RESPONDING to the GLOBAL FINANCIAL CRISIS
What We Did and Why We Did It

Bank Capital, Phase 2
The Banks: Reviving the System

Tim Clark, Matt Kabaker, Lee Sachs[1]

Note: The views expressed in this draft are strictly those of the author(s).

[1] Tim Clark was Senior Advisor, Federal Reserve Board, Division of Banking Supervision and Regulation; Matthew Kabaker was Senior Advisor to Treasury Secretary Timothy Geithner and Deputy Assistant Secretary, Capital Markets; Lee Sachs was Counselor to Secretary Geithner.

Hutchins Center
on Fiscal & Monetary Policy
at BROOKINGS

Yale SCHOOL OF MANAGEMENT
Program on Financial Stability

I. The State of the Economy and the Financial System During the Presidential Transition

By the time President Barack Obama was sworn into office, the economic fallout of the crisis was much more damaging than had been feared. The real economy was deteriorating and the financial sector remained under severe stress. The Treasury Department, the Federal Reserve, and the FDIC had responded aggressively with a series of innovative programs during the fall of 2008. Treasury Secretary Henry M. Paulson successfully lobbied Congress for an early fiscal stimulus package and, despite an initial setback, $700 billion to fund the Troubled Asset Relief Program (TARP).[2] That allowed Treasury to inject capital into nearly 700 lenders. To avoid further damage from the fallout of the Lehman Brothers bankruptcy and the collapse of AIG, the Fed slashed interest rates and pumped trillions of dollars of liquidity into US and global markets. The FDIC took the unprecedented step of guaranteeing all new bank debt for the financial system, a program that more than 100 banks participated in directly. Treasury designed and implemented a program to guarantee investments in money market mutual funds. And Treasury and the Fed orchestrated several programs aimed at restarting the mortgage and consumer lending markets that had become all but frozen.

These actions were essential in breaking the panic of the autumn and preventing the collapse of the financial system. They helped forestall another Great Depression and bought valuable time for a new Administration to decide what should come next.

The leadership and staff at the financial regulatory agencies and Treasury worked diligently throughout the transition to ensure the incoming Administration understood completely the actions they were taking, why they had made these choices and some of the trade-offs. Their efforts provided the essential foundation to our response, which ultimately required only a modest additional use of taxpayer resources.

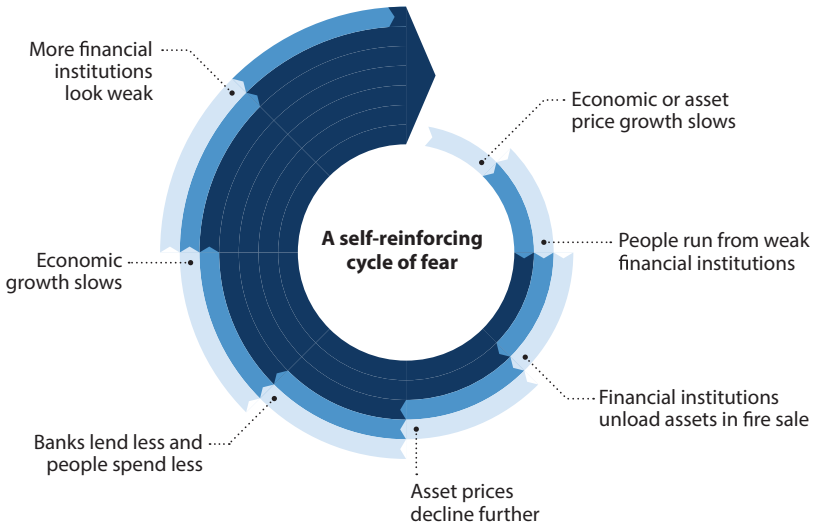
But these actions, and others, were not enough to stem the crisis. Even with all the powerful financial interventions during the autumn, the markets and the economy were in a downward spiral, with GDP falling at a real annual rate of 8 percent in the fourth quarter of 2008. Jobs declined by over 700,000 in the month of January alone. A deepening economic slowdown raised fears about further home price declines and consumer defaults, which could lead to additional losses on mortgages and other loans as well as the asset-backed securities to which their performance was tied. In response, asset values declined, raising concerns about the solvency of the biggest holders of those assets: banks and other financial institutions. While there were some signs of life from bank earnings, fears of another solvency crisis and a pullback in lending only exacerbated concerns that the economy would continue to fall, causing the cycle of worry to begin again.

Making matters worse was the uncertainty over what steps the U.S. government would take. In part because of the sheer amount of government action in so many areas, it appeared to investors that Washington kept changing the rules of the game, and they were concerned about the actions that a new Democratic administration might take.

[2] Though the legislation provided for a total of $700 billion, it only allowed the Administration to draw $350 billion initially. The incoming team would have to secure the second $350 billion before taking office in January.

Some on the Obama team talked during the transition about the idea of nationalizing some banks and imposing broader losses on creditors, leading to a chain reaction of rumors and unfounded speculation and contributing to further downward pressure on financial institutions.

Figure 1: Fear Cycle



Just as worrisome, we were acutely aware that the financial resources available to us were limited and potentially inadequate. The International Monetary Fund estimated, along with some private analysts, that U.S. financial institutions might have up to $2 trillion in losses. Yet we had only $250 billion to $300 billion of TARP government capital left to spend. We were concerned we would not have enough financial firepower to address the growing list of challenges we faced—and perhaps more important, fearful the markets would start to believe that we were out of ammunition.

We also knew these loss estimates were not static; the total would ultimately depend, in part, on what we did. An undersized fiscal response, a financial system left to resolve itself, and a continued confidence deficit would make it more likely that losses would be higher and the system would require more capital. By contrast, a credible fiscal program that reduced the risk of further economic contraction, paired with sensible policies to recapitalize the financial system and push against some of the fire sale dynamics in credit markets, could create an environment where assessments of worst case loss estimates might contract and the ultimate capital need might be more modest. While this paper will focus on the aspects of the strategy that directly addressed financial institutions and markets, the active fiscal and monetary measures would also prove critical in helping to reduce the risk of a major economic depression and allow our programs to succeed with much more modest outlays by both the public and private sector than initially forecast.

We needed to come up with a convincing strategy, one that would reduce uncertainty and have credibility with the markets. The strategy also needed to make clear what we would not do: allow another wave of damaging financial failures, for example. We knew we needed to build on the GSE conservatorship, the initial deployment of TARP capital, the FDIC's guarantees, the Fed's introduction of innovative liquidity programs, Treasury's money market fund guarantee program and other actions to create a clear plan for how to get the financial system working again so that the economy could start growing again.

We had two main objectives. First, we needed to recapitalize our financial system to mitigate the fear of a solvency crisis. Second, we needed to focus on ensuring that the credit markets were functioning and that prices in these markets better reflected fundamentals and did not continue to reinforce the downward spiral. (See Figure 2.)

Most importantly, we were determined to adopt policies that attracted private capital back into the financial system. This was the linchpin of our strategy; we wanted private investors to do most of the work for us—to recapitalize banks, to invest in credit assets, to see opportunity instead of risk. Designing policies that made financial institutions and financial assets investable again was necessary in part because of the limitations on our resources but also because of the risk and costs of a prolonged period of direct government management of the financial system. Each policy was tested through these lenses. Would it help restore confidence? Would it increase the probability that private capital would mobilize?

Over the next six months, we rolled out an ambitious response plan that would ultimately achieve these goals. Admittedly, it was far from flawless. Nor did it always seem just. We struggled to communicate what we did, and why we were doing it. But our core policy decision was to focus on stabilizing the financial system to help it support revitalization of the real economy. To engineer a sustainable economic recovery, it was necessary to fix the machines that provided credit to families and businesses. That meant resuscitating the very markets and institutions that led us into the financial disaster: the credit markets and banks. For the general public, that was hard to understand, but we believed there was no plausible alternative.

II. The Next Stage of the Financial Crisis Response

Our initial policy debates during the transition echoed those of the prior administration, and those of governments in previous financial crises. Should the policy response target the financial system and its major institutions or the households and businesses that depend on that system? [3] To fix a broken financial system, was it better to buy assets,

[3] This is as much a political problem as an economic one. That's because the institutions most in need of assistance are usually the ones that through incompetence, ignorance, or guile acquired the largest quantity of the "root cause" loans or securities that cause the financial crisis in the first order. It is the most culpable that become the most vulnerable. And it is relatively simple for commentators to make an argument that concentrating one's efforts in restoring basic function to the financial system rewards the most offensive contributor to the crisis itself.

forgive debt and provide assistance to impacted borrowers, or to inject capital in the system itself?

Those of us who were members of the Obama economic policy team revisited this fundamental debate. At the beginning, each alternative seemed like a better choice than taking on the politically difficult task of recapitalizing financial institutions. Despite trying to design the best version of each idea, we encountered the same challenges that left our predecessors in the Bush administration perplexed:

- How do we value assets that are transferred to the government? If the assets are priced too high (so that the government overpays), a hidden subsidy would go the existing owner or financial institution. If the assets were priced too low, no institution would voluntarily sell—and the problem we were trying to solve would metastasize, as these legacy assets continued to reside on the banks' balance sheets.
- How should the government dispose of the assets? We did not want to create a fire sale dynamic. We feared creating a shadow overhang of troubled assets; likewise, we were sensitive that reselling the assets to new buyers at such attractive prices would create a political backlash suggesting taxpayers were getting ripped off.
- How would we treat the borrowers? Would we be willing to make accommodations—including principal reduction—and who would decide? How would this be fair to borrowers with mortgages that were not purchased by the government? How would it be fair to those that continue to pay their mortgages—the "good" assets?

We also revisited another core debate in financial crises: Was this a liquidity crisis or a solvency crisis? Despite the earlier capital injections into Fannie Mae, Freddie Mac and the banking system, both private sector and government economists were still raising concerns about the solvency of the broader financial system. Wall Street analysts were projecting that the financial system would be severely undercapitalized once the banks began realizing the losses in their portfolios produced by the deepening recession. Analysts at the Fed also warned of a substantial remaining capital shortfall. In late 2008, the New York Fed was privately projecting that the banks could still face as much as a $290 billion capital deficit if the economy worsened under a "stress scenario" and up to $684 billion in an extreme case, with about 80 percent of those losses concentrated in the 15 largest banks.[4]

The market was also sending clear signals. Many of the critical measures of system solvency—equity values of banks, the price banks paid for short term borrowing, the price of insurance against the risk of bank failure—still signaled acute distress. The initial power of the bank preferred stock investments and the effective nationalization of

[4] Stress test, p. 283. These projections were rough estimates and constantly in flux. They were also unsophisticated in that they were not capital need models (with full accounting for taxes, earnings, etc.), but rather gross loss estimates. The development of stress tests, as mentioned later in this chapter, would allow Fed economists to make far more accurate projections of capital deficits for each bank in different gross loss scenarios.

Fannie and Freddie under the Bush administration appeared to be waning. One inference was that the earlier capital injections were undersized, particularly in light of the deteriorating economy. We thought this might be only part of the answer.

The combination of the market signals, the preliminary Fed assessment of potential capital shortfall and numerous private forecasts led us to conclude that in addition to a liquidity crisis, the system was very likely undercapitalized. Whether individual institutions were also insolvent was an open question. What was clear was that enough market participants and counterparties *believed* they were insolvent. One reason was that investors started paying close attention not only to the *amount* of capital held by the banks, but also to the *type* of capital on hand.

In their effort to recapitalize the banks while avoiding government control or nationalization, the Treasury Department under Paulson elected to make non-voting preferred stock investments in the banks. That, along with an escalating dividend rate (that stepped up after five years) as well as additional compensation restrictions (required by the TARP legislation), led the market to believe that this capital was not permanent. It would need to be repaid, with interest, to avoid further opprobrium or penalties. What started as government equity capital, in other words, began to look like a government loan.

As we prepared to move into the Treasury Department amid a deteriorating economy, we became convinced that we needed to address more definitively the remaining concerns about solvency. Not only did we need to add or attract more capital to the system, but we also needed to inject higher quality capital that could more easily absorb losses, or so-called tangible common equity. Taken together, this approach might create its own virtuous cycle: if the financial system were healthier, lending would pick up, the real economy would be healthier, and—while we knew we were in for a harsh downturn and a protracted recovery—the most adverse outcomes would be avoided. The question then became: how?

III. Recapitalizing the Financial System: Evaluating the Alternatives

Undercapitalized financial institutions exacerbate a crisis. They constrain lending activities as they seek to deleverage their balance sheets. The debt overhang can create heightened volatility in their equity, which can attract short sellers. Their debt can trade at a discount or at a wide spread, which increases borrowing costs. They may face incentives to gamble for redemption and make high risk investments at inopportune times.

Recapitalization, or the process of changing the mix of debt and equity, alleviates many of these concerns and puts the financial system on a substantially more stable footing. Here, we had four main alternatives:

1) ***Forbearance.*** Policymakers attempt to buy time to give financial institutions the room to recapitalize from operating earnings. They waive capital

requirements, provide liquidity, and commit to avoid catastrophic failure for the institutions. This can often take quite a long period of time and during that period, banks are likely to exhibit many of the counterproductive behaviors described above.

2) ***Resolution.*** Policymakers force debtholders of financial institutions to cancel their debts and replace them with equity. In the U.S., this is traditionally how the FDIC recapitalizes insolvent financial institutions and how corporate entities recapitalize under U.S. bankruptcy laws.

3) ***Loss Absorption.*** Policymakers can choose to assume losses that would otherwise be borne by the banking system. By absolving the banks of the need to pay these losses, equity capital is created and recapitalization achieved. This is often done through the use of asset purchases or guarantee programs.

4) ***Equity Injections.*** Policymakers attempt to create incentives for private investors to inject capital into banks or inject it themselves using taxpayer resources. This had been the primary approach of our predecessors in the Paulson administration.

FORBEARANCE

We ruled out forbearance. President Obama made that call, when he would admiringly cite examples of countries that he felt had pursued aggressive responses to financial crises. "Do Sweden, not Japan," was his common refrain. In other words, we were to take decisive action and differentiate ourselves from countries that pursued a more gradual strategy of incremental, temporizing measures. He embraced the foreign policy analogy used by Larry Summers, the director of the National Economic Council, who suggested we apply the so-called Powell Doctrine—the belief that a nation engaging in war should act with every resource and tool at its disposal to achieve a quick and decisive victory. We needed to act with overwhelming force.

RESOLUTION

Resolution was our preferred tool for smaller, less complex institutions. The FDIC had legal authority, expertise, and a long track record of resolving small and mid-sized banks in an efficient and effective manner. Unfortunately, we did not have the same tools to resolve much larger, more complex, and more interconnected institutions[5] without potentially devastating consequences to other financial firms and the broader economy. Equity injections seemed empirically less messy.

Proponents of resolution argued that this method was more just—that it would punish the institutions for their wrongdoing. As we saw it, the punishment was not being delivered to the institution itself and its executives, but rather to the debtholders who would be forced to exchange their debt for equity.

[5] Ultimately defined roughly as those >$100 billion in assets, the institutions that formed the initial 19 banks in the SCAP.

More importantly, resolution presented risks of a substantial contagion effect associated with imposing uncertain losses on a wide variety of creditor classes in the midst of the crisis. If these creditors saw losses being imposed on senior creditors of the bank, those who provided credit to other banks on a *pari passu* basis (equal ranking) but with shorter or demand maturities, might pull back from funding. These financial holding companies were organized in such a way that those in trading relationships, or holding derivative contract counterparties with credit balances, or providing wholesale funding were often *pari passu* creditors in the same legal entities as the long-term debt that would be haircut in a resolution. The risk of these creditors running from resolved institutions or others was potentially catastrophic.[6]

The use of resolution also risked spooking these same private investors, whom we were trying to attract to invest fresh equity capital into the banks. They were seeking clarity and certainty; forcing haircuts would muddy the rules and potentially cause anxious investors to flee.

Finally, there were serious governance concerns with a resolution-centric policy, especially if the government controlled the bank for any period of time. Governments are historically poor owners of operating businesses and the exit path from crisis management would become much more challenging.

Nevertheless, we agreed with the spirit of these arguments: resolution can work and ideally if you had enough time and a stable legal process where creditors and shareholders who knowingly assumed additional risk ultimately reap the consequences of that bargain to help recapitalize the institution, it can be a powerful and effective tool. We used it sparingly: the GSEs were formally resolved and the FDIC managed nearly 500 smaller bank failures during the crisis using its time-tested resolution tool-kit. These situations were distinguished mostly by the fact that we had a legal framework for resolution in both cases that did not exist for bank holding companies, or for any nonbank financial institution, like AIG, GE Capital or the major investment banks.

LOSS ABSORPTION (ASSET PURCHASES AND GUARANTEES)

The use of asset purchases or guarantees has significant conceptual appeal. As a policy choice, it can seem almost perfect in design: the government can buy assets or apply a guarantee to a basket of affected assets and agree to assume losses on those assets if they reach an agreed "out of the money" level. This is a form of synthetic capital to the bank. At its simplest level, if you are willing to buy (or guarantee) assets at the banks' elevated marks, you can use this to create capital. Calibration of the level of the guarantee and the basket of assets can be used to adjust the level of capital support provided. Loss absorption on a more aggressive basis has also been used (during the Mexican peso crisis

[6] The financial system at the time was funded to a great degree by short-term creditors. If those creditors believed that the government was going to force haircuts, or losses, on senior creditors, they would run from other institutions, forcing those institutions to quickly sell assets that they could no longer afford to finance. In our view, this would have put further downward pressure on the assets, causing more fire sales and exacerbating the fallout in the housing and other markets as borrowing rates rose even further. It had the risk of unraveling all the work that had gone into stabilizing the system.

in 1994, for example), where the government explicitly assumed realized losses for no compensation or for equity.

We spent considerable time exploring asset purchase schemes. With respect to asset guarantees, our predecessors announced this approach for Citigroup and Bank of America during the transition, promising that the Asset Guarantee Program would absorb losses on $306 billion and $118 billion of assets, respectively. But the program proved to be exceptionally difficult to implement. For example, we struggled to identify a way of setting a fair price on literally thousands of securities. Other challenges included determining the appropriate loss mechanism—mark-to-market, realized loss or another calculation—and then deciding how we would adjudicate, and who had control, over the settlement of the losses.[7] Finally, loss guarantees did not have the scalability of other policy designs. Despite a significant effort to make them work for Citigroup and Bank of America and consideration of their broader applicability, they did not play a large role in the policy response. Loss absorption ultimately was a component of some contingency planning, as discussed below with regard to the Legacy Loan Program.

A HYBRID APPROACH: "OPEN BANK" RESOLUTION AND EQUITY INJECTIONS

We ultimately tried to reconcile the attractive features of resolutions and equity injections in our policy formulation. Internally, we referred to the series of policies we adopted as "open bank resolution." Our idea was that we could potentially realize some of the attractive attributes of resolution—chiefly the ability to have some of the need for new capital met by existing holders of subordinated debt and preferred equity—while avoiding the contagion effects of imposing losses on senior creditors or having the institution undergo a process of bankruptcy that was ill-suited for financial institutions.

The simplest path would have been to have Treasury inject common equity into the banks. Other countries, notably the United Kingdom, pursued this path. But like our colleagues in the Paulson Treasury, we feared that once the government owned an enterprise, it would be difficult to get out. That fear was borne out by the experiences of other countries that nationalized banks and with Fannie Mae and Freddie Mac in the U.S., which are still owned by the government. At the other extreme, we could have compelled private sector involvement through resolution by forcing losses on existing creditors. For the reasons stated above, this was also sub-optimal.

Instead, we challenged ourselves to attempt something more novel: to pursue a series of policies that might create an environment where the private sector would mostly complete the recapitalization itself. Further, we wanted to differentiate among institutions. We felt that we had to allow strong institutions to get credit for their relative solvency and make sure that the weak institutions did not just get a measured dose of capital, but got all the capital they needed to survive even pessimistic assumptions on loss development.

[7] The Asset Guarantee Program was one of the few instances of an action that was announced—in this case a ring fence of assets at Bank of America—that was never actually implemented.

The use of private instead of public capital was beneficial from both a policy and political economy perspective. From a policy perspective, the potential pool of private capital was much deeper than the TARP funds that we had available. It would also minimize the expansion of the federal balance sheet.

Still, it involved significant risk. We had to imagine the set of conditions under which private capital might invest substantial resources, and we had to plan for the case where we tried to encourage this investment and failed. Indeed, some of our colleagues believed it was unrealistic to expect private investors to provide the large amount of capital that would be required. But we did several analyses that suggested that it was conceptually possible under the right set of public policies for the private sector to meet meaningful amounts of the new capital need. We believed there would be significant pent-up demand for bank equities if we could generate the conditions to cause this capital to become unlocked.[8] Our task was to figure out how to mobilize it.

Figure 2: Bank CDS and Libor-OIS Spreads

Source: Bloomberg.

[8] We concluded this by looking at the short interest in banks, which was quite high, and the investment of the major mutual fund managers in the financial sector relative to the weighting of the financial sector in important indexes. Rough calculations of demand from short covering (back to even modestly elevated levels instead of the peaks of early 2009) and a return of institutional investors from an "underweight" to an "equal weight" position suggested there could be meaningful demand for bank common equity.

IV. Stress Test and Backstop

Supervisory Capital Assessment Program (SCAP)

Restoring the banking system to health required that we determine where equity might be needed in the event of further economic pressure and to be prepared to provide some of it to the extent institutions could not raise the money from private investors. To accomplish that goal, we needed to put some bounds around the potential for further losses and provide clarity on how much capital banks needed and would be required to get. The Supervisory Capital Assessment Program (SCAP), better known as the bank stress tests, would be the critical tool. (See Figure 3.)

The stress tests marked the first time that regulators conducted an apples-to-apples analysis of potential losses across the banking system. It was a mammoth undertaking, led by the Fed and involving more than 150 bank supervisors, economists and financial analysts from the three major banking regulatory agencies, supported by advisory teams of lawyers, accountants and regulatory capital specialists. The assignment was to offer forward-looking projections of how much capital would be depleted by a severe economic downturn—including a scenario that was worse than the current dire forecasts coming from private sector economists. As it turned out, the exercise ended up examining the ability of institutions to survive potential loan losses worse than those banks suffered during the Great Depression. Any bank deemed to have a capital buffer that was not adequate to withstand severe further stress would be required to raise additional funds. And unlike most other bank exams, the results would be made *public*.

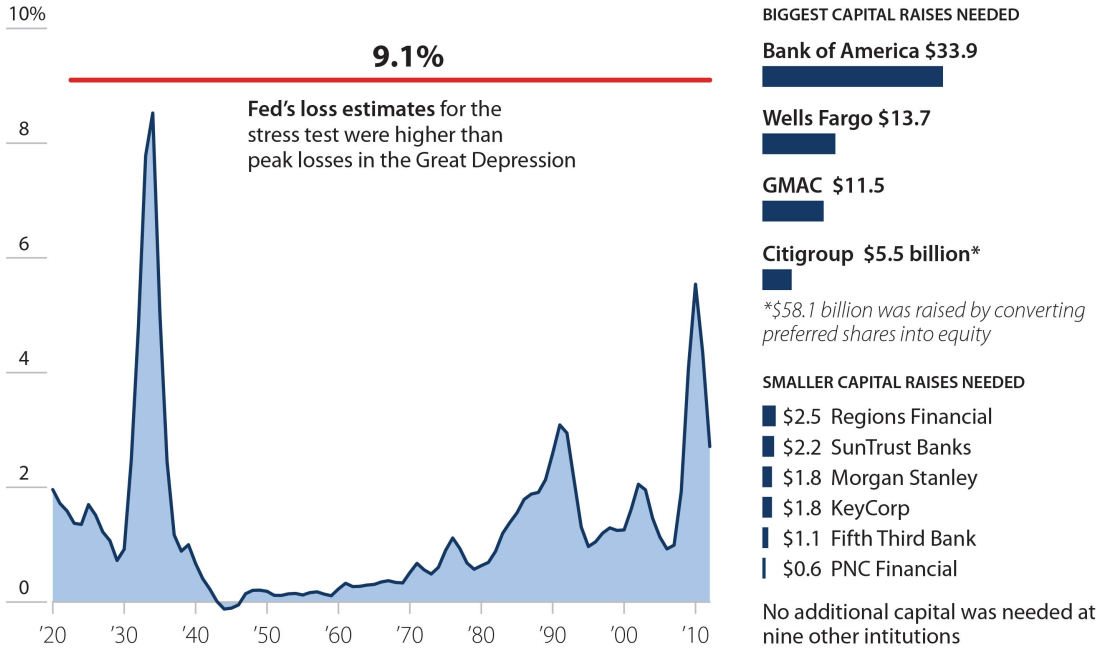
By providing clarity about potential losses and capital shortfalls (or the lack thereof) at each of the 19 largest banks—those with more than $100 billion in assets—that were required to participate, the stress tests would differentiate the weakest banks from those in a stronger position. The exercise would also help reduce the widespread uncertainty about the solvency of banks, one way or another.

Once completed, the test would then allow us to require those banks deemed to have fallen short to hold a significant buffer against worse-than-expected losses, promoting confidence and reducing the likelihood that the worst-case scenario would occur. Importantly, it would also allow private investors to more precisely model the value of a specific bank. They could be reasonably assured that so long as the bank raised the required capital, the government would not intervene. This addressed one of the investment community's biggest fears—that they might commit capital to the banking system only to find the government had changed course and their investment was going to be wiped out.

But for it to work, the market had to believe the results were credible. Indeed, it was critically important that the exercise not be seen as a whitewash meant simply to provide false confidence, which many observers were already claiming was likely to be the case. Our economic scenarios, loss projections and net revenue estimates needed to be transparent to investors—and seen as sufficiently tough. (For details on key design decisions, see sidebar, page 25.) To remove any appearance of political interference, the

stress test had to be administered by the Fed and the other banking agencies—independent of the U.S. Treasury. We had to run the test without preconceived notions of what the outcome would be and we all had to be prepared to accept and address the results.

Figure 3: Stress Tests



Sources: Federal Deposit Insurance Corp., Federal Reserve Board, International Monetary Fund.

None of this was without concern or controversy. Given the widespread use of stress tests today, it is easy to forget how unusual it was at the time for U.S. supervisors to require banks to capitalize against a hypothetical outcome. U.S. bank supervisors had never used a scenario-based stress test to assess the capital adequacy of banks and then required capital increases based on what those results showed was needed. Many thought it might not be possible to require a bank that was currently meeting all regulatory capital requirements to raise additional capital based on a hypothetical scenario. There were concerns that if we suggested a bank was "insolvent" by identifying a need for additional capital but did not resolve the bank immediately, we risked exacerbating the situation. But the extreme market pressures that banks were under indicated to supervisors that there were clear safety and soundness concerns. On those grounds, the Fed determined they had the authority to require additional capital.

We also had to grapple with how transparent we should be about the specifics of the stress test and the bank-by-bank results. On the one hand, if we were going to reduce the prevailing uncertainty and provide useful information about the state of the banking system, investors and others would need to be able to parse the analysis with adequate granularity. They would essentially need to be able to use the data for their own analyses to determine its credibility. Otherwise there would be continuing

suspicion that we had finessed the results to make the banks look stronger than they were. On the other hand, this level of transparency ran counter to decades of a banking supervision philosophy that extolled the virtues of confidentiality. The disclosure proposals led to contentious internal debates. There were concerns about setting what some deemed a bad precedent for supervision by increasing expectations for greater transparency in all future efforts. Worse still, we might risk calling attention to weaker banks—or possibly show they were all weaker than assumed—and prompt the very types of bank runs we were trying to avoid. The banks and some supervisors were concerned too much transparency would be destabilizing.

Ultimately, most of the skeptics came around to the need for greater transparency. Chairman Ben Bernanke and the Board of Governors decided we would let the public see the results in great detail and decide for themselves if our stress test was sufficiently rigorous and credible.

The stress tests offered substantial practical advantages. First, they provided the information Treasury officials needed to size a government capital injection backstop. Second, the stress tests allowed for differentiation between stronger and weaker institutions because like assets were treated similarly across the financial system.

Third, we ultimately decided to design the stress test so that it pushed back on the narrative that banks should be held to a "mark-to-market" standard. By measuring impairment in a stress scenario (but not necessarily assuming distressed market discount rates) and including the bank's pre-provision net revenue in the calculation, it reinforced what some Treasury staff called the Theory of Special Bank Relativity—that banks exist through time, and shouldn't be judged simply by how they stand at a certain point in time. Banks are designed to be "unstable" in this way, with demand deposits and short-term liabilities funding illiquid and long-term assets. If you force the banks to value their assets using a mark-to-market standard at the low point of the cycle, you undermine the primary reason why they are so important for supporting economic activity in the first place.

Fourth, the stress tests allowed the supervisors to define capital adequacy in a period of great uncertainty, and compelled the banks to raise additional capital they needed to reduce concerns about potential insolvency. The SCAP created essentially a new capital benchmark, known as post-stress capital, which required banks to hold at least 4 percent of their risk-weighted assets after the impact of the stress in a newly created and stronger capital definition, "Tier 1 Common." Through this mechanism, we were able to substantially increase both the quantity and quality of capital that banks were required to hold and to support credit availability.

The intent was to capitalize the banks so they could continue lending at least at current levels even if conditions worsened. Normally, the easiest way to maintain a required capital ratio in a downturn is to pull back from lending or shed assets—activities that only make a downturn worse. To address this concern, we measured capital needs using a post-stress ratio—the 'bogey,' as we came to call it—based on an assumption that banks' balance sheets at the end of the scenario were essentially the same size and composition as they were at the start. We then translated that into an

absolute dollar amount of capital we would require firms to raise rather than allowing them to shrink their balance sheets to meet the ratio.

Capital Assistance Program (CAP)

We were concerned that instead of helping attract capital back into the banking system, the stress tests could potentially make things worse—especially if a bank deemed undercapitalized or insolvent by the exam was unable to raise private capital and was left to sink or swim. We also knew that any credible stress test would take months to complete and investors would likely assume the worst during their pendency. It could have even sparked the very types of bank runs we were trying to avoid. Some form of backstop was necessary. Announced shortly before the banks underwent the stress test, we made clear that any bank unable to raise the necessary capital to meet the post-stress requirement under the SCAP would have access to additional government capital.

Enter the CAP. The Treasury agreed to subscribe to a form of contingent equity security in an *unlimited* quantity as necessary.[9] Further, we noted that the security would be convertible as necessary into tangible common equity of the bank and we defined the price at which it would convert based on the price of the bank's common equity as of the close of trading on the day before the announcement of the plan. The banks could convert their preferred stock provided by the previous administration under the Capital Purchase Program (the preferred that had come to be viewed as most debt-like by market participants) into the new security that was convertible into tangible common equity. This helped us partly address the math problem of only having approximately $100 billion left in the TARP: by allowing the conversion of the previously issued preferred we added approximately $200 billion of capacity to the program.

In a joint statement on Feb. 10, 2009, from Secretary Tim Geithner, Chairman Ben Bernanke, Chairwoman Sheila Bair, Comptroller John Dugan, and Director John Reich, the officials noted: "Our expectation is that the capital provided under the [Capital Assistance Program] will be in the form of a preferred security that is convertible into common equity, with a dividend rate to be specified and a conversion price **set at a modest discount from the prevailing level of the institution's stock price up until February 9th, 2009**." [emphasis added]. That final phrase was in brackets until moments before finalizing the release. The scope of the commitment we were making was sobering—we were committing the government to buy an indeterminate amount of common stock in the banking system at a fixed price. It would be up to the regulators to determine how much capital the system needed and up to the banks to see whether they could raise this capital at better terms. The government was standing behind the system and the stress test, and this alone provided some certainty and alleviated many of the widespread concerns about what the government might do with the banks.

[9] Unlike the SCAP that was limited to the 19 largest bank holding companies, the Treasury offered the CAP to all banks and qualifying institutions. BHCs had six months to raise additional capital after publication of the SCAP results. A firm could, however, apply to the CAP immediately after the release of the SCAP results but delay the actual funding for six months while it raised as much private capital as possible.

On the positive side, this program allowed market participants to invest in any individual bank knowing that there would not be a catastrophic failure at any other major institution that might threaten to produce a cascading downward spiral. On the negative side, existing owners of bank equities knew that if they could not raise capital at better terms than the CAP backstop, they would have to accept government capital and significant dilution.

Shortly before the stress test results were released on May 7, a joint statement from the independent banking regulators made it clear that bank holding companies should "design capital plans that, wherever possible, actively seek to raise new capital from private sources," including specifically "restructuring current capital instruments."[10]

Indeed, we had called our program "open bank resolution" because we saw several sources of capital to meet the banks' needs under the SCAP other than raising "fresh" equity from market participants or from Treasury. We wanted them to undertake "self-resolution" by seeking to convert their junior creditors to equity and wanted them to know that if they couldn't find new private capital, targeting debt-for-equity exchanges of their junior creditors was our preferred path before they sought government capital. While we had always been clear that from a policy perspective, we did not seek impairment of senior bank creditors, we also significantly hardened our language that junior creditors—holders of subordinated debt or other preferred securities—should expect to bear losses.[11]

We also wanted to give the market a roadmap that demonstrated how firms could execute "open bank resolution." Citigroup approached us in early 2009 and we saw an opportunity to announce nearly concurrently with the Financial Stability Plan a restructuring proposal that was consistent with our principles. In this transaction, announced on Feb. 27, we agreed to convert a portion of the preferred stock held by Treasury ($25 billion) into common stock at $3.25 per share if Citigroup could convert an equal amount of subordinated debt and private preferred securities at the same price. We viewed this individual action as an important part of the plan because it demonstrated to market participants how the broader program could be executed.

It was only after the Citigroup transaction that we began to see evidence that the market understood what we were trying to do. A report from Oppenheimer Group on March 2 was titled "Geithner's Evil Genius," and provided the following evaluation:

> "Treasury is telling the marketplace, by its actions if not its words, that it wants to ensure that the company has access to common equity at roughly [the CAP price]. Treasury will either supply the capital itself or it will drill into the more senior layers of the parent company capital structure to do. Treasury is, of course, not just sending this message with regard to Citi.

[10] Federal Reserve Board of Governors. Joint statement by Federal Reserve, Treasury, FDIC, and OCC on Treasury Capital Assistance Program and Supervisory Capital Assessment Program. Federal Reserve. Press Release. May 6, 2009.

[11] The top 19 banks at the time had approximately $300 billion of these securities outstanding, which again helped us manage our budget constraint. Between the $100 billion of remaining availability in TARP, the $200b of CPP preferred stock, and the existing stock of subordinated debt and preferred stock, there was $600b of capacity to help meet the stress test requirements without needing to raise any new equity.

> The clear implication is, of course, that this two-piece tool kit can be used in all the other BHCs."

In the end, the SCAP results were published in May. Excluding GMAC, which required additional capital but was being resolved separately as part of the auto rescue, nine of 18 banks were required to raise capital, totaling $178 billion. Their incremental need was sized at 2.3% of risk-weighted assets. This was on top of the 3.0% of assets they had received in the Columbus Day injections, with a major distinction being that SCAP required the banks to raise common equity (TARP/CPP was preferred stock). Through restructuring existing capital instruments, as in the Citigroup example above, taking account of their pre-provision earnings in the first quarter, and new common equity raises, all nine banks were able to satisfy this entire incremental requirement in the private markets in the months following the stress test.

Following SCAP, a number of those banks wanted to quickly pay back the government investments they had received through TARP. The Fed, to boost the quality of capital further in advance of further planned supervisory work on capital adequacy, required firms that wanted to do so to raise roughly $1 of additional common equity for every $2 of TARP funds redeemed. By late January 2010, these firms had raised enough additional capital to replace their government investments.

Meanwhile, the Capital Assistance Program was terminated—having never made a single investment. We saw this as strong indication of its success, since our objective was to recapitalize the system with private capital in the first place.

The Legacy Loan Program Contingency

Ultimately, we were relieved that the private sector mobilized for all institutions—strong and weak. This was by no means pre-ordained. In fact, while the major banking regulators were conducting the stress tests, we spent a good part of March, April and early May preparing for a worst-case scenario: what if the institutions were unable to raise any of the additional capital need in private markets? What if the additional capital that the banks raised after the stress test was still inadequate? How would we escalate our response to contend with a deepening crisis?[12]

For this, we knew we needed to partner with the FDIC. After all, they not only had the wherewithal and the authority (nearly unlimited), but they were also the experts on resolution. Working closely with the FDIC's Department of Resolution, we designed a mechanism that would essentially replicate resolution for an open institution. If the government had to use the Capital Assistance Program to inject equity into a financial institution resulting in implied ownership (upon conversion of the equity instrument) of more than a 50 percent, we were prepared to implement these more radical approaches.

[12] The same restrictions on authority still applied—how could we accomplish an intensive open bank resolution without having to use the bankruptcy process and without further increasing uncertainty and fears of nationalization and capricious government action.

One of our policy tools was called the Legacy Loan Program and offered a way to separate troubled assets from regulated banks. The FDIC agreed to finance the "purchase" of these assets from the bank by private sector investors and Treasury. And unlike TARP, there was no limit on the size of the program. In early 2009, for example, Citigroup, a bank holding company with approximately $2 trillion of assets, announced that it was moving $850 billion of troubled assets to an entity they called Citi Holdings.

One could imagine that the Legacy Loan Program might have been used to fully segregate these assets into a new entity, with financing by the FDIC. The "old" bank, now with $1.15 trillion of supposedly healthier assets and all the operating businesses could continue as a listed company (although in this scenario most likely owned almost entirely by Treasury) but without going through a disruptive bankruptcy proceeding.

This was not nearly as simple as this example implies. There were questions of authority, legal structure, burden sharing for the various debt and equity holders of an impacted institution, and raising the funding itself. But we viewed the Legacy Loan Program as an important tool in Plan B. So as not to raise alarm, we didn't talk about this program very much or how we intended to use it. It required a systemic risk determination that we quietly pursued—the Board of Governors of the Fed and the FDIC Board approved the program. All that was needed was the signature of the Treasury Secretary to launch the program.

The necessary document was never signed. In June 2009, FDIC Chairman Bair released a formal announcement that the program was being postponed. In that release, she noted, "Banks have been able to raise capital without having to sell bad assets through the LLP, which reflects renewed investor confidence in our banking system."

V. Reviving the Asset-Backed Securities Market

It was not enough to simply recapitalize the banks. We also needed to revitalize the asset-backed securities markets, which provided a critical source of funding to consumers and businesses. Over the last three decades, that market had grown to over $2 trillion but it had fallen by at least 25 percent in early 2009. The sharp drop in prices in these securities was deeply problematic and its impact extended beyond the realized losses to holders of the securities themselves. These distressed prices were being used to infer what the market thought the ultimate losses might represent. The market could then apply this information to the owners of these securities and determine what losses their owners might face. The fear of increased losses often rippled first through these markets and then ultimately to perceived fears of solvency for the institutions that owned these assets or faced similar credit risk.

What's more, the conditions in these markets posed a drag on lending. The prices of these securities reflected the yield or return that investors were seeking to own these assets. And these yields raised the benchmark for new loans. If an investor could buy a liquid security secured by car loans and make between a 15 percent and 20 percent return, why would that same investor buy a new security backed by similar car loans and lend to a consumer looking to buy a new SUV at 4 percent?

Restoring confidence would require some intervention in these markets. We needed security prices to more accurately reflect underlying perceptions of default risk instead of the fire-sale prices that were taking place every day in the credit markets. We needed to bring down the yield of these *legacy* securities to promote the formation of new securities, which would support lending. Our policy challenge was how, with limited resources, to sway such a large market. Like our predecessors in the Paulson Treasury, we rejected plans to use TARP funds to purchase these assets. Meanwhile, our colleagues at the Fed made it clear that law limited large-scale asset purchases under their quantitative easing initiatives to Treasuries and GSE securities.

Our assessment was that one of the biggest factors leading to a divergence between actual security prices and fundamentals of asset-backed securities was the so-called falling knife problem. Without a sense of how bad things could get, no prudent investor would invest. But there was another problem. Before the crisis, most of these securities -- - the AAA-labeled and super-senior rated tranches of mortgage-backed securities—had been purchased with significant amounts of leverage and little equity. An investor might have put down $1 million to finance a $100 million purchase of these securities. Now, that same investor would have to put down $50 million or $60 million to execute the same transaction.

Just as we were constrained by limited TARP funds, the private sector was potentially capital constrained. But if we could provide financing to support the purchase of these securities, we could lower the effective discount rate to own the securities and lower the quantum of capital required (through leverage) to purchase the securities. This is similar to the lender-of-last-resort policies pursued by the Fed to expand the use of the discount window. But those policies were institution-centric: the Fed lent to primary dealers and regulated financial institutions. Our belief was that it could be even more effective and equally conservative to focus on the collateral itself without regard to the institution that owned it. We were trying to create a form of discount window lending to provide leverage directly to the non-bank market.

Some thought it paradoxical that our solution to a crisis of over-leverage was to apply more leverage. But we thought the market had overcorrected in the other direction. So the medicine was much like a vaccine. We had to apply a bit more leverage, judiciously, to try to break the fire sale fever.

The Term Asset-Backed Securities Loan Facility (TALF)

The TALF was announced on November 25, 2008, but by Inauguration Day it had still not been implemented as the Fed wrestled with how to fit the program into its own legal constraints. It was initially designed by the Fed and the Paulson Treasury. Even among some highly innovative programs, we felt it was one of the most promising. It provided a chassis to accomplish the policy objectives we described above. The program was set up with an initial $200 billion and was intended to provide asset-level, non-recourse leverage to any purchaser of certain AAA-rated asset-backed securities regardless of that purchaser's discount window eligibility. The terms of the loans—how much the Fed would be willing to lend against the collateral—would be determined by the Fed itself and set at a level to ensure that the central bank was protected in all but the most

catastrophic scenarios. Importantly, it was targeted directly at capital formation: the Fed made TALF available only to certain kinds of newly issued securities (auto, student, credit card, and SBA), all with the intention of reviving basic consumer and small business lending and borrowing at reasonable rates to foster an economic revival.

The architecture of the program also tied the Fed and the Treasury together. To support the $200 billion of lending, the Fed required the Treasury, through the TARP, to provide a first-loss layer, of $20 billion to further protect the Fed from any losses under the program. This allowed a limited amount of TARP resources to have an outsized impact, 10 times as large as devoting TARP resources directly to lending or purchasing securities.

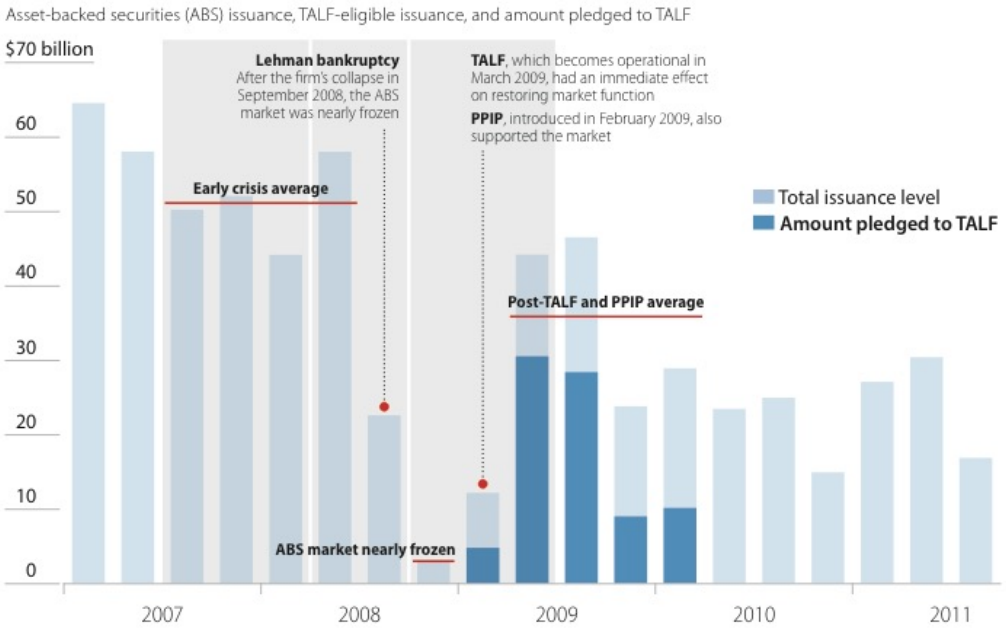
Our plan was to create a greatly expanded version of this excellent idea to demonstrate to the markets that there was a capable mechanism to restore function to asset-backed lending markets for all types of collateral. The Fed agreed to expand the program to other kinds of collateral for new security issuances and to increase its size. We felt this would send an important message and, as part of the consolidated set of announcements in early February, the Fed announced a massive TALF expansion to $1 trillion, extended the maturity of the eligible loans and added most other asset classes, including commercial and residential mortgage securities. Markets quickly took note of the scope of the program. The TALF was officially launched in early March 2009.

We continued discussions with the Fed on our final frontier—expanding TALF to finance so-called legacy securities as opposed to only new securitizations. The high yields available on legacy securities continued to have allure and forced pricing for new credit origination higher, drawing capital away from fresh lending.

This proved to be a real challenge for the Fed. They were concerned about how to define the eligible group of securities, about how to create a methodology to determine the advance rate, and about the political economy of lending to investment funds with a difficult-to-explain connection to new credit formation. We understood their concerns, but believed the benefits outweighed the potential costs. As these discussions continued, we feared we would not reach agreement and began to consider other ways we could potentially achieve our objectives.

We faced the same set of consistent challenges in designing another program to restart lending. The germ of the idea came from Warren Buffett, who wrote a letter to President-elect Obama outlining a concept where the government and private investors would co-invest in legacy assets together. The government would be a silent partner—outsourcing decision-making on the assets purchased and their price to their private sector partner. Similar models had been deployed by the Resolution Trust Corp. in the clean-up of the savings-and-loan disaster, relying on so-called partnership transactions that sold partial interests in acquired assets to private investors who then pursued recovery and workouts of the underlying loans. The government participated in the ultimate value recovery through a retained stake.

Figure 4



Sources: Total issuance level: Bloomberg; amount pledged to TALF: Federal Reserve Board

The Public Private Investment Program (PPIP)

The PPIP was announced in late March concurrently with the announcement that the Fed had ultimately agreed to consider expanding TALF to include legacy residential and commercial mortgage backed securities. Between the two programs, we were able to announce the potential to generate between $500 billion and $1 trillion in purchasing power in the market for these legacy assets. It was not important to us necessarily how much was ultimately purchased. In hindsight, the announcement itself marked the beginning in the turnaround in the markets for residential and commercial mortgage-backed securities. In fact, President Obama remarked in a meeting shortly after: why hadn't we announced this program earlier?

The PPIP solicited private sector fund managers to raise funds explicitly for the purpose of purchasing eligible legacy securities as determined under the program. Any private funds raised by these managers would be matched dollar-for-dollar with TARP funds and Treasury agreed to provide a credit facility for these funds in a 1:1 ratio with the total capital raised. This credit facility was a further inducement for investors—retail and institutional—to commit capital to these new funds.

In this way, $1 of private capital raised could be matched with $3 of government capital ($1 of equity and $2 of debt). We also conceived that these private-public investment funds would be heavy users of the TALF. So the capital in the PPIP program, when combined with the financing provided by the Fed through the TALF program, could theoretically support purchasing power of up to $1 trillion, which was the figure we cited in public announcements.

The asset managers would make all the purchase decisions and because of their fiduciary obligations to their investors, they would have to apply the same rigor to the performance of these funds as their other investment vehicles. They would also control the disposition of the assets and any restructuring decisions that needed to be made to optimize value. Originally, we had the idea that we would select five fund managers through a comprehensive bidding process administered by the Treasury.

We received over 100 applications and ultimately were so impressed with the quality of the applicants that we approved nine managers to seek capital for their public-private investment funds who subsequently raised $6 billion. With the match from Treasury and the credit facility, these funds ultimately deployed $24 billion of purchasing power.

VI. Impact of the TALF Expansion and PPIP Programs

Legacy TALF continued to be difficult to implement. It was officially launched for commercial mortgages in May 2009 but was never ultimately expanded to include residential mortgage backed securities. Usage of the TALF program in aggregate peaked in 2010 around $50 billion. These numbers, even combined, were quite a bit less than the $1 trillion of purchasing power we had announced. Similar to the CAP, described above, the mark of success of these programs was perhaps their modest usage. In fact, we succeeded in bringing down spreads in the asset classes we were targeting; by this yardstick, we accomplished our objective. Simply announcing the program had a meaningful impact—by demonstrating that we had the mechanism, capacity and intent to support the market if necessary, the market began to do our work for us.

Treasury published its last quarterly report on the PPIP in 2013 when the last fund had liquidated its remaining holdings. All the managers performed extremely well: the worst performing manager generated an 18.7 percent return and the best had a 26.3 percent return. In the end, the Treasury invested $18.6 billion on which it made a profit of $3.8 billion.

VII. Results and Lessons Learned

We were optimistic about our financial stability plan when we announced it in February 2009, but even we were surprised by the speed and capacity of the private sector to mobilize and reverse the negative trends. Building on the critically important capital injections and guarantees of October 2008, the overall mix of policies from the new

Administration and the Fed created a credible sense of our intent and capacity to keep the nation out of a second Great Depression. As a result, the market's views of the amount of capital required to manage through the downturn improved with time rather than deteriorated. The broader integrated strategy—including a credible backstop for senior creditors, complementary policies (like PPIP and TALF) to help restore the functioning of other credit markets and limit fire sale pressures, and supportive macroeconomic policies—was key to making the financial sector recapitalization strategy successful.

Within that recapitalization strategy, a credible stress test regime combined with a well-structured capital backstop and an effort to foster restructuring of junior debt and capital securities proved powerful. The credibility was driven by loss estimates judged to be severe and defined independently of fiscal authorities, with full transparency into individual banks. The capital requirement was set as a numerator (a minimum level of common equity post net losses) to avoid reinforcing deleveraging pressure. The backstop was appropriately sized and designed with a fixed price floor on public injections defined *ex-ante*. This limited the amount of dilution possible in extreme cases, and therefore supported equity prices and the ability of the private sector to act in place of the government.

Charles Eames, the famous modernist furniture designer, asserted that "design depends largely on constraints" and that one's "willingness and enthusiasm "to work within and around unchangeable elements determines one success or failure. The response to the financial crisis clearly follows this rule. The policy objective was relatively simple—recapitalize the financial system and support credit formation. The challenge and the creativity required was in the design. Our success came from putting people of many different backgrounds—regulators, bank liquidators, supervisors, monetary policy experts, economists, and financial market experts—into dialogue and forcing ourselves to challenge orthodoxy and come up with novel solutions.

LESSON 1: COLLABORATION IS KEY. Importantly, we worked together, across administrations and across agencies, with broad continuity in strategy and approach. Part of the political economy of crisis management was designing a set of programs that created the political space to allow the independent agencies with substantial crisis-fighting statutory authority to use these tools in the most effective manner. The various joint statements, joint releases, board resolutions, and a series of bilateral letters written between the Treasury and Fed were all part of an architecture that made sure that no agency was left on its own having to defend politically the consolidated set of actions required to stabilize the system.

LESSON 2: A WEAK CAPITAL REGIME CAN BE DIFFICULT TO RECOGNIZE UNTIL IT'S TOO LATE. There are significant benefits to having higher capital requirements at all points in the economic cycle. It can be hard to force undercapitalized banks to raise or conserve enough capital before it becomes too hard and expensive to do so in the early stages of a crisis. The pre-crisis capital regime was poorly designed. It permitted low quality capital, relied on relatively benign point-in-time measures of risk, it was backward looking, and did not incorporate contingent claims on capital or liquidity. Improvements have been made. To reduce the likelihood that the banking system will exacerbate an economic downturn and/or market turmoil, the current capital regime requires systemically important banks to be capitalized in good times to

withstand severe distress and continue to function. Appropriately, these banks now pay the cost *ex ante* of holding capital against potential severe distress.

Our successful experience with conversion of junior capital securities into high quality tangible common equity also suggests that recent changes to encourage institutions to manage to a constant and substantial layer of total loss absorbing capital (TLAC) at their holding company *might* also be a useful development in a future crisis if institutions attempt such exchanges earlier and avoid more distressed equity raises or deleveraging.

LESSON 3: UNCERTAINTY IS THE HARDEST VARIABLE TO CHANGE. The fear of a severe recession and a collapse of the financial system through destabilizing runs creates upward pressure on loss estimates and can be paralyzing to stabilization efforts. Recapitalization is essential, but insufficient to changing the curve of expectations. It requires a broader set of policies—including guarantees of bank and other financial system liabilities and a forceful Keynesian response. The public and market participants need to believe that government understands the scale of the problem, has the desire to resolve the crisis even at political cost, has the wherewithal, and has a credible mechanism. It is important to ultimately have an anchor for expectations—with assurance the system will be forced to raise (or be provided with) the capital to withstand losses in reasonably negative scenarios—but also that the most adverse scenarios (economic depression) can be avoided.

LESSON 4: PRIORITIZE PRIVATE CAPITAL SOLUTIONS. Our overarching theme of bringing the private sector back to the table—making the financial system investable—was a highly useful framing. But it was much harder to design these policies than to rely on government intervention like simple equity injections or asset purchases. They required a broad set of independent investors taking actions that were in their own self-interest all around the same time. On the other side of the ledger, the benefit for the public is that the response can be self-perpetuating, the exit from the policy response is much easier, and the recovery self-generating and faster.

LESSON 5: BREADTH OF RESPONSE IS IMPORTANT. In a crisis, it is useful to think about the system as a whole, not just triage the weakest institutions. The strength of our approach was the speed, level and breadth of the recapitalization (GSEs, investment banks, AIG, auto finance companies, largest bank holding companies, hundreds of smaller banks). A piecemeal approach can succeed and may be necessary in early stages where policymakers are testing whether there is a solvency crisis or when events intervene and there is simply no time. But a comprehensive response is necessary to ultimately carry the day.

LESSON 6: PROVIDE INSURANCE AGAINST ADVERSE OUTCOMES. Sometimes the best programs are the ones that sit on the shelf. Ideally, in crisis response, the government demonstrates a willingness to assume the risk in the tail—the risk of catastrophe—but leaves the private sector to manage the more attritional risk. Heavy program usage outside of the tail may suggest mis-calibration of the program. The existence of the program, or insurance, in the event circumstances deteriorate often provides the confidence necessary to avoid more catastrophic outcomes in the first order.

FINAL THOUGHT: We made mistakes. The initial outlines of our strategy, without the necessary details, caused another wave of uncertainty and concerns in the market about our intentions. The programs took longer to execute than we hoped. We were less than successful in managing the political economy of crisis response, in explaining what we were doing and why the focus on repairing the financial sector was so important to restoring growth in employment and incomes.

All that said, if you compare our response to other advanced countries in similar circumstances, we were able to achieve recapitalization and ultimately unwind government support over a relatively short period of time. The real economy was therefore able to recover more rapidly than elsewhere.

SIDEBAR: DESIGNING THE STRESS TESTS

Although the idea of a stress test was conceptually fairly simple, running the exercise was analytically and operationally complex. We (the Fed and banking regulators) had to develop a set of practices in real time to carry out an exercise that supervisors had never done before. And do it under substantial pressure from outside and inside the government. For it to work, the market had to believe the results were credible, and we took great care at every step along the way to make sure that its design was rigorous and robust. Here is a look at a number of the policy choices that we made.

DEFINING THE UNIVERSE OF FINANCIAL INSTITUTIONS

There was significant discussion about how many institutions would undertake the stress test. On the one hand, some of us at the Fed were concerned about our capacity to carry out the exercise on a large number of firms simultaneously. On the other, we wanted to make sure that we covered a suitably large swath of the banking system and the troubled mortgage assets. After exploring the merits of looking at just the 10 largest firms, we drew the line at banks with more than $100 billion in assets on a consolidated basis. That group was made up of the 19 largest domestic bank holding companies,[13] which together held more than two-thirds of the assets and nearly half of the loans in the U.S. banking system.[14] The group covered banks that were engaged in a wide range of complex activities, such as JPMorgan Chase and Goldman Sachs, as well as more traditional large regional banks with balance sheets consisting largely of loans and securities.

DEVELOPING THE ECONOMIC SCENARIOS

The steady stream of bad economic news and deteriorating conditions in early 2009 made coming up with the more adverse economic scenario complicated. For our exercise to be credible, we needed to stay at least one step ahead of the ongoing deterioration in the outlook and develop a more severe test than what was actually expected to occur.[15]

The Fed developed two scenarios. A "baseline" scenario was used to provide a rough benchmark of a weak economy. The Fed was especially attuned to the risk that the markets could perceive the baseline scenario they released for the stress tests as the same one being used by the FOMC for the setting of monetary policy. Thus, they used an average of three major publicly available macro forecasts as of February 2009.[16] The "more adverse" scenario was meant to be significantly more severe than what was

[13] As measured according to the assets reported for 2008Q4 in the Federal Reserve's Consolidated Financial Statements for Bank Holding Companies (FR Y-9C).
[14] Office of Financial Stability, 2010.
[15] The more adverse case assumed a very severe recession with a sharp drop in house prices. In particular, it assumed a 3.3% drop in GDP in 2009 and 0.5% increase in 2010; an unemployment rate of 8.9% in 2009 that would rise further to 10.3% in 2010; and a 22% drop in housing prices in 2009 as measured by the Case-Schiller Index, followed by a 7% decline in 2010.
[16] The Supervisory Capital Assessment Program: Design and Implementation, Federal Reserve Board, April, 2009.

expected and was the main focus for most observers of the stress tests. We were careful to point out that it was neither meant to be a "worst case" scenario nor the Fed's forecast of expectations. Instead, it represented a scenario that while very severe was plausible given the current environment. It was based in part on an analysis of the historical record of previous US recessions and national house price declines (going back to before World War II), but adjusted for the unprecedented decline in national housing prices that was occurring. As it turned out, the rapidly deteriorating economy led to an increase in the unemployment rate in early 2009 that ended up tracking very closely the rise in the more adverse scenario, and housing prices continued to fall substantially, increasing the risk that any stress test results to be announced later that spring might not be viewed as credible.

GAUGING 'POST-STRESS' CAPITAL ADEQUACY

To determine whether or not a bank had enough capital to withstand a hypothetical severe economic downturn involved three moving pieces: projecting the potential losses an institution would face; evaluating how much revenue that institution would earn; and deciding where to set the bar for "post-stress" capital adequacy.

PROJECTING POTENTIAL LOSSES

A key decision was made early on that we would run the stress test largely in keeping with traditional bank accounting standards, with the important distinction that we were assessing potential performance under a hypothetical scenario. Loss estimates for loans and securities in investment portfolios would not result from trying to mark the positions to market, as many analysts were trying to do on the back of envelopes, but rather by assessing their potential performance under the hypothetical scenarios consistent with accepted accounting practices. The resulting loss and revenue estimates would then be run through banks' income statements.

The preferred option for generating the stress loss estimates would have been to require all the banks to provide data that could be independently analyzed by regulators. But the Fed had yet to develop the robust stress testing infrastructure that exists today, nor did we have the time to create that capacity. We decided we would give the banks the scenarios, make them run the stress test themselves, and then analyze and adjust the results they provided. Given how bad many of the banks had proven at measuring their risks, our confidence in their practices was far from high. Moreover, we were well aware of their strong incentive to be overly optimistic. But there was no other feasible way to do this. Our focus would have to be on assessing their submissions and making whatever adjustments were necessary based on all available information, including a deep understanding of their operations informed by years of supervising the banks.

To support these efforts, economists at the Fed, FDIC and Office of the Comptroller of the Currency worked together to develop a set of loss estimates—known as "indicative loss ranges"—for each major loan class based on industry-wide asset characteristics. If a firm's analysis resulted in estimates that were significantly outside the ranges, the firm would have to explain why. This made it harder for the banks to game the test. It also

put the onus on them to show us the data they had to support their contention that their portfolios would perform better than average. One thing we had not counted on was the extent to which many banks did not have the risk measurement information needed to estimate potential losses under stress. If not a complete shock, this certainly complicated our work.

There was substantial back and forth during those few months between the supervisors and banks to get additional information about the risk characteristics of loans held by each of the banks. We benefited greatly from being able to look across all of the firms simultaneously. By having this 'horizontal' perspective we were able to see details on huge swaths of the system's loans and then drill down into each firm's specific portfolios. This allowed us to come up with adjusted estimates that were both consistent across loan categories (e.g., if two banks had the exact same loan, the result would be the same for both) and at the same time specific to the riskiness of each bank's particular portfolios. In other words, loss estimates were informed by a system-wide view of the major loan categories (e.g., residential mortgages, commercial loans, etc.) and banks that held loans with riskier characteristics would appropriately generate bigger losses in the stress test.

A challenge arose with respect to firms with substantial trading activities, of which there were five, including two (Goldman Sachs and Morgan Stanley) that had only recently become regulated bank holding companies and whose assets were mostly held in the trading book. Trading had generated huge losses already, largely in the structured credit positions that were the source of so much uncertainty.

Trading positions are marked-to-market regularly by banks and can change in composition more rapidly than the assets held in loan and investment portfolios. How could we estimate potential losses in trading-related exposures over the nine-quarter scenario timeframe? The only practical alternative was to have the banks test their trading positions applying a technique they had long used in a much more limited way: assume a sudden shift in global market values (and the risk factors that drive them). Extreme market volatility had already led to significant swings in valuation over the second half of 2008. There was no reason to think this could not continue. Trading firms would be required to hold enough capital to withstand both a severe macroeconomic downturn *and* an extreme market meltdown. Of the $600 billion of total losses estimated across all 19 firms in the stress test, $100 billion were from trading-related exposures, including credit exposures to trading counterparties, at these five banks.

ESTIMATING POTENTIAL REVENUES

Even while taking huge losses from deteriorating asset values and loans that will not be repaid, banks would continue to generate revenues from interest earned on loans and securities, trading activities, and other fee-based services over the scenario horizon. This "pre-provision net revenue," or PPNR, was a critical consideration and one that was largely being ignored by private sector analysts and others focused on marking to market the banks' balance sheets. But how would we calculate those net revenues and the impact they would have in offsetting the erosion of banks' capital under the prescribed scenario?

Again, the starting point was estimates submitted by the banks, which had extremely rosy views of their revenue prospects under severe stress. Indeed, it was with some alarm and a few chuckles that we noted the banks had estimated their aggregate PPNR under the more adverse scenario stress would be greater than what they had actually generated over *any* historical period of the same length. We told them that, at best, their PPNR estimates should not exceed actual results in 2008 unless there was compelling analysis to support it.[17] Internally, we used statistical analysis of industry earnings to derive revenue estimates for the firms' various revenue streams and these informed the final estimates.

DETERMINING THE CAPITAL BUFFER

Importantly, the post-stress capital requirement needed not only to be seen as a qualitative improvement over the existing requirements but also as sufficiently high to allow firms to continue to operate and lend during a deep downturn. Traditional, point-in-time capital measures had missed important risks and had little to no value for assessing banks in a rapidly deteriorating environment. Moreover, they included a significant amount of "hybrid" debt and debt securities that the markets discounted as a source of loss absorption. In essence, nobody trusted the reported capital numbers based on the current standards.

SCAP required banks to hold so-called "post-stress capital," or a capital cushion after the impact of the stress test, equivalent to at least 4 percent of their risk-weighted assets in 'Tier I Common' equity. This new measure was developed specifically for the stress test and ruled out most non-common-equity elements. This was a significant strengthening of the quality and quantity of required capital.

The final results from the more adverse scenario represented extreme levels of losses—losses on loans of roughly $450 billion accounted for approximately three quarters of the $600 billion of estimated losses in the stress test. That equaled over 9 percent of total loans outstanding, higher even than the loan loss rate in the Great Depression. In addition, estimates of PPNR showed a significant hit to revenues. Illustrating that the stress test had closely looked into all the portfolios at each of the firms, loan losses appropriately differed by loan type and across the banks. For example, aggregate commercial loans to businesses averaged a 6.1 percent loss rate, ranging from a low of roughly 2 percent at one firm to above 20 percent at another. Credit card losses averaged 23 percent, ranging from 18 percent to a high of almost 40 percent. After a long wait, anxious observers could see that the stress test results indeed represented a severely stressful outcome. In the end, most experts agreed that the test had been credible.

[17] The Supervisory Capital Assessment Program: Overview of Result, Federal Reserve Board, May, 2009.