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## Market failures and regulatory failures: Lessons from past and present financial crises

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**ADB Working Paper Series**

**Market Failures and Regulatory  
Failures: Lessons from Past and  
Present Financial Crises**

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Cooley, Matthew Richardson,  
and Ingo Walter

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**Abstract**

The paper analyzes the financial crisis through the lens of market failures and regulatory failures. We present a case that there were four primary failures contributing to the crisis: excessive risk-taking in the financial sector due to mispriced government guarantees; regulatory focus on individual institution risk rather than systemic risk; opacity of positions in financial derivatives that produced externalities from individual firm failures; and runs on the unregulated banking sector that eventually threatened to bring down the entire financial sector. In emphasizing the role of regulatory failures, we provide a description of regulatory evolution in response to the panic of 1907 and the Great Depression, why the regulation put in place then was successful in addressing market failures, but how, over time, especially around the resolutions of Continental Illinois, Savings and Loans crisis and Long-Term Capital Management, expectations of too-big-to-fail status got anchored. We propose specific reforms to address the four market and regulatory failures we identify, and we conclude with some lessons for emerging markets.

**JEL Classification: E44, G01, G15, G18, G21, G24**

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## 1. INTRODUCTION

The severity of the financial crisis of 2008 has forced academics, regulators and policymakers to rethink the contours of the current financial system. Calls for the greatest regulatory overhaul since the Great Depression have become common. Indeed, many observers, including ourselves, view the crisis first and foremost as a regulatory failure and are convinced that the current regulatory architecture—the product of many ad hoc responses to prior crises and antiquated in the face of the evolving structure and role of financial institutions—is in need of repair. But regulation is a tricky business; the law of unintended consequences always applies. The wrong decisions may well make future crises more likely and more severe, while regulation that is too heavy handed could stifle future financial efficiency and innovation.

While the current crisis has exposed multiple cracks in the financial system, the instinctive reaction of some is to call for a paradigm shift—even blaming the nature of capitalism itself. In reality, the problem is far less dramatic. A good rule of thumb for designing effective regulation is to focus almost exclusively on the specific source of the market failures and evaluate robust ways of addressing these failures through regulatory interventions.

History can be a good guide here. Somewhat paradoxically, even though financial crises are rare, they are recurring phenomena, just like the business cycle. Thus it is possible to think about crises—and how to respond to them—in a systematic manner. What are the common causes of crises across their recurrences? Are there lessons to be learned from the crises of the past that can be helpful in the future? What responses to crises have been most successful? And based on these, what can be done next to try to improve stability without unduly undermining efficiency and innovation?

One view of the financial crisis of 2008 has been that it illustrates the failure of the market-driven view of economic activity. In this view, the past decades of liberalizing markets, removing regulatory restrictions, and trusting markets to discipline themselves have had the unintended consequence of destabilizing the financial system.

A companion view is that one can best understand how markets act in terms of behavioral phenomena—like herd behavior—where market participants all move in the same direction in waves of pessimism and optimism. And indeed, if one had to describe market behavior in terms of bubbles and collapses, this turns out to be a very useful description. But there is an important distinction to be made between description and explanation. The notion of herd behavior or “animal spirits” carries with it little, if any, positive prescription for policy.

A contrasting view is an analytical market-driven view that asks what the specific market failures were that led to the crisis, and paves the way for thinking about regulatory solutions that can address these failures. We argue in this essay that such an analytical view also provides a better positive explanation of the financial crisis.

The set of institutions that today provide the architecture for the US financial system—the Federal Reserve System (Fed), the Securities Exchange Commission (SEC), the Federal Deposit Insurance Corporation (FDIC), and the Commodity Futures Trading Commission—all emerged over time in response to events, most often to past crises. Regulatory institutions that survive today exist because they turned out to be useful. They are seen to have contributed to the stability and growth of the US financial markets for many decades. There were many other institutions that did not meet this test, either because they were ill conceived from the beginning or because financial innovation rendered them obsolete.

Today, there is a strong desire to reform the surviving institutions, and there is some urgency to do so because of the enormous costs to society associated with their manifest failure in the current financial crisis. In this chapter, we document the market failures that

characterized the recent financial crisis and then develop a sensible set of policy responses to reform the regulatory landscape.

The first section of this discussion reviews some of the historical precedents, panics, and banking crises that led to the present financial and economic environment and that shaped the current regulatory system.

The second section describes the recent financial crisis in terms of specific market failures as they relate to the following:

- the excessive risk-taking incentives of financial institutions when government guarantees are not priced or are mispriced;
- the regulatory focus on individual, rather than the systemic, risk of financial firms;
- opacity of financial firms and markets that created externalities from failures of individual firms; and
- the likelihood of “runs” in the shadow banking system, which relies heavily on uninsured short-term funding.

In the third section, we lay out some principles of regulation that address these failures. Specifically, we propose the following regulation to address these issues:

- Government guarantees in the system (for example, deposit insurance, too-big-to-fail status, and implicit subsidies to hybrid financial intermediaries, such as the government-sponsored enterprises (GSEs) need to be priced to align the risk-taking incentives of financial firms.
- The systemic risk associated with actions of individual financial institutions needs to be priced, that is, firms need to be forced to internalize the costs of the negative externalities imposed by their actions on the system as a whole.
- Arguably, the leading candidate for the bottleneck that emerged in the financial system was the over-the-counter (OTC) market for derivatives; we argue for much greater transparency in this market.
- A key aspect of the crisis centered on runs in the wholesale funding markets (asset-backed commercial paper, repurchase agreements, unsecured commercial paper, and unsecured interbank lending). We argue for imposition of liquidity requirements for financial institutions that are similar in spirit to the way capital requirements are imposed.

The last section illustrates, through a series of examples, that these principles are as relevant for emerging markets as they are to the global wholesale markets.

## 2. LESSONS FROM PAST CRISES

If one focuses for the moment on the United States (US) during the twentieth century, it may come as a surprise to find that it has suffered a number of significant financial crises. Among them were the Panic of 1907, a severe contraction in 1921, the banking panic of the 1930s and the Great Depression, the failure of the Continental Illinois Bank and Trust Company in 1984, the savings and loan crisis of the 1980s, and the Long-Term Capital Management crisis in 1998. We discuss several of these, in turn, to illustrate the relationship between market failure and financial regulation.

Table 1 provides a summary of our discussion. In brief, we argue that the financial regulation of the 1930s was successful to the extent that it addressed the main sources of market failure at the time, namely, uncertainty about which institutions were insolvent. Financial crises began to recur in the 1980s. In contrast to the 1930s, however, the problems that arose in the more recent period—runs in the wholesale funding market, excessive risk shifting, and legal barriers to winding down institutions—were not repaired by regulatory

responses. In hindsight, some of these regulatory failures sowed the seeds for the crisis of today, just as poor regulatory responses today could likely sow the seeds of crises tomorrow.

**Table 1: Description of Five Financial Crises in the United States during the Twentieth Century<sup>a</sup>**

Crisis	Event	Market failure	Solution	Success?
Panic of 1907	Losses due to speculation; bank run due to links across players	Uncertainty about bank insolvency and lack of liquidity	Creation of Federal Reserve and lender of last resort	Did not deal with uncertainty issue and thus bank runs
Great Depression	Huge macroeconomic shock, caused large losses at banks nationwide	Uncertainty about bank firm insolvency led to massive runs	Creation of FDIC and deposit insurance coupled with bank regulation	Served well for about fifty years before becoming antiquated
Continental Illinois (1984)	Losses due to concentrated exposure, lost access to funding	Relied on wholesale, as opposed to retail, funding	Bailout and creation of TBTF designation	Gave TBTF special status without any cost; ignored wholesale funding
Savings and loan crisis (1980s)	Losses throughout system due to risk shifting on the part of banks	Mispriced government guarantee created misaligned incentives	Bailout and the creation in 1991 of risk-based deposit insurance	From 1996–2006, premiums no longer collected due to funds being well capitalized
LTCM (1998)	Large hedge fund ran aground	Too interconnected to fail	Negotiated unwind	Ignored LCFI mantra

Note: a. Abbreviations: LCFI, large complex financial institutions; LTCM, Long-Term Capital Management; TBTF, too big to fail.

Source: Authors.

## 2.1 Lesson 1: The Panic of 1907

The Panic of 1907 was triggered in the “curbside” stock market that was organized outside of the formal confines of the New York Stock Exchange.<sup>1</sup> Investors tried to corner the market in United Copper Company by executing a short squeeze. Their scheme failed, and the price

<sup>1</sup> The best recent account of this episode is Bruner and Carr (2007).



of United Copper plummeted. The same investors were also heavily involved with a number of banks and brokerages. When the United Copper play collapsed, it raised concerns about the safety of the banks that had lent money to back their scheme. The panic spread and led to pressure on other banks, forcing a number of banks to close their doors and suspend operations.

The problem that faced the banks and financial markets more broadly was the inherent contradiction of fractional reserve banking. All of the institutions involved in the panic were engaged in intermediation of one form or another, with less than 100% reserves. When depositors became concerned and demanded their money back, even solvent financial institutions found their cash and gold reserves insufficient to meet demand. Drained of cash, they were forced to shut their doors. The institutions that had evolved endogenously to address the problems of temporary liquidity shortages were bank clearing house associations that pooled resources to provide liquidity in times of stress and performed many of the functions of a central bank.<sup>2</sup> However, two problems emerged in the Panic of 1907. The first was that private clearing house associations also faced the risk of default. The second was that some companies, notably the trust companies in New York, were not allowed to be members of the clearing house association due to the internecine rivalry between commercial banks and trust companies.

There are many important lessons to be derived from the Panic of 1907. First, fractional reserve banking is inherently precarious. Second, information on solvency (or lack thereof) of financial institutions is incredibly valuable but extremely difficult to gather, and at the time, no institution existed to provide it. Finally, a lender of last resort for solvent but illiquid institutions is needed for financial stability, but the private provision of that liquidity through the clearing house associations was ineffective when it was most needed.

In May 1908, Congress passed the Aldrich Vreeland Act that created something called the National Monetary Commission, chaired by Senator Nelson Aldrich, whose mission was to study the underlying causes of the Panic of 1907 and develop proposals to make such events less likely in the future. The final report of the National Monetary Commission was published on January 11, 1911. For nearly two years, legislators debated the proposal, and it was not until December 22, 1913, that Congress passed the Federal Reserve Act. The bill was signed by President Woodrow Wilson on December 22, 1913, creating the Federal Reserve System.

The Federal Reserve has evolved over time and periodically has been severely challenged, notably in the 1930s and in the crisis of 2007–2009. But it has quite successfully served one of the critical purposes for which it was created, that is, the need for a credible lender of last resort facility. This was only a partial solution, however, since it failed to resolve the information problem of consumers who had to decide whether or not to join a run on a bank in the first place. It took the banking panics of the 1930s to focus additional attention on sources of instability other than illiquidity.

## **2.2 Lesson 2: The Banking Panics of the 1930s**

There were three separate waves of banking panics during the 1930s—in 1930, 1931, and early 1933. The economic forces at work in creating and perpetuating the Great Depression have been much discussed and debated. We will not repeat those issues here except to note that there is a general consensus that the contractionary monetary policies that the Federal Reserve Board pursued at the time were a contributing factor to the banking crisis of the early 1930s.<sup>3</sup>

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<sup>2</sup> See Gorton (1985).

<sup>3</sup> See Friedman and Schwartz (1971); Meltzer (2003, 2004).

The prices of goods and services in the US fell by approximately 25% between 1929 and 1933. This led to debt deflation, a phenomenon by which the collateral underlying loans shrink in value, causing the real burden of debt to rise and leading the economy to spiral further downward. In a parallel with the recent financial crisis, the collapse of the real estate bubble in the second half of the 1920s was arguably a factor contributing to the 1929 stock market crash and added materially to the solvency stresses imposed on the banks. The debt deflation of 1929–33 and the contemporaneous soaring of unemployment rates made it extremely difficult for homeowners to repay their debts. As borrowers were increasingly unable to make their payments, the underlying value of banks' assets fell, many banks were unable to meet the needs of their depositors, listed bank stocks plummeted, and a lack of confidence in the remaining banks led to a general state of panic (Bernanke 2000).

By March 1933, as Franklin D. Roosevelt took office, there was a full-fledged banking panic and cries for reform of the banking system. The responses to those pressures could have been many, for example, nationalizing the banks or relaxing restrictions on bank mergers or interstate banking (and the latter would have led to a highly concentrated banking system)—all of them solutions that had been adopted elsewhere and all actively debated at the time.

The immediate response to the panic was to declare a “bank holiday” in order to determine, as had been the case in 1907, whether individual banks were solvent, illiquid, or liquid enough to reopen. This helped to calm the system but only restored the status quo of the post-1907 world. The fundamental market failure still existed. Banks made money by engaging in risky intermediation. Consumers had no easy way of assessing that risk, leaving intact the possibility of panics and bank runs.

The policy innovation that addressed this problem was the Banking Act of 1933, which created the Federal Deposit Insurance Corporation to provide credible government insurance for individual bank deposits and which effectively dealt with the problem of retail bank runs. The Glass-Steagall provisions of the Banking Act separated investment banks from commercial banks, in an effort to insulate depositors' savings from being used to finance high-risk investments in the financial markets. Firms that already engaged in both commercial and investment banking activities, such as the J.P. Morgan Bank, were forced to break up into commercial banks (in this case, what became the Morgan Guaranty Trust Company of New York) and investment banks (in this case, Morgan Stanley and Company). The Banking Act further stipulated that interest not be paid on demand deposits in commercial banks; those seeking returns would have to use less liquid savings deposits or securities.

The creation of the FDIC was arguably the most successful policy response to the banking crisis of the 1930s. In fact, the FDIC resulted from an amendment to the Banking Act of 1933, and had been opposed by President Franklin Roosevelt and many leading bankers in the big US money centers. Nevertheless, this one institutional innovation was responsible for calming the fears of depositors and ending retail bank runs. Its creation was followed by many decades of relative stability in the financial system.

The Banking Act of 1933 required that all banks that were members of the Federal Reserve System have their deposits insured, up to a monetary limit, by the FDIC. Nonmember banks could also be covered, subject to approval by the insurer. Insured banks were required to pay premiums covering their insurance, based on their deposit size. Within six months of the creation of the FDIC, 97% of all commercial bank deposits were covered by insurance.

The FDIC has been a highly successful institution because it solved a well-defined problem: uncertainty about the solvency of the banks among retail depositors. More important, it did so in a way that acknowledged the contradictions and risks inherent in fractional reserve banking by making those responsible for managing the risks—the banks themselves—pay for insuring against them. These costs were passed through to bank borrowers, time depositors, and investors. Judged by the results, this was a remarkably successful piece of

regulation. It stabilized the industry. Bank runs disappeared, and the number of bank failures dropped to an extremely low level compared with prior decades.

The other important regulatory innovation of the 1930s comprised the Securities Act of 1933 and the Securities Exchange Act of 1934. The main intention of this legislation was to ensure that investors receive significant (or “material”) information concerning securities being offered for public sale and to redress market misbehavior. The objective was to “shine a bright light” on financial information so that investors could make informed decisions. To underscore the need for reliable information, the 1933 and 1934 acts required that public financial information be verified by independent auditors using standardized accounting rules. These rules gave a major boost to the efficiency and transparency of financial markets, and deserve much credit for stimulating the flow of capital in the US economy.

The important thing to note about both of these seminal regulatory innovations is that they were not attacks on the free market or on capitalism—something that could not be taken for granted since, at the time, the spread of socialism and communism was gaining momentum, and other options might well have seemed appealing. What these reforms recognized was the need for information and confidence to make the markets function better. These were attributes that only public policy could require of market participants and then provide to markets at large. The regulatory reforms also constituted a bet on the decision making of the individual investor. Given enough transparency, investors were believed capable of making smart and profitable long-term decisions. These were intelligent, effective pro-market regulations that worked well for many decades.

### **2.3 Lesson 3: Continental Illinois and Too-Big-To-Fail Status**

From the 1930s until the 1980s, the US banking system functioned fairly smoothly.<sup>4</sup> The lessons learned in the early part of the twentieth century and the institutions created to deal with the fundamental market failures and information frictions—the Fed, the FDIC, and the SEC (bolstered by the Investment Company Act of 1940)—led to a long period of relative tranquility in banking and financial markets. Bank failures slowed to a trickle as bank regulation focused on maintaining adequate capital and controlling risk.

There were bank failures to be sure, but the FDIC had a well-tested approach to the problem. When failure was unavoidable, the regulatory machinery worked as designed: either the regulators sold the bank successfully (“purchase and assumption”), or they liquidated the institution, made good on deposit insurance promises, and wiped out the uninsured depositors and other creditors. This set of procedures imposed a discipline on the banking system that seemed to work very well.

In 1982, however, federal regulators decided to close the Oklahoma-based Penn Square Bank, a US\$436-million institution that specialized in oil and gas sector loans. Penn Square originated large volumes of loans to the historically risky exploration sector of the US energy industry, which began to suffer as energy prices fell in the recession of the early 1980s. The seventh-largest bank in the US, Continental Illinois Bank and Trust Company, had invested aggressively alongside or through Penn Square and booked a large volume of Penn Square-originated loans. Continental Illinois had made many other loans to the energy sector and, at the same time, had expanded its lending to developing countries to help them finance debts incurred in the energy crises of the 1970s. In 1982 Mexico was forced to renegotiate its debt, triggering the less-developed-country debt crisis involving hundreds of bank loan syndications.

While many other US commercial banks followed the same lending strategy in the late 1970s, Continental Illinois’s credit exposures were compounded by a funding strategy that was unusual at the time. Traditionally, banks funded growth in their lending activities by

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<sup>4</sup> The following discussion about Continental Illinois relies heavily on FDIC (1997).

attracting larger volumes of savings from retail depositors. Continental Illinois, however, had a limited retail presence, due in part to federal and local banking regulations that limited the number of banking outlets it was permitted to have. Consequently, Continental Illinois depended heavily on funding itself in the wholesale money markets. Indeed, by 1981 it was sourcing most of its funding through federal funds and by selling short-term certificates of deposit on the wholesale money markets. Only 20% of Continental Illinois's funding came from traditional retail deposits in Chicago.

Continental Illinois had pursued an aggressive growth strategy and had assumed a great deal of concentrated risk. When the energy sector turned sour and the less developed countries rescheduled, Continental Illinois was unusually vulnerable to the views of the wholesale funding markets. In 1984 investors and creditors lost confidence in the bank, and in a precursor to the crisis of 2007–08, Continental Illinois was quickly shut out of its usual sources of funding in the domestic and Eurodollar markets.

In May 1984, Continental Illinois experienced what the FDIC described as a high-speed electronic bank run. To stem the panic, regulatory agencies and the banking industry arranged billions of dollars in emergency funding for the bank. The fear was that a failure of Continental Illinois would undermine the entire banking system. More than 2,300 banks had correspondent accounts with Continental Illinois. Unlike the uninsured retail depositor runs of the 1930s, this time it was an uninsured wholesale depositor run. In an extremely controversial decision, the FDIC tried to stop the run by extending its guarantee beyond its retail deposit limits to cover uninsured depositors and creditors, as well. This was the beginning of the notion that some banks should be considered too big (or too interconnected) to fail.

The FDIC's emergency help was followed by a package of permanent measures, making Continental Illinois the largest bank in US banking history to be rescued by government agencies. Unable to find a takeover partner, the FDIC ended up owning more than 80% of the bank. The Continental Illinois board was replaced, senior management was fired, the bank was restructured and later floated in a public offering, and subsequently was acquired by Bank of America. The FDIC's share of the bill to rescue Continental Illinois was later calculated to be US\$1.1 billion.

The Continental Illinois story provides a classic example of how a sharp drop in confidence can lead counterparties in the wholesale markets suddenly to withdraw funding from a wounded bank, spinning the institution into a liquidity crisis as potentially fatal as any nineteenth-century run on a bank by retail depositors—in this case, a liquidity crisis triggered by a suspected insolvency problem that turned out to be true.

It should have been a warning call that systemic risk can build up quickly in a credit expansion cycle and needs to be appropriately priced and regulated. But that was not to be. Continental Illinois should have been the canary in the coal mine. It demonstrated that the regulatory system crafted in the 1930s needed updating to account for the development of massive wholesale banking markets. Instead, and despite many warning voices, the problem was ignored.

## **2.4 Lesson 4: The Savings and Loan Crisis**

The most serious postwar crisis in the US banking sector was the savings and loan (S&L) crisis of the late 1980s. It is often blamed (with at least some justification) on the more lax regulatory environment that evolved during the Reagan administration.<sup>5</sup> That is not the entire story, however, and the S&L crisis remains an episode that contains valuable lessons for the crisis of .

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<sup>5</sup> White (1991).

Savings and loan institutions, as distinct from commercial banks, were another product of the Great Depression. They were created to serve the public policy goal of encouraging home ownership. The Federal Home Loan Bank Act of 1932 created the Federal Home Loan Bank System to provide liquidity and low-cost financing for S&Ls. There were twelve regional Home Loan Banks; these were owned by their members and were under the supervision of the Federal Home Loan Bank Board (FHLBB). The National Housing Act of 1934 created the Federal Savings and Loan Insurance Corporation (FSLIC) to provide federal deposit insurance for S&Ls, similar to what the FDIC provided for commercial banks. In contrast to the FDIC, which was established as an independent agency, the FSLIC was placed under the authority of the FHLBB. In retrospect, the FHLBB carried far heavier political baggage than did the FDIC.

For decades, the FHLBB's examination, supervision, and regulatory capabilities were relatively poorly developed, in part because S&Ls had a narrowly defined financial intermediation role and not much scope for expanding it. S&Ls took in savings on which they paid low interest rates and lent the money at marginally higher interest rates on thirty-year fixed-rate mortgages. This model all began to change with the accelerating inflation of the 1970s, when interest rates soared. S&L deposits began to flee in pursuit of higher returns, and even when Congress lifted caps on deposit rates, the S&Ls were still being squeezed on the other end by their legacy portfolios of thirty-year fixed-rate mortgages. It was a classic maturity mismatch. They needed to find other sources of income.

In response, the FHLBB began loosening its regulations. It allowed the thrifts to begin issuing adjustable-rate mortgages. Congress also encouraged diversification and explicitly authorized the thrifts to engage in consumer lending and investments in commercial real estate. Accordingly, both federal and state thrift regulators began relaxing restrictions on their asset allocation options, easing safety and soundness regulation, lowering capital requirements, and changing accounting rules to make it easier for S&Ls to meet their net worth requirements. All of these changes helped the thrift industry to grow dramatically. Between 1980 and 1986, 492 new thrifts were chartered in the US. Taken together, it was a recipe for disaster.

Things began to change when inflation was brought under control early in the Reagan administration, and a major recession took hold. Oil prices fell to levels that made many earlier investments unprofitable. An array of tax benefits for real estate investments was eliminated, and that made many earlier projects unprofitable. Much of the banking growth between 1983 and 1985 had been in commercial real estate lending.

By 1985 it had become clear that the thrift industry faced serious trouble. Enough S&Ls had folded or were in danger of folding that the FSLIC was insolvent. Efforts to recapitalize the FSLIC in 1986 and 1987 were bitterly opposed by the industry, which lobbied aggressively with members of Congress. Thrift failures increased during 1987 and into 1988, but the insolvency of the FSLIC meant that rescuing troubled thrifts would cost more than the FSLIC had available in its insurance fund. As a result, the regulators could not intervene in S&Ls that had more in liabilities than assets. This left many insolvent thrifts still in business. These "zombie" banks had incentives to take even greater risks in the hope that they could improve their outcomes, and many did so using an early version of brokered deposits by returns-chasing clients who hoped to be bailed out if things went wrong.

The crisis in the S&L industry was finally acknowledged and resolved after the inauguration of George H.W. Bush in 1989. Congress passed the Financial Institutions Reform Recovery and Enforcement Act of 1989, which abolished the FHLBB and shifted regulation of S&Ls to the Office of Thrift Supervision (OTS), transferred the thrifts' deposit insurance function from the FSLIC to the FDIC, and reinstated many of the regulatory provisions that had been weakened during the previous decade. In turn, the 1989 reform act created the Resolution Trust Corporation to liquidate or restructure the insolvent S&Ls.

There are several lessons to be learned from the S&L mess. The first is that when regulatory institutions have outlived their usefulness or have been rendered obsolete by market developments, it is not enough just to eliminate the boundaries without consideration of the risks that are being created. This was the case with the thrift industry, which had been created and developed with specific goals in mind.

Another lesson is that regulators can easily be captured by the industry they regulate. This was clearly the case with FHLBB. The S&L crisis reinforces the point that moral hazard is an important and ever-present issue. It is critical to close insolvent, insured financial institutions promptly in order to minimize potential losses to the deposit insurance fund (or the taxpayer, in general) and to ensure a more efficient financial marketplace—zombie financial intermediaries extract a heavy price on financial market efficiency. Finally, resolution of failing financial institutions requires that the deposit insurance fund be strongly capitalized with reserves based on real risk assessments.

## 2.5 Lesson 5: Long-Term Capital Management

An episode that deserves mention in any litany of financial crises is the collapse of Long-Term Capital Management (LTCM), the storied hedge fund that had grown so quickly between 1994 and 1998, and was so interconnected that it was thought to be a systemically risky institution.

In 1998 LTCM collapsed in a “liquidity event.” A sudden disappearance of liquidity from credit markets—associated with a Russian default on external debt on August 15, 1998—triggered a global “flight to quality.” It is interesting to ponder why this enormous liquidity event did not lead to a global financial meltdown.

As it became clear that the magnitude of LTCM’s liquidity problem was enormous and that unwinding its positions could put severe strains on financial markets, the president of the Federal Reserve Bank of New York, with Alan Greenspan’s blessing, called a meeting of all of LTCM’s major banks and prime brokers to get them to work on a cooperative solution to the problem. Reluctant banks were forcibly dragged into the workout. That is the formula that the Fed and US Treasury were trying to reprise on the fateful weekend in October 2008 when they met to discuss the fate of Lehman Brothers. In 1998 what they did worked. There was an orderly insolvency and dissolution of LTCM without undue harm to the markets or the banks most directly involved.

The resolution of LTCM and the unwinding of its complicated positions were orderly because they were carried out by LTCM itself with the support of the other major financial firms and the New York Fed. The lessons of the LTCM collapse were clearly articulated in a 1999 report entitled “Hedge Funds, Leverage and the Lessons of Long-Term Capital Management.”<sup>6</sup> It was signed by Robert Rubin, Alan Greenspan, Arthur Levitt, and Brooksley Born.

One lesson the report clearly delivers is that procedures for unwinding complicated systemic firms needed urgent attention. The report devotes an entire appendix to a discussion of the inconsistencies in the US Bankruptcy Code that interfered with a private market resolution of LTCM’s debt problems and derivatives contracts. It describes the extent to which existing bankruptcy procedures are not, in fact, conducive to private market solutions in complex situations involving both standard loan contracts and derivatives contracts. These were clearly failings that needed to be fixed.

The key LTCM lesson was that better mechanisms were needed for the resolution of large, systemic firms. Absent that, and absent methods for penalizing institutions for accumulating systemic risk, the system would be stuck with firms that are both too big and too interconnected to fail and to resolve at acceptable cost to the public. Unfortunately,

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<sup>6</sup> See President’s Working Group (1999).

regulators believed that hedge funds might be the type of firm to get into trouble in a financial crisis; but in the crisis of 2007–2009, it turned out to be investment banks and universal banks themselves, many of which were, in fact, running “in-house” hedge funds.

### 3. MARKET FAILURES OF THE FINANCIAL CRISIS OF

Financial crises have many common features. In the background real economy, there is usually the presence of an asset price “bubble” (or asset price inflation, for purists), a corresponding credit boom, and large capital inflows into that economy.<sup>7</sup> However, these characteristics are necessary but not sufficient for a financial crisis to develop. The severity of the crisis depends crucially on the underlying financial sector’s exposure to these conditions and, in fact, the overall market’s uncertainty about the financial sector’s exposure to them. A key role of financial regulation is to put limits on financial institutions so as to limit this exposure. While there are many reasons for the relative calm of the US financial system during the fifty years after the Great Depression, many analysts continue to give credit to the financial regulation that was enacted at that time.

As described in the preceding section, the banking acts of the 1930s solved the uncertainty problem that led to bank runs by providing deposit insurance through the creation of the FDIC. Depositors no longer had to run on insured banks because the government guaranteed deposits up to certain maximums. Of course, it was well understood that deposit insurance creates moral hazard—that is, an incentive for banks to undertake greater risk than they would otherwise without the insurance. Regulators and policymakers understood that deposit insurance could lead to excessive risk taking, so they set up a number of counteracting barriers:

- Banks would have to pay to be part of the deposit insurance system. So, at least, on an *ex ante* basis, regulators took into account the cost of the insurance. Deposit insurance was limited in magnitude per account, thus restricting the size of the banks.
- The risk-taking activities of banks were ring fenced to the extent that there was a separation of the commercial and, presumably more risky, investment banking activities.
- Enhanced supervision and winding-down provisions for individual banks, generally centered on required minimum capital requirements, which served as a buffer against the risk-shifting incentive arising from deposit insurance.

So what happened in the 1980s that kept deposit insurance but took away these protections?

There is considerable debate about this issue, but the general consensus is that technological and other innovations changed the nature of banking—and therefore competition—in the financial sector.<sup>8</sup> Some of these innovations included the development of the automated teller machine, which reduced geographic ties between banks and depositors; the proliferation of money market funds and cash management accounts by broker-dealers and asset managers outside the banking system; and an increase in the types of communication channels, further reducing the ties between local bankers and depositors. In other words, the traditional lines of business of banks no longer enjoyed their previously protected status.

Keeley (1990) used the increase in bank competition as an explanation for the S&L crisis described earlier. Prior to these technological changes, banks and thrifts enjoyed monopolistic advantages so that their bank charters had “franchise value.” But once this

<sup>7</sup> See, for example, Reinhart and Rogoff (2008).

<sup>8</sup> See Kroszner (2000); Kroszner and Strahan (2007).

disappeared, the value to risk shifting and exploiting the guarantees of deposit insurance increased. In general, there is ample evidence of risk shifting related to deregulation, stepped-up banking competition, and the S&L crisis.<sup>9</sup>

Around the same time, the institutional side of banking also changed dramatically. There was tremendous growth in the so-called shadow banking system—that is, financial institutions outside the traditional banking system that provide very similar services.<sup>10</sup> The shadow banking system includes derivatives—futures, options, swaps, repurchase agreements, and money market funds—securitization of loans in the mortgage, corporate, and household sectors, and an increasing emphasis on public equity and bond markets. As an illustration, the amount of assets of the financial sector held by depository institutions dropped from 60% in 1950 to less than 30% in 2006.<sup>11</sup>

Kroszner and Melick (2009) provide a description of two financial systems, one being the traditional model of banking, the other a modern version of banking.<sup>12</sup> In the old model, an individual deposits funds in a bank. The bank then uses these funds to lend to corporations or individuals. The bank pays interest on the short-term deposits using interest earned on the loans. Concern over the funding mismatch and potential solvency issues of the bank are addressed through the bank's asset-liability management process and the individual's deposits being insured. This insurance, however, comes at a cost, both in terms of premiums paid, restrictions on the bank's actions, and the requirement that a fraction of the funds be held as capital.

In the new model, the same individual now provides funds to a money market fund. This fund buys commercial paper issued by a special purpose vehicle of the bank backed by asset-backed securities. These asset-backed securities are made up of the same loans described above in the old model of banking. The money market fund rolls over the commercial paper periodically as it becomes due. In the overwhelming majority of the cases, the credit risk of the loans underlying the asset-backed securities had embedded recourse back to the banks (effectively “securitization without risk transfer”).<sup>13</sup> On the surface, this means that the economics underlying these two banking models are almost identical.

Yet the risk-sharing mechanics and pricing are quite different. The rate offered by money market funds is invariably higher than that for equally liquid funds at checking and savings accounts of banks. Are these higher rates due to greater efficiency? Or are the rate differentials due to credit risk and the lack of “deposit-like” insurance? Or are the rates due to implicit government guarantees in a framework in which these guarantees are not priced, bank actions are much less restricted, and at most, only one-tenth the capital is required for off-balance-sheet financing via the special purpose vehicles? One set of arguments focuses on efficiency (welfare gains), and the other set of arguments focuses on risk shifting (inefficient wealth transfers).

Taking this background into account, we now describe the four market failures that we believe triggered and amplified the financial crisis of .

### 3.1 Risk-Taking Incentives of Financial Institutions

Given their inherently high leverage and the ease with which the risk profile of financial assets can be altered, banks and financial institutions have incentives to take on excessive risks. Ordinarily, market mechanisms would be expected to price risks correctly and thereby

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<sup>9</sup> See, for example, Saunders, Strock and Travlos (1990); Cordell, MacDonald, and Wohar (1993); Kroszner and Strahan (1996); Hovakimian and Kane (2000).

<sup>10</sup> Gorton (2009).

<sup>11</sup> Kroszner and Melick (2009).

<sup>12</sup> See also Acharya, Schnabl, and Suarez (2009); Gorton (2009).

<sup>13</sup> See Acharya, Schnabl, and Suarez (2009).



ensure that risk taking in the economy is at efficient levels. However, there are two factors that have impeded such efficient outcomes.

First, with the repeal of most protections from the Banking Act of the 1933, the only remaining protection against risk shifting is capital requirements. If the guarantees are mispriced, financial firms have an incentive to skirt capital requirements and take excessive risk. One way of telling the story of the crisis is that financial institutions managed to exploit loopholes in the regulatory system and built up large amounts of tail risk on the economy, particularly tied to residential real estate, with little or no underlying capital.

The second mechanism that induces excessive risk taking is a failure of corporate governance involving shareholders and employees. The fact that financial institutions have become large and increasingly complex and opaque in their activities has weakened external governance that operates through capital markets (accurate prices), the market for corporate control (takeovers), and boards. Coincident with this, and to some extent a corollary to it, has been the fact that financial risks at these institutions are now increasingly concentrated in the hands of a few “high-performance” profit-risk centers, which have an incentive to produce short-run imaginary profits at the expense of long-term risks (that is, “fake alpha”).

At this point, we concentrate on what we consider to be the primary factor associated with the financial crisis, namely, the accordance of the numerous government guarantees in the system—most notably deposit insurance, the implicit guarantee of “too big to fail” (TBTF), and the “subsidies” provided to government-sponsored enterprises like Fannie Mae and Freddie Mac. Together, these imply that the vast majority of liabilities in the US financial system were subject to some form of safety net, with profound implications for efficiency in capital allocation, incentives, and the structure of financial intermediation.

At the same time, it is important to note that the fact that banks received “free” or underpriced government insurance does not necessarily imply excess risk taking on their part. If the franchise value of their enterprise exceeds the benefits to risk shifting, then there might be very little effect associated with moral hazard from the insurance. The possibility of material shareholder losses, and the limits imposed on banks via Glass-Steagall, did contribute to relative calm for fifty or so years after the 1930s. However, once the Glass-Steagall separation between commercial and investment banking was lifted (steadily since 1970s), and competition dramatically increased (within and across states in the US as well as globally), the only real protection for the financial system came from adequate capital requirements.

There were two consequences resulting from increased competition and the erosion of profits underlying the traditional lines of business of banks. First, it meant banks increasingly moved into businesses highlighting noninterest income, such as trading and fees. Second, and more important, it increased the relative value of risk shifting, since bank charter values had been eroded by deregulation. Because mispriced guarantees had effectively removed the market discipline component of governance normally reserved for creditors, risk shifting was particularly easy to do.

In the crisis of 2007–2009, financial firms managed to shift risk by exploiting loopholes in regulatory capital requirements to take an undercapitalized, US\$2- to 3-trillion, highly leveraged, one-way asymmetric bet on the economy, particularly tied to residential real estate but also to commercial real estate and other consumer credit exposures. This bet was taken in four distinct ways.

First, the banks funded their portfolios of risky loans via off-balance-sheet vehicles (structured investment vehicles and conduits). These vehicles required about one-tenth the amount of capital of the same exposures held on the balance sheet, yet in 95% of the cases,

the credit risk effectively had full recourse back to the sponsoring institutions.<sup>14</sup> Acharya and others (2010, figure 3.7) provide evidence of the remarkable growth in asset-backed commercial paper in the precrisis period.

Second, financial institutions bought “underpriced” protection from monoline insurers and AIG, in the sense that banks were able to pocket the difference between the spread on the AAA tranches of the securitization instruments and the monolines’ premiums. Because neither AIG nor the monolines had much capital backing this insurance, and certainly not enough in a systemic crisis, the risk again was effectively recourse back to the financial institutions through the counterparty risk of the insurers.

Third, financial institutions made outright purchases of AAA tranches of nonprime securities, which were treated as having low credit risk and zero liquidity and funding risk. Together, the broker-dealers, the GSEs, and the banks held more than half of the US\$1.6 trillion of these securities outstanding.<sup>15</sup> Table 2 shows these holdings for financial institutions in 2007. This is the exact opposite of the key objective of securitization, in which the safest parts of credit risk are meant to be transferred from the financial sector to institutional investors and the capital markets at large.

**Table 2: Holdings of Mortgage-Related Debt by Financial Institutions, 2007<sup>a</sup>**

Billions of dollars, except as indicated

Institution	Loans	HELOC	Agency MBSs	Non-agency AAA	Subordinated CDOs	Non Subordinated CDOs	Total	Percent
<b>Banks and thrifts</b>	2,020	869	852	383	90	...	4,212	39
<b>GSEs and Federal Home Loan Bank</b>	444	...	741	308	...	...	1,493	14
<b>Broker-dealers</b>	...	...	49	100	130	24	303	3
<b>Financial guarantors</b>	...	62	...	...	100	...	162	2
<b>Insurance companies</b>	...	...	856	125	65	24	1,070	10
<b>Overseas</b>	...	...	689	413	45	24	1,172	11
<b>Other</b>	461	185	1,175	307	46	49	2,268	21
<b>Total</b>	2,925	1,116	4,362	1,636	476	121	10,680	...
<b>Percent</b>	27	10	41	15	4	1	...	...

Note: <sup>a</sup> Abbreviations: CDOs, collateralized debt obligations; HELOC, home equity line of credit; MBSs, mortgage-backed securities.

Source: Krishnamurthy (2008).

Fourth, in August 2004, investment banks successfully lobbied the SEC to amend the net capitalization rule of the Securities Exchange Act of 1934. This amendment allowed a voluntary method of computing deductions to net capital for large broker-dealers. It permitted the investment banks to use internal models to calculate net capital requirements to market risk and derivative-related credit risk, placing them on an equal competitive footing with universal banks of Europe operating under the Basel II Accord. The net impact was essentially to double the leverage applied by investment banks.

There is strong evidence in the literature for the existence of mispriced government guarantees and the consequences arising from these guarantees. In terms of the financial crisis of , how did these guarantees contribute to market failures?

<sup>14</sup> See Acharya, Schnabl and Suarez (2009) for an anatomy of asset-backed commercial paper conduits.

<sup>15</sup> See Acharya and Richardson (2009a).

With respect to deposit insurance, as described earlier, there is some consensus that moral hazard played an important role in both initiating and prolonging the S&L crisis. As a logical consequence, substantial reforms were enacted to address this issue, notably the Federal Deposit Insurance Corporation Improvement Act of 1991. One of the major changes in setting FDIC premiums was to make them more risk based. In theory, the FDIC assesses higher rates on those institutions that pose greater risks to the insurance fund. In practice, however, if the deposit insurance fund is well capitalized (that is, 1.25% of reserves to total insured deposits), no premiums are assessed to those banks considered to be of the lowest-risk category. In fact, from 1996 to 2006, more than 90% of all banks paid very little in deposit insurance premiums.<sup>16</sup> Acharya and others (2010, figure 2.1) illustrate this point by showing a reserve ratio close to 1.25% for this period and a small increase in fund balances.

The S&L crisis implied the need for risk-based insurance premiums to be charged to banks. In what constitutes a significant regulatory failure, the risk-based method was not applied to the extent that 90% of the banks fell in a single risk bucket, and indeed no insurance premiums at all were charged to the majority of US banks. This effectively meant that the US was running a free deposit insurance system with little or no protection at all at the time Glass-Steagall was repealed, and commercial banks were free to engage in all forms of investment banking and trading.

At first glance, the moral hazard inherent in depository institutions was limited in scope, since deposits were only a limited fraction of the assets (and liabilities) of the US financial system. However, since the majority of assets of the financial sector were held by a small number of large complex financial institutions (LCFIs), the market discipline provided by liability holders can be considered notionally similar to that provided by depositors given the presumptive too-big-to-fail (TBTF) guarantee. Since the 1984 bailout of Continental Illinois (described in the first section), the TBTF issue had been much discussed in regulatory and academic circles.<sup>17</sup> Even before the financial crisis of 2007–2009 made the TBTF guarantee explicit, there was ample evidence that a TBTF policy was effectively in force and that it distorted market pricing for more than two decades before the onset of the crisis itself.<sup>18</sup>

The case of the GSEs—Fannie Mae and Freddie Mac—illustrates the key importance of moral hazard and government guarantees. Fannie Mae was founded in 1938 in the wake of the Depression to provide liquidity and aid to the mortgage market. It became a government-sponsored enterprise in 1968, and shortly after, Freddie Mac was formed to compete with Fannie Mae to create a more efficient secondary market for mortgages. Both were listed companies, with shares actively traded in the market. While not explicit and often denied, there was the presumption that both the guarantor function and debt of the GSEs had full backing of the US government. Fannie and Freddie shareholders could be wiped out under adverse circumstances, but their debt holders fully expected to be rescued at face value by the GSE relationship with the US Treasury. Indeed, GSE debt generally was priced marginally above the prevailing treasury rate. US institutional investors (like pension funds) and foreign investors (like the People's Republic of China (PRC)'s central bank) were big players, chasing a few basis points of “free lunch” and fully expecting the implied Treasury Department backstop to kick in if times got tough. An excellent bet, as it turned out.

Consider the investment function of the GSEs. For every dollar of mortgage-backed securities (MBSs) purchased with equity, there was a large amount of debt issued to purchase additional MBSs.<sup>19</sup> The extraordinary point is the GSEs' access to very high

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<sup>16</sup> This issue was only partially addressed by the Federal Deposit Insurance Reform Act of 2005 to the extent that the ratio of reserves to total deposits covered a wider range for which premiums would be collected.

<sup>17</sup> See Stern and Feldman (2004); Ennis and Malek (2005).

<sup>18</sup> See, for example, the empirical evidence in O'Hara and Shaw (1990); Penas and Unal (2004); Morgan and Stiroh (2005).

<sup>19</sup> For the book and market leverage ratios of the GSEs over the period of 1993 to 2007, see Acharya and others (2010, figure 2.2).

leverage, given that they were investing in risky mortgage securities with questionable liquidity. This provides an idea of the size of the implicit government guarantee. In fact, the empirical literature has quantified the transfer from the taxpayer to the GSEs' bondholders and stockholders to be in many billions, even before the crisis ignited.<sup>20</sup>

Furthermore, it has been well documented that the investment portfolio of the GSEs also became riskier through time, as both Fannie Mae and Freddie Mac began to load up on nonprime mortgages—under intense pressure from both the Clinton administration (through the Department of Housing and Urban Development under Secretaries Henry Cisneros and Andrew Cuomo) and by Congress, to better serve the political end of housing affordability for lower-income Americans. Though the available data are sparse and somewhat controversial—with some analysts arguing that the nonprime bets were much larger—it is clear that by the mid-2000s, at least 15% of GSE funds were invested in subprime mortgages.<sup>21</sup> In contrast to prime mortgages, however, they were not hedged using corresponding interest rate swaps, making them highly vulnerable.

In their recent study, Acharya and others (2010, figure 2.3) illustrate the size of the GSE mortgage portfolios, noting the subprime holdings in the years immediately before the crisis. With the lack of market discipline from debt holders due to the government's guarantee, one would expect that the GSEs would invest in riskier assets to the extent possible. It is therefore not surprising that as nonprime mortgages took off, the GSEs shifted risk toward these assets. As creditors did not price the risk exposures of GSEs, given the implicit guarantee, and as equity holders allowed the risky bets to maximize their option value on the guarantee, the interests of effective claimants of GSEs—the taxpayers—were marginalized in the highly politicized corporate control environment of these public-private hybrid financial institutions.

### 3.2 Systemic Risk of Financial Institutions

Over the preceding two decades, there had been tremendous, sometimes unrecognized, growth in the systemic risk arising from failures of financial institutions (LTCM case, described in the first section, being the prime example). There is in essence a negative externality on the system because the systemic cost of a financial institution's collapse—which can lead to failures of others, the freezing of capital markets, or both—is not fully internalized by that institution.

With mispriced guarantees and the repeal of Glass-Steagall, the only protection the financial system had from excessive risk taking was prudential bank regulation, primarily through capital requirements aimed at constraining financial leverage and risk. The market failure here was that regulation should have been focused on such externalities so as to curb the risks to the financial sector and the economy at large. However, prudential regulation of the financial sector has focused not on systemic risk but rather on the individual institution's risk profile. This design is seriously flawed. Regulation that ignores externalities encourages financial institutions to pass their risks in an unfettered manner throughout the system and on to unregulated entities.

For instance, as they reduce their individual risks, financial institutions are rewarded with a lower capital requirement that gives them the license to originate more risk, possibly aggregate in nature. This new risk gets passed around in the system and creates a financial sector in which any individual institution's risk of failure appears low to the regulator, but it is either hidden in the unregulated sector or has combined to form an aggregate concern—in either case, it is systemic in nature. Instead of penalizing behavior that leads to excessive systemic risk, current financial regulation appears to be rewarding it.

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<sup>20</sup> See Passmore (2005); Lucas and McDonald (2006).

<sup>21</sup> See the congressional testimony of Edward Pinto (US House 2008).

As we have emphasized, in this crisis, financial firms loaded up on assets with low volatility and high systemic risk (and therefore high expected returns). At the risk of repeating, the best example was many of the large financial intermediaries that ignored their own securitization business models by holding onto the nondiversifiable credit risk associated with the AAA tranches of securitized loan portfolios. Because little capital (typically 10 to 20% of nominal credit exposure) was attached to these bets—that is, the transactions were highly leveraged—it can be shown that their economic properties were those of writing an extreme out-of-the-money put option on the aggregate market.<sup>22</sup> It is well known that writing out-of-the-money put options produces large expected returns; this is why financial institutions engaged in the trade. Large expected returns, however, go hand in hand with large aggregate risk. There is no free lunch. This is why financial institutions got into so much trouble when the negative aggregate shock to the real estate market began in 2007. Consequently, the financial sector's capital buffer to protect underperforming loans in times of recession eroded almost instantaneously, leaving the sector with no capital protection for very weak portfolios.

The failure to focus on systemic risk, as opposed to individual institution risk, extends beyond prudential bank regulation. Specifically, there are several types of systemic risk that can be generated from the failure of a financial institution, especially during a financial crisis. Past crises also provide a guide here.

The first is counterparty risk. If a financial institution is highly interconnected to many other financial institutions, then its failure can have a ripple effect throughout the system. Consider the OTC derivatives market. The main reason for systemic risk in OTC markets is that bilaterally set collateral and margin requirements in OTC trading do not take account of the “counterparty risk externality” that each trade imposes on the rest of the system, thus allowing systemically important exposures to be built up without sufficient capital to mitigate associated risks.<sup>23</sup> The prime example in the current crisis is AIG, which built up US\$450 billion of one-sided credit default swap exposure on the so-called AAA tranches of securitized products. These positions were created with little or no capital support. Because all the trades were in the same direction, once the trades lost value, it meant that AIG's failure would inevitably propagate and amplify throughout the financial system.

Another example was the rating downgrade of monoline insurers that took place in the first six months of 2008. As the major rating agencies began to downgrade the monoline insurers during 2008, their guarantees lost their AAA backing, and thousands of municipal bonds and structured products were downgraded as a consequence. The downgrades, in turn, caused financial institutions to increase capital requirements as the losses on the insured securities were forced back onto their balance sheets. Furthermore, institutions had to rebalance portfolios now that some of their underlying bonds were no longer AAA rated, putting additional downward pressure on bond pricing.

And, consider again the GSEs. As one of the largest investors in capital markets, the GSEs presented considerable counterparty risk to the system, similar in spirit to LTCM in the summer of 1998, as well as to the investment banks and some insurance companies during this current crisis. While often criticized for not adequately hedging the interest rate exposure of their portfolio, the GSEs were nevertheless major participants in the interest rate swaps market. As was characteristic of other LCFIs, the GSEs increased their swaps and derivatives positions through the years; by 2007 the total notional amount of their swaps and OTC derivatives was US\$1.38 trillion and US\$523 billion, respectively.<sup>24</sup> Failure of GSEs would have led to a winding down of large quantities of swaps with the usual systemic consequences.

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<sup>22</sup> See, for example, Coval, Jurek, and Stafford (2008).

<sup>23</sup> See Acharya and Bisin (2009), who formalize the notion of counterparty risk externality.

<sup>24</sup> See Acharya and Richardson (2009b, figure 4.5).

The list could go on. But whether it was a few punters speculating in the curbside market outside the New York Stock Exchange in October 1907 who happened also to be exposed to many banks, or the 1984 collapse of Continental Illinois with exposure to over 2,000 other banks, or a failing LTCM in August 1998 with more than US\$1.25 trillion in notional swap positions—making it the seventh-largest institution in notional derivatives—the warning signs should have been clear. The system cannot withstand the failure of a highly interconnected institution. In the oft-cited words of Mark Twain, “History doesn’t repeat itself, but it does rhyme.”

The foregoing discussion also points to the second way systemic risk can enter the market, namely, spillover risk that arises as one institution’s trouble triggers liquidity spirals, leading to depressed asset prices and a hostile funding environment, pulling others down and thus leading to further price drops and funding illiquidity.<sup>25</sup> In a distressed market, you sell what you can sell as long as liquidity remains, regardless of the underlying asset quality. In the case of the GSEs, which owned such a large (and leveraged) portfolio of relatively illiquid MBSs, their failure would have led to a fire sale of these assets that would have infected the rest of the financial system, which was holding similar assets. To the extent that the MBS market is one of the world’s largest debt markets, the fire sale could have brought other financial institutions down, similar to what actually happened with the subprime collateralized debt obligations (CDOs).

The third type of systemic risk is that financial institutions operating in the shadow banking system are subject to bank-like runs. The “new model” of banking relied heavily on the short-term wholesale funding market. For example, the volume of repo transactions soared from US\$2 trillion a day in 1997 to US\$6 trillion daily a decade later in 2007, and money market funds accumulated over US\$4 trillion in assets, compared with the US\$8 trillion of deposits in the banking sector. Since these funds were rolled over on a short-term basis, sudden fund withdrawals that occur because of uncertainty about a financial institution’s health can ironically cause the institution to fail. Short-term liabilities were funding longer-term, less liquid assets that the institutions could not unload in an orderly way. These are the same issues that exist in “old-fashioned” banking and are handled inside the bank using conventional asset and liability management—except here, the problem exists across institutional boundaries, and there is no asset-liability management process that transcends them.

When a particular institution that is engaged in maturity mismatch fails in this manner, uncertainty about the health of similar institutions can lead to an indiscriminate run, and otherwise well-capitalized firms can face withdrawals of their short-term liabilities, in turn causing a systemic crisis. While many observers point to the fall of Lehman Brothers, the forced sale of Merrill Lynch, and near failure of Morgan Stanley—and possibly Goldman Sachs—as the most telling illustration of runs in this crisis, there are others. Most notably, the collapse of Lehman Brothers and the value of its short-term debt caused the largest money market fund, the Prime Reserve Fund, to “break the buck,” leading to a run on the entire system. Only the government’s 100% backstop of money market funds reversed the slide.

More generally, consider the fact that securitization had become a primary tool to issue credit to individuals and corporations. The recent study by Acharya and others (2010, figure 3.4) demonstrates the massive growth in this market from 2001 to 2007. Of course, if the securities underlying the pool of loans via securitization were held in the capital market at large, then there would not be a systemic issue. But as we know from this crisis, many of these securities were in fact held in vehicles that had recourse back to the sponsoring financial sector firms, funded using short-term, highly mobile, asset-backed commercial paper. This funding exposed the financial institutions to runs reminiscent of those seen during the Great Depression.

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<sup>25</sup> Brunnermeier and Pedersen (2009).

Two of the more recent crises discussed earlier—the failure of Continental Illinois and LTCM—should have alerted the system and its regulators to the dangers of a new type of “bank run” (via the wholesale funding markets) and to the systemic nature of counterparty risk. These two types of failures were at the center of the current crisis.

### 3.3 Opacity of Financial Institutions and Markets

One can reasonably debate about the advantages and disadvantages of a more transparent financial system. On the one hand, transparency reduces the benefit of private information, which, in turn, reduces the collection of such information. On the other hand, the past crises—especially the Panic of 1907, the Great Depression, and the LTCM crisis—illustrate how information asymmetry can potentially lead to runs on the entire system, even if many of its institutions are healthy.

There are four types of institutions with different regulation and guarantee levels—commercial banks, broker-dealers (investment banks), asset management firms, and insurance companies—and mispriced guarantees and excessive risk taking for any one type can wreak havoc on the whole financial sector. This is because of the *counterparty risk externality* that has been largely unregulated. There are several aspects that have contributed to this externality.

First, the incentive to get too big to fail pushes institutions towards the LCFI model, the regulatory structure for which has yet to be fully articulated. The coarseness and lack of regulatory granularity of these institutions has allowed the unregulated sectors—primarily, the so-called shadow banking sector and hedge funds—to thrive. Financial institutions have innovated ways to take unregulated risk exposure (for example, through prime brokerage activity) and to park their assets off the balance sheet temporarily (for example, in the form of asset-backed conduits and structured investment vehicles) so as to get relief from regulatory capital requirements and subsequently take on additional risks. The sheer magnitude of this activity—especially in the shadow banking sector—and its recourse to the financial sector have meant that systemically important pockets can easily develop in the financial system that have little or no regulatory oversight or scrutiny.

With the repeal of Glass-Steagall and the lack of market discipline due to government guarantees, the financial system’s only protection was through the regulators (that is, regulatory capital requirements). However, there was no one single regulatory body responsible for LCFIs. This allowed for substantial regulatory arbitrage across regulators. The most telling example was that AIG was able to choose the OTS as the regulatory body for its holding company because it had bought a small savings and loan. The OTS clearly did not have the expertise to supervise the insurer’s parent company. Indeed, it can be argued that lapses in LCFI corporate governance, laid bare during the crisis, suggest that such institutions may be too big and complex to manage and control, not to mention too big and complex for just about any external regulator to do its job effectively.

Second, innovations for sharing risk such as credit default swaps (CDSs) and collateralized debt and loan obligations (CDOs and CLOs, respectively), which have the potential to serve a fundamental risk-sharing and information role in the economy, were designed to trade in opaque, OTC markets. While such a trading infrastructure is generally beneficial to large players and has some benefits in terms of matching trading counterparties, its opacity—especially in terms of counterparty exposures—is a serious shortcoming from the standpoint of financial stability during a systemic crisis. If financial institutions take on large exposures in such markets (for example, commercial banks with access to mispriced deposit insurance encouraging the growth of a large insurer providing credit protection), then the failure of a single large institution can raise concerns about the solvency of *all* others, given the opacity of institutional linkages.

The main problem associated with the trading of OTC derivatives (CDSs, foreign exchange derivatives, and interest rate swaps, among others) is that the contracts are bilateral, typically with collateral depending on the type of contracts and the rating of the counterparty. The advantage of OTC contracts is that they are tailor made, which is important to entities that want to be perfectly hedged. On the other hand, they are more subject to liquidity shocks and counterparty risk. Moreover, an issue that transcends these two problems is the lack of transparency within the system. Unlike in the case of a central clearing house or an exchange, no one knows precisely what the total exposure is, where it is concentrated, and what the value of such contracts is. These issues always exist, but they rarely surface when positions are small. However, when the sizes become large, and combined commitments are many times larger than the underlying contracts, the lack of transparency makes the system prone to information problems, converting a small shock into a systemic failure.

In the current crisis, counterparty risk concerns arose around the failures of Bear Stearns (which was a large CDS clearer), Lehman Brothers (on which CDSs were traded in significant quantity), and AIG (which had written US\$450 billion worth of CDSs on AAA-rated CDO tranches of mortgages, loans, and bonds). Table 2-3 illustrates the magnitude of the OTC derivatives problem in this crisis relating to AIG, showing the payments (via government aid) to its various counterparties in the autumn of 2008. The payments are broken down into collateral postings under CDS contracts, outright purchase and closing of contracts tied to CDSs on nonprime mortgage-backed securities via Maiden Lane III, and guaranteed investment agreements held by municipalities. The table shows that almost US\$60 billion of losses would have been borne by counterparties, causing possible failures elsewhere in the system and potentially leading to a meltdown.

**Table 3: AIG Financial Products Counterparty Payments,  
September 16, 2008 to December 31, 2008 in Billions of dollars**

Collateral postings under AIGFP CDS	Maiden Lane III payments to AIGFP CDS counterparties	Payments under guaranteed investment agreements
Société Générale: 4.1	Société Générale: 6.9	California: 1.02
Deutsche Bank: 2.6	Goldman Sachs: 5.6	Virginia: 1.01
Goldman Sachs: 2.5	Merrill Lynch: 3.1	Hawaii: 0.77
Merrill Lynch: 1.8	Deutsche Bank: 2.8	Ohio: 0.49
Calyon: 1.1	UBS: 2.5	Georgia: 0.41
Barclays: 0.9	Calyon: 1.2	Colorado: 0.36
UBS: 0.8	Deutsche Zentral- Genossenschaftsbank: 1.0	Illinois: 0.35
Deutsche Zentral- Genossenschaftsbank: 0.7	Bank of Montreal: 0.9	Massachusetts: 0.34
Wachovia: 0.7	Wachovia: 0.8	Kentucky: 0.29
Rabobank: 0.5	Barclays: 0.6	Oregon: 0.27
Total for top twenty counterparties: 18.3	. . .	Total for top twenty counterparties: 7
Overall total: 22.4	Overall total: 27.1	Overall total: 12.10

Source: AIG ([www.aig.com/aigweb/internet/en/files/CounterpartyAttachments031809\\_tcm385-155645.pdf](http://www.aig.com/aigweb/internet/en/files/CounterpartyAttachments031809_tcm385-155645.pdf)).

An equally important issue is that there was essentially no regulatory oversight or jurisdiction. Currently, the Commodity Futures Trading Commission, SEC, and the Fed regulate exchange-traded derivatives in a fragmented manner, resulting in inefficiencies and arguably a waste of valuable resources. In contrast, OTC derivatives are mostly unregulated, creating a clear incentive to engage in regulatory arbitrage. This lack of



regulation of OTC derivatives received a seal of approval by the passage of the Commodity Futures Modernization Act of 2000, under heavy lobbying pressure from the financial industry. In fact, a number of policymakers have argued that this act led to serious deficiencies in the system, including Enron taking advantage of this legislation in some of its fraudulent accounting practices, and perhaps more important, the unchecked growth of the CDS market.

In short, growth in the size of financial institutions and in their linkages and fragility has raised the prospect of extreme counterparty risk concerns. When these concerns have materialized, financial institutions have been unable to fathom how losses resulting from a large institution's failure would travel along the complex chains connecting them. The consequence has been complete illiquidity of securities (such as credit derivatives) held primarily by these institutions and a paralysis of interbank markets, which, in turn, has paralyzed credit intermediation in the whole economy. It is important to realize that what superficially may appear to be a problem of illiquidity of a class of assets and markets may well be a symptom of the deeper issues of excessive leverage, risk taking, and the resulting insolvency of financial institutions fueled at least partly by mispriced guarantees.

Financial institutions, left to private incentives, do not and will not internalize this potentially severe *counterparty risk externality*.

### 3.4 Runs on the System

As discussed in the systemic risk section of this chapter, regulated financial institutions, as well as their unregulated siblings, have fragile capital structures in that they hold assets with long duration or low liquidity, but their liabilities are mainly short term in nature. While commercial banks are not subject to large-scale runs because of deposit insurance and central bank lender of last resort support, the other kinds of institutions are vulnerable, and indeed many of them—most notably Bear Stearns and Lehman Brothers, as well as a number of managed funds in the money market and hedge fund arena—did experience “wholesale” runs during the crisis. And commercial banks still are subject to localized runs in the wholesale funding and interbank markets if they themselves are perceived to have exposure to institutions experiencing large-scale runs.

Of course, not all runs are problems that need a regulatory fix. In the crisis of , it is not clear that the run on subprime lenders in the first half of 2007, the run on asset-backed commercial paper conduits in the second half of 2007, and the run on hedge funds post-Lehman were market failures. Take the asset-backed commercial paper market as an example. There is much discussion in academic and policy circles about the sudden inability of asset-backed commercial paper conduits to roll over their commercial paper. Some view this as a run on the system that needed to be fixed—a “buyer's strike.” But this was not because of information asymmetry about the quality of the underlying asset-backed securities. Rather, there was a sudden awareness that the risk of *all* the AA- and AAA-rated tranches of the underlying asset-backed securities was systemic in nature, and that the likelihood of this risk had increased sufficiently so that these securities were no longer safe for investment portfolios. In other words, this was not a question of insolvency. If insolvency is defined as trading below par, then all these conduits were insolvent, given the fact that they lacked any meaningful capital support.

Thus the real concern is when runs are *not* affiliated with failure or insolvency. For example, during the early 1930s, the banking crisis led to runs on many solvent institutions, and likewise, during the week of Lehman's failure, the crisis led to runs on money market funds that had not “broken the buck.” To the extent that such runs represent an information contagion from runs on other, less deserving institutions, they carry a systemic externality. In other words, addressing the likelihood of runs on the shadow banking sector—the uninsured parts of the intermediation sector—may be a critical ingredient to stabilizing the system as a whole.

## 4. PRINCIPLES OF FINANCIAL REGULATION

What implication does the financial crisis—and our assessment of market failures that led to it—have for financial regulation going forward?

The previous section outlined four market failures that are interlinked and need to be addressed collectively:

- mispriced government guarantees,
- focus on individual versus systemic risk of firms,
- lack of transparency in the financial system, and
- runs on the financial system.

We now consider appropriate regulation to deal with these failures.

### 4.1 Risk-Taking Incentives and Systemic Risk of Financial Institutions

With respect to the risk-taking incentives of financial firms, much of the focus by policymakers in the US and elsewhere has been on both the type and level of compensation contracts within financial firms. It has been argued that, in the period leading up to the crisis, bankers were increasingly paid through short-term cash bonuses based on volume and current marked-to-market profits, rather than on the long-term profitability contribution of their bets. Coupled with the fact that shareholders of the failed (or nearly failed) institutions lost most of their investments, policymakers see this as prima facie evidence of massive failure of corporate governance at the equity level (that is, between shareholders and boards, and between boards and managers). That Citigroup's board fired its CEO in 2008 without a succession plan would be astounding in any listed company whose shareholders are about to be devastated, much less a systemically critical financial conglomerate. While clearly this view cannot be completely discounted, we believe that, in the end, it is not the issue of greatest urgency or an issue where it is clear what advantage regulators have in resolving it. As outlined in the preceding section, the costliest market failure of corporate governance—one that regulators can do something about with reasonable precision and success—was at the debt and regulatory levels.

To understand this, we examine how the claim structure of the LCFIs is different from that of a regular nonfinancial firm. On the liability side, LCFIs are highly levered entities. At least 90% of the claim holders of an LCFI are debt holders (including depositors). Another claimant is the government as guarantor. Given this structure of claims, corporate governance mechanisms that align the manager with equity holders may deviate significantly from those that maximize firm value. Put differently, corporate governance mechanisms in LCFIs have to be designed so as to align the manager with the interests of the debt holders and the government guarantor and not just those of the shareholders.

To assess the role of regulation in this context, it is useful to think through the optimal governance system that the LCFI should have. Take the example of FDIC insurance.<sup>26</sup> If the FDIC insurance is properly priced, the with-guarantee value of the LCFI would be equal to the without-guarantee value of the LCFI. On the other hand, if the FDIC insurance is not properly priced, then the appropriate objective in structuring corporate governance and managerial incentives would be to maximize the without-guarantee value of the LCFI. Otherwise, the LCFI management might make value-destroying choices to take advantage of the discrepancy in the pricing of the FDIC insurance.

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<sup>26</sup> Note that the same reasoning holds for other types of insurance provided by the government, for instance, the implicit insurance provided to TBTF institutions.

If one were to specify a model of a banking system with limited liability in which each bank both maximizes shareholder value under conditions in which the regulator provides a safety net (that is, guarantees for creditors such as deposit insurance or implicit TBTF support) and also faces systemic risk (that is, systemwide costs in a crisis), the optimal plan would be for the regulator to “tax” (that is, charge an insurance premium) each individual bank an amount equal to the sum of two components.<sup>27</sup>

The first component would be the bank’s *expected losses upon default*. That is, the government guarantees in the system need to be priced. Financial firms must pay for the guarantees they receive. Because the price of these guarantees will vary across firms in light of their different risk profiles, each firm will choose some optimal level of risk-taking activities consistent with the cost of the guarantees, almost surely at a more prudent level than in the absence of appropriately priced insurance. Ostensibly, the FDIC determines the level of premiums it charges on the basis of risk, although in reality, premiums are only charged when the fund is poorly capitalized. Consequently, this policy will not optimally evaluate the firm’s assets, and the result will be excessive risk shifting. Hence insurance premiums need to be charged to banks on a risk-sensitive basis, and crucially, at all parts of the cycle. Premiums should not be rebated to banks in good times, as this destroys the incentive role played by premiums.

The second component would be the bank’s *contribution to a systemic crisis*, that is, its marginal expected losses in the crisis, or in other words, *the contribution of each firm to aggregate losses above a certain threshold of aggregate losses*. In addition to expected losses, the systemic risk contribution also needs to be priced. In this way, the financial institutions can be made to internalize the costs of the negative externality imposed on the system by their losses and failures. Arguably, the principal failure that contributed to the crisis was that financial sector regulations sought to limit each institution’s risk in isolation and did not focus sufficiently on systemic risk. As a result, while individual firms’ risks might have been properly dealt with in normal times, the system itself remained, or was induced to be, fragile and vulnerable to large macroeconomic shocks. Consistent with economic intuition, these systemic losses increased with lower initial capital, riskier asset holdings that contributed to the tail interdependence between the institution and the system, institutional and aggregate volatility, and the severity of the externality.

Charging a premium for systemic risk will cause financial institutions on the margin to hold more initial capital up front (be less leveraged) and to take less risky positions. That is, by incorporating the “tax” in exposure decisions, the financial institution will organically choose to become less systemic. Putting aside the political economy of the viability of expanding FDIC-like premiums, the biggest hurdle to successful implementation is measuring systemic risk contributions and setting the proper price for the insurance. There are two main obstacles.

First, the regulator may not have the expertise to set the appropriate price. This is especially true with LCFIs, since their risk profile can change rapidly as they enter and exit markets or change the weight of various kinds of exposures. There are a number of empirical studies that use publicly available data and standard statistical techniques to evaluate whether the more systemic firms do, in fact, perform worse in crisis conditions, and the findings seem quite encouraging that systemic risk is generally measurable.<sup>28</sup>

An alternative solution to this first problem would be to partially privatize the systemic guarantees through private reinsurance or a public-private reinsurance scheme.<sup>29</sup> The idea is that private insurers would help price the insurance while the government would provide most of the underlying capital in return for a proportionate share of the premium income.

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<sup>27</sup> For a formal treatment of such a “tax,” see Acharya and others (2009); Acharya and Yorulmazer (2009).

<sup>28</sup> See, for example, Acharya and others (2009).

<sup>29</sup> Acharya and Richardson (2009b, chap. 13).

While some reinsurance schemes have been considered by the FDIC, most recently in 1993, with the conclusion that the market did not seem viable, there is reason to be more optimistic today. Financial markets in general have become much more sophisticated in how they develop niche products. An example of innovative coinsurance, motivated by the events of September 11, 2001, is the Terrorism Risk Insurance Act, enacted in November 2002 and providing federal reinsurance for qualifying losses from a terrorist attack. The Terrorism Risk Insurance Act incorporates both industry loss triggers and government excess loss coverage, which helps to minimize the insurance industry's losses yet provides insurers with an incentive to price, monitor, and reduce risks. Something similar might work in this context.

The second problem in charging for systemic risk contributions is perhaps more serious. The issue with moral hazard is that *ex ante* contracting does not lead to first-best actions.<sup>30</sup> Because the actions of banks are not fully observable after the premiums for the guarantees and systemic risk are set, the banks can subsequently change their behavior. While a private market such as that just described may be better able to monitor bank actions, the optimal contract in such a setting usually calls for some type of state-contingent mechanism. It often imposes a severe penalty function in bad states to get the agent (that is, the bank) to avoid excessive risk-taking activities. It involves the same underlying economics as do most insurance contracts to the extent that those contracts often have large deductibles. Here, the "punishment" can take several forms, all with the intention of aligning incentives and thus bringing back market discipline:

—The creation of an insolvency regime for complex financial institutions that would allow the orderly failure or restructuring of insolvent firms. Under current discussion are plans to force firms to develop an *ex ante* way for them to unwind if they fail—a "living will." Putting aside whether this is feasible for global institutions, this type of punishment would pass the moral hazard test.

—Alternatively, one could require financial institutions to hold in their capital structure a new kind of "hybrid" claim that has a *forced* debt-for-equity conversion whenever a prespecified threshold of distress (individual, systemic, or both) is breached.<sup>31</sup> While this has the benefit of recapitalizing financial firms in a crisis, more significantly, it brings back market discipline via creditor losses.

—A less discussed option is to institute so-called double liability for stockholders of financial institutions.<sup>32</sup> Under double liability, shareholders of the bank lose not only the value of the stock but are also charged an additional penalty, possibly up to the par value of their holdings. While double liability may be impractical and raises many conceptual and legal issues, it was in fact standard practice from 1863 to 1933.

Arguably less efficient, but easier to implement, would be a state-contingent plan for deposit insurance premiums that are higher in good states and thus reduce the net payoff in these states. Reducing these payoffs provides less reward to excess risk-taking activities as well. This reduction would effectively take the form of windfall profit taxes.<sup>33</sup> A related idea is to require that firms have a certain amount of convertible debt that dilutes shareholders' percentage ownership during good economic times, reducing the return to undertaking risky gambles.<sup>34</sup>

The success of the Banking Act of 1933 had two sides to it. On the one hand, it effectively put an end to runs on bank deposits. On the other hand, it managed the moral hazard

<sup>30</sup> For example, John, John, and Senbet (1991); Prescott (2002).

<sup>31</sup> See, for example, Doherty and Harrington (1997); Flannery (2002); Squam Lake Working Group (2009); Hancock and Passmore (2009).

<sup>32</sup> Kane and Wilson (1997).

<sup>33</sup> For examples of payoff structures in a stylized model of deposit insurance, see Prescott (2002).

<sup>34</sup> See John, John, and Senbet (1991).

problem through a combination of insurance premiums, capital requirements, and separation of investment and commercial banking. Currently, however, the general view is that insurance premiums are lowered by banks through lobbying in good times, higher capital requirements are quite costly—not just privately for bankers but also for society—and separation of bank activities by scope is no longer feasible. We explain below that these concerns are either surmountable or overstated.

Consider, for instance, the case of higher capital requirements, with capital defined as core equity. The Modigliani-Miller theorem, the most basic theorem in finance, shows that the value of the firm's assets will be the same regardless of how those assets are financed when the form of financing does not distort the nature of asset investments.<sup>35</sup> In other words, choosing investments should be based solely on whether the return on the project's assets exceeds its cost of capital for those assets. Increasing the return on equity via leverage is just a wash and contributes nothing to efficiency in capital allocation. Given that the systemic costs to leverage are so high, this suggests that higher capital requirements will not necessarily be socially costly at all. While the Modigliani-Miller theorem is not reality, it is a useful starting point.

Putting aside the tax benefits of debt, the issue of how costly it is to raise equity depends on whether one believes the agency problems of LCFIs are due primarily to conflicts between shareholders and managers, or to conflicts between shareholders and creditors or regulators. If it is the latter, as we have argued, then the relatively higher cost of equity financing versus debt financing is being driven by the mispriced guarantees that benefit the creditors. Fixing this problem—that is, charging for the guarantees and systemic risk—is tantamount to charging for higher leverage, which will, in turn, put the cost of capital for debt and equity on equal footing. While it is true that banks can alter their risks in fairly swift and opaque fashions, and this necessitates a certain amount of demandable debt for discipline, this argument has yet to be tested for complete empirical merit when favorable tax treatment of debt and mispricing of debt due to government guarantees have been properly accounted for.

Thus higher capital requirements for riskier—and systemically riskier—activities are certainly an option. However, as we have learned from the financial crisis, capital requirements can be gamed. So, to some extent, the financial system must rely on the power and supervisory expertise of the regulator. Furthermore, significant improvements are possible by closing major capital loopholes and relying less heavily on the rating agencies. With respect to the loopholes, a good rule of thumb is that if off-balance-sheet financing in reality involves recourse back to the banks, then the capital at risk should be treated as though the activity were on the balance sheet. Moreover, counterparty credit risk exposures to financial firms, including OTC derivatives and securities financing transactions, should also be taken into account.

While the Basel II Accord did expand the notion of risk for financial institutions, in hindsight, it chose simplicity over accuracy in the determination of how capital should be treated. It seems reasonable to consider not only the credit risk of defaultable assets but also the liquidity, funding, market, and specification (or valuation model) risks. In retrospect, Basel II was necessary but not sufficient for preventing institutional and systemic failure. It focuses narrowly on the individual risk of institutions but ignores altogether the systemic risk. Indeed, by encouraging the use of CDSs to reduce banks' regulatory capital, it arguably encouraged the concentration of risk elsewhere (in monoline insurers and AIG, which turned out to be highly vulnerable) and propagated systemic risk.

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<sup>35</sup> Modigliani and Miller (1958).

#### 4.1.1 Example: AAA-Rated Tranches of CDOs

We can illustrate some of these ideas using the super senior AAA tranche of collateralized debt obligations relative to a more standard AAA-rated asset, say an AAA corporate bond. Specifically, assume that the probability and magnitude of losses (that is, the expected mean and variance) associated with default are similar between the two classes of securities. What are the differences?

First, there is the liquidity risk, which refers to the ability of the holder to convert the security or asset into cash. Even before the crisis started, the super senior tranches were considered to be highly illiquid and more of a hold-to-maturity type of security. The fact that these securities offered a spread should not be surprising, given that there are numerous documentations of a price to illiquidity. For instance, consider the well-documented spread between the off-the-run and on-the-run US Treasuries.<sup>36</sup>

Second, there is the funding risk, which refers to the mismatch in the maturity of the assets and liabilities. There is a tendency for financial institutions to hold long-term assets using cheap short-term funding, a kind of a “carry trade.” But this exposes the institution to greater risk of a run if short-term funding evaporates during a crisis. Indeed, some researchers have argued for capital requirements to take into account this particular funding risk.<sup>37</sup> These two points suggest that it would be useful to know the “liquid” assets the financial institution holds against short-term funding. One could imagine that the higher the ratio, the less an institution is subject to a liquidity shock and therefore the less risky it is.

Third, the systematic risk of the AAA tranche is much higher than that of the more standard AAA-rated asset. The AAA tranche has no idiosyncratic risk, so all of its volatility surrounding the probability and losses associated with default occurs only when the market does poorly and households’ or corporations’ underlying assets in the CDOs default in a correlated fashion. In other words, the losses occur when the system can least afford them. This is particularly acute in systemic crises because these correlated defaults are most likely to occur during extreme market downturns.

The fourth and final difference has to do with a form of risk rarely discussed, the one associated with specification error or model risk. It is important to realize that the measurement error of risk varies across assets—consider the difference between measuring the interest rate risk of Treasury securities versus the aggregate market risk of stocks. The AAA tranches, especially those involving more structured products like CDOs-squared, are mathematically equivalent to a compound option.<sup>38</sup> It is well known that compound options are very sensitive to the risk (volatility)—and the risk that risk will change (volatility of volatility)—of the underlying asset. For AAA-tranche CDOs, the initial parameters chosen are the correlation and volatility of the loans in the portfolio. Given the fact that these parameters are mostly unknown and likely to evolve over time in any case, it suggests caution in estimating the risks and treating them as known in banks’ or regulators’ internal risk models.

Capital requirements should be a function of the risk of the underlying assets, and these risks should be related to the above issues. To the extent that financial institutions spend considerable time and effort circumventing capital rules by searching for higher spreads and consequently engaging higher risks, appropriate accounting for these risks would help alleviate the excessive risk taking.

As a final comment on capital requirements, there is much discussion in policy circles about whether narrower banking, along the lines of the Glass-Steagall provisions of the 1933 Banking Act, would help alleviate systemic risk. Narrow banking would generally restrict the

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<sup>36</sup> Krishnamurthy (2002).

<sup>37</sup> See Brunnermeier and others (2009).

<sup>38</sup> See Coval, Jurek, and Stafford (2008).

types of exposures that could be built up by institutions subject to deposit insurance and other forms of government support, such as proprietary and directional trading, equity investments using the firm's capital and implicitly through asset management activities like mutual funds and hedge funds, and structured asset-backed securities intended to be passed onto the capital market at large ("pipeline or warehouse exposure"). There is some validity to this view, although it is often described as impractical in a world of global banking. Of course, if substantial capital requirements were tied to the riskier exposures, then LCFIs should, on their own, decide to engage in less of these risky activities, and functional separation of activity generating systemic risk could be achieved in an organic fashion rather than by fiat.

## 4.2 Transparency

All financial crises have the common feature that opacity greatly amplifies the financial shock, leading to bank-like runs and the freezing of markets. It is not clear how one could regulate LCFIs to become more transparent. Any "systemic risk" regulator that is established will undoubtedly try, most likely by requiring the LCFI to release financial information that takes into account off-balance-sheet financing, maturity mismatch, liquid asset holdings versus short-term funding, and so on. The hope is that regulation based on correctly pricing government guarantees, a systemic risk assessment, and mandatory convertible debt would organically lead to greater transparency. The LCFIs would have incentives to let the market know it is much less complex and risky than meets the eye.

In 2007–2009 crisis, the leading candidate for the bottleneck in the financial system was the OTC market for derivatives. Its sheer size and unregulated nature meant that there literally was no information about counterparty exposures, either at the regulatory or market level. Fixing this key problem, perhaps after the LTCM debacle, would have gone a long way toward making the most recent crisis less severe.

Regulators should separate the economic role played by derivatives and financial transactions from shortcomings in their trading infrastructure. There is little merit in shutting down these markets (for example, prohibiting short selling), even during crises. However, the concerns arising in the case of counterparty risk due to the opaque nature of OTC derivatives need to be addressed:

—First, standardized markets, such as credit default swaps and related indexes, should be traded on centralized counterparty-cum-clearinghouses or exchanges:

—Second, smaller, less standardized markets, such as for collateralized debt and loan obligations, which also pose significant counterparty risk issues, should have at the least a centralized clearing mechanism so that a clearing registry is available to regulators to assess the contagion effects of a large institution's failure.

—Third, OTC markets can continue to remain the platform through which financial products are innovated; but to give these markets an incentive to move to a centralized registry and eventually to a clearing house, there should be an explicit regulator in charge of enforcing higher transparency in OTC markets—possibly in the form of bilateral information on net exposures with some time delay—and providing infrastructure for enforcement relating to insider trading and market manipulation practices;

—Fourth, in order to implement these changes, the regulator may simply have to play the coordinating role—possibly requiring some firmness with large players—to move trading onto centralized trading platforms. Also, the global nature of these markets will require a certain degree of international coordination between regulators, especially when timely counterparty information is required.

Table 4 summarizes some of the market mechanisms and characteristics associated with possible trading of OTC derivatives.

**Table 4: Summary of Different OTC Market Organization**

<b>Market organization</b>				
	<b>OTC</b>	<b>Registry</b>	<b>Clearing house</b>	<b>Exchange</b>
<b>Trading style</b>	Bilateral negotiation	Bilateral negotiation	Bilateral negotiation	Continuous auction
<b>Market participants</b>	Large well-capitalized firms	Large well-capitalized firms	Well-capitalized counterparties only	Retail trade possible; largest trades in upstairs market
<b>Flexibility and standardization of contracts</b>	Maximum flexibility	Maximum flexibility	Flexible terms; standardized credit enhancement	Largely standardized contracts
<b>Counterparty credit risk</b>	Substantial	Substantial	Little to none	Little to none
<b>Collateral and margin requirements</b>	Bilateral negotiation and management	Consistent mark-to-market valuation of positions and collateral; required amounts set bilaterally by counterparties	Consistent mark-to-market valuation of positions and collateral; required amounts standardized and set by clearing house	Consistent mark-to-market valuation of positions and collateral; required amounts standardized and set by clearing house
<b>Currently enforced (“current”) levels of price information</b>	Largely opaque; daily quotes available	Currently largely opaque; daily quotes available	More transparent; daily settlement prices publicly available	Transparent to all
<b>Current levels of volume and open interest information</b>	Opaque	Largely opaque	More transparent	Transparent to all
<b>Current level of information on large trader positions</b>	Opaque	Available only to regulators	Available only to regulators	Available only to regulators
<b>Netting of cash flows</b>	Bilateral only	Yes	Yes	Yes
<b>Netting of offsetting positions</b>	Bilateral only	Bilateral only	Yes	Yes
<b>Secondary market</b>	Only by mutual agreement between counterparties	Only by mutual agreement between counterparties	Yes	Yes

Source: Acharya and Richardson (2009b).

### **Bank Runs in the Shadow Banking System**

The Panic of 1907 and the banking crises of 1930, 1931, and 1933 all had in common massive systemwide runs on banks. Arguably, the most recent crisis also went pandemic when there was a run on the investment banks and money market funds after Lehman Brothers failed. But the earlier Bear Stearns episode also had the features of a run, even



though the firm was neither particularly large nor particularly complex. Like past runs, the runs on investment banks and money market funds occurred because there was uncertainty and lack of information about the health of these institutions, and their funding sources were short term and highly mobile (repo and securities lending transactions for investment banks, and short-term fund flows for money market funds).

As mentioned repeatedly in this chapter, the solution in the 1930s was to create deposit insurance and a number of protections to counter risk-taking activities. In the most recent crisis, the government temporarily guaranteed money market funds and, some would argue, the creditors of investment banks when it offered support to Goldman Sachs and Morgan Stanley after experiencing the systemic impact of Lehman's failure in the fall of 2008. The ongoing question is, what should financial regulation to contain the risk of contagious runs in the shadow banking world look like? There seem to be two ways to go.

One surefire approach to prevent runs would be to guarantee the liabilities. But these guarantees would need to be priced, and surely the activities of these firms would need to be restrained in a Glass-Steagall manner. This regulatory approach advocated above—insurance plus scope restrictions—also calls for pricing the guarantees and systemic risk. Existing research, both ours and that of others, suggests that systemic risk (estimated from market data) is higher for firms that have a mismatch between their assets and liabilities. Thus a systemic premium for a guarantee would be one way to proceed. Financial institutions would have an incentive to lower the assessment through reducing the mismatch in funding. This reduction in funding would naturally lower the probability of a systemwide run.

A more structured approach would be to impose liquidity requirements on financial institutions that are similar in spirit to the way capital requirements are imposed. The basic idea would be to mandate that a proportion of the short-term funding must be in liquid assets—ones that can be sold immediately and in quantity at current prices. This requirement might also be sufficient to prevent runs. It will, in effect, increase the cost to financial institutions of taking on carry trades and holding long-term asset-backed securities. For example, in the context of the securitization market, the business model was developed under the premise of “originate to distribute.” But in this crisis, financial firms did not follow this model. Instead, firms held onto these securities and funded these purchases short term, creating a significant mismatch and making them susceptible to runs. Imposition of liquidity requirements would cause these trading activities to migrate naturally to the capital market at large (for example, pension funds, mutual funds, hedge funds, and trading accounts of wealthy individuals), where they arguably belong.

Highly regulated entities such as money market funds would be treated similarly, albeit with less reliance on the credit rating agencies. And, in accordance with our earlier arguments, regulators would need to consider not only the credit risk of defaultable assets but also their liquidity, market, and specification or model risks.

The implementation of liquidity requirements to stem runs is complicated by the fact that some institutions benefit from a government guarantee of their short-term funding (such as deposit insurance) while other firms do not. The purpose of the guarantee (at least in the case of deposit insurance) is so that banks can provide loans to the real sector of the economy without the threat of a run, not so that they can load up on illiquid, long-term securities. Of course, if the guarantees are mispriced, then banks with insured deposits will have an incentive to enter the market of managed funds and money market funds, and this regulatory arbitrage might distort prices and risks.

## 5. LESSONS FOR EMERGING MARKETS

We conclude by discussing the implications of the financial crisis—and of our assessment of the market and regulatory failures that led to it—for financial stability in emerging markets. We focus on three issues: government guarantees, mostly in the form of deposit insurance; the implications of these guarantees in the current crisis; and the transmission of systemic risk.

### 5.1 Government Guarantees

Explicit and implicit government guarantees such as deposit insurance and implicit TBTF status can generate significant moral hazard in the form of risk-taking incentives. Even absent other market failures, this moral hazard can lead to excessive systemic risk and financial fragility. Consider our analysis of the lessons for the US from the current crisis. Deposit insurance enacted in the 1930s in the wake of the Great Depression had long-term success only because significant protections were put in place in terms of insurance charges, regulation (mostly in the form of capital requirements and wind-down provisions), and restrictions on bank activity. As these protections began to erode in the US in recent years, the moral hazard problem resurfaced.

To some degree, this lesson was already known to researchers studying the moral hazard of government guarantees in emerging markets. As pointed out by Demirgüç-Kunt and Kane (2002), the number of countries offering explicit deposit insurance increased multifold from twelve to seventy-one in the thirty-year period starting in the 1970s. They argue that the key feature of a successful deposit insurance scheme is the financial and regulatory environment in which it functions. Such environmental conditions include the coverage limits of deposit insurance, the degree to which depositors take coinsurance on their balances, restrictions on certain deposit accounts, and whether the program is funded publicly or privately, among other characteristics.

Demirgüç-Kunt and Detragiache (2002) look at a large cross-section of countries in the post-1980 period and conclude that deposit insurance increases the likelihood of a banking crisis.<sup>39</sup> Moreover, the likelihood and severity of the crisis increase the weaker the institutional and regulatory environments are and the greater the coverage offered to depositors. The authors conclude that the incentive problems associated with the moral hazard from deposit insurance can be partially offset by effective prudential regulation and loss control features of deposit insurance. This result is completely consistent with the analysis provided here in relation to the US.

In addition, the analysis in the first and second sections argues that opacity amplifies the financial crisis once it starts and suggests remedies for this problem. Consistent with this view, Kaufmann and Mehrez (2000) find that for a large cross-section of countries, a lack of transparency worsens financial crises. The authors conclude that regulation should focus on increasing the transparency of economic activity, government policy, and the financial sector, especially when the country is going through a period of financial liberalization.<sup>40</sup>

### 5.2 Bailouts, the Current Crisis, and Emerging Markets

The provision of government guarantees is quite common during a crisis, and has occurred, for example, in Sweden (1992), Japan (1996), Thailand (1997), Republic of Korea (1997), Malaysia (1998), and Indonesia (1998).<sup>41</sup> In the current crisis, the US guaranteed money

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<sup>39</sup>. See also Hovakimian, Kane, and Laeven (2003).

<sup>40</sup>. This, too, is the conclusion of Demirgüç-Kunt and Kane (2002).

<sup>41</sup>. Demirgüç-Kunt and Kane (2002).

market funds after the fall of Lehman Brothers and made explicit the previously implicit guarantees of the GSEs and the TBTF institutions.

What is the impact of such guarantees?

Honohan and Klingebiel (2003) find that unlimited depositor guarantees and regulatory forbearance increase the fiscal costs of financial crises.<sup>42</sup> Moreover, these actions increase the expectation that this will be the government's solution for future crises, thus undercutting market discipline and increasing the chances of risk-shifting among financial institutions. Laeven (2002) also finds that in many countries, deposit insurance is sharply underpriced, thus contributing to both the likelihood of a financial crisis and the cost of one if it occurs. Of course, as described in the second section, deposit insurance premiums were not collected from most banks in the US from 1996 to 2005 because their funds were considered to be well capitalized. As in the discussion of government guarantees above, the lesson here is that the problems that plagued the US are similar to those that have afflicted emerging markets.

Of course, many analysts might point to the apparent "success" of the guarantees employed in the US during the current financial crisis, and even more so to the stellar success stories of the Indian and Chinese banking sectors and the government backing they received. Therefore we analyze these latter cases as examples in emerging markets.

Consider India first. A significant part of the Indian banking system is still state owned. While they are generally considered less efficient and sophisticated than the private sector banks, public sector banks in India actually grew in importance during the financial crisis (which for India could be considered as the year 2008). The reason is simple and somewhat perverse: there was a "flight to safety" away from private sector banks, which have limited deposit insurance, to public sector banks, which are 100% government guaranteed (effectively so, as with the GSEs in the US). This is because the relevant law (the Bank Nationalization Act) explicitly places 100% liability for public sector banks on the government.

Hence, when the financial crisis hit India—especially in autumn of 2008, by which time the Indian stock market had plummeted by more than 50% and corporate withdrawals from money market funds threatened a chain of liquidations from the financial sector—there was a flight of deposits to state-owned banks.<sup>43</sup> During the period from January 1, 2008, through February 24, 2009, the public sector banks' market capitalization fell by 20% less than that of the private sector banks. Interestingly, this occurred even though based on a precrisis measure of systemic risk—the marginal expected shortfall measure—public sector banks were substantially more likely to lose market capitalization during a marketwide downturn than private sector banks.<sup>44</sup> In addition, within the private sector banks, those with higher systemic risk suffered more during the economy-wide crisis of 2008 (as the systemic risk measure would predict), whereas within public sector banks, those with higher systemic risk actually performed better! This divergence in the behavior of public and private sector banks is telling and strongly suggests a role for government guarantees in boosting weak public sector banks at the expense of similar-risk private sector banks.

The trend of benefiting the state-owned banking sector at the expense of the privately owned banking sector continues. Recent reports suggest that loan growth among private sector banks in India has not been that high in 2009, whereas loans at public sector banks

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<sup>42</sup>For further analysis and discussion of the costs of providing guarantees during a banking crisis, see also Claessens, Klingebiel, and Laeven (2004); Kane and Klingebiel (2004).

<sup>43</sup>In a notable incident, Infosys, the bellwether of Indian technology and a NASDAQ-listed company, moved its cash in hand from ICICI Bank, one of the largest private sector banks, to State Bank of India, the largest public sector bank.

<sup>44</sup>Acharya, Agarwal, and Kulkarni (2010). The marginal expected shortfall was calculated as follows. The worst 5% days for the S&P CNX Nifty (or Bombay Stock Exchange Sensex) were taken over the year 2007. On these days, the average return of a financial firm was measured. This average return is the marginal expected shortfall for that financial firm. The results are available from the authors upon request.

have grown in many segments, such as vehicle-backed finance, by as much as 10 percent. In essence, government guarantees have created an uneven playing field, which is destabilizing for two reasons. First, it has weakened those institutions that are in fact subject to market discipline. Second, it has raised prospects that the “handicapped” private sector banks (due to lack of comparable government guarantees) may have to lend—or take other risks—more aggressively in order to maintain market share and generate comparable returns to shareholders. Bank regulation in India tends to be on the conservative side, often reining in risk taking with overly stringent restrictions. However, the debilitating effects of government guarantees can travel quickly to the corporate sector and other financial firms reliant on banks, which are not directly under a bank regulator’s scrutiny or legal mandate.

In PRC’s case, as a part of its fiscal stimulus, the Chinese government essentially employed its almost entirely state-owned banking sector to lend at large to the economy. From July 2008 to July 2009, lending by the Chinese banking sector grew by 34%. While this has clearly helped the Chinese economy recover quickly from the effect of the financial crisis in the US—and its consequent effects on global trade—much of the growth in banking sector loans mirrors the growth in corporate deposits. In other words, loans are often sitting idle on corporate balance sheets, a phenomenon that is generally associated with severe agency problems in the form of excessive investments. While some of the “excess” may be desirable as part of the stimulus, especially if it is in public goods such as infrastructure projects, estimates suggest that the excess liquidity is also finding its way into stock market and real estate speculation. It is not inconceivable that such lending through state-owned banks would be reckless and sow the seeds of asset-pricing booms and, perhaps, the next financial crisis. The moral hazard is clear: PRC has bailed out its entire banking system more than once before, and at far greater magnitudes than the US has in the current crisis.

The examples of India and PRC highlight the classic risks that arise from government guarantees. First, they create an uneven playing field in banking sectors where some banks enjoy greater subsidies than others. This invariably leads the less subsidized players to take on excessive leverage and risks to compensate for a weak subsidy, and the more subsidized players to simply make worse lending decisions given the guarantees. Second, government-guaranteed institutions are often employed to disburse credit at large to the economy, but this invariably ends up creating distortions, as the costs of the guarantees are rarely commensurate with the risks taken. The situation in India partly mirrors that in the US, where commercial banks enjoyed greater deposit insurance but investment banks did not; over time, investment banks expanded their leverage significantly, leading to their demise. Commercial banks suffered, too, but fared somewhat better because of their insured deposits. The situation in PRC is comparable to the massive credit expansion and risky betting that occurred on the balance sheets of Fannie Mae and Freddie Mac in the US.

Both of these problems festered because of government guarantees and contributed to the financial crisis of 2007–2009. India and PRC should not rest on their laurels because of their rapid recovery from the latest global economic crisis. Instead, they need to safeguard their financial and economic stability by engaging in a rapid privatization of their banking sectors—or at the least, stop inefficient subsidization of risk taking through state-owned banks. Government guarantees do not just weaken the banks that are guaranteed but also create systemic risk by weakening competing banks, subsidizing corporations, and fueling excessive asset speculation.

### **5.3 Systemic Risk of Emerging Markets**

Our earlier analysis of systemic risk described various ways a financial institution produces systemic risk when it fails: counterparty risk, fire sales, and “runs.” One of the principal conclusions from that analysis is that systemic risk is a negative externality on the system and therefore cannot be corrected through market forces. In other words, there is a role for regulation in order to force financial institutions to internalize the external costs of systemic

risk. The exact same analogy for financial institutions within a domestic market can be made with respect to international markets, and especially so for emerging markets.

Even if a domestic regulator penalized a multinational financial firm for producing systemic risk locally, does this penalty carry through to all the international markets a firm operates in? In other words, should the penalty be more severe in such a case because failure can lead to systemic consequences elsewhere? The issue becomes even more complicated because financial institutions have an incentive to conduct regulatory arbitrage across national jurisdictions, that is, if institutions are more strictly regulated in one jurisdiction, they may move (their base for) financial intermediation services to jurisdictions that are more lightly regulated. But given their interconnected nature, such institutions nevertheless expose all jurisdictions to their risk taking. Individually, jurisdictions may prefer to offer regulation “lite” (adopt a regulation “lite” structure) in order to attract more institutions and thereby jobs.

In the current crisis, the poster child for being internationally interconnected is Iceland.<sup>45</sup> Iceland, a tiny country with its own currency, allowed its banking sector to grow almost tenfold in terms of foreign assets compared to the growth of its own GDP. Its huge leverage aside, Iceland’s survival was completely dependent on conditions abroad. The systemic risk of the three largest Icelandic banks (Kaupthing, Landsbanki, and Glitnir) also went beyond its own borders. Because the banks had fully exploited internal expansion within Iceland, they opened up branches abroad, particularly the United Kingdom and Netherlands, by offering higher interest rates than comparable banks in those two countries. When the Icelandic banks began to run aground and faced massive liquidity problems, in a now somewhat infamous event, the U.K. authorities invoked an antiterrorism act to freeze the U.K. assets. Essentially, Iceland as a country went into shutdown.

Of course, the most common source of systemic risk is a run. It is well known that, for many emerging markets, capital inflows are their lifeblood. There are numerous examples of capital flowing into new, emerging markets only to be suddenly withdrawn upon the occurrence of a crisis. These runs can leave the corporate and banking sectors of the developing country devastated, especially if there are currency, liquidity, or maturity mismatches between the assets and foreign liabilities. An example from the recent crisis is that net private capital flows to emerging Europe fell from about US\$250 billion in 2008 to an estimated US\$30 billion in 2009. Not surprisingly, emerging Europe has been one of the hardest hit in terms of the impact of the crisis on its GDP and internal institutions.

The current crisis has been severe for both its financial effect (for example, a spike in risk aversion among investors) and economic impact (the largest drop in global trade since World War II). Therefore it is quite surprising that compared to past banking crises, emerging markets have gotten through largely unscathed. This can be attributed in part to better (or excess!) internal planning—having a substantial stock of international reserves—and partly to liquidity funding by international government organizations such as the International Monetary Fund and World Bank. Both of these elements suggest an approach to international coordination that mirrors how one might regulate systemic risk domestically.

Emerging markets need to coordinate with their larger brethren on prudent measures such as leverage limits and currency reserves. As a reward, these markets could access international lender of last resort facilities during a liquidity event and, in a systemic crisis in which there is a run on all financial institutions, employ loan guarantees and recapitalizations that are fairly priced and impose low costs on taxpayers. Of course, it would be necessary to shut down and resolve insolvent institutions to maintain the right incentives in good times.

If national regulators can agree upon a core set of sensible regulatory principles, then the constraints imposed by such alignment would reduce substantially the practice of regulatory arbitrage through jurisdictional choice. The central banks could present their proposals with

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<sup>45</sup>. See Buiters and Sibert (2008).

specific recommendations to their respective national authorities, and seek consensus internationally through the Financial Stability Board or committee of the Bank for International Settlements. The lessons learned from this crisis should be an especially useful aid in such discussions.

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