

The Federal Reserve as Lender of Last Resort during the Panic of 2008

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Since the onset of the financial crisis in late 2007, the US Federal Reserve (Fed) has, as of December 29, extended roughly \$1.2 trillion in credit to the private sector in an effort to restore financial stability. These actions have altered the size and composition of the Fed's balance sheet in ways not seen since its founding in 1914. According to Alan Meltzer, author of the definitive history of the Federal Reserve, “[such an extension of credit] is unique, and the Fed has never done something like this before. If you go all the way back to 1921, when farms were failing and Congress was leaning on the Fed to bail them out, the Fed always said ‘It’s not our business.’ It never regarded itself as an all-purpose agency.”¹

This report examines the impact of the Fed's unprecedented lending on its formulation and implementation of monetary policy. The first section provides some background on the Fed's recent actions within the context of its role as lender of last resort (LOLR). The second outlines some of the ways in which the surge in Fed lending has affected the implementation of monetary policy. The third and fourth sections respectively discuss the degree to which the Fed has exposed itself to default risk, and the consequences for monetary policy if the Fed were to experience significant losses on its loans to the private sector.

I. The Fed and the Lender of Last Resort function

An important function of every central bank is to act as LOLR for the banking system. There is a long history of central banks providing liquidity during banking panics. The idea is that lending to sound institutions facing a temporary shortage of funds would ameliorate bank “runs” precipitated by a loss in confidence. This view of the LOLR was articulated by Bagehot (1873), who advised central banks to lend freely, but at a penalty rate, against good collateral. A major practical difficulty, of course, is distinguishing good collateral from bad—especially during financial panics, when market prices may become distorted. In the 19th century, the Bank of England on several occasions deviated from Bagehot's advice, lending against a diverse range of assets that included mortgages, railway debentures, and even unimproved land.² During the postwar era, however, the central banks of industrial countries—and especially the Fed—have been quite conservative in their exercise of the LOLR option.

Why the Fed was compelled to intervene

It is apparent in retrospect that a major vulnerability of the US financial system is its surprisingly heavy reliance on short-term funding, particularly the \$1.8 trillion market for repurchase

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¹ Quoted in Andrews (2008).

² See Kindleberger (1989), pp. 195-196.

agreements (repos), and the \$1.8 trillion market for commercial paper of various forms.³ These arrangements have allowed US financial institutions to borrow flexibly at low cost, but the constant need to roll over these loans leaves the system susceptible to liquidity crises.

This vulnerability was not widely recognized prior to the markets' collapse earlier this year. Because repos are collateralized transactions, lending funds on the repo market was thought to be virtually risk-free—or at least as free of risk as the securities used as collateral. However as doubts arose about the value of the collateral lenders became unwilling to extend credit. This inability to obtain short-term funding in turn jeopardized borrowers' ability to meet current obligations, and given the interconnectedness of financial markets, the failure to do so could have touched off a chain reaction of defaults. Similar problems arose in the market for credit default swaps (CDS), which require the seller of protection to post collateral to cover potential losses. Here again, the perceived deterioration in the quality of collateral raised the specter of default by the counterparties in these transactions. The loss in confidence has spread to the commercial paper market, where the volume of outstanding paper has plummeted by 35 percent since its peak in August 2007. The markets for asset-backed and financial paper have been especially hard hit.⁴ The scramble for short-term funding, along with a flight to quality, has led to a sharp increase in the spreads between the spreads between private-sector money market rates, such as those on commercial paper, Eurodollars, and LIBOR, and those on T-bills.

This story is a familiar one. Financial intermediaries routinely finance illiquid (and often risky) assets with liquid short-term liabilities. And with alarming regularity, loss of confidence in the value of the collateral backing the loans triggers a “race for liquidity.” Unable to refinance their short-term debt, intermediaries fail. The collapse of the money market in the present crisis is therefore just the 21st century equivalent of an old-fashioned bank run, and the demands for collateral from CDS issuers are analogous the margin calls of 1929.

A summary of recent Fed actions

The vast expansion of Federal Reserve credit in recent months is a heroic attempt to ease the liquidity crisis. With financial institutions unwilling to lend to one another, the Fed had no choice but to step in and lend to institutions in need of cash. In doing so, the Fed is acting as the LOLR, as central banks have done time and again. What distinguishes the Fed's reaction from other central banks' is the scale and scope of its interventions.

The discount window is the Fed's conventional channel for lending to illiquid banks.⁵ Until now, the facility had not been used extensively, however, even during the Great Depression. The only significant use of the window prior to this year was in connection with the failure of Continental Illinois in the mid-1980s. The Fed's clear preference has been to operate, as much as possible, through open market operations rather than lending to the banking system through the discount window.

The Fed has employed three tactics in its efforts to revive the money market. One is to lend Treasury securities to the private sector, accepting privately-issued securities as collateral. The idea is that, by increasing the supply of good collateral in the system, this exchange facilitates the extension of credit by lenders who do have funds available, but are unwilling to accept risky

³ Figures are the from the Federal Reserve's Flow of Funds accounts, release Z.1, tables L.207 and L.208.

⁴ The source for these figures is the Federal Reserve's October 23 Commercial Paper release.

⁵ Contrary to Bagehot's dictum, the Fed until 2003 lent funds through the discount window at a preferential rate, seitching to a penalty-rate “Lombard” facility in January of that year.

securities as collateral. These loans are made through the Term Securities Lending Facility (TSLF), supplementing the existing overnight securities lending program.

The second tactic is to lend funds directly to the private sector, accepting illiquid privately-issued securities as collateral. Four new facilities have been established for this purpose: the Term Discount Window Program, the Term Auction Facility (TAF), the Primary Dealer Credit Facility (PDCF), and the Asset Backed Commercial Paper Money Market Mutual Fund Liquidity Facility (AMLF).

Its third tactic is the outright purchase of illiquid assets, such as commercial paper and asset-backed securities. The three facilities in this category are the Commercial Paper Funding Facility (CPFF), the Money Market Mutual Investor Funding Facility (MMIFF), and the Term Asset-Backed Securities Loan Facility (TALF). While all three have been established, as of December 29 only the CPFF has engaged in securities purchases. In addition, the Fed announced on November 25 its intention to purchase up to \$100 billion in the direct obligations of government-sponsored enterprises (GSEs), and up to \$500 billion in mortgage-backed securities backed by Fannie Mae, Freddie Mac, and Ginnie Mae.

In addition to these eight standing facilities, which are summarized in Table 1, the Fed has extended credit on an *ad hoc* basis to prevent the collapse of Bear Stearns and AIG. In the Bear Stearns case, this credit came in the form of a non-recourse loan to Maiden Lane LLC, an SPV created for purchasing troubled assets from Bear Stearns prior to its sale to JP Morgan. The AIG rescue initially involved collateralized lending directly to AIG. That deal has since been restructured, replacing a portion of the original credit lined with the purchase of \$48 billion in mortgage-backed securities and CDOs by two Fed-funded SPVs, Maiden Lane II and III.

The last major component of the Fed's lending campaign is its extension of dollar-denominated funds to foreign central banks through its bilateral credit (swap) lines with foreign central banks. All told, the total amount of credit extended through standing facilities, *ad hoc* loans, swap lines and asset purchases comes to roughly \$1.8 trillion, exceeding in both size and scope anything it has done since its inception in 1914.⁶

These actions are significant for three reasons. First, they have vastly increased the size of the Fed's balance sheet, which has more than doubled to \$2.2 trillion from its year-ago size of \$850 billion. Second, the composition of the Fed's portfolio has changed beyond recognition. The composition of the Fed's balance sheet as of December 29 is depicted in Figure 1, along with a similar breakdown for October 2007. The figure shows that a year ago Treasury securities comprised 91 percent of assets. That share has since fallen to 22 percent, with 46 percent consisting of private-sector credit made through the facilities summarized above (55 percent if the value of the securities lent through the TSLF are included). Credit to foreign central banks now comprises 28 percent of the balance sheet. This massive shift out of Treasuries and into private sector assets means the Fed has now assumed some amount of default risk, although exactly *how* much is hard to know at a time when market prices are erratic indicators of the securities' fundamental value. Third, some of these facilities—notably, the Primary Dealer

⁶ This figure includes approximately \$578 in collateralized lending to the private sector through standing facilities, \$185 billion in securities lending through the TSLF, \$40 billion in direct lending to AIG, \$401 billion in outright asset purchases via Fed-funded SPVs, and \$614 billion to foreign central banks via reciprocal lines of credit. These numbers, and the other Fed balance sheet data cited in this report, come from the Fed's December 29 H.4.1 release.

Credit Facility, the lending to AIG, and the outright purchase of commercial paper—involve the funding of non-bank institutions.

Such dramatic shifts in the Fed's portfolio have not been seen since Federal Reserve-Treasury Accord of 1951. Until now, the largest extension of credit to the private sector was the \$8 billion loan to prop up the failing Continental Illinois Bank in 1985. The Fed's balance sheet at the time was roughly \$170 billion, so the Continental loan represented only five percent of the institution's assets.⁷

Nor do these actions have any modern parallel among major central banks. The closest comparable experience is that of the Bank of Japan during its policy of quantitative easing. Between 1997 and 2004, the Bank of Japan doubled the size of its balance sheet, from ¥46 trillion to ¥92 trillion. Like the Fed, the Bank of Japan repeatedly relaxed its collateral requirements for loans to the private sector. The scale of this lending was relatively modest, however, and the expansion of the BOJ's balance sheet was accomplished largely through the purchase of government securities. As of 2004, privately-issued bills purchased by the BOJ comprised only 18 percent of that central bank's portfolio, compared with the Fed's 46 percent.

II. Fed lending and monetary policy implementation

In understanding the effects of the Fed's lending programs on monetary policy, it is useful to distinguish between two related but distinct definitions of "liquidity"—a distinction that has grown sharper as the US financial system has become less bank-centric. One definition of the term has to do with the availability of short-term funding. The primary objective of the Fed's various lending facilities is to provide liquidity in this sense of the word, in the hope of resuscitating the market for short-term funds. An alternative definition of liquidity is the provision of bank reserves, which is traditionally achieved either through open market operations, or discount window lending to banks.

While the two conceptions of liquidity overlap, they are not interchangeable. The Fed may provide liquidity, in the sense of facilitating short-term funding, by lending securities through the TSLF. Equivalently, Fed may lend directly to member banks, and offset the increase in reserves through the sale of Treasury securities on the open market. Other Fed facilities, such as the TAF, increase liquidity in the sense of facilitating short-term funding, while also increasing bank reserves. The expanded deposit and debt guarantees provided by Federal Deposit Insurance Corporation (FDIC) under its Temporary Liquidity Guarantee Program are also intended to stabilize banks' funding sources, and thereby improve those institutions' liquidity.

Until September, the Fed's strategy seems to have been to increase the availability of short-term funding while at the same time limiting the impact on bank reserves and the monetary base. That strategy became unsustainable as lending surged in September and October of this year. From a base of close to zero, borrowings began to grow in December 2007 with the implementation of the TAF, reaching \$168 billion by August 2008. Total reserves nonetheless remained constant at \$44 billion during this period. Borrowing by depository institutions shot up in September and October, reaching a peak of \$437 billion in the week ending October 15. Borrowings have since

⁷ Between 1942 and 1951, the Fed made large shifts in the maturity structure of its portfolio in its efforts to support targeted levels of long-term interest rates. Only in the 1920s does one see a significant extension of credit to the private sector; but this was prior to the development of a significant market for Treasury securities, when the Fed operated primarily by discounting privately-issued securities.

declined, but only because they have been replaced by outright purchases of commercial paper through the CPFF. The effect on the banking system's reserves is comparable, with total reserves reaching \$785 billion as of December 24.⁸

Operational issues

The vast expansion of its balance sheet creates a dilemma: how to provide ample liquidity to the money market while at the same time maintaining control of the federal funds rate and limiting the expansion of total reserves and the monetary base. As shown in Figure 2, rapid reserve growth since August has put downward pressure on the funds rate, which has fallen well below the Fed's target in recent weeks.

One way to finesse this problem is to abandon the funds rate target, and allow the rate to seek its own level as reserves increase. An explicit change in the operating target would presumably require the FOMC's approval, and it is not inconceivable that the FOMC would take this step, or simply cut the interest rate target to zero as the Bank of Japan did during its policy of quantitative easing.

Given that it remains committed to pursuing a funds rate target, however, the Fed has two tools for achieving its liquidity objective. One is to rely as much as possible on the TSLF, in which the Fed lends to financial institutions some of its holdings of Treasury securities, accepting privately-issued securities as collateral. As it is essentially just an exchange of securities, such a transaction has no impact on the level of reserves in the banking system, and thus it is equivalent to an operation in which the Fed lends funds against privately-issued collateral, and offsets the reserve increase through a sale of Treasuries. The volume of Treasury securities on the Fed's balance sheet limits the Fed's ability to use this tool, since it cannot sell or lend securities it does not hold. One way around this constraint is for the Fed to lend funds against privately-issued securities as it does under its other facilities, such as the TAF. By itself, this would increase the level of reserves, and put downward pressure on the funds rate. However the Treasury can offset this downward pressure by selling on the open market new securities issued under the Supplementary Financing Program, and depositing the proceeds in the Treasury's account at the Fed. This combination of transactions has increased by roughly \$200 billion the volume of Treasuries in the market leaving unchanged the amount of reserves in the banking system.⁹

The Fed's other tool for controlling the funds rate is to pay interest on financial institutions' excess reserves. This authority had been scheduled to go into effect in 2011, but the Emergency Economic Stabilization Act of 2008 moved the implementation date up to October 1. The interest rate paid on excess reserves was initially set at a level 75 basis points below the funds rate target. This spread was cut to 35 basis points on October 23, and to zero on November 5, in an effort to limit the divergence between the effective and target rates. One side effect is a reduction in banks' incentive to lend out excess reserves, and there will be a greater tendency to leave the funds parked at the Fed. Consequently, although paying interest on reserves will

⁸ The Data are from the Fed's November 6 H.3 and November 5 H.1.1 releases. Because the monetary base consists of total reserves plus currency, base growth has been comparable to the increase in total reserves.

⁹ In terms of its balance sheet effects, this combination of transactions is equivalent to one in which the Fed purchased securities from the Treasury, and then lent those securities to the private sector under the TSLF.

enhance the Fed's control over the funds rate, it may encourage banks to hold more excess reserves, reduce the money multiplier, and inhibit the revival of bank lending.¹⁰

Will the Fed's measures work?

There are three ways to interpret the efficacy question. The narrowest is simply whether Fed lending has kept financial institutions from failing. Clearly it has: after Bear, only Lehman has failed, and the Fed surely could have prevented that failure had it chosen to do so.

A broader statement of the efficacy question is whether Fed lending has restored the money markets' normal functioning. In the best-case scenario, a demonstrated willingness to lend would by itself be enough to quell a panic. As pointed out by Kindleberger, the implicit promise of a central bank liquidity backstop should promote lending between financial institutions during periods of financial stress, and only a limited amount of lending may be needed to restore confidence.¹¹ This best-case scenario clearly has not materialized: the Fed has felt it necessary to extend vast amounts of credit, and the process shows little sign of unwinding.

Moreover, symptoms of money market distress remain in spite of the Fed's massive lending efforts. Spreads between private-sector interest rates and Treasury yields rose sharply in September and remained very high for most of October. As shown in Figure 3, the Eurodollar-Treasury spread peaked at nearly 600 basis points even as borrowing rose to \$400 billion. Taylor and Williams (2008) conclude from this experience that the interest rate spreads are driven primarily by default risk, and that the Fed's lending (and in particular the TAF) has done little to improve conditions in the money market.

The pessimistic Taylor-Williams assessment is not entirely warranted, however. While the interest rate spreads surely incorporate a certain amount of default risk, there are two reasons to interpret the correlation between lending volume and spreads with caution. First, Figure 3 shows that lending volume tends to increase during periods of financial stress, presumably because firms needing credit are forced to turn to the Fed to obtain short-term funds. Even the establishment of new credit lines, whose dates are marked by vertical lines in the graph, appears to be an endogenous response to deteriorating financial conditions. Second, the volume of lending and the announcement of new lending facilities are followed, with some delay, by a narrowing of the spreads, or at least a reduction in their rate of increase.

The broadest and most important question concerning the policies' effectiveness is whether the Fed's radical measures will reverse the sharp contraction in lending, and thus revive the macroeconomic activity that depends on credit.

With little scope for further cuts in the federal funds rate target, the remaining path open to the Fed is to increase reserves, and by extension the monetary base. Unlike funds rate cuts, there is no theoretical limit on a central bank's capacity to increase reserves. The rationale for such a policy is that, if banks are awash in excess reserves, at some point they will start lending out those reserves.¹² (As noted above, paying interest on reserves will reduce the incentive to do so.)

¹⁰ Goodfriend (2002) takes a contrary position, arguing that paying interest on reserves will make monetary policy *more* effective by allowing a larger volume of reserves to be put into the system,

¹¹ Kindleberger (1989), p. 239. This promise of a liquidity backstop may diminish institutions' incentives for prudent behavior, and create a moral hazard problem. For this reason, Kindleberger suggests it is optimal to leave some doubt as to whether the central bank will in fact intervene.

¹² In the case of Japan, reflationary policies focused on the monetary base were advocated by Meltzer (2000) and Hetzel (2004), among others.

The revival of lending, along with the accompanying increase in the money supply, should then promote economic recovery. The success of this strategy is far from certain, however, as no amount of liquidity will revive lending so long as financial institutions lack sufficient capital.

Japan's experience with its quantitative easing policy from 2001 through 2004 confirms this pessimistic assessment. Over a span of roughly three years, the BOJ engineered a sixfold increase in total reserves, from ¥5 trillion to roughly ¥33 trillion. This was accomplished primarily by large-scale open-market purchases of Japanese government bonds (JGBs), rather than lending to the private sector. The policy succeeded in flooding the money markets with liquidity, and the overnight interest rate fell to virtually zero. However the policy had the perverse effect of inhibiting interbank lending as BOJ-furnished reserves eliminated the need for banks to borrow among themselves. Moreover, the increase in total reserves had no discernable effect on bank lending, or on broader monetary aggregates.¹³

III. Risks associated with the Fed's lending facilities

Leaving aside the operational issues associated with managing the liquidity-enhancing measures outlined above, the Fed's strategy of either buying or lending against privately-issued assets entails a certain amount of credit risk. Exactly *how* much risk is hard to gauge. Most of the Fed's lending is collateralized by investment-grade securities, although the meaning of "investment grade" has been clouded by recent downgrades and deteriorating credit quality.

Traditionally, the Fed has sought to avoid taking risk onto its balance sheet, and consequently its System Open Market Account (SOMA) portfolio has consisted almost entirely of Treasury securities—and this was the case as recently as August 2007, before the Fed initiated its new lending programs.¹⁴ That is no longer the case, now that the Fed has \$1 trillion of private-sector assets on its balance sheet.¹⁵

This unparalleled shift raises certain legal issues, as the Federal Reserve Act (FRA), narrowly interpreted, is intended to restrict the Fed's purchases to risk-free assets—and only from depository institutions. However section 13(3) of the FRA permits the Federal Reserve, in "unusual and exigent circumstances... to discount for any individual, partnership, or corporation, notes, drafts, and bills of exchange when such notes, drafts, and bills of exchange are indorsed or otherwise secured to the satisfaction of the Federal Reserve bank," when that institution is unable to secure credit from other banking institutions.¹⁶ The Fed has invoked this provision repeatedly in establishing its new credit lines. Most of the Fed's new arrangements—the TAF, TSLF, PDCF and the AMLF—are well within the scope of section 13(3). In these cases, losses would be realized only if the value of the collateral declines sufficiently and the borrowing institution is unable to make up the difference.¹⁷

¹³ Kuttner (2004) contains a more detailed review of the Japanese experience.

¹⁴ The Fed has also occasionally purchased securities issued by government agencies, but only in very small quantities. The "other" assets depicted in the chart consist of Treasury currency, gold, and special drawing rights.

¹⁵ This figure excludes the off-balance securities lending through the TSLF.

¹⁶ The catch-all phrase "otherwise secured to the satisfaction of the Federal Reserve bank" would seem to give a great deal of discretion over what, if any, collateral should be required for these loans. The conventional interpretation, as discussed in Clouse et al. (2004), is that the loans should be collateralized by high-grade debt securities.

¹⁷ A crisis of a severity sufficient to cause a sharp decline in collateral values would also be likely to jeopardize borrowers' solvency, so recourse may be of little value in practice.

Its other lending programs could expose the Fed to considerably more risk. Maiden Lane LLC is one potential source of losses. Financed by a \$28.8 billion non-recourse loan from the Fed and \$1.2 billion in subordinated debt from by JP Morgan, the SPV was set up to purchase \$30 billion in troubled assets from Bear Stearns prior to its sale to JP Morgan. Without recourse to JP Morgan's assets, the Fed would stand to lose if the value of the securities owned by Maiden Lane declined by more than \$1.2 billion.¹⁸ Losses on the Fed's other asset purchases are also a possibility: these purchases include the \$326 in commercial paper through the CPFF, plus \$48 in mortgage-backed securities and CDOs purchased from AIG by Maiden Lane II and III. The Fed's \$40 billion credit line to AIG also involves a certain amount of risk, despite being secured by AIG's assets and warrants for a 79.9% equity stake. While the Fed has cited section 13(3) of the FRA as the legal basis for each of these actions, they are clearly pushing the limits of what is allowed under the conventional interpretation of the Act.

In the end, it is hard to gauge with any certainty the Fed's risk exposure under these various facilities. In many cases, the risk is limited by the Fed's collateral requirement, and its recourse to the resources of the borrowing institutions. Still, some losses are not beyond the realm of possibility in the event of a severe deterioration in collateral values, accompanied by the failure of one of the borrowing institutions. Moreover, given the sheer volume of credit extended by the Fed, such a loss could conceivably erode or erase entirely the \$43 billion notional value of the Fed's capital.

IV. Consequences of losses or insolvency

The possibility of major losses or insolvency raises two sets of issues. The first involves the economic implications (if any) of the losses themselves. The second has to do more with the political ramifications of the losses, and the extent to which those losses could jeopardize the central bank's independence. Neither set of issues has attracted much research, either theoretical or empirical. Nevertheless, central banks seem to take seriously the threat of loss or insolvency and, in least in the case of Japan in the early part of this decade. Judging from the statements of BOJ officials such as that of Ueda (2004), fear of capital losses was a major factor inhibiting the BOJ from taking more aggressive steps to combat the recession.

The direct economic implications of losses

In understanding the likely consequences of losses on the part of the central bank, it is helpful to recognize that the distinction between the central bank and the treasury is at some level artificial, at least under a fiat currency. The reason is that the liability side of the Fed's balance sheet consists of currency and reserves, while the asset side has until recently consisted almost exclusively of Treasury securities. Because these securities are themselves liabilities of the government, they disappear once the two entities' balance sheets are combined. On the consolidated balance sheet, the government's liabilities consist of the Treasury securities and currency held by the public, and its assets consist of its existing stock of financial and physical assets, plus the present value of its future tax revenues and the seigniorage earned by the central bank through the issuance of money.¹⁹

¹⁸ The fair value of Maiden Lane's assets has since been marked down by \$2.7 billion, leaving the Fed with a paper loss of roughly \$1.5 billion.

¹⁹ Ize (2005) and Buiter (2008) both emphasized that it is the present value of seigniorage that effectively determines the central bank's solvency.

The Fed's purchase of a security that subsequently loses value can be thought of as an exchange of one piece of paper (e.g., currency) for one of lesser value (e.g., a worthless mortgage-backed security), and the loss would appear on the Fed's balance as a decline in net worth. In the absence of any commitment to future tax increases, the purchase of the bad assets would be financed by seigniorage—printing money—and this would lead to an eventual rise in prices.²⁰ The central bank's assumption of default risk therefore raises the possibility of relying on the “inflation tax” to fund any losses.

Now suppose that instead of exchanging high-powered money for worthless securities, the government finances the securities' purchase by issuing debt. The private sector will then have received a Treasury security, which, assuming the government runs a balanced budget over time, implies higher taxes in the future. On a consolidated basis, tax receipts rather than seigniorage revenues balance the government's budget.²¹ For this reason, the Treasury's assumption of default risk makes inflation less likely than in the case of a central bank bailout.

Now consider the possibility that the central bank realizes losses on its lending to the private sector, but the Treasury subsequently recapitalizes the central bank. In a recapitalization, the Treasury would give to the central bank assets consisting of Treasury debt. In exchange, the Treasury would receive an equity stake in the central bank, which would appear as capital on the asset side of the central bank's balance sheet. Both of these changes would be mirrored on the Treasury's balance sheet: an increase in its assets (equity in the central bank) accompanied by an increase in liabilities (debt). Because it has no effect on the government's consolidated balance sheet, recapitalization *per se* should not alter the economic implications of any central bank losses.

For recapitalization to mitigate the inflationary consequences of a central-bank financed bailout, it must involve the substitution of Treasury obligations, which are presumably backed by the power to tax, for those of the central bank, which are backed only by seigniorage.²² This can be accomplished in one of two ways. First, the central bank could sell the securities it received from the government, thereby offsetting the issuance of money used to purchase the bad assets. Alternatively, the Treasury could sell securities directly to the public and deposit the cash at the central bank, thus retiring its outstanding monetary liabilities.²³ Either way, debt replaces money on the consolidated government balance sheet.

Viewed in these terms, recapitalization is essentially the Treasury's assumption of the losses incurred by the central bank, along with a commitment to finance those losses through taxation. This commitment need not be explicit. Meltzer (1999), commenting on the Japanese situation in the early part of the decade, expressed confidence in “the government's obligation to stand behind the BOJ. No central bank has ever faced default, and no responsible government would

²⁰ Borrowing Milton Friedman's memorable term, this would be equivalent to a “helicopter drop” of money. Then-Fed governor Ben Bernanke's reference (2002) to Friedman's term earned him the moniker “Helicopter Ben.”

²¹ This assumes that debt issuance is not merely a means to postpone the collection of seigniorage revenues. Sims (2004) showed that the issuance of Treasury securities *without* an accompanying commitment to increased tax revenues could, theoretically, cause the price level to explode “exponentially upward,” even if the money supply were held constant.

²² Note that the central bank could independently sterilize its loan losses through the sale of Treasury securities, provided its inventory of securities exceeded its loan losses.

²³ This could happen gradually via a reduction in the central bank's remittances to the Treasury of the interest it earns on its holdings of government debt.

permit that to happen.” But the relationship between the central bank and the government must be one in which such a commitment would be credible. Sims (2004) pointed out that this might not be the case for the European Central Bank (ECB), which lacks a corresponding Euro-area taxing authority.

Loan losses and central bank independence

A second reason central banks may wish to avoid capital losses is the perceived loss of independence this might entail. Although a consolidated balance sheet is a useful description of the economic relationship between the central bank and the Treasury, Ueda (2004) dismisses this conception as “naïve.” In his view, significant losses would change the balance of power between the government and the central bank and make the bank susceptible to government interference.²⁴ If so, then inflationary finance would be less of a problem than the imposition of the government’s preferences on the central bank. This could result in higher inflation if the government pressured the central bank to target an unrealistically high level of economic activity.²⁵

There are several reasons to think that losses could jeopardize central bank independence. First, the reallocation of the bank’s portfolio towards assets that subsequently defaulted would result in a loss of income—funds that are normally turned back over to the government. A significant decline in those revenues could therefore have political ramifications, and possibly give the Treasury more leverage over the central bank. This problem would be especially acute in the unlikely event that the banks’ revenues were insufficient to meet the institution’s operating budget. In this case the bank would have to appeal to the Treasury for funding through the budgetary process, and this would undoubtedly entail messy negotiations.

Second, the central bank’s *de facto* fiscal expenditures could be interpreted as the central bank doing the Treasury’s bidding, effectively monetizing a government bailout of the private sector. Such a perception is understandable, as the central bank’s purchases of worthless assets would be equivalent to (in terms of the impact on the consolidated balance sheet) the Treasury’s issuance of bonds to finance the purchase of the assets, accompanied by the central bank’s issuance of money to purchase of the government bonds.

Third, this central bank’s purchase of assets that subsequently lost value will inevitably be perceived as an *ex post* bailout of the institutions from which it purchased the assets. Such a transaction would surely raise questions about the central bank’s accountability, as it would represent an expenditure not appropriated through the normal political process, and in some cases a transfer of funds to a specific financial institution. This latter issue might be particularly severe in the case of the \$29 billion non-recourse loan to JP Morgan in event of a default. As former Fed governor Alan Blinder put it, “People at the Fed from Bernanke on down are not very happy about having had to commit so much taxpayer money on their own rather than have Congress or the executive branch commit it.”²⁶

The Fed is already facing criticism for the lack of transparency in its lending policies. Bloomberg News has filed a lawsuit under the Freedom of Information act demanding disclosure

²⁴ Ueda’s preoccupation with possible losses on the BOJ’s holdings of long-term government bonds was somewhat misplaced because, if held to maturity, the bonds’ full par value would be recovered. The “paper losses” from fluctuations in the bonds’ value would not matter unless the bonds were sold at a loss before maturity.

²⁵ This is a manifestation of the theoretical time inconsistency problem articulated by Barro and Gordon (1983).

²⁶ Quoted in Reddy (2008).

of the identities of the borrowers, and the assets pledged as collateral, and Chairman Bernanke has faced pointed questions on the matter in congressional hearings. The Fed's rationale for not revealing this information is that disclosing borrowers' identities would raise questions about the borrowers' creditworthiness, and possibly precipitate a run. This is surely a legitimate concern, and the Fed's policy of nondisclosure in this case is understandable.

More puzzling is the Fed's reluctance to publish lists of the securities accepted as collateral, and the terms (e.g., the size of the "haircut") taken on those securities. House Financial Services Committee Chairman Barney Frank has cited "delicacy with respect to pricing" as the reason for not revealing that information.²⁷ However some in the private sector have argued that revealing more information about the collateral being accepted by the Fed would help restore market liquidity. The European Central Bank is significantly more transparent than the Fed in this regard, and it has posted on its web site a detailed security-by-security listing of eligible collateral and the haircut it takes on each security.

Finally, a major loss or insolvency on the part of the central bank may be damaging for the simple reason of public embarrassment. While impossible to quantify, many central banks enjoy a reputation for technocratic competence and integrity that could be undermined by the perception that it lost money on foolish investments.

Other central banks' experiences with losses and insolvency

The issues raised above are not merely theoretical curiosities. In the past decade, a surprising number of central banks have experienced significant losses, and some have become technically insolvent. Table 2 provides a brief and incomplete summary of some of these recent episodes, drawing on and expanding a similar table appearing in Dalton and Dziobek (2005).²⁸ The reasons for the losses vary. The majority result from foreign exchange intervention, typically associated with attempts to peg the exchange rate and sterilize inflows of foreign-currency denominated assets.²⁹ However there are at least two cases in which the losses stem from the central bank's effort to stabilize the banking system during a financial crisis. Interestingly, not all of the losses—even in cases of technical insolvency—were recapitalized.

The sample is too small, and the experiences too diverse, to draw firm conclusions about the economic implications of these central banks' losses. There is at least no *prima facie* evidence that losses cause dire economic consequences, such as runaway inflation. Figure 4 through Figure 8 depict the time series of inflation rates for five of the countries listed in Table 2: two cases (Brazil and Hungary) in which the central bank was recapitalized, and three cases (Chile, the Czech Republic, and Thailand) in which it was not.

The charts reveal no clear tendency for inflation to rise following the realization of the losses. In fact, for every country but Thailand, the downward inflation trend continued unabated despite the deterioration of the central banks' balance sheets. The role of recapitalization is not clear, at least based on these five countries: inflation remained under control in both Chile and the Czech republic, whose central banks were not recapitalized, while Thailand experienced a surge in the year inflation following its losses. The central bank's statutory independence may also be a

²⁷ Quoted in Pittman, Ivry and Fitzgerald (2008).

²⁸ Also included are a number of episodes mentioned in Ueda (2004), and Stella (2008). There may be earlier examples as well, but as yet these are not well documented.

²⁹ Because of its large accumulation of dollar-denominated assets, the People's Bank of China may be susceptible to just such a problem.

factor in determining the behavior of inflation. Using the criteria in Kuttner and Posen (2001), neither the Hungarian nor the Thai central bank would have been classified as autonomous during these episodes. A reasonable conjecture is that inflation is a problem primarily for those central banks that were not recapitalized *and* lacked clear statutory independence.

V. Conclusions and policy recommendations

A central bank's job as lender of last resort is never an easy one. Bagehot's guiding principle—to lend freely at a penalty rate against good collateral—is clear, but its application is inevitably messy. Distinguishing good collateral from bad is difficult, and determining how good is “good enough” requires considerable judgment. Moreover, the lender of last resort function confronts the central bank with an awkward credibility problem. To encourage prudent behavior, the central bank would like to convince financial institutions that it will not intervene in a crisis, knowing full well that the consequences of non-intervention may be catastrophic. Realizing this, the private sector can rationally expect a central bank rescue.

The Fed in 2008 faces all the usual dilemmas associated with the lender of last resort function. The unprecedented size and scope of its lending operations creates two additional problems for the conduct of monetary policy. The first is operational: how to resuscitate the short-term money markets without losing control over the federal funds rate, banking system reserves, and the monetary base. This is not a major issue, however, and if the economy were to continue to deteriorate, near-zero interest rates and a significant expansion of the monetary base would not be unwelcome.

A more serious issue is the possibility of significant loan losses, which, if financed with seigniorage, could lead to rising prices. To be sure, with the economy experiencing a severe recession, *deflation* is a greater near-term threat than inflation. In this environment, the monetary expansion resulting from the monetization of loan losses could be an effective measure to combat deflation. This does not require the Fed's direct involvement in the rescue of distressed firms, however, as the same reflationary effect could be achieved with debt-financed bailouts in conjunction with conventional Fed purchases of Treasury securities. Saddling the Fed with bailout duties obscures its core objectives, unnecessarily linking monetary policy to the rescue of failing institutions. Moreover, as noted above, loan losses could compromise the Fed's independence and thus weaken its commitment to price stability in the future.

These are legitimate reasons to be wary of the expansion of the Fed's LOLR function beyond its traditional purview of collateralized lending. In view of these concerns, it would be desirable to return to Bagehot's narrower conception of the LOLR function, and turn over to the Treasury the responsibility for the rescue of troubled institutions, as this inevitably involves a significant contingent commitment of public funds. Specifically, these considerations argue for the Treasury to finance the purchase of distressed assets via Maiden Lane, Maiden Lane II and III, and the SPVs established in connection with the CPFF.

The Treasury has in two instances used TARP funds to reduce, slightly, the Fed's involvement in bailing out imperiled institutions. The first is the Treasury's purchase of \$40 billion in preferred AIG shares. This has allowed the Fed to reduce its credit line to that institution, although at the same time the Fed has taken on additional risk with its purchase (via Maiden Lane II and III) of AIG's distressed CDOs and mortgage-backed securities. Second, the Treasury's provision of \$20 billion in credit protection will reduce the Fed's exposure to credit risk in the TALF

program. Its provision of a backstop for residual risk in Citigroup's \$306 portfolio of distressed assets is a step backward in this regard, however, as it involves an exposure to credit risk unconnected with its core function of liquidity provision.

The Treasury's assumption of bailout financing and outright asset purchases would yield four benefits. First, the use of debt instead of money would allow the Fed to regain control of reserves and the federal funds rate, thus simplifying the implementation of monetary policy.³⁰ Second, it would allay concerns about the unintended inflationary consequences of Fed-financed bailouts, and restore clarity to the Fed's policy objectives. Third, it would strengthen the perceived independence of the Fed vis à vis the Treasury. And fourth, the principles of transparency and accountability would be better served by the explicit recognition of taxpayers' contingent expenditures.

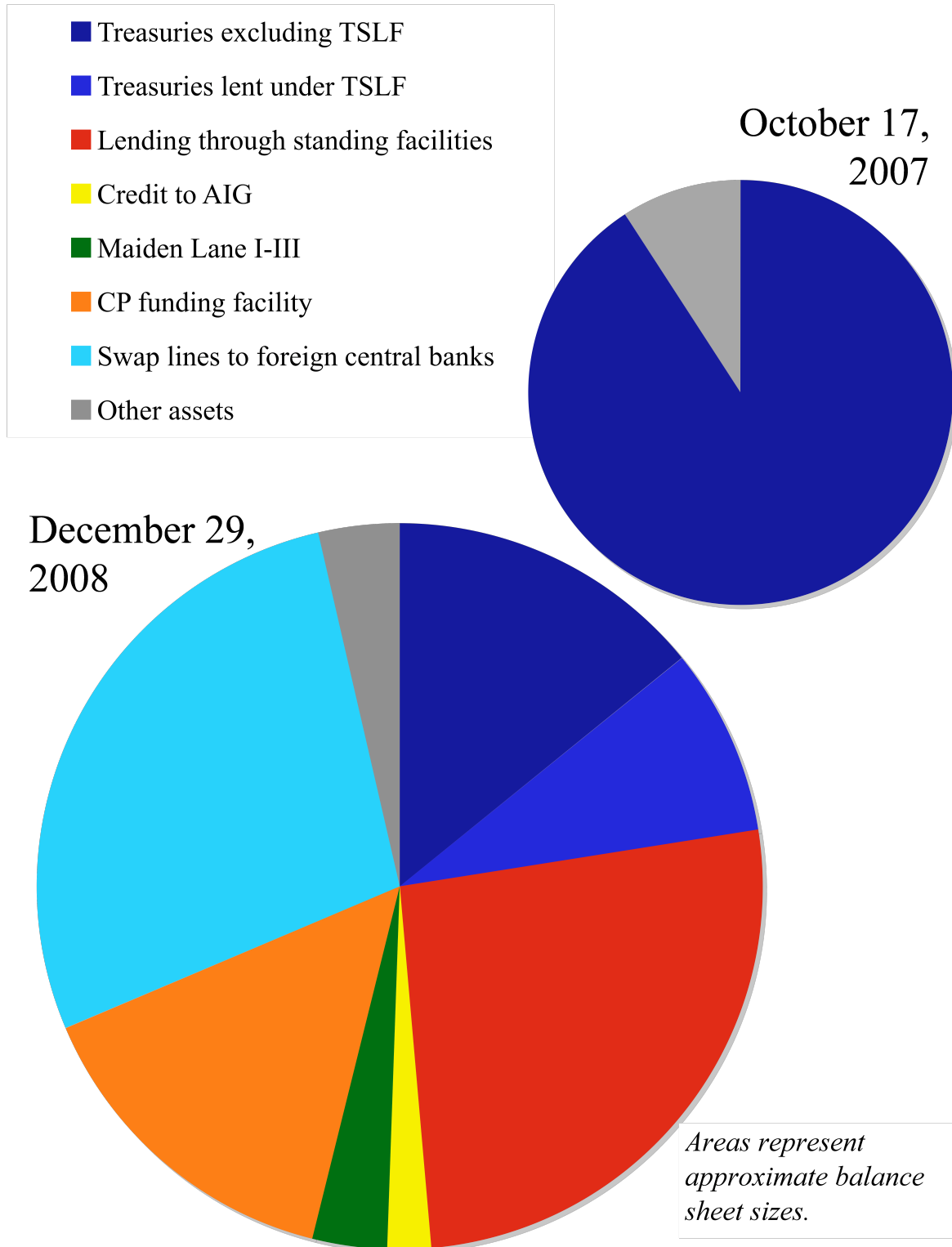
³⁰ Naturally, the Treasury would pay interest on any new debt it would issue for this purpose. But these interest payments would be partly offset by increased remittances from the Fed, which would presumably be paying interest on a smaller volume of excess reserves.

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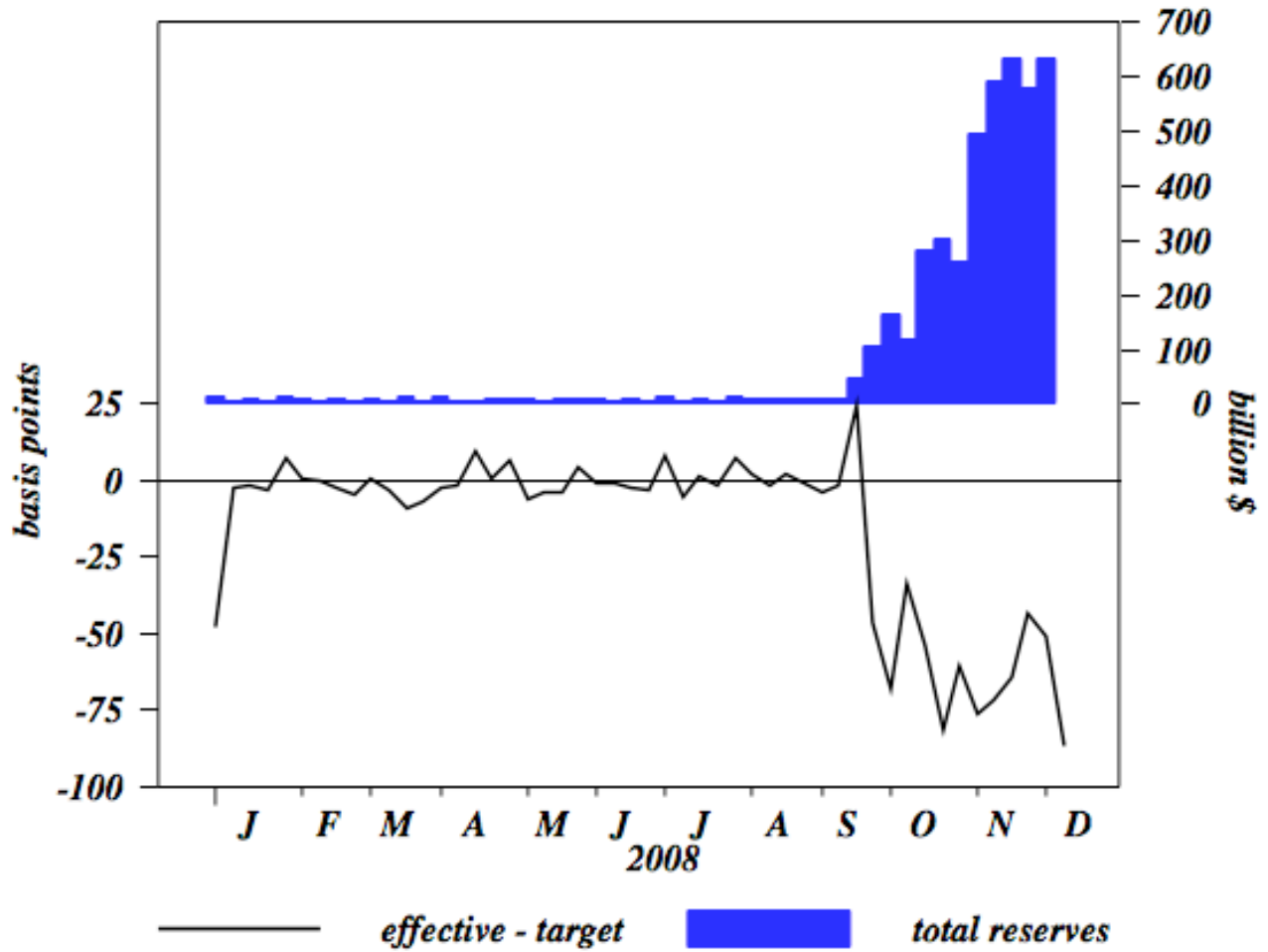
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Figure 1: The evolution of the Fed's balance sheet



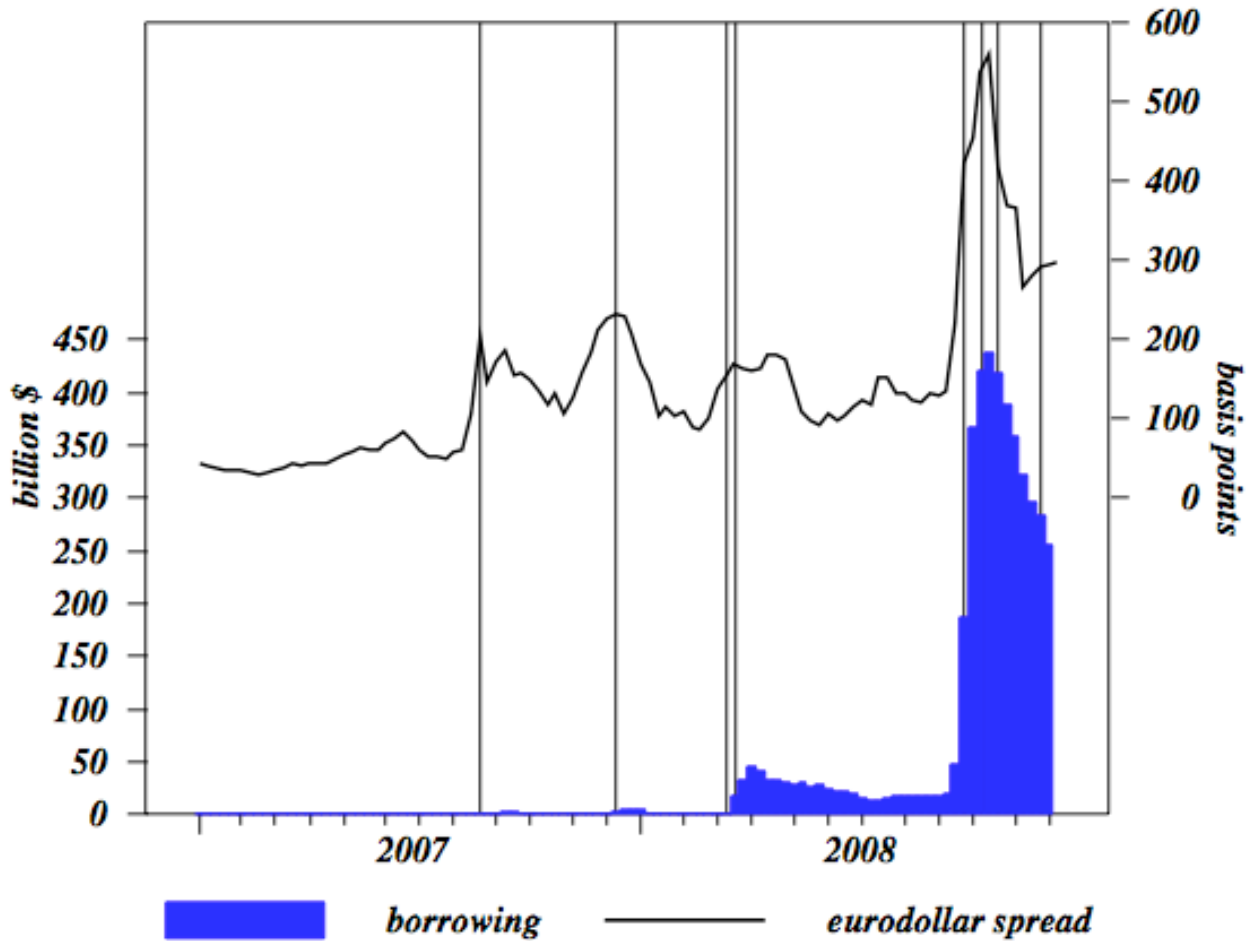
Source: Federal Reserve H.4.1 release, December 29, 2008.

Figure 2: Deviations from the funds rate target and total reserves



Source: Federal Reserve Releases H.15 and H.4.1 (via the FRED database of the Federal Reserve Bank of St. Louis).

Figure 3: The Eurodollar to T-bill spread and total borrowing from the Fed



Source: Federal Reserve Releases H.15 and H.4.1 (via the FRED database of the Federal Reserve Bank of St. Louis). Vertical lines mark the introduction of new lending facilities. From left to right, they are: (1) Term discount window, (2) Term Auction Facility, (3) Term Securities Lending Facility, (4) Primary Dealer Credit Facility, (5) ABCP Money Market Fund Liquidity Facility, (6) Money Market Funding Facility, (7) Money Market Investor Funding Facility, and (8) Term Asset-Backed Security Loan Facility.

Figure 4: Inflation in the Czech Republic, 1990-2008

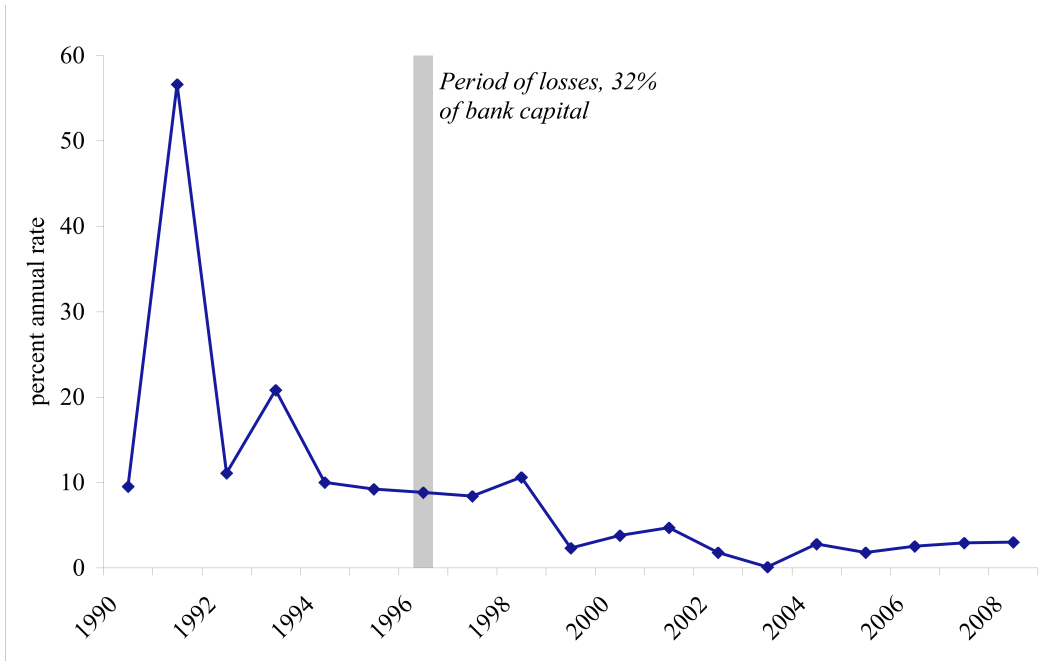


Figure 5: Inflation in Hungary, 1990-2008

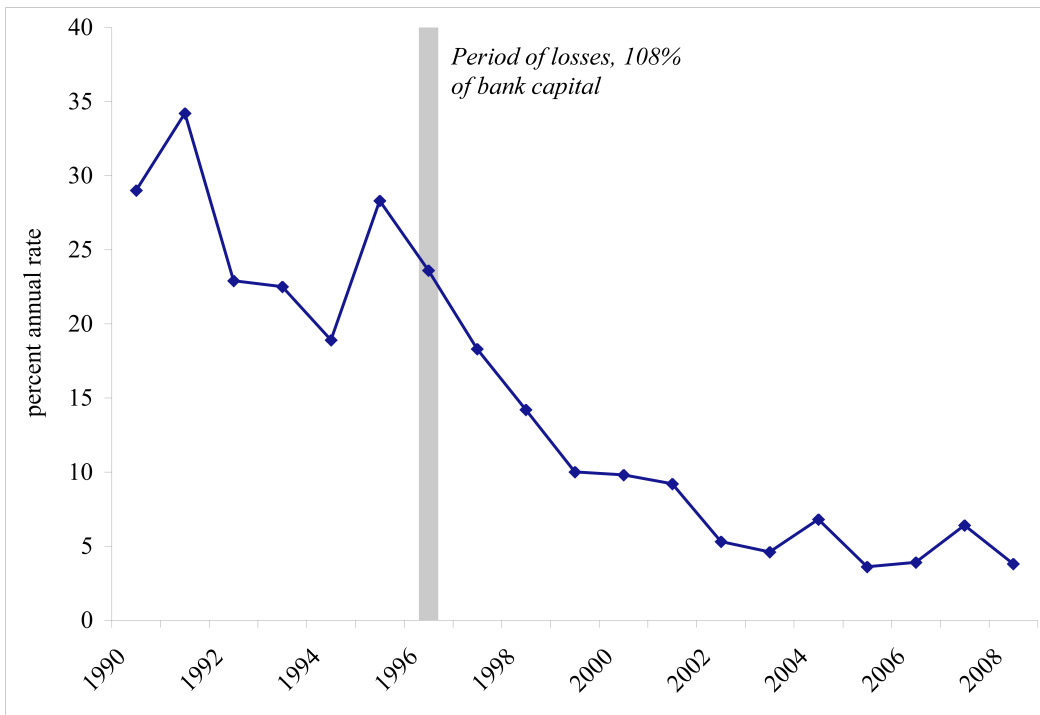


Figure 6: Inflation in Chile, 1990-2008

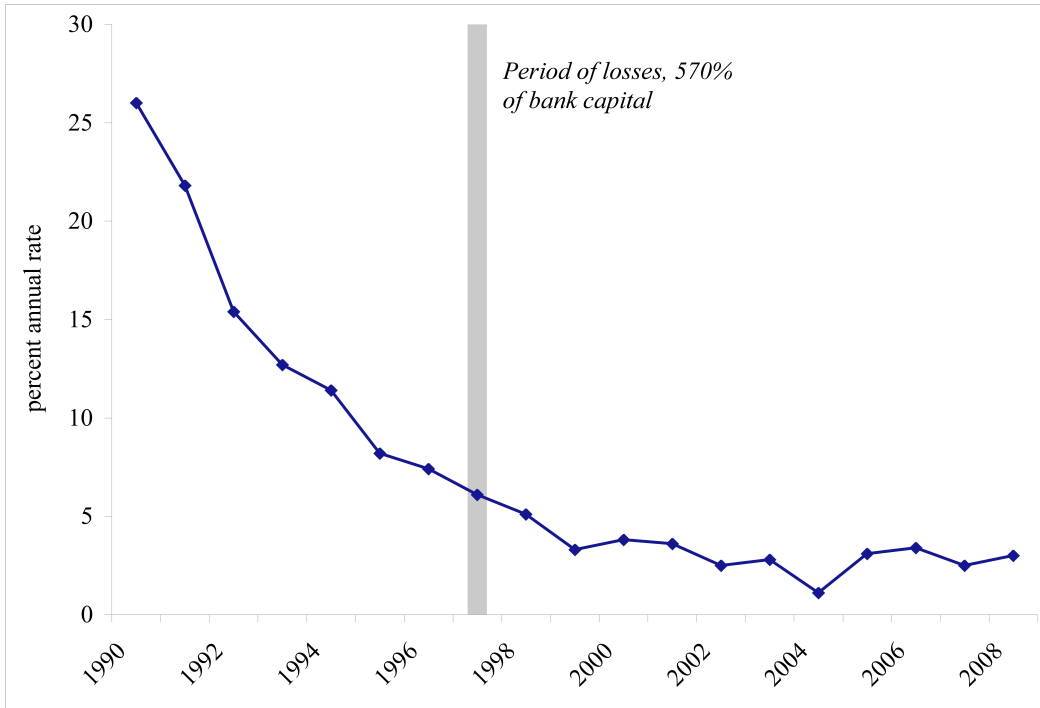


Figure 7: Inflation in Brazil, 1995-2008

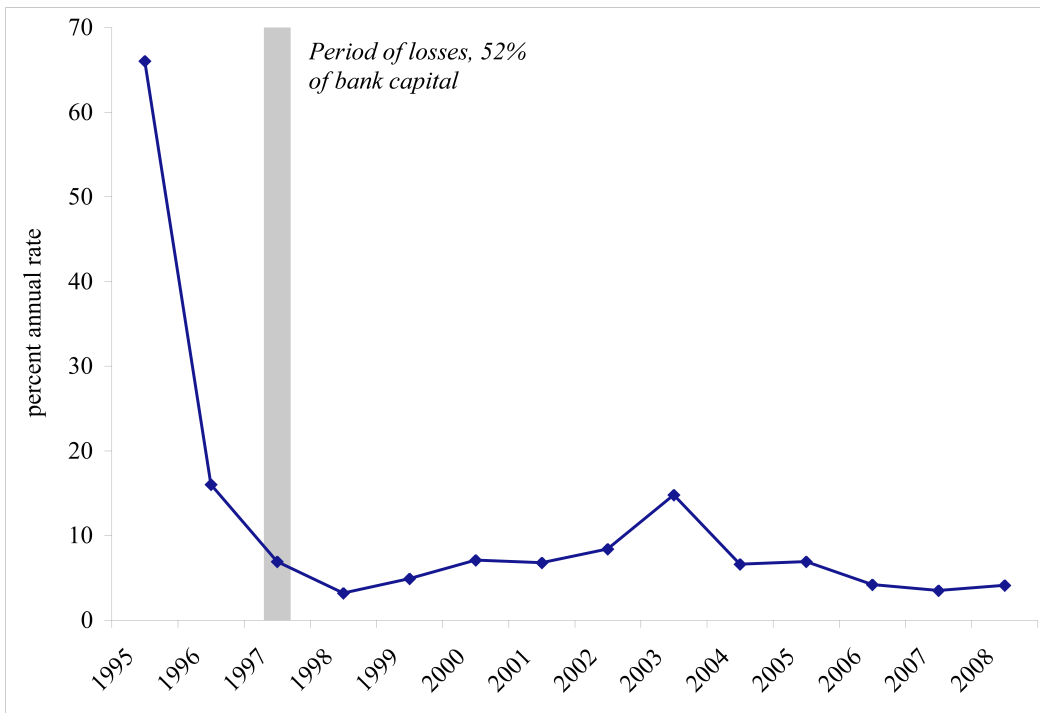


Figure 8: Inflation in Thailand, 1990-2008



Source for inflation data in figures 4–8: International Monetary Fund, World Economic Outlook database.

Table 1: Summary of the Fed’s new lending facilities

Facility	Announcement date	Purpose
Term Discount Window Program	August 17, 2007	Longer-term (up to 90 days) collateralized lending to depository institutions
Term Auction Facility (TAF)	December 12, 2007	Longer-term (28- or 84-day) collateralized lending to depository institutions
Term Securities Lending Facility (TSLF)	March 11, 2008	Lending Treasury securities to primary dealers using investment-grade privately-issued securities as collateral
Primary Dealer Credit Facility (PDCF)	March 16, 2008	Overnight lending to primary dealers collateralized by investment-grade securities
ABCP Money Market Fund Liquidity Facility (AMLF)	September 19, 2008	Lending to banks using asset-backed commercial paper (ABCP) as collateral
Commercial Paper Funding Facility (CPFF)	October 7, 2008	Purchasing, via a Fed-financed SPV, three-month secured and unsecured commercial paper
Money Market Investor Funding Facility (MMIFF)	October 21, 2008	Purchasing, via Fed-financed SPVs, money market instruments including CP and CDs with maturities less than 90 days
Term Asset-Backed Securities Loan Facility (TALF)	November 25, 2008	Purchasing, via Fed-financed SPV, securities backed by consumer and Small Business Administration loans.

Source: http://www.newyorkfed.org/markets/Forms_of_Fed_Lending.pdf. Updated using press releases from <http://www.federalreserve.gov/newsevents/press/monetary/2008monetary.htm>.

Table 2: Recent Central Bank Loss Experience

Country	Year(s) of losses	Reason for losses	Losses, % of CB capital	Government recap?
Costa Rica	1980-2000	Forex intervention		
Jamaica	1987-93	Forex intervention, domestic subsidies		
Uruguay	Late 1980s			
Peru	1991			Y
Philippines	1990s	Forex intervention, low initial capitalization		Y
Korea	1993-94	Forex intervention	7	N
Hungary	1996	Forex intervention	108	Y
Czech Republic	1996	Forex intervention	32	N
Venezuela	1997	Forex intervention		
Brazil	1997	Forex intervention	52	Y
Thailand	1997	Forex intervention	147	N
Chile	1997	Forex intervention, banking system recapitalization	570	N
South Africa	1998	Forex intervention		
Nicaragua	2000-01	Banking system recapitalization		

Notes: the table is based on information from Dalton and Dziobek (2003), Ueda (2004) and Stella (2008).