What can we learn from similarities and differences in the performance of banks in different countries?
- Press accounts imply that failures of consumer protection were an element of the U.S. mortgage credit boom, in that many borrowers allegedly did not understand what they had gotten themselves into. To what extent was that the case? To what extent should consumer protection policy be viewed as an element of the effective promotion of financial stability?
- “Market discipline” is a commonly suggested method of promoting stability and efficiency. Many studies find evidence that it pushes prices and quantities in the “right” direction in the cross section.
  - Presumably it will be a long time before the authorities can credibly threaten to impose default losses on holders of large bank liabilities. How should policy change as a result? How should firms change their strategies?
  - Casual observation suggests that market discipline is “too weak” during credit booms and asset price bubbles, and “too strong” after crashes. True? If so, why? Is there a role for policy action? What are the implications for supervision and regulation?
- Did the participants in the securitization process have poor incentives to perform adequate due diligence? If so, why were arms-length investors willing to buy securitized debt? Why did issuers hold so much of the debt they securitized?
- What asset price relationships departed materially farther from frictionless ideals due to lessened arbitrage

activity during the crisis? Why did arbitrage falter, and to what extent will arbitrage activity return to former levels? For example, covered interest parity, a bedrock of international finance, failed throughout the crisis period in that interest rate and foreign exchange price relations departed from longtime norms.

- A “parallel banking system” of off-balance-sheet vehicles and other entities depended on the conventional banking system through a web of liquidity-support and credit-support contracts as well as reputational links, and was a primary source of initial shocks to the conventional system during the crisis. Why did this parallel banking system develop? What would be the costs and benefits of extending regulation to the “parallel” system?
- Similarly, “maturity transformation” vehicles played a major role in the money market shock. What is the source of demand for such transformation, and how can it best be satisfied in the aggregate?
- To what extent did credit derivatives and other credit risk transfer mechanisms actually spread risks throughout the financial system versus making the locations of risk-bearing less transparent? Was stability enhanced or reduced?
- Many observers have suggested that mark-to-market accounting rules were a primary amplification mechanism. Were they? If so, why? What would be the costs and benefits of different accounting rules?
- What role should risk management play in the corporate governance of financial institutions? What arrangements would promote effectiveness?
- Many observers have criticized financial institution disclosure practices. What constitutes “good” disclosure ex ante? If disclosure was inadequate, why?
- In spite of the poor outcomes for many highly rated securities, few have seriously suggested that rating agencies be outlawed. Instead, they appear to be increasingly viewed as public utilities. Did they contribute to the crisis? What is a proper view of their role? What regulation is implied?
- Market arrangements, such as margining, imply that procyclical leverage arises endogenously. Why? Do the efficiency gains outweigh the impact on stability?
- Money market investors appear to expend little effort in monitoring and pricing risk ex ante. Instead, they run when risk begins to become more than *de minimus* ex post. Is this an efficient arrangement? What role did runs on money market funds play in the crisis?
- Recent official documents, such as those produced by the Financial Stability Forum, propose various reforms and include large numbers of recommendations for changes, each of which appears modest. Is such a patchwork approach to regulation and other official action likely to be effective? Or should fundamental approaches change?
- Did short sales contribute to the crisis? Do they pose risks to financial institutions? If so, what are the risks? How can they be measured?
- How should risk be measured in an environment characterized by infrequent but very large systemic crises? Are there measures that would be more appropriate than stress tests?
- How important were risk management mistakes in the crisis—as opposed to risk-taking decisions that worked out poorly? If risk management mistakes played an important role, why? Were insufficient resources devoted to risk management? Did risk managers have poor incentives?
- Was the crisis in part the product of a regulatory failure? If so, was it because of poor regulations or poor regulators? Did regulators have the right incentives? Did they have enough independence from the political process? How should regulatory bodies be governed?
- Capital regulation did not work as intended. Why not, and how should it be changed?
- How important was the role of competition in the risk posture of firms before the crisis? Did competition lead them to take more risks?
- Did fire sales play a significant role in the crisis? Can their impact be measured?
- Why did the Lehman bankruptcy filing trigger severe stress in the financial markets? Could other resolution mechanisms have helped?

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