



ANNUAL REPORT

FEDERAL RESERVE BANK *of* CLEVELAND

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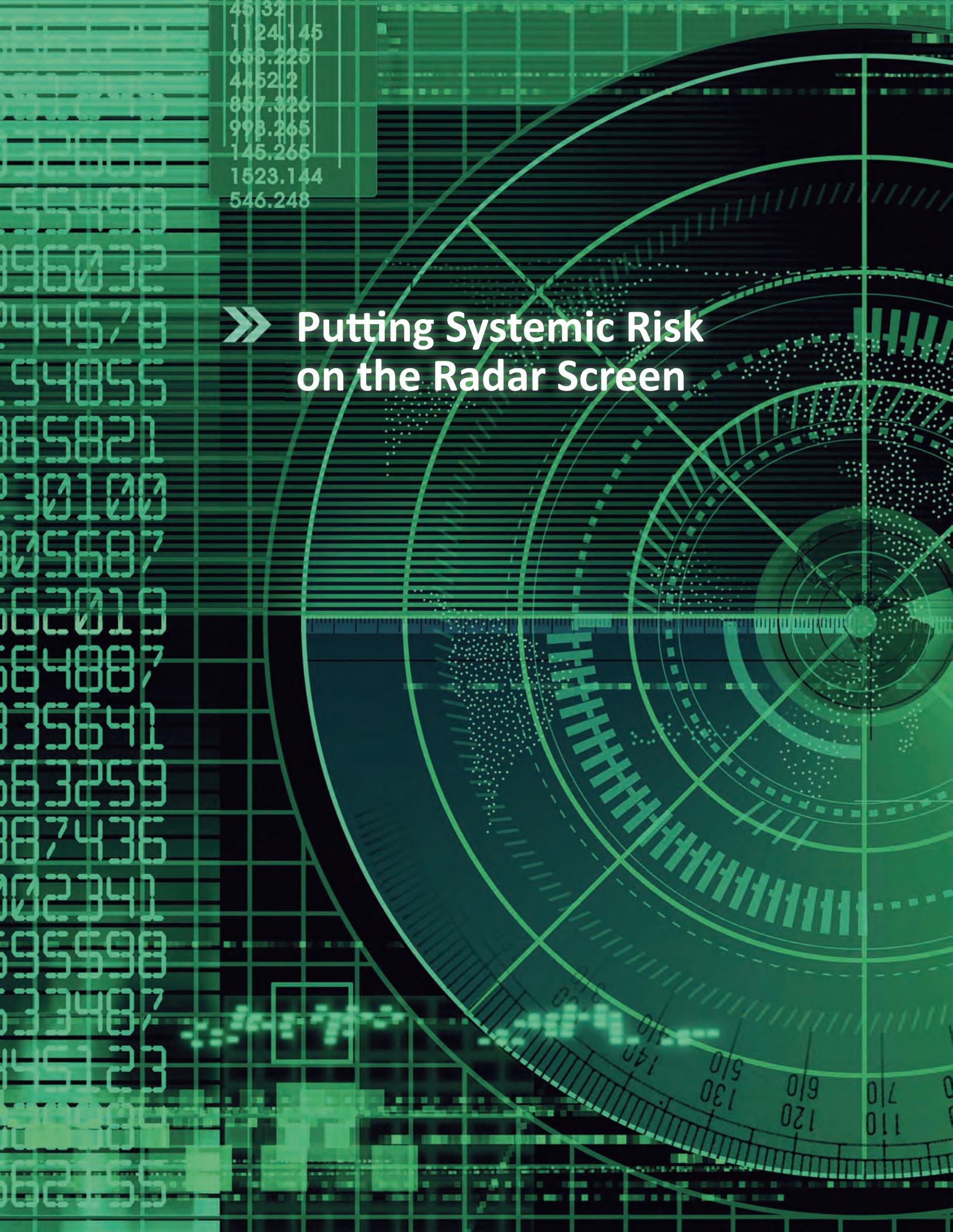
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» Putting Systemic Risk on the Radar Screen



As the nation ponders its response to the greatest financial crisis in generations, plans for regulatory reform are everywhere. Proposals to break up big financial companies, create a new agency for consumer protection, and lay out additional rules for derivatives, insurance companies, and hedge funds—they're all on the table.

Many proposals call for enhanced supervision and regulation to combat systemic risk. Some proposals would tie leverage restrictions, capital requirements, or deposit insurance to systemic risk. Federal Reserve Bank of Cleveland President Sandra Pianalto has outlined three tiers of supervision with various levels and types of systemic significance.¹ Regardless of the outcome of current regulatory reform deliberations, systemic risk and systemic risk supervision seem destined to be a part of our new financial order.

1. Pianalto (2009).

But what exactly does systemic risk *mean*? Without a clear and comprehensive definition of systemic risk, and some way to measure it, no proposal can be fully implemented. In this essay, we argue that policymakers must begin in earnest to define and measure systemic risk. Without proper measures, one regulates, or governs, by anecdote rather than by facts.² Even reforms about which there is little controversy—such as the need to supervise and regulate systemically important financial institutions differently—will be limited or possibly counterproductive unless systemic risk is measured accurately. Although quantifying systemic risk may sound esoteric and technical, we suggest that it is easy enough to know where to begin and absolutely critical that we do so.

2. Stigler (1975).



Without a clear and comprehensive definition of systemic risk, and some way to measure it, no proposal can be fully implemented.

What Is Systemic Risk and How Should We Measure It?

Let's accept, from the outset, that there are several plausible definitions of systemic risk, but any definition must capture the idea that a *significant fraction* of a financial market will be disrupted. Think about the classic

banking panic, where depositors rush to convert their bank accounts into cash. In fact, scholars often emphasize the significant-fraction aspect by distinguishing between a run on a single bank and a panic, which involves many banks.³ Today, the significant-fraction idea means recognizing disruptions both inside and outside the banking system, including disturbances at nonbank financial institutions and within financial markets more broadly.

A second concept that a systemic risk definition should embrace is that of *contagion*: Problems at one financial institution may spread to others, just as a fire might spread through a crowded tenement. The contagion may arise because one bank's failure makes people nervous about the safety of other banks, or because financial connections at one bank lead directly to a second bank's failure. In the recent crisis, the panic quite obviously spread beyond banks. On September 16, 2008, the Reserve Primary Fund, a money market fund that held Lehman Brothers commercial paper, "broke the buck," meaning it could no longer keep its net asset value at the standard one dollar. This alarming news started a run on other money market mutual funds, leading to a near shutdown in the commercial paper market, a major source of funding for nonfinancial businesses.⁴

The twin ideas of significant fraction and contagion can help make our definition of systemic risk more concrete. The Commodity Futures Trading Commission defines systemic risk as follows: "The risk that a default by one market participant will have *repercussions on other participants* due to the interlocking nature of financial markets. For example, Customer A's default in X market may affect Intermediary B's ability to fulfill its obligations in markets X, Y, and Z."⁵ Alternatively, here is a definition offered by several professors at New York University: "Systemic risk can be thought of as a widespread failure of financial institutions or freezing up of capital markets that can substantially *reduce the supply of capital to the real economy*" (emphasis ours in both definitions).⁶

These definitions suggest that we recognize two dimensions of systemic risk—one looking at the risk lodged in a specific institution or market segment, and the other looking at the overall risk in the financial system. At the economy-wide level, unacceptable systemic risk is the risk that the financial system cannot perform its major functions, especially those that support production, consumption, and employment. We can also see in these definitions the beginning of the process of identifying systemically important firms—those whose problems could, in certain circumstances, lead to widespread financial and economic disruption.

3. Gorton (1985).
See also Warsh (2009).

4. Dwyer and Tkac (2009).

5. Commodity Futures Trading Commission (2010).

6. Acharya, Philippon, Richardson, and Roubini (2009).

Measuring Systemic Risk

Let's say that we are satisfied, for now, that we know what we are looking for. How will we detect systemic risk? The first step is to recognize that it will likely have several defining characteristics, making it impossible to measure on a single scale. Think of an airline cockpit with its intricate display of outputs and dials. An experienced pilot watches several indicators of weather, location, and flight status as well as the plane's fuel gauge and oil pressure. Similarly, we expect that a systemic risk supervisor would consider a broad set of indicators, some giving a market-wide view and others assessing particular firms.

Legislation defines the mission of most current financial supervisors in terms of the legal entities they supervise: banks, broker-dealers, or insurance companies. The recent financial crisis revealed several gaps. Even within the most comprehensively supervised banking organizations—financial holding companies—it was difficult to assemble a comprehensive risk profile, let alone an adequate appreciation of the potential risks they might pose to the financial system.⁷ But the crisis revealed that financial supervisors have to look even more broadly at the companies they supervise—they have to look at the various ways in which the firms are connected to one another and to how the financial markets themselves are functioning.

In the recent financial crisis, commercial banks as well as mortgage companies, broker-dealers, and insurance companies all fell prey to the panic. Fundamentally, the crisis revealed the instability of the “shadow banking” sector, where borrowing and lending took place outside commercial banks through financial conduits, structured investment vehicles, and financial product divisions of supposedly solid firms. And, as we learned all too painfully, the shadow banking system was quite fragile and was connected to the mainstream banking system in ways that were not fully understood. So as we seek measures of systemic risk, we will have to cast a wide net.

The Federal Reserve Bank of Cleveland has stressed four factors—the four C's—that we believe are important for understanding systemic risk and for gauging its extent: **contagion**, **concentration**, **correlation**, and **context**.⁸ Eventually, we will have to find ways to quantify the first three and to contend with the fourth.

Contagion is a defining feature of systemic risk. How are different markets connected? How can a shock in one market be transmitted to another? The recent financial panic, for example, progressed quickly through the subprime mortgage market, money market mutual funds, and on to the commercial paper market.

Concentration. Seasoned travelers know that bad weather at JFK or O'Hare—major airline hubs—causes more delays than snow at airports in less-traveled cities like Akron or Topeka. In the financial sphere, this means that the more business that is concentrated in a few firms, the greater the systemic risk. Thus, problems at only a few major firms can destabilize the entire industry.

Correlation puts too many eggs in one basket. When firms take on the same risk, they can end up hobbled by the same shock. The problems of subprime mortgages infected many financial institutions and investors who held large amounts of mortgage-backed securities and collateralized debt obligations. Through the intricacies of structured finance, even the AAA-rated tranches of securities became “economic catastrophe bonds” when loans across the country began to sour and housing prices fell.⁹ A more subtle correlation emerged as investors lost confidence in the ratings, making their “investment-grade” bonds hard to sell. Once confidence in the ratings methodology for securitized assets

7. This difficulty could be overcome by clarifying the Federal Reserve's role as the consolidated supervisor of financial holding companies. A consolidated supervisor has the authority to collect information from all affiliates within a holding company and to take supervisory actions that enable it to manage the consolidated risk of the entire enterprise.

8. Thomson (2009) and Haubrich and Thomson (2009).

9. Coval, Jurek, and Stafford (2009).



eroded, investors became wary of familiar products far removed from subprime mortgages, such as student and auto loans. Thanks to correlation, the panic spread.

Context. *When* something happens is often as important as *what* happens. For example, the hedge fund Amaranth Advisors LLC collapsed in September 2006 after a deep loss in its derivatives investments, yet its failure did not have a systemic impact. In contrast, the hedge fund Long-Term Capital Management, with losses only half as large, suffered large capital losses and liquidity problems in fall 1998, right on the heels of the Asian crisis and the Russian default, and its difficulties had a significant effect on broader markets.¹⁰ Similarly, the treatment of Drexel Burnham Lambert in 1990 was much different from the assisted merger of Bear Stearns into JPMorgan Chase in early 2008, when the economic crisis was unfolding.

10. Greenspan (1998).

The four C's describe broad characteristics of firms and markets that should matter to a systemic supervisor. Ultimately, having good metrics for the first three C's—contagion, concentration, and correlation—will prove quite helpful to financial supervisors. But even now, with these guideposts, we can move to a more operational level for defining and measuring systemic risk.

Professor Andrew Lo of MIT's Sloan School of Management has suggested that systemic supervisors should consider looking at **leverage, liquidity, sensitivities, and implicit guarantees** associated with specific financial organizations. All of these are subject to measurement, to varying degrees of precision.¹¹

11. Lo (2009).

Financial Decoupling

Properly understanding the positions of firms requires coming to grips with the recent practice of decoupling legal and economic ownership rights.¹ This possibility became most famously apparent in the payments from AIG to Goldman Sachs.² AIG paid \$7 billion (borrowed from the Federal Reserve and the Treasury) to Goldman, even though Goldman had earlier reported that it had no exposure to AIG. Presumably, Goldman could do this because its position was fully hedged—that is, offset by gains on other contracts that would pay out if AIG could not. How certain such a hedge actually was in the intense days of September 2008 is another question, but this case illustrates how derivatives and hedging make it difficult to gauge the true exposure of any firm. In some sense, the accounting and disclosure rules have not yet caught up with marketplace practices.

One form of decoupling goes by the name of stealth ownership, where large investors such as hedge funds can use derivatives to take an economic interest in a firm

that would require disclosure if it were held in traditional instruments such as stocks. Indeed, the hedge fund Atticus Capital told the *Wall Street Journal* that it routinely used such strategies to keep its competitors in the dark.³ Lack of disclosure makes it even harder to understand the links and possible contagion between firms.

Clearly, stealth ownership hides the connections needed to assess contagion, correlation, and other aspects of systemic risk. It can also make it hard to judge how a firm will behave. Would investors seek to shut down a firm losing money, hoping to stop the drain? Or would they make more money from their derivatives if things continue to go badly? Would regulators (or anyone) find it harder to form a coherent picture, even with a mass of data? “Connecting the dots” might not be easy.

1. Hu and Black (2008).

2. Hu (2009).

3. Zuckerman (2007).

The four C's—contagion, concentration, correlation, and context—describe broad characteristics of firms and markets that should matter to a systemic supervisor.

Leverage describes how much a firm borrows based on its size. Leverage is commonly defined as the value of a firm's assets divided by its shareholders' equity. The portion of assets not financed with equity must be financed with debt. More leverage allows higher profits, but leverage also means that a huge loss becomes more likely to bankrupt the firm, since capital may be depleted and the debts must be repaid. The subtle ways leverage can affect a firm might best be illustrated by AIG: The firm's AAA rating allowed it to be quite highly leveraged. But when AIG lost that rating, it had to put up more collateral for its derivative positions—collateral it did not have—causing the crisis that led to its bailout.¹² Leverage may seem easy to measure, but it becomes complicated in practice. Even when measured reasonably well, there is always the question: How much leverage is too much? And should the nature of a firm's assets and liabilities figure into the setting of a leverage limit?

12. Sjostrom (2009).

Liquidity measures how easily an asset can be sold or how much its price drops if the asset is sold quickly. If a firm needs cash, the safest asset in the world will be useless if no one will buy it. At the firm level, a distinction is often made between insolvency and illiquidity. For an *insolvent* firm, the value of its liabilities exceeds the value of its assets. An *illiquid* firm, even though it may be solvent, cannot meet its short-term obligations with valuable but hard-to-sell assets. Illiquidity can also create contagion. A desperate firm sells assets at fire-sale prices, which reduces the market value of similar assets at other firms, undermining market confidence in these firms. If the firms are forced to sell assets because of that loss of confidence, the problem spirals out of control. As is the case with leverage, financial analysts have put forward several liquidity measures. Supervisors will have to determine which one is the best benchmark and how much liquidity to require in various financial environments.

Sensitivities, which option traders call “the Greeks” (because they are usually denoted by Greek letters in the textbooks), measure how asset values change with interest rates and market conditions. This set of gauges is intended to describe how exposed and vulnerable the firm is to different shocks or scenarios that may plausibly arise. Supervisors would find it difficult to compute these measures based on regulatory reports, but sophisticated firms should already be tracking these measures. Obviously, the more volatile a firm's asset valuation, the more quickly its leverage and liquidity ratios are likely to change.

Implicit guarantees are a less obvious source of risk, but they make it difficult for both firms and their supervisors to accurately gauge exposures. Both the firms themselves and the government offer these guarantees, which further complicates matters. The poster children for implicit firm guarantees were the structured investment vehicle and the related asset-backed commercial paper vehicle. Structured investment vehicles were legally structured as a way to remove assets from bank balance sheets, so had only limited guarantees from the sponsoring bank. Nonetheless, after the crisis hit, many banks provided recourse. On the government side, the recent crisis also provides examples, most notably Fannie Mae and Freddie Mac.

Making Measures Work

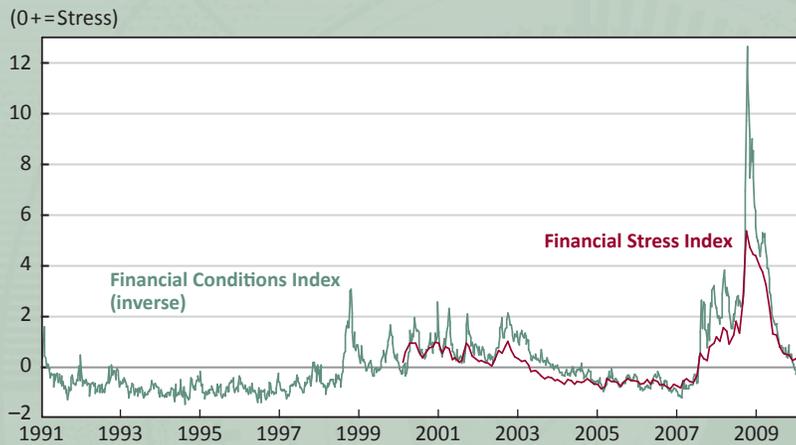
Integrating these concepts into something that financial supervisors can use requires another level of detail and, in some cases, extra care. Supervisors who want an early signal that markets are getting dangerous should follow a broad set of measures (and develop a healthy skepticism about their use). Supervisors seeking measures that signal actionable steps against individual firms will have to exercise greater caution, however. Waiting for near-certainty could be costly to market stability, but acting prematurely could needlessly harm the firm in question.

Several promising steps are being taken already to gauge both market risk and firm risk. One direction is to construct an early warning system for systemic problems at the broad market level.¹³ Sometimes this takes the form of a financial stress index such as the Bloomberg Financial Conditions Index, which looks at a variety of interest rates and prices (see figure 1).¹⁴ Other versions look at both prices and quantities, issuing a warning when asset prices shoot up at the same time as total credit (see figure 2).¹⁵ Yet another approach treats the entire economy as one big portfolio and looks at the “distance to default,” or roughly how large a shock it takes to destabilize the system.¹⁶

13. For example, De Nicolo and Lucchetta (2010). The Federal Reserve Bank of Cleveland has also been working on developing and piloting a model.
 14. Bloomberg (2010). The Federal Reserve Bank of Kansas City also puts out a Financial Stress Index.
 15. Borio and Drehman (2009).
 16. Gray, Merton, and Bodie (2007).

FIGURE 1

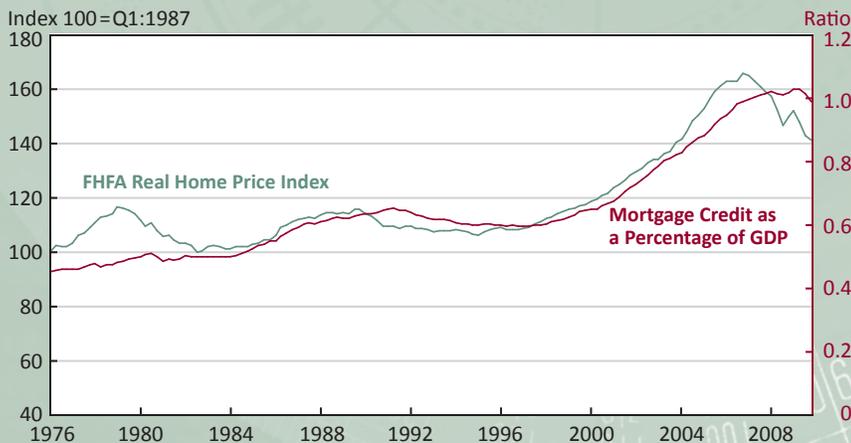
Financial Stress Index and Inverse of the Financial Conditions Index



Sources: Federal Reserve Bank of Kansas City; and Bloomberg.

FIGURE 2

Real Home Price Index and Mortgage Credit as a Percentage of GDP



Sources: Federal Housing Finance Agency; Bureau of Labor Statistics, Flow of Funds; and Bureau of Economic Analysis.

Some proposed reforms—particularly those that would classify some firms as being systemically important and subject them to enhanced supervision—require a set of institution-specific systemic risk measures.

Some proposed reforms, however—particularly those that would classify some firms as being systemically important and subject them to enhanced supervision—require a set of institution-specific systemic risk measures. Going down this path means looking more closely at individual firms, assessing which ones are either highly vulnerable or highly dangerous. The vulnerable firms are those with a high chance of failing when the system gets a shock.¹⁷ One way to identify these is to look for firms whose stock price plummets when the overall market drops. Knowing a firm is sensitive to systemic risk is not the same as knowing it is a likely source of contagion, however. To identify dangerous firms, we can turn the question around and ask which firms will bring down the market.¹⁸ In the data, this means looking at how much the market falls when the firm has a bad day.

17. Acharya, Pedersen, Philippon, and Richardson (2009).

18. Adrian and Brunnermeier (2009).

Getting the details right is tricky and important: Nobody wants to close a bank, cap its leverage, or lend it billions of dollars based on a bad measure of systemic risk. For instance, what counts as a “big drop” in the market, and do you use stock prices, bond yields, or derivatives? Not only can each give different results, but as market-based measures, each reflects the market’s view of risk, which may not be grounded in reality.

Furthermore, using data from quiet times to infer behavior in crisis situations has its perils. The space shuttle *Challenger’s* O-rings performed acceptably in cool conditions, but failed dramatically in freezing temperatures.¹⁹ Long-Term Capital Management had a sophisticated risk control system that indicated a well-hedged portfolio: Market shifts would have offsetting effects on different assets, keeping the firm balanced. But when the crisis came, the offsets didn’t work, all prices moved together, and the firm needed a rescue. Clearly, it will take time to implement the systemic risk tools, to calibrate them in different ways, and to learn how successful they can be over time. The work is certain to be frustrating and contentious—and yet, it must be done.

19. An extended discussion is in Tufte (1997).

Data Needs and Beyond Knowing a firm’s stock price in real time is straightforward. It is quite another matter to observe a firm’s leverage, liquidity, sensitivity, and counterparty exposures on a nearly constant basis. This information will be among the most important data the systemic supervisor will collect, particularly in times of crisis, when the supervisor must quickly make tactical decisions about which firms to save, recapitalize, or close. But many, if not most, firms consider details about their portfolios and investment strategies as proprietary information, so supervisors should anticipate that firms may look for ways to avoid disclosing it.

A start would be to collect basic aggregate information about the firm: assets under management, leverage, portfolio holdings, counterparties, and investors. For commercial banks, much of this information is already collected, but for firms in less-regulated areas, such as hedge funds, it is not. According to Andrew J. Donohue, director of the Securities and Exchange Commission’s Division of Investment Management, “It is not uncommon that our first contact with a manager of a significant amount of assets is during an investigation by our Enforcement Division.”²⁰ Indeed, the exposures generated by AIG’s credit

20. Donohue (2009).

default swap contracts went unappreciated, even though the company was regulated as both an insurance company and a thrift holding company.

Just as airline safety requires more than assessing the metal fatigue on jetliners—crew rotation schedules, maintenance reviews, and air traffic patterns all matter as well—financial market safety requires many coordinated pieces of information. Data about individual firms build on knowledge of market structure and performance, such as clearing and settlement practices, market volume, patterns of counterparty relationships, and market liquidity. Clearly, supervisors will need to acquire some combination of firm- and market-level data to assess the overall state of the system.

A New Information Infrastructure?

Several proposals have been advanced to create a new “information infrastructure” for the financial system. Federal Reserve Board Governor Daniel K. Tarullo recently provided a rationale for, and a set of principles to guide, an enhanced data collection regime.²¹ As Tarullo notes, data collection can be costly, and data overload can create problems for supervisors, so it pays to think carefully in advance about what information needs to be collected.

21. Tarullo (2010a).

Can a Stock Option Predict Financial System Chaos?

Martín Saldías Zambrana, a visiting scholar at the Federal Reserve Bank of Cleveland, takes what’s known as a “contingent claims” approach in his proposal for a forward-looking systemic risk indicator. In the simplest terms, a contingent claim gives the holder the right to something else depending on what happens in the future. An option to buy a share of AIG at a certain price level during a certain time period is a type of contingent claim, for example.

Zambrana uses the option-based “distance-to-default” measure developed by Moody’s KMV, a credit analysis firm. Distance to default is a measure of the probability that a firm will default, so we use the term “probability of default” in this explanation. The measure uses estimates of the market value of a firm’s assets, the volatility of the asset value, and the bankruptcy threshold (that is, the point at which the firm will become insolvent). These estimates are typically backed out of observed accounting data and the price of the firm’s traded equity using an option pricing model.

Although it may sound skull-cracking—and indeed, this process typically involves sophisticated mathematics and analytic tools—it is a fairly straightforward procedure. The probability-of-default measure can be constructed for any firm if the minimum information requirements are met.

Zambrana computes probability of default both for a traded index of European bank stocks (the index is called DJ STOXX) and for each of the banks in the index. He then constructs an index of the probability-of-default measures using individual banks’ probability of default.

Zambrana’s innovation is to use a well-known fact in finance: An option on a portfolio of stocks is not worth the same amount as a portfolio of options on the individual stocks in the portfolio. (That’s simply because the option to buy or sell an entire portfolio of stocks does not come with the same inherent flexibility as having an entire portfolio of options to buy or sell stocks.) This means that his two probability-of-default measures for the European banking system will not be the same, *except when there is perfect correlation between the stocks in the portfolio*.

Why is this important? A lesson learned from the demise of the hedge fund Long-Term Capital Management and from research by Andy Lo at MIT is that during periods of financial distress, asset returns in the financial system become more correlated. That makes increased correlation in financial markets a handy indicator of increased systemic risk. So tracking the differences between Zambrana’s two probability-of-default measures for the European banking system provides an indicator of increased systemic risk.



Knowing a firm's stock price in real time is straightforward. It is quite another matter to observe a firm's leverage, liquidity, sensitivity, and counterparty exposures on a nearly constant basis.

The academics behind the Squam Lake proposal are primarily worried about counterparty risk and fire-sale risk.²² They would have large financial institutions report quarterly on their asset positions and risk, and regulators would aggregate and release the data with a delay (to allay confidentiality concerns). Regulators would “standardize the process used to measure values and risk exposure” to allow for easier comparison across firms and greater information sharing among different regulators. Whatever the advantages of the fragmented U.S. financial regulatory system, it does mean that sharing information among agencies takes a concerted effort, particularly among regulators of different industries, such as state insurance commissions, the Federal Reserve, the Securities and Exchange Commission, and the Commodity Futures Trading Commission.

22. Squam Lake Working Group on Financial Regulation (2009).

Tarullo and others note that data requirements are likely to be substantial. Some have called for the creation of a new agency, such as a National Institute of Finance, to gather, prepare, and house the required data.²³ Federal Reserve Bank of Philadelphia economist Leonard Nakamura proposes a U.S. financial regulatory database that would register every direct claim against firms, households, or other legal entities and would include derivatives contracts such as futures, options, and swaps.²⁴ In his proposal, institutions that buy, sell, or hold a registered asset would report their holdings and activities quarterly. Note that this requirement is not restricted to large, or even financial, firms. Some have called for even more frequent reporting—for instance, having financial institutions submit same-day details of all transactions to a highly secure non-public database accessible to regulators.²⁵

23. Mendelowitz and Liechty (2010).

24. Nakamura (2010).

25. Rowe (2009).

Reporting all of this information could be onerous, so it would probably make sense to pilot the system on a smaller scale before expanding it, to compare costs and benefits. Regular and timely reporting of a firm's aggregate exposure to different counterparties, with full details available by close of business in case of an authentic emergency, would give a more manageable set of information for supervisors without imposing a burden that would send firms scurrying to an offshore tax haven.

The Changing Face of Supervision

A world in which systemic risk is measured and managed will require new skill sets and processes for regulators and, quite possibly, new forms of supervision. Analyzing the new information, searching for trends and vulnerabilities, and developing and refining better measures of systemic risk will take teams of analysts drawn from various fields. Few people will have the necessary expertise in network theory, risk analysis, and statistics, to say nothing of the legal background, to process all of the information.

Although regulatory reform legislation has not yet been enacted as of this writing, it is quite clear that supervision must change. Systemic risk will be monitored in some fashion, and the information collected will be incorporated into supervisory practices. Indeed, the Federal Reserve has already made a number of changes in its practices and is contemplating additional ones. In response to the financial crisis, the Federal Reserve has found it useful to create cross-functional teams of examiners, economists, and market and legal experts. These teams were involved with the Supervisory Capital Assessment Program (SCAP)—also known as the stress test—for the nation’s largest banks. The SCAP, announced in February 2009, when confidence in the banking system was still very shaky, has been widely regarded as successful in bolstering public confidence and in quelling the turmoil in financial markets.²⁶ The program has also had a profound effect on how Federal Reserve officials are thinking about systemic risk supervision going forward.²⁷

The SCAP demonstrated the value of conducting cross-firm, horizontal reviews of all activities within holding companies that can create risk for the firm and the financial system. The Federal Reserve will be combining firm-specific data analysis and market-based indicators to identify situations that may affect multiple firms. By using scenario analysis, the Federal Reserve would be able to gauge the effect of possible market developments on the capital, liquidity, and leverage positions of systemically important financial institutions. Eventually, more sophisticated modeling would attempt to link traditional and enhanced supervisory information about a collection of financial institutions with market-based stress indicators to build a more comprehensive picture of emerging systemic problems. Although supervisors will always use judgment in interpreting the results obtained from such models, the modeling itself will require measures that quantify possible sources of systemic risk.

26. Similar teams have been formed to assess the effects of incentive compensation on financial firms. See Alvarez (2010).

27. Tarullo (2010b).

Bridges and Hedge Funds: Endogenous Risk

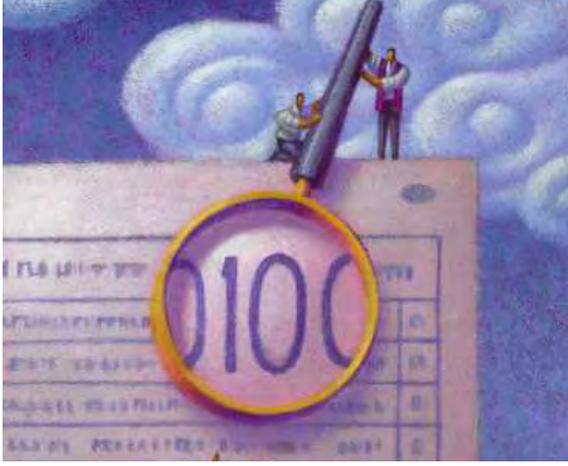
One reason to be careful about using measures of systemic risk is that the wrong measure can make problems worse. In a systemic context, some measures of risk can create feedback loops that increase market instability. Construction engineers, outdoing even economists in the realm of jargon, call this “synchronous lateral excitation,” an effect seen in London’s Millennial Bridge, where pedestrians, adjusting to small wobbles caused by wind, swayed in step, reinforcing the swings and causing even bigger wobbles.¹ This endogenous risk can show up in financial markets. For example, if traders in a firm have a hard risk limit, a small increase in volatility means they must reduce their position. As traders in many firms do this, prices fall, and the market price change leads to a higher measured level of risk in the market, forcing traders to sell even more.

The lesson is that too naïve a measure of risk, when implemented as a policy, may create the very thing it was intended to prevent. Indeed, something quite similar most likely occurred in one section of the hedge fund industry in August 2007.² Losses (or portfolio rebalances) probably led at least one large fund employing a statistical arbitrage strategy to sell, moving market prices enough to trigger other funds following similar quantitative strategies to deleverage in turn. The resulting movements were so large relative to previous movements that one participant described them in the lingo of quantitative risk management as “25-standard-deviation moves,” something generally not expected before the collapse of the universe.³

1. Strogatz, Abrams, McRobie, Eckhardt, and Ott (2005).

2. Lo (2008).

3. Thal Larsen (2008).



Systemic risk will be monitored in some fashion, and the information collected will be incorporated into supervisory practices.

A Call for Transparency and Dialogue

The recent financial crisis should serve as a powerful reminder that financial markets are dynamic and will adapt to changes in supervision and regulation. We should anticipate that some market participants will look for ways to minimize the restrictions placed on their activities by developing new financial instruments and legal structures, and by expanding the use of implicit guarantees. Financial supervisors will need all the help they can get to stay current with evolving conditions. For its part, the public will want its own assurances that the supervisors are keeping a watchful eye.

In monetary policy, the public has many opportunities to observe the Federal Reserve's progress in achieving its dual mandate to promote stable prices and maximum sustainable economic growth. The Federal Reserve's monetary policy body, the Federal Open Market Committee (FOMC), meets regularly and immediately publishes its policy decisions and rationale. More information follows in meeting minutes, speeches by Fed officials, and Congressional testimony, providing the public with a good understanding of how inflation and unemployment can affect the Federal Reserve's actions. Many highly sophisticated "Fed watchers" frequently comment on the FOMC's strategy and actions, a situation that enables the FOMC to recognize when its own views might differ markedly from those of others. Over time, the FOMC has come to appreciate that a thoughtful communication strategy is a useful component of the policymaking process itself, and that its dialogue with the public leads to better policymaking.

Likewise, we think that supervisory efforts to limit systemic risk could benefit from the credibility and accountability that would arise from an expanded public dialogue. Wall Street gurus and others can criticize the measures of risk—or feel free to propose their own. Pundits can bemoan the supervisors' slow response to rising levels of risk—or their overreaction to noisy data. Public discourse about supervisory strategy and actions could help market participants understand how supervisors are identifying and mitigating systemic risk, and ultimately sharpen the tools and refine the gauges in the supervisors' toolboxes.

More research, data collection, analysis, and practical experience are likely to considerably improve supervisors' ability to tie specific measures of systemic risk to requirements for deposit insurance premiums, capital, liquidity, and leverage. In a very real sense, the supervision of systemic risk stands at the early stages of an evolution that prudential supervision has been undergoing for decades. Even as late as the 1970s, different federal supervisors (primarily the Federal Reserve and the Comptroller's Office of the Treasury) had very different approaches to bank supervision. Attempts to provide a more standardized approach began in the Johnson administration, but progress was slow.²⁸ In 1978,

²⁸ Robertson (1995).

Congress formalized the convergence, creating the Federal Financial Institutions Examination Council, which introduced the CAMEL system (for Capital, Assets, Management, Earnings, and Liquidity).²⁹ The system continued to evolve: Concerns that banks held too little capital prompted supervisors to add a risk-based approach in 1988. That approach did not account for market risk, so in 1997 supervisors added an S for Sensitivity to market risk. As banks used securitization to further reduce capital, other changes were implemented.³⁰ The next step in that evolution could well be a similar system for macro-stability ratings, such as the recent proposal by Gary Stern and Ron Feldman.³¹

29. Tarullo (2008).

30. Tarullo (2008).

31. Stern and Feldman (2009).

In this essay, we have explained why we think it is important to learn more about systemic risk measurement. We have shared some of our thinking about the topic and summarized the thinking of others. But this one-way communication does not constitute dialogue. What do *you* think about designing ways to measure systemic risk and a platform to manage it? Take this as a request for public comment: Send your ideas to us at SystemicRisk@clev.frb.org.

References

- Acharya, Viral V., Lasse H. Pedersen, Thomas Philippon, and Matthew Richardson. 2009. "Regulating Systemic Risk." In Viral V. Acharya and Matthew Richardson, eds., *Restoring Financial Stability: How to Repair a Failed System*. Hoboken, N.J.: Wiley.
- Acharya, Viral V., Thomas Philippon, Matthew Richardson, and Nouriel Roubini. 2009. "A Bird's-Eye View: The Financial Crisis of 2007–2009." In Viral V. Acharya and Matthew Richardson, op. cit.
- Adrian, Tobias, and Markus Brunnermeier. 2009. "CoVar." Staff Report No. 348. Federal Reserve Bank of New York (August).
- Alvarez, Scott G. 2010. "Incentive Compensation." Testimony before the House Committee on Financial Services (February 25).
- Bloomberg Financial Conditions Index. 2010. (www.bloomberg.com/apps/quote?ticker=BFCIUS%3AIND).
- Borio, Claudio, and Matthias Drehman. 2009. "Assessing the Risk of Banking Crises—Revisited." *Quarterly Review*, Bank for International Settlements (March), 29–46.
- Commodity Futures Trading Commission. 2010. "A Guide to the Language of the Futures Industry." (www.cftc.gov/educationcenter/glossary/glossary_s.html).
- Coval, Joshua, Jakub Jurek, and Erik Stafford. 2009. "The Economics of Structured Finance." *Journal of Economic Perspectives* 23(1): 3–25.
- De Nicolo, Gianni, and Marcella Lucchetta. 2010. "Systemic Risks and the Macroeconomy." IMF Working Paper 10/29, International Monetary Fund (February), 1–40.
- Donohue, Andrew J. 2009. "Regulating Hedge Funds and Other Private Investment Pools." Testimony before the Subcommittee on Securities, Insurance, and Investment of the U.S. Senate Committee on Banking, Housing, and Urban Affairs (July 15).
- Dwyer, Gerald P., and Paula Tkac. 2009. "The Financial Crisis of 2008 in Fixed Income Markets." Working Paper 2009–20. Federal Reserve Bank of Atlanta (August).
- Gorton, Gary. 1985. "Bank Suspension of Convertibility." *Journal of Monetary Economics* 15(2): 177–93.
- Gray, Dale F., Robert C. Merton, and Zvi Bodie. 2007. "Contingent Claims Approach to Measuring and Managing Sovereign Credit Risk." *Journal of Investment Management* 5(4): 5–28.
- Greenspan, Alan. 1998. Testimony before the House Committee on Banking and Financial Services at the Hearing on Hedge Fund Operations (October 1).
- Haubrich, Joseph G., and James B. Thomson. 2009. "Too Big to Fail and the Definition of Systemic Significance." *Lombard Street Journal* 1 (15): 24–30.
- Hu, Henry C. 2009. "Empty Creditors and the Crisis." *Wall Street Journal* (April 10).
- Hu, Henry C., and Bernard S. Black. 2008. "Equity and Debt Decoupling and Empty Voting II: Importance and Extension." *University of Pennsylvania Law Review* 156: 625–739.
- Leland, Hayne, and Mark Rubinstein. 1988. "Comments on the Market Crash: Six Months After." *Journal of Economic Perspectives* 2(3): 45–50.

- Lo, Andrew W. 2008. "What Happened to the Quants in August 2007?" In *Hedge Funds: An Analytic Perspective*. Princeton, N.J.: Princeton University Press.
- Lo, Andrew W. 2009. "The Feasibility of Systemic Risk Measurement." Testimony written for the House Committee on Financial Services (October 19).
- Mendelowitz, Allan I., and John Liechty. 2010. "The National Institute of Finance: Providing Financial Regulators with the Data and Tools Needed to Safeguard our Financial System." Testimony before the Senate Subcommittee on Security, International Trade, and Finance, Committee on Banking, Housing, and Urban Affairs (February 10).
- Nakamura, Leonard. 2010. "Durable Financial Regulation: Monitoring Financial Instruments as a Counterpart to Regulating Financial Institutions." White Paper. Federal Reserve Bank of Philadelphia (January 4).
- Pianalto, Sandra. 2009. "Steps toward a New Financial Regulatory Architecture." Remarks, Ohio Bankers' Day, April 1. (www.clevelandfed.org/For_the_Public/News_and_Media/Speeches/2009/Pianalto_20090401.cfm).
- Robertson, Ross M. 1995. *The Comptroller and Bank Supervision: A Historical Appraisal*. Washington DC: Office of the Comptroller of the Currency, 213.
- Rowe, David. 2009. "Twenty-first-century Supervision." *Risk* (December): 93.
- Shiller, Robert J. 2005. *Irrational Exuberance*. Princeton, N.J.: Princeton University Press, second edition.
- Sjostrom, William K. 2009. "The AIG Bailout." *Washington and Lee Law Review* 66(3): 943–94.
- Squam Lake Working Group on Financial Regulation. 2009. "A New Information Infrastructure for Financial Markets." Council on Foreign Relations, Center for Geo-economic Studies, Working Paper (February).
- Stern, Gary H., and Ron Feldman. 2009. "Macrostability Ratings: A Preliminary Proposal." *The Region*. Federal Reserve Bank of Minneapolis, 12–17.
- Stigler, George J. 1975. "The Economist and the State," in *The Citizen and the State: Essays on Regulation*. Chicago: University of Chicago Press, 50.
- Strogatz, Steven H., Daniel M. Abrams, Allan McRobie, Bruno Eckhardt, and Edward Ott. 2005. "Theoretical Mechanics: Crowd Synchrony on the Millennium Bridge." *Nature* 438 (November), 43–44.
- Tarullo, Daniel K. 2008. "Banking on Basel: The Future of International Financial Regulation." Washington DC: Peterson Institute, 30–31.
- Tarullo, Daniel K. 2010a. "Equipping Financial Regulators with the Tools Necessary to Monitor Systemic Risk." Testimony before the Senate Subcommittee on Security, International Trade, and Finance, Committee on Banking, Housing, and Urban Affairs (February 12).
- Tarullo, Daniel K. 2010b. "Lessons from the Crisis Stress Tests." Remarks at the Federal Reserve Board International Research Forum on Monetary Policy. Washington DC (March 26).
- Thal Larsen, Peter. 2008. "Goldman Pays the Price of Being Big." *Financial Times* (August 13).
- Thomson, James B. 2009. "On Systemically Important Financial Institutions and Progressive Systemic Mitigation." Policy Discussion Paper No. 27. Federal Reserve Bank of Cleveland (August).
- Tufte, Edward R. 1997. *Visual Explanations*. Cheshire, Conn.: Graphics Press.
- Warsh, Kevin. 2009. "The Panic of 2008." Remarks, Council of Institutional Investors, 2009 Spring Meeting, Washington DC, April 6. (www.federalreserve.gov/newsevents/speech/warsh20090406a.htm).
- Zuckerman, Gregory. 2007. "Concentration Proves Winner at Hedge Fund." *Wall Street Journal* (May 14).