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LEARNING FROM THE CRISIS: WHAT CAN CENTRAL BANKS DO?*

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Large-scale and unusual events often present occasions for introspection and learning, especially when they bring unwanted consequences. Even if no one is at fault for causing some event in the first place (an earthquake, for example), it is only natural to ask what might be done to mitigate the consequences should a similar catastrophe recur. When what went wrong was itself the result of human action, the question at issue is not merely containment but prevention.

The broader question is to what extent the lessons from such unusual events are applicable in more normal times. No one expects the massive traffic jams typical when residents evacuate a coastal city in advance of a hurricane to occur at other times. Learning to manage such evacuations is helpful for occasions when they occur, but the knowledge has limited relevance for controlling ordinary traffic patterns.

As economists and policymakers now begin to sort out the wreckage from the 2007-? financial crisis and economic downturn, these distinctions will inevitably be central to any

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normative lines of inquiry. What can central bankers, regulators, and others in positions of responsibility do to render this kind of disruption less likely to recur? If another such crisis does happen, what steps should policymakers take to contain its extent within the financial system and to limit its contractionary impact on nonfinancial economic activity? Does what policymakers did (or failed to do) during the crisis shed light on how they should conduct monetary policy, or regulate banks and other financial institutions, in more normal times?

The 2007-? crisis and downturn constituted one of the most significant economic events since World War II. In some countries the real economic costs – costs in terms of reduced production, lost jobs, shrunken investment, and foregone incomes and profits – exceeded that of any prior post-war decline. (In the United States, for example, the peak-to-trough decline in real output was 3.8 percent, slightly greater than in 1957-8; unemployment has not reached the level that followed the 1981-2 recession, but it seems likely to remain abnormally high for much longer than it did then.) To a greater extent than is usual, however, the decline affected countries in all parts of the world – though, of course, some more so than others. With the overall volume of world trade down by 12 percent in 2009 (according to the IMF), it is hardly surprising that so many export-oriented economies were affected.

It is in the financial sector, however, that this latest episode primarily stands out. The collapse of major financial firms, the decline in asset values and consequent destruction of paper wealth, the interruption of credit flows, the loss of confidence both in firms and in credit market instruments, the fear of default by counterparties, and above all the intervention by central banks and other governmental institutions – both in scale and in form – were extraordinary. Whether this latest episode constitutes the worst real economic downturn since World War II is, for many

countries, a close call. But there is no question that for the world's financial system what happened was the greatest crisis since the 1930s.

This contrast – between a financial crisis exceeding anything in the prior two-thirds of a century and an economic downturn much more in line with prior post-war experience – immediately suggests where the most useful opportunities for learning may lie. What did policymakers do that so contained the crisis within the financial markets? What aspects of what they did offer lessons that may be applicable to more ordinary times? What changes are needed to lessen the likelihood of future crises, or to render them more readily containable should they occur?

This paper's principle conclusions are as follows:

- For purposes of how monetary policy influences nonfinancial economic activity, what principally matters is not money but credit: its volume, its price, and its availability.
- In light of how most central banks now set interest rates, central banks in effect have not one policy instrument but two; over time horizons long enough to matter for monetary policy, the quantity of central bank liabilities can be varied more or less independently.
- The composition of central bank assets also matters; central bank securities holdings, in large volume, affect market interest rate relationships.
- By contrast, policymakers have not yet figured out what instruments are effective for restoring the vitality of bank lending markets once lenders have become severely impaired.
- Additional financial regulation, implemented by public policy, is necessary. Neither self-regulation nor regulation by capital market creditors is effective for complex institutions in today's markets.
- One element of that regulation should be a separation between the deposit and credit aspects of banking and inherently risk-oriented trading activities (but not activities, including trading and underwriting, in which risk is incidental to the provision of banking services).

- In some countries, most obviously the United States, governments need expanded authority to resolve the failure of bank holding companies, independent broker-dealers, and insurance companies.
- The classical rule for lender-of-last resort policy – rescue illiquid firms but not insolvent ones – is not longer useful. In a financial crisis the distinction between illiquidity and insolvency has become largely non-operational.
- For purposes of lender-of-last-resort policy, as well as regulation, it would help to distinguish between financial losses that reflect genuine losses of wealth to the economy and those that are merely one side of a zero-sum bet.

The Crisis and the Policy Response

The broad narrative of the financial crisis that began in 2007 is by now well known.¹ Beginning in the late 1990s, but especially once the relatively mild 2001 recession had ended, house prices in the United States rose rapidly. Increasingly lax underwriting standards – high loan-to-value ratios, back-loaded payment schemes, and little if any documentation – were both a cause and a consequence of the rise in prices: less onerous lending conditions spurred demand for houses, while the rising value of the underlying collateral lessened concerns for the creditworthiness of borrowers. Securitization of a large fraction of the newly issued mortgages further lessened the originators' interest in their integrity. Investors in the created securities, or in derivatives based on them, either misled themselves (for example, similarly counting on rising house prices to nullify the implications of borrowers' lack of creditworthiness) or were misled by rating agencies that carried out inadequate analysis and also faced serious conflicts of interest. Importantly, many of these investors were non-U.S. entities.

At the same time, two more general developments, one concerning financial institutions and the other concerning financial instruments, rendered the U.S. financial system, and those

who participated in it, more vulnerable. First, the distinction between banking and trading mostly disappeared – and not simply as a consequence of the formal repeal in 1999 of what remained of the Depression-era Glass-Steagall separation, which had largely eroded long before. Most of the large commercial banks, facing the need to raise their own capital in competitive securities markets, relied increasingly on trading profits, in effect turning themselves into hedge funds. (Otherwise they would have had little reason to retain shares of the mortgage-backed securities that they earned fee income by packaging and selling.) Meanwhile, most of the large investment banks, which already had significant trading operations, increasingly used the repurchase-agreement market to fund themselves with what, in effect, amounted to short-term deposits.

Second, the continuing development of the market for financial derivatives moved beyond the role of enabling investors (including financial institutions) to hedge risks that they already bore and instead increasingly provided vehicles for taking on new, unrelated risks – permitting participants either to speculate on changes in the market price of those risks or simply to generate a new form of fee income. As a result, many of the risks to which investors became exposed bore little or no connection to fluctuations in any component of the economy's actual wealth. The risks borne, increasingly, were merely bets on one side or the other of a zero-sum game.

Given the vulnerability created by these two more fundamental developments, it is not surprising in retrospect that a sufficient catalyst would trigger a widespread crisis. The turnaround in U.S. house prices that began in late 2006 provided such a catalyst. By late 2007 house prices on a nationwide basis were falling at a double-digit annual rate. By late 2008 the

rate of decline, nationwide, was nearly 20 percent. In some states, and in many local residential markets, the declines were significantly greater. (Because what matters for any individual mortgage is the specific house collateralizing that loan, the dispersion of price changes around a given average rate of decline worsens the probability of default.) Especially in the market for “sub-prime” mortgages, delinquencies and defaults increased. In time, so did foreclosures. In some areas spreading foreclosures helped drive house prices down still further.

The resulting loss of value on mortgage-related securities accrued not only to investors but also to many of the banks and other firms that had sponsored and distributed these securities (again, because they were acting as traders in addition to their role as originators and distributors). With only thin capitalization – leverage ratios of 12-15 for a typical large commercial bank and 25-30 for a typical investment bank – the institutions taking the largest paper losses also lost the confidence of both equity investors and creditors. Rolling over their short-term funding therefore became problematic; in effect, institutions that were not banks sustained “bank runs” on liabilities that were not deposits. (In the U.K., where deposit insurance had long been inadequate, there were actual deposit runs on banks.) Interbank lending markets became subject to unprecedentedly wide spreads, and in many cases largely ceased to function. Further, once financial institutions lost the market’s confidence they became unable to participate in a wide variety of auxiliary transactions from which they ordinarily earned fee income; the counterparty risk that they presented was too great.

With so many banks and other lending institutions impaired in any or all these ways, credit for nonfinancial borrowers became increasingly scarce – and not just for housing finance. In August 2008, the month before the Lehman Brothers failure, U.S. banks’ commercial and

industrial loans outstanding totaled \$1,558 billion.² By December 2009 outstandings were only \$1,343 billion. Over the same period consumer loans, from banks as well as other lenders, declined from \$2,578 billion to \$2,483 billion (latest data for October 2009). The contraction of credit was much sharper in capital markets. The volume of asset-backed commercial paper outstanding dropped from \$1,208 billion in July 2007 to only \$489 billion in December 2009. Unsecured commercial paper issued by nonfinancial firms continued to increase irregularly through December 2008, reaching \$206 billion, but since then has fallen to just \$108 billion in December 2009. The total volume of new bond issues sold in the United States on behalf of U.S. corporations fell from \$2.3 trillion in 2006 to only \$749 billion in all of 2008.

In addition, declining asset values imposed a sizeable loss of real wealth on both household and firms. The value of corporate equities outstanding in U.S. markets dropped from \$26.4 trillion in the summer of 2007 to \$13.9 trillion in early 2009. The value of residential real estate owned by households declined from \$22.9 trillion at yearend 2006 to \$15.7 trillion in early 2009. Both the unavailability of credit and the loss of wealth presumably played a part in the drop in spending that ensued. Similar patterns, in greater or lesser degree, appeared in many other countries as well.

The sequence of actions that many of the world's central banks took in response to these events has been extraordinary – in many respects comparable, within the financial realm, to the broader burst of economic experimentation undertaken by the Roosevelt administration during the New Deal period in the mid 1930s. As was the case then, some of the steps implemented seem to have enjoyed success while others have not. Relatively few have proved outright counterproductive (at least within the limited time to date).

In the United States, the initial indication of extraordinary action came in December 2007 when the Federal Reserve System implemented the first of what would become a series of new credit facilities, the “Term Auction Facility,” to channel additional central bank credit to commercial banks needing reserves. In March 2008 the Federal Reserve established two further credit facilities, the “Term Securities Lending Facility” and the “Primary Dealer Credit Facility,” to extend central bank credit against a broader class of collateral, and also to nonbanks. In the same month the Federal Reserve also provided an emergency loan to J.P. Morgan to facilitate the bank’s take-over of Bear Stearns. In May 2008 the Federal Reserve expanded the TSLF to accept high-rated asset-backed securities as collateral. In July 2008 the FDIC took over mortgage lender IndyMac. In September 2008 the U.S. Government placed the mortgage agencies Fannie Mae and Freddie Mac in receivership. Following the Lehman failure, that same month, the Federal Reserve approved the applications of Goldman Sachs and Morgan Stanley to become bank holding companies, the Office of Thrift Supervision closed mortgage lender Washington Mutual, and the Securities and Exchange Commission banned short-selling of financial stocks. In October 2008 the U.S. Congress raised the limit on FDIC insurance to \$250,000 per account, the Federal Reserve introduced a “Commercial Paper Funding Facility” and a “Money Market Investor Funding Facility” and also expanded several of its existing new facilities, the U.S. Treasury announced a plan to inject up to \$250 billion of capital directly into key financial institutions (and the definition of Tier I capital was changed to include stock purchased by the Treasury), and the FDIC guaranteed the senior indebtedness of all regulated U.S. financial institutions. In November 2008 the Federal Reserve and the Treasury jointly extended an emergency loan to insurance company AIG, both of them plus the FDIC extended

special aid to Citigroup (including a non-recourse loan from the Federal Reserve), and the Federal Reserve began direct purchases of obligations issued by Fannie Mae and Freddie Mac. In January 2009 the Federal Reserve, the FDIC and the Treasury jointly extended aid to Bank of America, on similar terms to what Citigroup received (including the non-recourse loan from the Federal Reserve). In February 2009 the Federal Reserve expanded its recently created “Term Asset-Backed Securities Loan Facility” to \$1 trillion and further widened the range of eligible collateral. Nor did the list of actions taken end as of one year ago.

Outside the United States, extraordinary actions to arrest the crisis began even earlier. In September 2007 the Bank of England extended an emergency loan to Northern Rock. In February 2008 Britain nationalized Northern Rock outright. In October 2008 the Government of Ireland guaranteed the liabilities of the country’s six largest banks. Several other European governments, most notably Iceland, either rescued outright major banks that were impaired or guaranteed their domestically domiciled banks’ liabilities. In January 2009 the U.K. government announced its comprehensive bank rescue plan. Beginning at the end of September 2008, the ECB undertook a special term-refinancing operation (in the amount of E 120 billion), changed the tender procedure in its regular monetary policy operations to provide additional liquidity to the banking system, narrowed and then re-widened the “corridor” between the interest rates on its two standing facilities (see the discussion below on the operation of “corridor” systems for central bank setting of interest rates), lengthened the average maturity of its operations, expanded its list of eligible collateral, and introduced several special facilities allowing the bank to transact with new counterparties or to undertake new kinds of transactions. In Japan, which had been employing extraordinary policy measures since the early 1990s (so that by the time this crisis

occurred they no longer seemed so extraordinary in the Japanese context), the Bank of Japan expanded its securities lending facility, increased both its outright purchases of Japanese Government securities and its purchases via repurchase agreements, expanded the range of private securities eligible for repurchase, introduced outright purchases of commercial paper and corporate bonds, and undertook special operations to provide funding for Japanese corporations.

At the same time, central banks carried out conventional monetary policies as well, though often in unconventional ways. In September 2007 the U.S. federal funds rate was 5 1/4 percent. By January 2008 the Federal Reserve had lowered it to 3 percent. In October 2008 – after the Lehman collapse – it lowered the funds rate to just 1 percent, and in December 2008 it went to zero. The ECB, with its near-exclusive statutory focus on price stability, waited until October 2008 to lower its fixed rate, from 4 1/4 percent to 3 3/4 percent. By December 2008 the rate was down to 2 percent. In March 2009 the ECB lowered it to 1 1/2 percent, and in May 2009 to 1 percent. The Bank of Japan likewise waited until October 2008 to ease monetary policy, cutting the uncollateralized call loan rate from 1/2 percent to 0.3 percent. In December 2008 it reduced the rate further, to 0.1 percent.

International coordination among central banks was also a part of this story. To cite only one instance, in October 2008 – three weeks after the Lehman failure – the Federal Reserve, the ECB, the Bank of England, the Swiss National Bank, the People's Bank of China, the Bank of Canada and the Sveriges Riksbank all cut their policy interest rates simultaneously. Most of the major central banks also took pre-emptive measures to enable themselves to act in support of stability in the foreign exchange markets. In December 2007 the Federal Reserve established new swap lines with the ECB and the Swiss National Bank, although for only \$20 billion and \$4

billion, respectively. Over successive months both lines were increased several times. In addition, Federal Reserve swap lines were opened with other central banks, including the Reserve Bank of Australia, the Sveriges Riksbank, Norges Bank, and Danmarks Nationalbank. By September 2008 the Federal Reserve's swap lines with these and other central banks totaled \$620 billion. In October 2008 the Federal Reserve established new swap lines with the central banks of Brazil, Korea, Mexico and Singapore, in each case for \$30 billion.

Finally, although fiscal policy is beyond the scope of this paper, it is important to note that once the downturn began many countries also enacted fiscal measures directed at stimulating economic activity. In the United States, for example, in January 2008 Congress passed a \$150 billion measure providing for checks to be sent directly to households, and in February 2009 Congress passed a \$787 billion stimulus package combining a variety of spending increases (spread out over several years) and tax reductions. Among other countries, the most notable fiscal action taken was the RMB 4 trillion (\$586 billion) stimulus package announced by the Chinese government in November 2008. Against the background of decades of resistance to the use of discretionary fiscal policy for purposes of deliberate counter-cyclical stabilization, on the part of professional economists as well as many policymakers – on a variety of grounds, including the difficulty of knowing when such measures would be helpful, the difficulty in agreeing on what to do, the time required for implementation, and concerns that such measures would be an opportunity for politically motivated unproductive spending – these actions also stand out as among the extraordinary policy responses to the 2007-? crisis and downturn.

Implications for Monetary Policy

For purposes of monetary policy, the strongest single lesson of the crisis and the response to it is that what matters is not money but credit.³ Indeed, the economics profession's half-century-long fixation on money – how to measure it, how to control it, why households and firms hold it – appears in retrospect as mostly a distraction. Much of this was amply evident well before 2007; most central banks had long since given up their monetary targeting regimes. But the events of the 2007-? crisis and downturn dramatized the point more sharply. In most countries money stock (however measured) had not fallen. The central bank had not allowed the monetary base to decline. There was no cause to believe that the reason households and firms were not spending was that their holdings of money balances were too low. There was also no evidence that central bank restrictiveness in providing reserves was a cause of high interest rates: soon into the crisis, risk-free interest rates in most countries were at historic lows, and the obligations of private borrowers bore high rates because of perceived risk and the unavailability of credit, not insufficient reserves. The causes of the downturn lay elsewhere – specifically, in restricted credit flows and depressed asset prices.

A second lesson, less widely recognized, is that nowadays most central banks do not normally set interest rates by increasing or decreasing the volume of reserves that they provide to their banking systems.⁴ The traditional understanding of how a central bank sets a (presumably short-term) interest rate involves its varying the supply of bank reserves, or some other subset of its own liabilities, in the context of an interest-elastic demand for those liabilities on the part of the private banking system and perhaps other holders as well (including the nonbank public if the measure of central bank liabilities taken to be relevant includes currency in circulation). It is straightforward that the central bank has monopoly control over the supply of its own liabilities.

Familiar reasons for banks to hold central bank reserves include the need for balances with which to execute interbank transfers as part of the ordinary payments mechanism, the further need for currency to satisfy customers' everyday demands (in systems in which vault cash is a part of banks' reserves), and in some countries (for example, the United States) outright reserve requirements imposed by the central bank. The negative interest elasticity on the demand side follows as long as banks have at least some discretion in the amount that they hold for any or all of these purposes, and the interest that they earn on their reserve holdings differs from the appropriately risk-adjusted rates of return associated with alternative assets to which they have access.

Long before the 2007-? crisis, however, this standard textbook account had ceased to bear a visible relationship to the actual conduct of monetary policy by most of the world's major central banks. Even in the United States – where in principle the standard story ought to apply most naturally, because of the prevailing central banking institutions (most importantly, reserve requirements and, until 2008, no interest paid on reserve balances) – before 2000 the evidence indicated that the amount by which the Federal Reserve System increased or decreased bank reserves in order to move the prevailing federal funds rate was not only extremely small, compared to the size of the markets in which U.S. banks operate, but becoming smaller over time. On many occasions moving the rate required no, or almost no, central bank transactions at all. Since 2000 the amount by which reserves have changed on days of policy-induced changes in the federal funds rate has become noticeably larger on average. But in a significant fraction of cases – one-third to one-fourth of all policy-induced rate changes – the movement in reserves has

been in the wrong direction: a *decrease* in reserves accompanying a *reduction* in the interest rate, or vice versa.

In many systems outside the United States, where the central bank normally relies on a “corridor” system to fix its policy interest rate, the absence of any relationship between the volume of reserves supplied and the movement in the rate follows more directly – at least at a daily frequency of observation – although the implications have not received widespread attention. The ECB, for example, maintains standing facilities both for banks’ deposits of reserves and for marginal lending of reserves by the Eurosystem central banks, with the rate for banks’ borrowing from the central bank normally 200 basis points above the rate at which their deposits of excess reserve balances are remunerated. Other central banks maintain similar systems.⁵ (Once the current period of near-zero short-term interest rates is over, so may the U.S.; as of 2008, the Federal Reserve now pays interest on excess reserves, at least in principle). The result is to maintain a constant degree of supply-demand pressure in the market for reserves, *at the margin*, regardless of the total quantity supplied. Hence by varying the upper and lower boundaries of the corridor together (which is the usual practice, in many such systems effected automatically by the structure of the two standing facilities), the central bank can change its policy interest rate without necessarily making any change in its own balance sheet. The movement of the corridor instead changes banks’ demand for reserves at a given interest rate.

This separation between the central bank’s balance sheet and the influence it is exerting on short-term interest rates – either straightforwardly in a system like the ECB’s or more opaquely in the Federal Reserve’s case – bears two significant implications. At a fundamental level, it represents a departure from the role of central bank liabilities that has underpinned much

of monetary economics for more than a century. According to Wicksell's classic analysis, what was necessary to expand economic activity by maintaining the market interest rate above the "natural" rate was not just a one-time injection of additional reserves but a continual increase in the supply of reserves: hence the "accelerationist" view of inflation, by which real economic activity maintained at greater than the natural rate would lead not to a one-time increase in prices but to a perpetual increase (in some renderings, a perpetual increase in the rate of increase), was consistent with the classical notion of a fixed relationship between prices and money (in this case, central bank money).⁶ By contrast, if a corridor system for interest rate setting enables the central bank to hold interest rates at a sub-"natural" level without any increase in the supply of its liabilities, then at least one relationship in the chain running from interest rates to real activity to prices to money must break down. (Alternatively, over time the interest rate that the central bank sets in this manner would become "decoupled" from the rest of economic activity – in particular, from anything bearing a connection to the marginal product of real capital.⁷)

The crisis and the policy response to it, however, have highlighted a further, more practical implication. At least over some period of time potentially sufficient to matter for macroeconomic purposes, central banks have not one instrument of conventional monetary policy, as usually assumed, but two: not the short-term interest rate *or* the quantity of central bank liabilities, but the short-term interest rate *and* the quantity of central bank liabilities. A reductionist form of this proposition had already become evident from the "quantitative easing" program undertaken by the Bank of Japan in the 1990s. But in that case the central bank did not actually have two effective policy instruments; the occasion for the quantitative easing in the first place was that the Japanese short-term risk-free interest rate had reached the zero lower bound,

so that the quantity instrument was a replacement for the interest rate instrument. In a narrow sense, the same is true in the United States today: the federal funds rate is likewise at the zero lower bound.

But this focus places too narrow a construction on the point at issue. For more than a decade, during most of which time U.S. short-term interest rates were far from zero, the quantity of reserves that U.S. commercial banks held with the Federal Reserve fluctuated narrowly around \$40 billion. Reserves were approximately \$40 billion when interest rates were high, and they were approximately \$40 billion when interest rates were low. Movements of the federal funds rate implemented by the Federal Reserve had little or nothing to do with the quantity of reserves. But this absence of a relationship in turn implies that the Federal Reserve did not have to maintain the reserve quantity at \$40 billion through all of this time. Presumably it could have varied that quantity. And, especially if it had implemented a corridor system (which it now has, at least in principle, since 2008), it could have varied the quantity of reserves with little or no implication for its ability to impose the interest rate level it chose.

In fact the Federal Reserve did not avail itself of this opportunity. But once the 2007-? crisis hit, the central bank significantly expanded its balance sheet. In December 2007 total reserves were (as usual) \$43 billion. By December 2008 they were \$820 billion. By December 2009 they were \$1,153 billion. (By contrast, the outstanding currency increased at a more normal pace: from \$758 billion in December 2007 to \$812 billion in December 2008, and \$858 billion in December 2009.) Even against the background of the size of the U.S. securities markets, these were very large increases in reserves, and therefore in the total quantity of central bank liabilities. Other central banks implemented similar balance sheet expansions. The Bank of England's total

assets are normally somewhat below 5 percent of U.K. GDP. By mid 2009 they were nearly 16 percent. The comparable increase for the ECB was from 10 percent to almost 18 percent of Euro-area GDP.

Moreover, once the central bank has a second, quantity-based instrument with which to affect the financial markets, the composition of the assets that it holds represents a further degree of freedom. Here the Federal Reserve presents the most striking case. As of yearend 2009, the Federal Reserve held \$2,220 billion of assets (against bank reserves, currency outstanding, and all other liabilities). Nearly half of this total – \$910 billion – consisted of direct holdings of mortgage-backed securities guaranteed by Fannie Mae, Freddie Mac or Ginnie Mae. In ordinary times the U.S. central bank would have held none of these securities. Much of the rest of the yearend 2009 balance sheet likewise consisted of assets that the Federal Reserve ordinarily would not hold, or credit extended against securities that the Federal Reserve ordinarily would not accept as collateral. Only \$777 billion, out of the \$2,220 billion total, consisted of U.S. Treasury obligations.

Presumably these capital market interventions were intended not merely to affect the overall level of interest rates but also to influence the structure of market interest rates – in other words, spreads. Were they effective? The Federal Reserve's objective in buying nearly \$1 trillion of mortgage-backed securities was to restore liquidity to the market for these securities and reduce mortgage interest rates, thereby increasing the demand for houses, and hence supporting house prices and stimulating residential construction. Although so far there is little formal evidence bearing on the success of this large MBS purchase program, conventional home mortgage rates in the United States have fallen from nearly 6 percent in the summer of 2008 to

below 5 percent in the latter months of 2009 while Treasury rates remain roughly unchanged. More formal evidence for some of the Federal Reserve's other targeted lending facilities indicates an effect that is both statistically and economically significant. After controlling for such influences as the federal funds rate, the Treasury bill rate, the Aaa-Baa bond spread, and the ratio of financial to nonfinancial firms' stock prices, regression-based evidence suggests that each \$1 billion of purchases of commercial paper by the CPFF narrowed the spread between commercial paper rates and OIS rates by .2-.4 basis point. In analogous regressions, the estimated per-dollar impact of use of the TAF is roughly twice as large.⁸

The remaining question, however, is what policy measures can restore the market for bank lending. Small businesses seeking to expand or finance inventories, and households seeking to buy automobiles or undertake other ordinary consumer expenditures, do not have access to the capital markets. As Japan discovered more than a decade ago, reviving bank lending in the wake of a financial crisis is highly problematic. As of December 2009, U.S. banks' portfolios of commercial and industrial loans, consumer loans, credit card loans, and interbank loans were all still shrinking. Policy measures taken by agencies other than the Federal Reserve – emergency loans and direct injections of capital to the large banks, relaxation of rules for marking bank assets to market, and the like – may have prevented these declines from being still larger.⁹ But at least so far, they have not yet stimulated any increase in lending. Perhaps the best solution is not to allow the banks to become so impaired in the first place – in other words, to rely on regulatory policy before the fact, not either monetary policy or lender-of-last resort policy once the crisis has occurred.

Implications for Financial Regulation

One inescapable principle that the events surrounding the 2007-? crisis in the United States highlighted is that a democracy gets the regulation it chooses. If voters elect public officials who do not believe in regulation, and those officeholders appoint people who also do not believe in regulation to lead the key agencies within the nation's regulatory apparatus, then there will not be effective regulation no matter what the prevailing statutes say.

A further lesson of the crisis, which makes this basic principle of democratic governance all the more important, is that self-regulation by for-profit private firms is insufficient to meet the challenges presented by today's complex financial markets. One reason, to repeat, is that financial firms must raise their own capital in competitive securities markets. A second is that a variety of features of today's financial firms, beginning with limited liability but hardly limited to that one feature of the modern corporate structure, provide sharply distorted incentives compared to what effective self-regulation would require. (When reading the classic texts on banking, like Thornton and Bagehot, it is worth recalling that in Henry Thornton's time all London banks except the Bank of England had to be partnerships – no other limited-liability “joint stock banks” allowed – with a maximum of six partners.¹⁰) A third reason is that the governance structure of large modern corporations in general, not just financial firms, is inadequate for effectively guarding even the interests of these firms' stockholders. The notion of corporate governance exercised via a board of directors, with the board in turn responsible to the shareholders, has long been something of a fiction for most large publicly held companies. But many fictions are useful ones. What the crisis has helped demonstrate is the extent to which this fiction has ceased to be useful. With an ever greater fraction of most corporations' stock held by passive entities, and

shareholders not allowed even a non-binding advisory “say” on compensation, it is not surprising that management incentives are often at odds with those of the firm’s ultimate owners.

Yet a further, also related, lesson of the crisis is that vigilance by creditors is no effective substitute for regulation either. Whether because they too face faulty governance and perverse incentives (reliance on what Louis Brandeis, a century ago, famously labeled *Other People’s Money*), or because they have become convinced that governments will issue blanket guarantees of insolvent firms’ obligations, the idea of restraint exercised by lenders is no longer credible. Nor are the judgments of firms, like credit rating agencies, that supposedly serve as sources of information for lenders.

The implication is that regulation is necessary and that it is the responsibility of public policy to provide it. At least in the U.S. context, the leading example of regulation that is needed but now missing is a separation between trading functions – in which risk-taking is not an incidental consequence of providing some banking-related service (like underwriting or credit provision) but rather the central definition of the activity – and ordinary banking. In recent years the tendency has been toward an ever greater fraction of banks, of any significant size, taking on proprietary trading activities that in effect amount to sole ownership of a hedge fund. But there is no evidence of meaningful synergy between such risk-taking and either the deposit or the lending business. One possible explanation is that margins in both deposit taking and lending have been so competed away that ordinary banking business is no longer viable without a subsidy, and that profits from an affiliated hedge fund operation are the most convenient way of providing that subsidy. Such model is clearly not sustainable, however (why would hedge fund owners want to divert their profits to subsidize banking activity, or anything else for that matter?). Further, as

the 2007-? crisis has shown, it is not clear that this kind of trading is always profitable, and when the losses accrue to banks in particular the outcome involves externalities that impose potential costs more broadly, costs that in the end the taxpayer has to bear. If it were true that ordinary lending and deposit taking were not viable businesses without a subsidy, the more plausible remedy would be some kind of public utility model; but the need for a subsidy in the first place is far from demonstrated.

The more apt lesson to draw from the crisis, therefore, is that the regulatory structure should impose (in the United States re-impose) a separation between inherently risk-taking trading and banking, where banking for this purpose includes not only lending and deposit taking but also related activities, including trading, where risk-taking is not inherent but rather ancillary to the provision of banking services. Whether such a separation need take the form of an outright prohibition, or merely incentives provided through tax and accounting mechanisms, is an open question that merits serious analysis. For example, in numerous other settings accounting rules distinguish between gains and losses on positions taken to hedge other positions and those taken “naked.” To cite the most obvious application, it would be relatively straightforward to distinguish between credit default swaps used by banks to hedge the risk associated with extending credit to a corporate borrower (where a CDS position would be no greater than the amount of the bank’s credit exposure) and the use of CDS’s simply as a speculative vehicle. Since the outstanding market CDS volume today is normally large compared to the indebtedness of the firms against which these swaps are written, it is likely that many participants in this market are using them for the latter purpose. Either barring banks outright from doing so, or

providing tax and accounting incentives for them not to do so, would be one useful element of a regulatory separation between banking and inherently risk-oriented trading.

A further question of some current importance in a number of countries (the U.S. included) is what role central banks should play in the regulation of banks, and perhaps of other financial firms as well. This issue lies well beyond the scope of this paper. It is useful to note, however, that evidence for the United States indicates significant cross-relationships between the kind of macroeconomic information that central banks ordinarily create and use in the course of monetary policymaking and the information that is usually at the heart of most bank supervision activity. Specifically, information contained in U.S. banks' CAMEL ratings turns out to have significant marginal predictive value with respect to key macroeconomic variables of interest to monetary policy (output growth, for example, or unemployment), and information contained in the Federal Reserve's internal macroeconomic forecasts (the "Greenbook") likewise has significant marginal predictive value with respect to aggregate bank ratings and outcomes.¹¹

Implications for Lender-of-Last-Resort Policy

Lender-of-last-resort policy is different now than it was when Henry Thornton and Walter Bagehot wrote about it.¹² Banks are no longer the simple partnerships that they were in Thornton's day, and Bagehot's assumption that the overwhelming majority of banks were soundly managed and solvent would sound hopelessly naive today. (What remains unchanged, however, is the potential fall-out from the failure of a large bank; as Bagehot wrote, "no cause is more capable of producing a panic, perhaps none is so capable, as the failure of a first-rate joint stock bank in London.") More importantly, the difficulty of assessing a proper value for illiquid

assets has rendered Bagehot's famous rule – lend freely, at a penalty rate, against good security – impossible to implement. In situations like the 2007-? crisis, in which banks held large volumes (compared to their capital) of securities that were not trading and for which prospects for future cash flows were highly uncertain, distinguishing what was or was not a “good security” was precisely the sticking point.

For just the same reason, the frequently stated corollary of Bagehot's rule – come to the rescue of illiquid firms but not insolvent ones – has become equally impossible to implement in such a crisis. For practical purposes, the distinction between illiquidity and insolvency has disappeared. Depending on the hypothetical value attached to these illiquid securities with uncertain future cash flows, any given bank was either solvent or not. To be sure, fair-value accounting does not require holders to price illiquid assets at “fire sale” prices. But for many of the securities at the heart of the 2007-? crisis, the gap between the price that a forced liquidation would fetch and the present discounted value of all of the promised cash flows if paid as scheduled was (and for many securities remains) vast. What arbitrary valuation to place on them, somewhere between those respective lower and upper bounds, was (and for many banks remains) the difference between solvency and insolvency.

The more obvious lesson of the crisis, in the United States, is the need for enhanced resolution authority for cases in which the central bank (or other elements of the government) chooses not to effect a rescue. Under prevailing U.S. law the Comptroller of the Currency and the FDIC are empowered to take over a bank; but there is no such authority for a bank holding company. If policymakers had wanted temporarily to nationalize one or another of the most impaired commercial banks, therefore – rather than buying shares in it and guaranteeing its

liabilities – they would have to have left both the holding company and all of its other constituent parts in private hands (but without the prospect of support from the bank). There is similarly no such authority for the government to take over an insurance company, or an independent broker-dealer. Bankruptcy remains a possibility, of course, but without the expedited resolution that the COC/FDIC procedure provides.

As a result, the choice policymakers face is often between supporting impaired and perhaps insolvent firms on terms unfavorable to taxpayers and risking the market disorder consequent to a protracted bankruptcy procedure (as occurred following the Lehman failure). Further, because impaired firms' owners and managers understand that this is the choice policymakers face, they are able to use the threat of bankruptcy – “playing the bankruptcy card” – to extort terms in a voluntary take-over that are more favorable to themselves and yet more unfavorable to the taxpayer (as occurred in the take-over of Bear Stearns by J.P. Morgan). Legislation to provide expanded resolution authority is now pending before the U.S. Congress. Enacting it would fill a significant gap in U.S. policy authority.

An additional helpful measure, for use in cases in which either the central bank acts as lender of last resort or the relevant authority nationalizes an impaired firm, would be to distinguish (along the lines suggested above) between losses that are reflections of genuine losses to the economy and losses that represent merely one side or the other of a zero-sum bet. For example, when the value of a house falls, that is a loss of wealth to the economy as a whole. If the homeowner continues to service the mortgage, he bears the loss himself: his net worth is diminished by the amount of the price decline. If the homeowner defaults on the loan, then someone else – either the bank that originally lent the money or some investor to whom the bank

sold the loan – also bears part of the loss. If the government steps in and reimburses the bank, or the investor, then taxpayers will bear part of it too. But however this loss is divided, what is inescapable is that someone, somewhere, will bear it. What much of the debate surrounding the 2007-? crisis was (and still is) about is how these losses should be divided among homeowners, banks, loan-purchasing investors, and the taxpayers. But the losses that occurred must be borne by someone, and the U.S. economy is poorer because of them.

By contrast, if two firms have bet on, say, whether the peak temperature in Mumbai on some designated day would exceed ninety degrees, one will turn out to be right, the other wrong. One will win, the other will lose, and the amount the winner wins will be identical to what the loser loses. There is no loss of wealth to the economy involved, merely a transfer of wealth from the loser to the winner. Many of the huge losses that financial institutions around the world sustained in the recent crisis were of this second kind; and for each of these positions, on the other side of the bank or insurance company (the obvious U.S. example was AIG) that posted losses and turned to the taxpayers for assistance there was also, somewhere, a winner. The most transparent example of this phenomenon, and the most important in the 2007-? crisis, is again credit default swaps. In the case of many if not most of these contracts, the volume of swaps outstanding far exceeded the amount of debt that the specified company whose credit was being insured owed. Most of these swaps therefore had nothing to do with allocating genuine losses of wealth. Instead, they simply created losses for the firms that bet incorrectly, exactly matched by gains for the corresponding winners.

This fundamental distinction, between shares in losses to the economy and what are instead merely the losing side of zero-sum bets, has potentially important implications for lender-

of-last resort policy. It should matter, in deciding which insolvent institutions to rescue and which to let fail, whether the losses incurred represent a share of a genuine loss to the economy or the losing side of a zero-sum bet. Further (as the discussion above has already indicated), this distinction also has implications for regulation. There is a clear case for discouraging, or possibly even barring, institutions that might be eligible for government bail-outs from making these zero-sum bets.

A More Fundamental Question

The opening section has already summarized this paper's principal specific conclusions – for monetary policy, for financial regulation, and for lender-of-last-resort policy – and there is no need to restate them here. Instead, it seems appropriate in conclusion to pose a more fundamental question: How well is the world's financial system, or the financial system of any specific country, performing the economic function it is supposed to be serving? And at what cost?

For the past two years, at least in the United States, attention has mostly been focused on investors' losses from buying mortgage-backed assets at inflated prices, not on the implied consequence that if the bond prices were too high then mortgage interest rates were too low, and hence the economy built, and Americans bought, too many houses. In just the same way, when the 1990s stock market boom crashed what most people talked about was investors' losses on their telecom stocks, not the fact that if the stocks' prices were too high then the cost of capital to the firms that issued them was too low, and so the communications industry worldwide laid

millions of miles of fiber-optic cable that nobody ended up using. In both instances, the cost was not just financial losses but wasted real resources.

The crucial role of the financial system in a free-enterprise economy is to allocate capital investment toward the most productive applications. (As noted above, the financial system also provides payment services, along with safe and convenient saving vehicles for individuals; but these are more straightforward tasks that a public utility arrangement could just as well handle.) The energetic growth and impressive technological advance of the Western economies, over what is now a long period of time, suggest that their banks, and their stock and bond markets, steer investment capital reasonably well to firms that will use them productively. In the United States, and in some other economies too, start-up firms trying out a wholly new idea (for example, Microsoft, or Google, or Apple) enjoy access to bank loans, venture capital investments, and other forms of funding. The financial crisis and economic downturn of 2007-? blemishes this record of accomplishment, but certainly does not wipe it away.

But the issue is important enough to warrant questioning and even serious empirical investigation, not simple faith. Moreover, framing the question in terms of just how efficient a financial system is in allocating capital provides a natural point of entry for also asking at what price that efficiency comes. If a new fertilizer offers a farmer the prospect of a higher crop yield, but the price of the fertilizer and the cost of transporting and spreading it exceeds what the additional produce will bring at market, the investment is a bad deal for the farmer despite the greater technical efficiency. Most investments in mechanisms that make things happen are subject to the same principle. A financial system, which allocates scarce investment capital, is no different.

What does the Western world's way of allocating an economy's capital cost to run? In the United States in recent years, the financial industry has accounted for an unusually large share of all profits earned. The "finance" sector's share of total corporate profits rose from 10 percent, on average from the 1950s through the 1980s, to 22 percent in the 1990s, and 34 percent in the first half of this decade.¹³ In a fundamental sense, those profits accruing to the financial sector are part of what the economy pays for the mechanism that allocates its investment capital (and also provides other services, like checking accounts and savings deposits). Even a bare-bones notion of the cost of running the financial system, however, includes not just the profits financial firms earn but also the salaries, the office rents, the travel budgets, the advertising fees, and all of the other expenses they incur. The finance industry's share of U.S. wages and salaries has likewise been rising, from 3 percent in the early 1950s to 7 percent in the current decade.¹⁴

The counterpart to this rising fraction of wages and salaries paid is the financial system's absorption of an ever greater share of the economy's human resources. This pattern has been especially evident among the most highly skilled. For years now, much of the best young talent in the Western world has gone into private financial firms. At Harvard University, for example, more than one-fourth of recent graduating classes have gone to work at hedge funds, private equity firms, investment banks, and the like. The same is true elsewhere as well, and more so over time; the extent to which employees in the U.S. economy's financial sector are more likely to have college educations than employees working elsewhere in the economy has more than tripled over the last three decades. At the individual level, no one can blame these new graduates. At the aggregate level, however, the question is whether the economy is making the best use of one of its most precious resources. While some part of what these people do helps to

allocate our investment capital more effectively, much of their activity adds no apparent economic value.

Finally, to return to the lessons of the 2007-? experience, this latest episode is a sharp reminder that the simple operating expense of running the financial system (including both the profits accruing to financial firms and the wages and salaries they pay) is not the only cost if this system also exposes the economy at large to occasional losses in the form of foregone production and incomes, and to the need for taxpayer assistance. To recall, what makes a new fertilizer a good deal for the farmer is not just that it delivers greater production per acre but that the added production is sufficient to pay the manufacturer and leave an excess to increase the farmer's own return. What makes a more efficient financial system economically worthwhile is not just that it facilitates greater production and economic growth, but that the rest of the economy benefits. The more the financial system costs to run – including costs like those incurred in the 2007-? crisis and downturn – the higher is the hurdle for satisfying that criterion.

Notes

1. There are numerous useful accounts that provide helpful narrative and detailed supporting statistical information. A few of the most recent examples include the IMF's October 2009 *Global Financial Stability Report* and Ch. 3-4 of the October 2009 *World Economic Outlook*; Part I of the OECD's December 2009 *Financial Market Trends*; and Ch. 2 of the BIS's December 2009 *Quarterly Review*; also see previous issues of the same publications. Central banks have also issued numerous useful accounts.
2. Data, here and below, are from the Federal Reserve System.
3. In sufficiently simple textbook models – for example, when banks' assets consist only of loans and reserves, all bank liabilities are monetary deposits, banks' capital and reserves are fixed, and there are no nonbank lenders – money and credit move isomorphically so that there is no point in drawing the distinction. But such models bear little relation to the modern world of banking and finance where banks have nonmonetary sources of funding, their capital is not fixed, capital rather than reserves is often the binding constraint on their credit creation, and many credit-creating institutions are not banks and do not hold reserves with the central bank.
4. The discussion of this point here follows that in Benjamin M. Friedman and Kenneth N. Kuttner, "Implementation of Monetary Policy: How Do Central Banks Set Interest Rates?" (Elsevier: *Handbook of Monetary Economics*, Volume 3, forthcoming).
5. For a useful early analysis of the working of corridor systems for central bank interest rate setting, see Graeme Guthrie and Julian Wright, "Open Mouth Operations" (*Journal of Monetary Economics*, 2000).
6. "If, other things remaining the same, the leading banks of the world were to lower their rate of interest, say 1 per cent, below its ordinary level, and keep it so for some years, then the prices of all commodities would rise and rise and rise without any limit whatever... the upward movement of prices, whether great or small in the first instance, *can never cease* so long as the rate of interest is kept lower than its normal rate, *i.e.*, the rate consistent with the then existing marginal productivity of real capital." Knut Wicksell, "The Influence of the Rate of Interest on Prices" (*Economic Journal*, 1907); emphasis in the original.
7. See Benjamin M. Friedman, "Decoupling at the Margin: The Threat to Monetary Policy from the Electronic Revolution in Banking" (*International Finance*, 2000), for an analysis of what such a "decoupling" would mean.
8. Colin Motley, "The Commercial Paper Funding Facility" (thesis in progress, Harvard University). The equation also includes the Aaa bond rate, the 5-year credit default swap index for financial firms, the assets of money market funds and money market mutual funds, the volume of Federal Reserve term auction credit, and a dummy variable for the initial establishment of the CPFF. The dependent variable is the spread between the rate on 3-month

AA-rated financial company paper and the 3-month OIS rate.

9. Notwithstanding the widespread discussion of mark-to-market accounting – and the numerous complaints from bank officials – U.S. commercial banks are required to value only a relatively small fraction of their assets in this way; see, for example, Robert C. Pozen, “Is It Fair to Blame Fair Value Accounting for the Financial Crisis?” (*Harvard Business Review*, 2009). In 2008 only 22 percent of banks’ assets were subject to mark-to-market accounting for purposes of either regulatory capital or income statements.

10. See Charles F. Dunbar, *The Theory and History of Banking* (Putnam, 1922). I am grateful to Kevin Hoover for the reference to Dunbar’s text.

11. See, for example, Joe Peek, Eric S. Rosengren and Geoffrey M.B. Tootell, “Is Bank Supervision Central to Central Banking?” (*Quarterly Journal of Economics*, 1999) and “Is Financial Stability Central to Central Banking?” (Federal Reserve Bank of Boston, *After the Fall: Re-evaluating Supervisory, Regulatory and Monetary Policy*, forthcoming)

12. See Henry Thornton, *An Enquiry into the Nature and Effects of the Paper Credit of Great Britain* (Hatchard, 1802), and Walter Bagehot, *Lombard Street: A Description of the Money Market* (King, 1873).

13. Data are from the U.S. Department of Commerce. “Finance” here excludes both insurance and real estate; with those additional firms included, the share of total profits in 2001-5 was 37 percent.

14. Thomas Philippon and Ariell Reshef, “Skill Biased Financial Development: Education, Wages and Occupations in the U.S. Financial Sector” (NBER Working Paper No. 13437, 2007) .