Yale SCHOOL OF MANAGEMENT
Program on Financial Stability

Lessons Learned Oral History Project Interview

Interviewee Name and Crisis Position	Patricia Mosser[1] Senior Vice President, Markets Group, Federal Reserve Bank of NY
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Introduction

The Yale Program on Financial Stability (YPFS) interviewed Patricia Mosser regarding Mosser's time as senior manager of the Open Market Desk at the Federal Reserve Bank of New York (FRBNY) during the Global Financial Crisis of 2007–09.[2] Mosser oversaw market analysis, monetary policy implementation, many crisis-related liquidity facilities, foreign exchange operations, and analysis of financial stability and reform. In her more than 20 years at the FRBNY, she also served as an economist and manager in the research department.

In the aftermath of the financial crisis, Mosser moved to the US Treasury Department and headed the Research and Analysis Center at the Office of Financial Research. Mosser has written extensively on financial stability and monetary policy topics including financial reform, crisis policy tools, and the monetary transmission mechanism. She is a consultant to the Bank of England.

At the time of this interview, she was director of the MPA Program in Economic Policy Management at Columbia University's School of International and Public Affairs and led the school's initiative on Central Banking and Financial Policy**.**

This transcript of a telephone interview has been edited for accuracy and clarity.

Transcript:

YPFS: **Please explain your role on the Open Market Desk at the New York Federal Reserve.**

[1] The opinions expressed during this interview are those of Ms. Mosser, and not those any of the institutions with which the interview subject is affiliated.
[2] A stylized summary of the key observations and insights gleaned from this interview with Ms. Mosser is available in the Yale Program on Financial Stability's *Journal of Financial Crises*.

Mosser: At the time of the crisis, I was a senior vice president in the Markets Group of the New York Fed. The Markets Group, among other things, is responsible for the implementation of monetary policy on behalf of the Federal Reserve System, Treasury auctions for the Treasury Department, and foreign transactions on behalf of both. It also has the very closely associated role of providing relatively high-frequency financial market analysis on conditions in the US and around the globe.

The part that I was responsible for can be broken down into about four categories. First was Treasury Market operations and analysis of Treasuries in related markets. This included the occasional purchase of Treasury securities, securities lending operations on behalf of the Fed, and, on behalf of the US Treasury, auctions in the primary (new issuance) market. In addition, I was responsible for all international operations and market analysis, including foreign exchange operations. Not that we did those very often. We certainly practiced being ready, but foreign exchange intervention is rare.

My staff also did reinvestment of foreign exchange reserves for the Fed and the Treasury and analysis of the global financial market conditions as they impacted the United States. Third, I was responsible for another staff which did financial market analysis in credit, equity, and commodity markets—everything from mortgage-backed-securities markets, corporate bond markets, to securitizations and stock markets. Before the crisis, the Federal Reserve did not do any transactions or market operations in those markets, so this was a staff that was focused much more on the analytics.

Last, and certainly not least, I was responsible for a staff that provided cross-market monitoring and provided more technical analytical support to the entire Markets Group. Every day, the Open Market Desk was responsible for writing a couple of daily reports and doing conference calls explaining what was going on in global markets and why it would matter to the Fed or the Treasury. People rotated in and out of that daily market monitoring group, because it drew from all of the other staffs at the Desk. On any given date, the individuals were on the hot seat if something unusual happened in global markets. All the staffs worked very closely together on market analytics.

I was not responsible for money market operations or repurchase agreements, which, in those pre-crisis days, were the day-to-day way that the Fed controlled the federal funds rate. Also, I was not responsible for the discount window. However, all the areas I just named all worked together incredibly closely all the time.

YPFS: **Given the roles you were involved in, did you begin to see problems or worry about events long before they really ballooned into something bigger?**

Mosser: The short answer to that is yes, but we weren't worried nearly enough. It was very clear from at least 2006 that the mortgage market was way out over its skis, both in terms of home prices, which were going up incredibly rapidly, and in terms of mortgage lending, where there were many, many new mortgage products that were largely untested, a lot of them sold into securitizations. Securitizations were increasingly complicated so that figuring out who held the mortgage risk was increasingly difficult. The Open Market Desk monitored these market conditions regularly. In addition to using hard data, the Open Market Desk would regularly speak to a broad group of market participants—traders and asset managers, for instance—about what they were seeing. In addition, there were a series of reports written by mortgage market analysts in the private sector. It was very clear from the in-house data, from what the analysts were writing, and what market participants were saying that the housing market was overheating significantly, both in the financial side and in the real side.

Overheating in markets is not uncommon. It happened in the late '90s in equities, it happened in high-yield bond markets in the '80s and again in the '90s. It happened in commercial real estate in the late 1980s. It ends badly with usually pretty big losses. The failure of a one or more financial firms is not unusual. It can even cause a recession, such as those in the early 1990s and the early 2000s. There was absolutely that concern, that the overheating in housing and mortgages was going to turn and that the odds were that people were taking risks they were either grossly optimistic about or they just didn't understand the kind of mortgage they were taking out or the kinds of securitizations they were investing in. There was discussion at the Fed and elsewhere, and also analytical work, but less consensus about how serious it would be.

In one of the first pieces that I remember, a senior staffer at the New York Fed wrote an internal report on how the lower-end quality of the mortgage market was already in very serious trouble in the summer of 2006. To be clear, the Desk was not on the leading edge of this prediction. We waited until we were sure we had enough information that could be useful to policymakers at the Fed and Treasury.

The first really big market signal that something was very wrong was later on in the year when new derivatives products in lower-quality mortgage securities were introduced. Almost immediately many investors starting using these derivatives to short, meaning to bet on a decline in housing prices and mortgage values. That's a dead giveaway. The new products made it cheap for investors to short when it was hard to short before. The value of the derivatives index fell sharply.

While derivatives market pricing seemed very distorted relative to what was going on in cash [securitization] markets, where values did not fall sharply, it

turns out the derivatives market wasn't so distorted, but it was the actual securities markets that were not reacting correctly.

In the first few months of 2007, there was a lot of bumpiness in equity markets giving the first real sign of serious market volatility that was broader than just in low-quality mortgages.

Increasingly, it became clear there were losses mounting. A few investment funds took big markdowns in April. In May and June, two large mortgage-related hedge funds managed by Bear Stearns collapsed. Over the course of late June into July, there were significant dislocations in corporate credit markets, securitizations, collateralized loan obligations, and so forth, and a bunch of arbitrage Desks, who arbitrage differences between equity and corporate bond pricing, lost quite a lot of money because of liquidity problems.

By the time we got to August 2007—which many consider the start of the crisis—the pressures had been building for some time.

The shock that tipped over money markets was a little like the straw that broke the camel's back: It was an announcement from BNP Paribas that they could not price certain investment funds holding US mortgages. But in reality, that announcement was just the latest in a series of pieces of bad news and the confirmation of negative price shocks. I have no explanation for why that particular announcement tipped the market over.

One other piece of information that you could not see in prices, but that we were aware of, was increasing concern in the dealer-intermediated commercial paper markets throughout the month of July. These concerns were not seen in commercial paper interest rates or pricing, but the people who were intermediating those markets and placing commercial paper on behalf of companies noted a large decline in demand for commercial paper, particularly asset-based commercial paper which might be exposed to mortgage risk.

YPFS: **Isn't that interesting that these concerns didn't translate into the pricing? How odd was that?**

Mosser: This is one of the interesting differences across markets. Because commercial paper is basically a short-term bond, right? It's short-term corporate debt and, like all corporate debt markets, commercial paper is a principal-intermediated market: The financial institutions that facilitate the issuance of CP take a security on their books and then sell it off to customers over time. These dealers basically stand ready to sit in the middle of a market; they are not just agents matching buyers and sellers, they actually are both buyers and sellers sitting in the middle.

Bond markets, for the most part, work this way. (Equity markets typically do not.) People in that business are paid pretty handsomely for taking the risk of sitting in the middle between everybody else. As part of that business they, up to a point, view it as their job to make those markets run more smoothly, because if it's really, really bumpy, they would in the long run make less money. For example, if CP is a little bit cheap because customers aren't buying or there is excess supply on a given day, the dealer will then buy a little bit more on the odds the market is going to recover—if not tomorrow, then in a few days, and then they would sell the excess CP back into the market at a higher price. Part of the job, at the margin, is to do a certain amount of arbitrage in the market—that's market-making.

My guess is that the largest dealers in commercial paper markets in July 2007 bought up excess supply for some time until they realized it was way too many days or weeks of excess supply, and the demand was just not coming back. It couldn't be seen in the prices or interest rates on commercial paper, because the dealers were doing what they thought was the right thing, which was taking up a little extra slack to keep the markets orderly and prices stable. Until one day they said, "Okay, that's it; I can't take any more risk and put more CP in my portfolio." While I can't be certain that this is exactly what happened, the market intelligence we received at the time suggested that it was. And with dealers' holding high inventories of commercial paper, all it took was a couple of additional shocks, including the announcement from BNP Paribas in early August, and dealers stopped buying up the excess supply. By refusing to purchase more paper as dealer, and perhaps dumping some of the excess, prices fell sharply, interest rates went up, and quantity of commercial paper fell. That's my hypothesis.

YPFS: **At what point did the Fed realize conventional tools might not be enough to stabilize the financial system?**

Mosser: The Fed and others in the financial policy world in New York and Washington were perfectly well aware of the limitations of the Federal Reserve to provide liquidity to the entire financial system. It didn't take a genius to know that only about one-third of the US financial system had direct access to the Federal Reserve for lender of last resort. That, combined with the restrictions on the type of collateral that the Fed could take in repo operations, meant that the Fed's ability to lend broadly across the financial system was very limited. Over the years, the Fed did quite a lot of internal work assessing its lender-of-last-resort capacity. It was measurable and well-known. In fact, there were interagency exercises done. Hank Paulson has referred to this on several occasions. When he went into the Treasury, he used the President's Working Group to do some cross-agency work on what could be done in a crisis. If the massive loss and liquidity needs were somewhere else (not commercial banks), the only way the Federal Reserve could lend would be to invoke Section 13(3) of the Federal Reserve Act, which is exactly what they did when

Bear Stearns failed. That was the point when the Fed started lending, in repo markets, against risky collateral.

YPFS: That being known, clearly people didn't think there was much of a risk.

Mosser: People certainly knew this; there were people who had thought about it and, indeed internally, we did some analysis before '07. There were designs of potential emergency lending facilities on pieces of paper, conceptual designs, but nothing was done to actually implement those designs. The examples I remember were how to lend to the broader financial system against risky collateral. That's 13(3) lending. The other was a set of work that had been going on for some time about how to best manage liquidity needs by global banks in currencies that are not their home currency. We had actually used swap lines before, following 9/11 with the ECB, so we knew that swap lines with central banks was one possibility for doing it. But there were a few other ideas like allowing reciprocity of collateral at different central banks. If your collateral is in the wrong place from where you needed your funding was sort of the problem that people were concerned about.

There were work teams and even some international work thinking through international liquidity provision, but none of it was implemented at that stage. The problem was not a lack of imagination about thinking what could go wrong; it was either not enough urgency or not enough hours in the day to actually put together a fully formed emergency facility that might be ready to truly pick up and operationalize off the shelf.

One reason for the lack of urgency was that in previous disruptions, when liquidity had been needed, one of the things the Fed had observed (and it happened in this crisis too) is that when other markets are disrupted, everybody goes to the banks for liquidity, because many lending arrangements (for example, commercial paper) have backup lines at the banks. The banks, on rare occasions, then come to the Fed and borrow. If you can stop the negative liquidity dynamics by doing that, then the banking system is still big enough to be the core liquidity provider to the rest of the financial system, and then they can come to the Fed. That was sort of the mantra, and it had worked on a couple of occasions in the past (for example after the collapse of the hedge fund LTCM in 1998), though not for crises the size of this one. If the size of the shock and the size of the liquidity needs had been smaller, then perhaps that model could've worked again. It could have stopped this downward spiral, and the liquidity hoarding that occurred market by market. But this crisis was just too big. There was just too much leverage, there was too much risk, and it was spread way too broadly for that past experience to be relevant.

YPFS: Was it known at this point just how big this crisis was?

Mosser: No. I can tell you what my view was. I was looking at the situation and saying, "This is going to be a complete mess. The big banks are going to lose a ton of money. Fannie and Freddie are going to lose a ton of money. It's going to be very ugly for about six months. It'll probably cause a recession." I did not think it was going to be the 1930s and a global financial collapse, but that's what we got.

The destruction of wealth from the tech bubble was as big as this. But there was no comparison in terms of the amount of leverage, no comparison in terms of the breadth of impact on the real economy, because this collapse was focused in household debt and household assets, not stock market losses that are concentrated in a very different part of the economy and among the wealthy. The tech bubble caused a recession. It caused big, big, big problems in the corporate bond market where there is a lot more leverage, and there were spillover effects, but that could be managed through stereotypical tools because, overall, the leverage just wasn't that much.

This crisis may have seen the same amount of wealth lost, but with orders of magnitude more leverage, both in the real sector—meaning households—and in the financial sector. So that when asset prices began to drop, everyone who had borrowed to invest in that asset (a house or a mortgage) suffered much larger losses. It was not appreciated how much massive hidden leverage there was and how much larger that leverage was than the experiences of the previous, say, 20 or 30 years.

YPFS: **At the start of all these disruptive liquidity events, you would expect the financial institutions to come to the discount window, but they did not.**

Mosser: They did not. It was actually expected that they would be reluctant to come. The Fed discount window has been heavily stigmatized for a long time. It had a long history of intentionally stigmatizing itself. Until the early 2000s, the discount window didn't attach a penalty rate. The discount rate was below the federal funds rate. It was cheaper to borrow from the window, but if you came, you were subject to lots and lots of additional regulatory scrutiny. And you had to justify why you needed to borrow and reveal exactly what you were going to use it for. To use it to improve liquidity positions, so that short-term interest rates were less volatile in the market, was not a rationale that was taken.

The Fed saw the error of its ways in the '90s. By the early 2000s, it had completely revamped the discount window into a much more traditional standing central bank facility which is priced at a penalty rate, meaning above the federal funds rate—above a typical market rate. You came in at the end of the day, and you had collateral, and no questions were asked.

But memories are long, and it really didn't matter. There were many times before the crisis, when at the end of the day banks would end up paying

exorbitant rates to borrow reserves overnight from another bank just because they made a mistake that day, and they were a little short of cash. Those should have been moments when banks would be calling up their Federal Reserve Bank at 4:00 in the afternoon and saying, "Okay, I need to borrow $25 million from the window. Because of a small mistake, I'm short today." Banks did not do this.

Europe is different. If this were the European Central Bank, a European bank would've been at the ECB in a heartbeat, no problem. There was no stigma associated with it. The ECB has a very similar facility, and it is amazingly unstigmatized and remains so to this day, partly because they invented the whole monetary policy and operational system from scratch in 1999 and didn't have a history of stigma. The Fed did not have that, and we knew it. It was really obvious, even when the liquidity problems were becoming systemic in August '07, there wasn't one firm at the end of the day coming in. Even when everyone has the same problem, no bank wanted to be first.

A few of the big banks came in on a token basis in August, at the encouragement of the Fed. They borrowed a little bit, and said, "Everybody who needs to, should be borrowing, but we don't need it." It made the stigma worse.

It was known that stigma was a problem. Back when Treasuries were getting short and the US government was running surpluses in the late '90s, the Fed published a white paper about how it could provide liquidity to the market through the discount window by running an auction of discount window credit instead of a standing facility.

The staff who had written that 1990s paper were still working at the Federal Reserve. They remembered the paper, and immediately it was obvious that it could work, with some changes, as a lender-of-last-resort facility for a systemic crisis. They and others set about figuring out how to adapt it. The idea was to get all banks to come in, bid on the same day in a competitive auction, then the auction determines the rate they borrow at. The Fed doesn't tell the banks the rate, the banks tell the Fed, and everyone has safety in numbers in coming in to bid. They could pick a really low rate if they weren't anxious for the funds, or higher if they were. That will give everybody cover, and it should work to reduce stigma. The facility was set up so banks had to wait a couple of days to get funding, unlike the discount window where you needed the cash at 5 p.m. the same day. The banks were bidding for longer term funding, not just an overnight loan. The facility became the Term Auction Facility, or TAF.

The facility had never been implemented in the 1990s, only proposed on a piece of paper. So, creating the TAF required implementing a new facility from scratch and across the entire Fed system. The discount window was in all 12

Reserve Banks. They all do their own lending, so this operation involved every Federal Reserve Bank to run. The TAF was very complicated to do, actually.

YPFS: Did it work as expected?

Mosser: It worked. It was the very first emergency facility. As I said, they tried to encourage the people to come to the discount window by having the biggest guys do it, and it didn't work. No one touched it. But many banks immediately came into the TAF, and it was second largest facility the Fed created.

Then, too, the foreign banks, particularly the European banks, were facing a significantly larger shortage of dollars than the US banks. That makes sense because foreign banks don't have a US deposit base to rely on, and so they have to borrow US dollars from someone else. Often, that funding would come via a US bank or a US securities firm. But when the usual US lenders are worried about their own liquidity, they're certainly not going to go out of their way to lend out extra funds. If anything, they're going to reduce the amount they lend, and that's what happened.

The European banks, which had sizable, financial businesses in US dollars all around the globe were scrambling around for dollars in those days. Term funding beyond a day was increasingly hard to get over the course of Fall 2007. For that reason, preliminary conversations about the idea of instituting swap lines again began informally as early as August '07, and more formally in September.

In the end what was decided, by the policy makers here and in Europe, was to do TAF and the swap lines together at the same time. That coordination persisted for the rest of the crisis. My personal view was that coordination was extremely important and made both lending facilities more effective. The combination of TAF and the swaps provided dollar liquidity in the US to banks and to the ECB and the Swiss National Bank to distribute to their banks. All the operations happened within a single 24-hour-period, and all the cash was disbursed two days later. It was surprisingly highly coordinated, even though the details of the operations, central bank by central bank, were slightly different.

One additional note about the swap lines: They became the largest single lending program done by the Federal Reserve in the 2007–09 crisis. There were 14 central banks eligible to borrow, and eventually 10 central banks—Australia, Denmark, Japan, Korea, Mexico, Norway, Sweden, and UK in addition to the ECB and Switzerland—used the swap lines regularly to provide US dollar funding to financial institutions, particularly banks, in their jurisdictions. The structure of the original swap lines was adjusted several times and countries were added as the crisis deepened. The size and scope of the lines very much reflects the unique role of the US dollar in the global

financial system. A financial crisis in the US caused, and in the future will again cause, a *global* liquidity shortage. In fact, the shortage of dollar funding inside the US was significantly smaller than the shortage of funding outside the US.

The good news is the central banks, including the Fed, recognized this immediately, and so from the beginning the international cooperation among the central banks on swap lines was unprecedented. At the height of the crisis in the fall of 2008, the need for US dollar funding was so vast that the five central banks who are home jurisdictions to the largest global banks essentially made their US dollar lending unlimited. The Fed vastly expanded the potential size of TAF auctions at the same time that the Fed's swap lines with the European Central Bank, the Bank of England, the Swiss National Bank and the Bank of Japan were changed to full-allotment tenders, with lending limited only by the ability of banks in those jurisdictions to post appropriate collateral to their central bank. All five central banks used the same US dollar interest rate in their dollar lending operations; all their operations had the same maturity. The three central banks in Europe even coordinated the timing of the bids in their lending operations to close at the same moment. All five central banks settled the dollar lending transactions on the same day so that global financial system would receive liquidity injections at the same time. All changes to the lines were announced via joint press releases from all the central banks. The message of this close coordination was clear: This is a global crisis. And so central banks adopted, to the extent possible, a global policy stance.

YPFS: **Could you tell who was coming into those auctions?**

Mosser: We could tell in the U.S who was coming into the TAF. It was all eventually made public because Congress insisted. That is unfortunate because it's now made the problem of stigma even worse for the future. The Fed had never released the names of who borrowed before. Total borrowing was reported weekly by Federal Reserve district. That was one reason banks never wanted to come in as a one-off because then one district would show an increase in discount window lending, and then everybody would start to speculate, "Oh, which bank did that?" It was another reason the window was stigmatized. Now, if you come in and either do TAF or borrow from the window, your name and the amount is published two years later. That's a requirement from Dodd-Frank. It was considered highly confidential data at the time. And now for two years it still is highly confidential.

YPFS: **What about the European banks?**

Mosser: We do not know specifically who borrowed from the other central banks who eventually had swap lines, including those in Europe. We sometimes received informal information about borrowers from conversations with other central banks, but there was no reason for counterparty information of other central

banks to be the Fed's concern. If you think about it, when the FOMC set up the swap lines, one of the advantages of them, from the Federal Reserve's standpoint, was from a counterparty risk perspective. The Fed didn't have any direct risk exposure to the banks who borrowed from the other central banks, so the Fed didn't need information on who they were.

Effectively, with the swap lines, the Federal Reserve would lend dollars and receive foreign currency from the foreign central bank in return. The amount of dollars was determined by how large the auction was that the foreign central bank was doing. For example, the Fed would lend dollars to the ECB, who would on-lend the dollars to their banks who had bid. The ECB would post euros in the Fed's account at the ECB. The Fed didn't draw on those euros. It didn't use them. It didn't put them in the market. When the loan was done, the ECB received the dollars from its banks with interest. The ECB then sent the dollars back to the Fed, and the Fed gave the ECB back its euros. That's the way the transaction worked.

A foreign exchange trader would tell you that a commercial FX swap transaction is quite different. The lender of dollars would receive euros and then go out and do something in the market with them. But the central banks swaps did not to that. In the central bank liquidity swaps, the foreign currency provided to the Fed by foreign central banks is more akin to collateral.

The risk of the swaps for the Fed was sovereign risk. It was the risk that the other central bank would not pay them back, and they would have to take permanent possession of the foreign currency. But that required a default on the part of the other central bank

YPFS: **Was there any concern that that would happen?**

Mosser: The Fed was very, very careful in choosing central banks. Ultimately, as the crisis progressed and became truly global, the shortage of US dollar funding for the rest of the world became very acute. In response, the FOMC expanded swap lines to 14 central banks around the globe, including four emerging market central banks. In most cases, these other countries were collateral damage in the global crisis, particularly the emerging economies. They didn't own US subprime mortgages. But they had very open economies, did a lot of international trade (much of it conducted in US dollars), and so they were dependent on funding their businesses and their financial markets in US dollars. They got smacked around by the dollar liquidity crisis, particularly in the fall of 2008 after the failure of Lehman, and ended up very short of dollars.

Korea is a great example of that. In the fall of 2008, Korea's currency was effectively in a "run" as banks, investors, and companies scrambled to sell Korean won for US dollars, even though the Korean economy and financial system had been strong just a few months earlier. The exchange rate collapsed,

foreign capital flows had a sudden stop, and the financial system and economy were under extreme stress. The Bank of Korea first lent out its US dollar foreign exchange reserves to its financial system to slow down the collapse, but the swap line with the Fed was important, not only for the dollars it provided, but particularly because it signaled clearly that the problem was a global financial crisis, not anything specific about Korea.

In choosing which central banks to have swap lines with, one of the several considerations for the FOMC was the stability of the macroeconomic policy and general medium- and long-term health of the economy. The stronger the economy and policy were, then the probability that the central bank might actually not pay you back was infinitesimal. Those countries which were in dire fiscal straits were told no. I'll give you a public case. Iceland came and asked for a swap line and the Fed said, "No, we are not the IMF. You need to talk to the IMF." If there is a potential for a significant sovereign default, a liquidity swap line from another central bank is not going to cut the mustard.

YPFS: **And the IMF had always played that role previously?**

Mosser: They have. When people ask me what's the difference between IMF providing liquidity, it's interesting. The IMF now has a standing facility that is "no questions asked," that you sign up for in advance, but the criteria is really similar to the Fed criteria. The difficulty they have is stigma. Because of the IMF's history of lending to troubled countries, their lending has stigma associated with it too. They have been trying to separate out different types of lending facilities to reduce stigma. One type of lending the IMF does is for troubled countries, and those loans come with requirements to pursue certain macroeconomic policies. The "no questions asked" lending facility is different and requires countries to already have stable economies and economic policies. A second important difference is that the IMF doesn't have enough dollars, or any other currency for that matter, to lend to big countries. They are not a central bank and so cannot expand their balance sheet as needed to provide funding. So, most of the IMF's "no questions asked" lending is to smaller countries.

The programs I mentioned, the TAF and swap lines, ended up being introduced together in early December of 2007. They immediately seemed to narrow lending spreads both abroad and in the US. There's a question about whether they were big enough. Certainly, it would have been better if they would've been implemented sooner. Between August and December 2007, the liquidity stresses, particularly in dollar markets, grew significantly worse. Spreads were larger, and the ability for a financial company to borrow for three months rather than one week eventually went away. The terms at which you could borrow short-term, whether it was through a wholesale deposit, whether it was through commercial paper, whether it was through repos for that matter, was nearly all overnight by the end of 2007. Therefore, the run risk in the

financial system increased significantly between August and December, even though the economy didn't look that bad and the stock market didn't really start to turn down till toward the end of the year.

I don't think anybody I worked with was under the impression that we had this under control in the fall of 2007. Things were deteriorating, financially and in the economy, but they were deteriorating slowly. Unfortunately, the time to implement new programs, in some cases, took a while. It is important to remember that these tools hadn't been tested except perhaps in a small size for a really short time period, such as after 9/11 with the ECB swap line. If you're a policy maker, do you want to go out proactively with a tool that's not very well tested when you're not sure conditions are that bad? You might be pretty sure it's going to work, and your staff is sure it's going to work, but you have actually never tested the thing. The risk is high. Of course, hindsight is 20/20, and we should have been better prepared. The biggest lesson of this is to have more of this stuff sitting on the shelf and to go out and test it even if you're not going to use it right away.

I will say to their credit that the markets group at the Federal Reserve tests a lot of things they don't use now, but they tend to be monetary policy tools and not lender-of-last-resort tools. One of the things that Bill English and I—in our paper—urge the Fed to do, is more testing of these tools.[3] Explain publicly this doesn't mean anything about policy, and you're just trying something out, and you want to test it and make sure it works. They haven't done a TAF operation since 2010. That's a long time not to use a tool.

YPFS: **But how do you use it or test a facility without alarming people?**

Mosser: You do it the best you can. But explain it very forthrightly and very publicly. Say: "This means nothing about policy. We're going to put liquidity in the system. We're going to ask people to come in and bid—for tiny amounts by the way. We encourage everybody to come in and do this, because the day you need it, you're going to need it. And so, come in, and we're going to lend to you." The Fed does not need to put liquidity into the system right now. There are excess reserves coming out of everybody's ears, but they are doing monetary policy operations every now and again for very small amounts just to test that they could do it—small test operations. They announce them, and they put them in the operational statement at the end of the FOMC meeting when they say they're going to do this. They have a standard line along the lines of: This means nothing about current policy; this is prudent risk management to test the tools that we have not used in a while because, at some

[3] English, William B., and Patricia C. Mosser. 2020. "The Use and Effectiveness of Conventional Liquidity Tools Early in the Financial Crisis." In *First Responders: Inside the U.S. Strategy for Fighting the 2007–2009 Global Financial Crisis*, edited by Ben S. Bernanke, Timothy F. Geithner, and Henry M. Paulson, Jr., with J. Nellie Liang, 49–81. New Haven: Yale University Press.

point in the distant future, we may need this tool. That's basically what they say and it's not a big deal. They test the swap lines, too, even when other countries don't need the dollars.

YPFS: Have people been busy creating new tools that are sitting on the shelf?

Mosser: I don't know if they are. Not publicly. The Fed has created new tools to manage their large balance sheet. I'm guessing for the last few years that has very heavily dominated what they are doing in terms of new tools. And an example of this is the reverse repo facility to help make sure that with a very large sheet they can actually control the federal funds rate above zero. That's a big deal. That's a real-world, today problem.

I do know what I have read about the Fed's test operations—for example, testing swap lines and testing open market operations. The Open Market Desk has occasionally bought and sold agency MBS in tiny amounts to prove they can. The Fed has not bought agency MBS in size since QE finished, but they want to test to make sure they can do it. If anything was going to rattle financial markets, it would be: "Oh, the Fed's actually buying agency mortgage-backed securities again? They haven't bought those in six or seven years." But they are just testing that they could do it if they had to, and they buy infinitesimal amounts—really small amounts. I know they're doing those things. I don't know if they are privately developing or testing anything else that isn't public. Obviously, I'm not privy to that.

YPFS: Can you talk specifically about the Bear Stearns case? At what point did that become a big issue and how did the Fed decide to invoke emergency authority to lend to that firm?

Mosser: The distress in markets, particularly repo markets, started in February 2008. Reduced funding in repo was not only to Bear Stearns, but Bear Stearns was the least well capitalized securities firm and most concentrated in mortgage products, and that had been true for a very long time. If there was someone who was going to be run, and particularly if the run was associated with housing losses, Bear Stearns was by far and away the most vulnerable. That was common knowledge. It wasn't a surprise that when repo followed asset-backed commercial paper (ABCP) in the sort of second pullback of liquidity, that the first thing that happened there is: "let's get away from doing any repo at all on anything that looks like risky mortgage collateral."

Money market investors, like money market mutual funds, buy repurchase agreements as assets, but in normal times they weren't incredibly picky about their counterparties or the collateral backing the repo. But once mortgage quality deteriorated and large firms took losses, money funds started to look closely at what they had signed up for in the triparty repo platform. For example, they scrutinized borrowers who gave them non-agency mortgage-

backed securities as collateral for repo operations. And either quickly or slowly, they rejected either the borrowers or taking mortgage collateral in repo.

That was a problem for a company like Bear that was heavily mortgage concentrated. In addition to that, Bear was facing significant loses on its balance sheet. For those who would still take collateral from Bear, they were asking for much higher haircuts because people were very uncertain about the value. And mortgage collateral was a larger proportion of their balance sheet than the other investment banks. My understanding is that they had a Treasury book, but they likely would have been selling higher quality assets like Treasuries simply because they had to cover their losses leading up to this. That was probably going on for a while. The investment banks are famous for deleveraging in this sort of environment, and I'm sure that Bear was doing that in 2007 and early 2008. They didn't have a lot of great high-quality collateral that could go into repo anymore. All of a sudden, money market investors started looking at Bear and saying, "Wait a minute. I don't care what your collateral is. You're risky enough now that I don't want your collateral. I don't want to lend to you period." Risk management in money fund investing is, ultimately, to run. You start by asking for more collateral and shortening up the term, but eventually you just walk away. That is your risk management, and that's what happened. They walked away from Bear.

Starting in the beginning of February, and certainly by the end of February, there was a run going on in repo markets. They were pulling back from everyone, but Bear was going to be the first to go. In mid-March, Bear Stearns came to ask for an emergency loan from the Fed because they were going to have to declare bankruptcy. About a week and a half before that, the Fed announced it was contemplating a new liquidity facility. I don't think it had a name yet, but it became the Term Securities Lending Facility [TSLF]. It was going to be a facility that would lend out the Fed's Treasury portfolio for lower quality collateral at a significant haircut. In essence it would exchange higher quality assets for lower quality assets.

The Fed announced that they were considering a few facilities, but because they'd never done it operationally before, it was interesting how the Desk decided to handle it. The Desk's Treasury staff actually went out quietly and spoke to the two clearing banks who ran triparty repo platforms used by nearly all dealers and banks. The Desk discussed how to use the triparty system to do riskier securities lending through them. The Desk did some securities lending through their clearing banks, which were BoNY [Bank of New York Mellon] and [JPMorgan] Chase at the time. The Desk wanted to know if they could do it for term. The Desk had staff investigating the operational angle of a new facility before a formal announcement about the terms and before the failure of Bear. The reaction in financial markets to those pre-Bear efforts was very quiet. It was noted, but it didn't raise any red flags in the

markets. The TSLF was underway for about a week and a half or two weeks before Bear Stearns failed.

So, in short, were we worried about it? You bet. In addition to the TSLF planning, during the same timeframe, the Fed used its traditional open market authority—which required checking with the FOMC, asking for a change in the authorization, and the chairman's permission—to conduct repo operations just as we do for monetary policy, but with important changes. Repos would be for term and against agency mortgage-backed securities collateral. It was called the Single-Tranche Repo Program, and it conducted one-month lending operations done through the primary dealers. The large securities firms—some of them parts of banks, some of them standalones—would come in and bid. They would pledge just mortgage-backed securities. The Fed would lend to them at whatever the auction rate was for a month. They built the program up from $20 billion a month to a maximum size of $80 billion. That started before Bear Stearns came in as well, and it was aimed specifically at the repo market run that preceded Bear Stearns failure.

Because of the rules about open market operations and the laws governing the Fed, the Desk could not take high-risk mortgage-backed securities—private-label mortgage-backed securities—in the single tranche operation. The Federal Reserve Act has a list of what the Federal Reserve can buy and sell. It's a very short list. Sovereign bonds, sovereign agency bonds, foreign exchange, and a couple of early 20th century 'dogs-and-cats' assets that basically no one uses anymore. That's it.

So, if you can buy and sell an agency mortgage-backed security—a Fannie or a Freddie mortgage-backed security—then they can definitely repo it out, because a repo is a purchase of asset combined with a sale on a future date. Under normal circumstances, the Fed cannot do repo with a private-label security of any kind, not a corporate bond, not an equity, not a mortgage-backed security that isn't issued by a government agency. The repo program I mentioned could only do this against agency mortgage-backed securities collateral. But honestly, anything that had mortgage on it at that point was pretty distressed. So, the program helped. It wasn't a massive help, but at least it helped. Everybody knew there was not just a problem with Bear Stearns, but there was a systemic problem in the repo market in the weeks leading up to Bear Stearns demise.

YPFS: **How much was the Fed involved in finding an acquirer for Bear Stearns?**

Mosser: I was not involved in those conversations. That is a question that you'd have to ask someone like Tim Geithner or Meg McConnell because they were part of those conversations. The Fed—and this required a vote of the Federal Reserve Board, not the FOMC—decided to make an over-the-weekend loan to Bear Stearns against a certain set of assets. The Fed Board had to invoke Section

13(3) of the Federal Reserve Act, which allows the Fed to lend to nonbanks against risky collateral, but only in "unusual and exigent circumstances." That decision was, of course, contingent on the fact that Fed staff had to go in and look at the collateral, and so the FRBNY gathered up people to go evaluate the collateral. At the discount window, banks all pre-pledge collateral. We know what it is. The discount window staff would have analyzed it already. They would have figured out the haircuts, and they would know what they were dealing with. And the Fed regulated banks, so it would have had information on their financial health and risk.

With Bear, the Fed has none of that. We'd never seen their collateral. The Fed didn't regulate them. Previously, the Fed had no authority to look at their books. They had never pre-pledged any risky collateral to the FRBNY discount window because they weren't allowed to borrow.

At some point over the weekend of March 14-16, the conversation turned from looking at the assets as collateral to the solvency of the firm. The Fed was going to eventually need somebody to take the first-loss position in front of it when it became clear that the needed lending was likely to be more than an over-the-weekend loan. The eventual outcome of that was the creation of the first "Maiden Lane" special purpose vehicle [SPV], which held legacy Bear Stearns assets, financed with equity/first-loss from JPMorgan Chase and lending from the FRBNY.

While the discount window was deeply involved in evaluating Bear's collateral and size of the loan, the rest of the Open Market Desk was more focused on the systemic problem. Regardless of what happened to Bear, either bankruptcy or distressed purchase, all of the security firms and the repo market in general needed a discount window facility immediately. And so, they created one, in about 36 hours. It was called the Primary Dealer Credit Facility [PDCF]. It was created over the weekend of March 14–16. Notably, the Term Securities Lending Facility was also announced that week but wasn't implemented for another week.

YPFS: **How critical was the Bear Stearns acquisition to either quieting things down or changing the pace of the deterioration?**

Mosser: It mattered, but Fed liquidity to the financial system was more important. If the PDCF and TSLF had not been done, the fear was that Bear acquisition wouldn't have done much to calm things down because everybody knew that all of the investment banks, and in particular the standalone investment banks, were being run on. They had no access to central bank liquidity, and their primary short-term funding source, repo, had been in a run for about two and half or three weeks. They were all incredibly vulnerable. It was clear Lehman was the next weakest, Merrill was the next weakest after that, then Morgan Stanley, and then Goldman Sachs. All you had to do was look at their balance

sheets, 10Ks, how much liquidity they had, and the quality of their assets to figure it out.

The great fear was that even if you resolved Bear, the run would continue. If you didn't have some sort of an immediately available standing liquidity facility for the other investment banks, Lehman would be run out of existence in a couple of days, and the others would follow within days or weeks. All of a sudden, you would have lost this enormous section of the US financial system. The PDCF was designed to forestall that, and it did. At least temporarily.

It was understood that the next weakest balance sheet, and therefore the one most susceptible to losing funding, was Lehman. But, if you looked at the concentration of mortgage exposure of US financial institutions—and for a moment you abstracted from banks versus nonbanks—there were many other distressed firms: WaMu, Countrywide, Fannie, Freddie, and down the list. The difference between those firms and the securities firms is that they had retail deposit funding with FDIC insurance and access to the window—or, in the case of Fannie and Freddie, their liabilities were implicitly guaranteed by the government, so they were not run on in the same way yet. Eventually, they were run on of course, but it took much longer. Access to the safety net and central bank liquidity matters a lot.

There was no lender of last resort for the large security firms. That was a problem that was identified, as I have said before, in exercises that had been done in previous years. Quite some time before the crisis, the Federal Reserve was noting the risk of a run against particularly large securities firms, who had lots of short-term financing and lots of long-term assets on their books—that's their business model—but with no deposit insurance, no access to lender of last resort. It was understood that if that type of run would happen, the only way the Federal Reserve could lend to them would be to invoke 13(3), and that's exactly what they had to do.

YPFS: **It seems a failure in our system that the investment banks' regulator didn't have any lender-of-last-resort capabilities.**

Mosser: The United States is extremely peculiar. This is a legal/regulatory structure problem. It is different from the vast majority of countries, certainly large, advanced countries with international dealer banks—those firms that make global capital flow go. Except for the US, countries all have universal banking models, which means you'll have different subsidiaries, one focused on retail, one focused on investment banking, etc. The European model works like this. Japan works like this. The retail deposit subsidiary has deposit insurance, just like the United States. The difference is that the entire company has access to a lender of last resort. It doesn't matter whether the asset sits in the retail bank or in the investment bank; it's a single entity. But in the United States, only the deposit-taking bank subsidiary, not the bank holding company, has access to

the discount window. This meant that 60% of Citigroup didn't have access to the discount window either, because they were not a bank. When I say bank, I mean commercial banking entity, commercial banking charter. JPMorgan was half and half, bank-nonbank, probably, before the crisis. Wells is mostly bank. Bank of America is probably 60% bank, 40% dealer. Something like that. It's crazy. You can have the same asset, the same identical asset, sitting in the bank at Bank of America versus sitting in the broker-dealer Bank of America, and only the bank side can approach the window and borrow using that asset as collateral. It's a legal restriction, quite nonsensical, and very damaging in a systemic crisis.

YPFS: That remains the case after reform?

Mosser: It's not fixed at all. Dodd-Frank didn't touch it and didn't even try to. Dodd-Frank tried to fix it from an umbrella regulatory standpoint. You know this whole SIFI [systemically important financial institution] thing. If you're a SIFI, the Fed gets to regulate you, but it doesn't change lender of last resort. It simply says that if you have a securities arm and the securities arm is too risky, such as short-term borrowing against too risky long-term assets, your regulator ought to make you fix that because you have a bigger risk of being run on if the value of the assets goes down.

It is true that the SEC was and still is the securities firm regulators, but it didn't really look that closely at this problem. There have been regulatory changes. If you're really big and you're an investment bank, then you're given to the Fed to be regulated—like Goldman Sachs and Morgan Stanley. But, in the event, it's not going to be helpful, because if there was a financial crisis tomorrow, Goldman Sachs' bank is still very small, and so the vast majority of the firm does not have access to the discount window.

YPFS: It's an interesting picture you've painted of Tim Geithner meeting with officials over the weekend that Bear went under and not having a clue what was on their books.

Mosser: Yes. The Fed had no regulatory relationship with Bear Stearns whatsoever. They were a primary dealer. We knew their Treasury book and their mortgage-backed securities collateral book for agencies because we transacted for monetary policy purposes with them. The Fed had no regulatory oversight over them whatsoever. We had no ability to go in and look at anything else in their books. We had no ability to get them to change their behavior, or take less risk, or anything. That was the SEC's job.

YPFS: How prepared was the Fed to adapt to this crisis at this stage?

Mosser: Not well enough. Immediately after the PDCF was started, the first thing that the Fed did, with the SEC's permission, was to send staff on a temporary basis

into all of the large investment banks. The rationale for that legally was that the Fed needed to understand them as counterparties. If we're responsible for lending to these folks and we don't regulate them, then we needed to know what quality collateral they could pledge to us so we could haircut it appropriately. We also needed to understand their liquidity positions, so we could understand how much default risk the Federal Reserve—on behalf of the United States government—was taking. No one would really argue with that logic. Effectively, the Fed sent teams of supervisors into the firms.

YPFS: **Did they have the staff to do that, or did they have to hire people, bring in people?**

Mosser: They pulled senior experienced staff out of other places. At the New York Fed, a number of people from our research area were tapped, some people from our supervision area were reassigned, and at least two people from my staff went. They just got moved. We lost them for a number of months. Now at the same time, we were hiring. During the financial crisis, the NY Fed hired a bunch of very good people, some who had quit their jobs and wanted to do public service and others who lost their jobs because the losses were so big at some companies. It was helpful to have more people with expertise in these markets to join the bank, but they weren't immediately assigned to analyze the investment banks. In some cases, they back-filled positions of those who had been reassigned.

YPFS: **And then six months later Lehman emerges as a problem.**

Mosser: It does. In the interim, there was another run over the summer, on Fannie and Freddie. They were always very undercapitalized. They had been criticized for years, and lots of papers were written and speeches given—several by Alan Greenspan—about how they represented a systemic risk. It was clear that they were grossly undercapitalized and were probably insolvent by July, but this sort of aura of being a government agency lasted until sometime in July 2008, and then there started to be a run.

They were heavily, heavily, heavily dependent on short-term debt. They borrowed massive amounts to buy back their own securities to hold in an investment portfolio. They had long-term, 30-year mortgage-backed securities on one side and overnight borrowing that was considered, prior to the crisis, almost sovereign debt, almost like Treasury bills, on the other side. People just started running away from agency short-term debt in July, and they couldn't fund themselves. The losses kept mounting.

Eventually, the Treasury Department made the decision in late August or early September to put them into conservatorship. That was a signal of how bad and how widespread the pullback in financing mortgages had gotten, because Fannie and Freddie largely speaking didn't have huge quantities of subprime

mortgages. They had mostly prime mortgages, meaning higher quality household credit scores, but they had taken a lot of mortgages that had very small down payments. House prices were falling sharply at this point. Even if it looked as if you were a good borrower, your mortgage was probably underwater. The economy was slowing down, and once people began losing their jobs, even prime mortgages were going to suffer significant losses. The forecast was dire.

That's an important backstory for Lehman. Once Bear Stearns was gone, Lehman was known to be the weakest investment bank. They struggled to keep their liquidity intact, but the continued decline in real estate prices was just devastating for them. In their case, they were heavily exposed to commercial as well as residential real estate. The commercial real estate collapse happened a little later, but eventually it too suffered large losses. For some time, there were conversations of trying to find an acquirer for Lehman, trying to do a partial buyout of a troubled firm, perhaps with some lending from the Fed. Tim Geithner's book explains this as well as anything.[4] I was not part of those conversations, but I certainly knew that Lehman was an active borrower from the TSLF, the PDCF, and so forth.

The more troubling problem, and at the time more surprising (in part because it came with a much shorter fuse), was AIG. In the days leading up to what everyone calls Lehman weekend, the rumors and the market intelligence we were receiving in the markets about AIG was quite troubling. AIG was an insurance company. They had zero relationship with the Federal Reserve. We had no idea, other than their public 10Ks, what their books were, what their liquidity position was, and so forth. They had raised a bunch of capital in the market in June, about $25 billion. It was still rated triple A until September.

From the Fed's perspective, they were very opaque. They hadn't borrowed from the Fed at all. There may have been some form of conversations between their senior executives and some at the FRBNY in late August, but I wasn't privy to that. What I was privy to was taking a meeting with them on Friday afternoon, September 12th, before Lehman weekend. A group of executives from AIG came over to the FRBNY. I met them along with a senior manager from bank supervision, who I asked to come along because I was concerned where the conversation was going to go given the market rumors. I thought it was probably better that somebody who had regulatory experience was in the room. They didn't object, even though the Fed wasn't their regulator.

They admitted at that point that they were going to be downgraded on Monday and that the cash withdrawals they would face due to collateral calls, largely on derivative and securities lending transactions, would more than wipe out their entire liquidity pool. Because of the downgrade, they weren't sure how

[4] Geithner, Timothy F. 2014. Stress Test: Reflections on Financial Crises. New York, Crown Publishers.

much commercial paper they were going to be able to roll over in the coming days, and so they could be short liquidity. They thought they could last for another week or two. My personal judgment was that they could last maybe a day or two. They were, as people often are in these circumstances, overly optimistic about the willingness of their commercial paper lenders to continue to fund them.

It was very serious. It was 4:45 p.m. on a Friday afternoon. In an email that has now been published in several places, which I sent to Tim Geithner as well as to senior officials at the Federal Reserve Board, we explained the situation and noted it was very dire. We determined that we'd go back and talk to AIG in more detail with a team of people about two and a half hours later on Friday evening. Which is what we did. That whole weekend, I, and a much larger team of people, many of them from our supervisory and regulatory area, did a lot of analysis of information that AIG gave us. Unfortunately, the financial information provided by AIG kept changing every few hours, making it difficult to assess the quality of their collateral, their liquidity, or whether the company was solvent. At the same time, AIG was in its own discussions trying to find a buyer or an investor who could help them fill the liquidity hole they were going to run into (in my opinion a matter of days, in their opinion a matter of a week or two). They—and we—had conversations with many of their state insurance regulators as well.

As it turned out, all of those efforts were unsuccessful. On Monday, AIG was downgraded. On Tuesday, they got a loan from the Fed. I was not involved in the work around AIG after that. On Monday and Tuesday after the Lehman weekend, the financial system started falling apart. That was when many of the Fed facilities were expanded dramatically, and a bunch of new facilities were being considered and designed to respond to the exploding crisis. I was pulled off working on AIG and returned to working at the Desk. Obviously, the efforts around AIG were enormous with an entire team of people from the FRBNY overseeing what became a huge loan, and later the Treasury Department coming in and taking an equity position in the company.

YPFS: **I'm not sure what the email you referred to on AIG was.**

Mosser: There is an email Geithner refers to in his book. It's an email that was in the financial crisis commission report and in the C.V. Starr trial[5] about the state of AIG's liquidity positions over the weekend. There were a series of analyses done by the FRBNY over that weekend, much of it at the time was used in determining both the size of the loan to AIG, the needed collateral and the overall riskiness of the firm (which was very high). Much of that analysis ended up being presented as evidence in the Starr trial about whether AIG was

[5] Starr Int'l Co. v. United States, 856 F.3d 953 | Program on Financial Stability (yale.edu)

solvent or not solvent, and the terms of the loan that the Fed made to it. The problem was that AIG was perhaps borderline solvent. The Fed asked for a very high interest rate on the loan. The lawsuit was about the fact that the interest rate was too high, and the collateral requirements were too punishing. The risk was incredibly high for the Fed because it didn't have anybody—no other firm or fiscal authorities—in the first loss position in front of its loan. It had to ask for more because of the high risk.

YPFS: Let's talk about your email against a bailout of AIG.

Mosser: I wasn't in favor of letting AIG fail, per se. I was in favor of allowing the AIG Financial Products subsidiary, and therefore its parent, to fail. I was in favor of lending to what appeared to be the solvent part of the company, which were the insurance companies. That was what my email said. That was sent on the Tuesday.

YPFS: Do you regret your position on AIG?

Mosser: No, I don't regret it. If it would have been possible to do, I still think it would have been the right choice. I, however, was not privy to what was going on with Lehman Brothers at the same time. At the time, it seemed like a correct choice because it was saving a part of the company that had the highest value added. The difficulty from a systemic risk standpoint of doing that, is that negative impact on the liquidity positions of the rest of the financial system, both internationally and domestically, would have been very large and additive to the liquidity loss from the Lehman bankruptcy. If AIG could have been "split," the liquidity losses to the rest of the financial system would have larger because AIG would not have been able to pay out on its derivatives losses. However, a significant amount of the liquidity hole at AIG was secured borrowing (basically repo transactions), and importantly, it was the insurance companies which were doing those repos. If the company could have been split, the Fed would still have had to lend very large amounts to the insurance companies. The difference was, in my view, that insurance companies were solvent, but illiquid, while the financial products subsidiary was both insolvent and illiquid. I was not sure that the entire parent company was solvent. Some people thought they were. I didn't think so at the time.

In the economists' lexicon, my email suggested a good bank, bad bank solution: You let the bad bank go, and you basically lend to the part that's solvent and let it recover, and that helps mitigate the damage.

There were two reasons as far as I know why my proposal wasn't acted upon, and they were both perfectly valid reasons, particularly given the time pressure and constraints. One was the fact that the systemic risk of the liquidity shock to the rest of the financial system of letting AIG go was very large. If you thought the whole company was marginally solvent, then the

liquidity shock of forcing part of the company to go into bankruptcy was not worth it in terms of systemic risk to the rest of the system. But the Fed would've had to step up and lend to it anyway. Let's be clear here. At that stage, the Fed was the only game in town. If the rest of the financial system had not gotten paid by AIG, they would've been walking right into the Fed and borrowing the same amount of money, so it was not about lending by the Fed, it was a question of to whom. If you thought that systemic shock was too much, particularly given that Lehman was going into bankruptcy court, the system couldn't take it. Then you have a systemic risk reason for keeping the company intact, and that was the determination that was made.

The second reason was a legal one. I knew nothing about the legal structures of AIG. We had enough trouble looking at its financial books. Apparently, AIG had a very convoluted corporate structure with somewhat unusual cross-default clauses in the way the subsidiaries were set up, including a cross default between subsidiaries and the parent company. If those were binding, then legally, it would have been almost impossible to split the company as I suggested.

YPFS: **Were there similar legal terms and complexities in the Lehman corporate structure?**

Mosser: I don't know. It's certainly true that you cannot do cross default arrangements if you have a bank subsidiary. The FDIC is very picky about those things. If a bank or a bank holding company fails, the FDIC has to pay out deposit insurance, which only applies to the commercial bank deposits. They do not take on anybody else's liabilities that are not part of the commercial bank entity. As an example, when WaMu failed, about 40% of the parent company was not in the bank. The FDIC paid the depositors in WaMu's savings and loans the full value of their account. It is what deposit insurance is about and that's one reason that WaMu was not run on. But the other part of WaMu went into bankruptcy as far as I know. It was sold off in pieces, with significant losses to the senior creditors.

YPFS: **With Lehman, was there really no option but to let it go?**

Mosser: As far as I know, there was no option but to let it go. There was no buyer, and the vast majority of the assets sat inside a broker-dealer for which there is no resolution regime, only bankruptcy. In contrast, insurance companies are regulated company by company, and AIG had dozens and dozens of them. Each one's regulated by the state it's in. They all also hold all their own capital, and each one of those insurance companies has a very clear resolution regime, meaning they can be taken over by a regulator and wound down slowly in an orderly way so they don't go into bankruptcy court. Ultimately, if AIG had failed, part of the company would have been in bankruptcy, but the insurance companies presumably would have been put into resolution by regulators.

There was nothing like that for securities firms. The SEC had no power to do that for securities dealers, and Lehman was largely a securities dealer, here and in the United Kingdom. In the United Kingdom, as far as I know, they also don't have a resolution regime for a pure securities dealer. The only way they fail is bankruptcy. There is a legal process to make sure that as the company goes down, they don't accidentally take away any money from segregated accounts that are their customers. That's protected and watched very carefully. But the assets and liabilities of the company itself, what the company owns as opposed to what their customers own, if they go into bankruptcy those are available to its creditors, and they have been from time immemorial—and it's not pretty when it happens.

YPFS: Was Lehman misrepresenting their holdings?

Mosser: Nearly everybody was overly optimistic about the value of their holdings—everybody. AIG was, Fannie and Freddie were, the banks were. One of the problems is when you're in the middle of a run it's incredibly hard to know what the fundamental values of your assets are. If you can't fund an asset and you have to sell it, particularly if it's a specialized, illiquid, risky asset, and you're forced to sell it in a day or a week, everybody knows you're being forced to sell it because no one will lend you money to finance it. The price you get could be very, very low and very, very, very far away from the underlying economic value of the asset—by that I mean the value the asset would have if it were held to maturity, or if you could calculate the present discounted value of all the future payments that you're going to get from that asset. The second of those numbers is probably way above the price you can sell it for in a run. Very common in finance. It's very common with illiquid assets.

In Lehman's defense, when they said their assets were worth more than the price they could get in the market, they were not being completely disingenuous. Had they marked them overly optimistically? Probably. Quite possibly. But in that sort of circumstance, it's very hard to tell. When I talk to my students about this I say, well, what's the value of this asset? Say it's some kind of exotic, risky corporate bond. But right now, the stock market is falling. Liquidity is drying up in the market, and you're a hedge fund who owns the risky bond, and you've been repo-ing it. You can't repo it anymore. You can't finance it, so you have to sell it. It's a risky corporate bond in a falling market. In these type of circumstance, risky (junk) bond prices can fall by 50% and then rally 35% when the market turns around. Really did the fundamental value of that bond actually fall 50% and then rebound 35% over a matter of weeks/months? Probably not. So, what was the "true" value of the bond?

It's a liquidity effect. The riskier the asset, the bigger the liquidity effect. Lehman had a balance sheet filled with high-risk, illiquid stuff. That was a mistake from a liquidity risk management standpoint. A big mistake. The fact

that they claimed that their assets were worth at least something more than what their prices were in September 2008, for most of those assets, that's probably right. Even with that benefit of the doubt, there's huge differences of opinion. People have looked at this a for a long time, and carefully, about whether they were solvent or not. Some say they were not; some say they were. Honestly, if they were that close to insolvency, it's no wonder nobody would fund them. You had to look really pristine.

I'll give you another piece of evidence on this. In the fall of 2008, all of the big financial institutions around the globe who held US mortgage assets marked those assets way, way, way down. The big banks took massive, massive losses, at least on paper, because of that markdown in their assets. Both the mark to market on the things that were in securities form and the markdown on whole loan mortgages were large.

Over the subsequent two years, by the end of 2009, particularly into 2010, those same banks made shockingly large profits. People were very, very surprised. A very significant contributor to those higher profit numbers were remarking back up those old mortgage assets, because in fact the banks had marked them down too much in the fall of 2008. Clearly, fundamental mortgage values didn't change that much in a year or two. House prices were still down something like 35% at that point. In short, in 2008, it was very hard to tell what the value of mortgage assets were because of the loss of funding for them.

One reason for those mortgage markups in later years was that the US turned around a lot quicker than is typical after a really bad financial crisis. That seems like a horrible thing to say, because you look at it and say, "Really, 10% unemployment, this is good?" But if you look at other countries, if you look at the 1930s and other crises since then, then it's true the US did relatively better.

YPFS: **In the Fed's response to these events, did you ever get the sense that there were political considerations and concerns about public perception that were factoring into the response, that might have delayed a response?**

Mosser: It was certainly clear that from Bear Stearns on, and the testimony that Secretary Paulson, Chairman Bernanke, and Tim Geithner gave, that this was going to be a huge political hot potato for the Fed. I can't speak to the decisions that were made about Lehman. Hank Paulson had said pretty bluntly that he didn't want to bail out any more financial institutions. One thing that the Fed was very concerned about in making a loan is being secured to its satisfaction, which typically meant (a) receiving collateral with a conservative haircut and (b) lending to an institutions with a good equity position—or having someone taking an equity position in front of them. That could be a private sector entity with a good capital position, or that could be the government. At the beginning

of AIG loan, the Fed made an exception to that. But you'll notice within about three weeks after TARP was passed, the Federal government took the first loss piece using TARP capital to provide an equity position in the Fed's loan to AIG. As market conditions continue to deteriorate, the Fed got nervous about their risk position. After all, the Fed is the central bank, not the fiscal authority. At that stage, it was clear that the only entity who could take an equity position ahead of the Fed was going to be the government through TARP, which is effectively what happened.

The government couldn't do it earlier because they didn't have the authority to do it, until TARP passed. It was also pretty clear that no one in the private sector would step up and step in front of Lehman or AIG and put in equity the way that JPMorgan had done with the Bear Stearns Maiden Lane SPV.

I do wonder how much politics influenced the view of financial institutions, because JPMorgan got a certain amount of heat for doing what they did with Bear.

YPFS: **What do you mean by that?**

Mosser: JPMorgan took political heat for some odd reasons. First of all, they were criticized for not paying enough. Well, Bear Stearns was almost bankrupt. Something close to zero, probably was the correct number.

Later they and other large banks were criticized for not doing it again. But financial institutions in September 2008 had six additional months of losses and falling asset prices. They were just much weaker institutions. Even the same ones that might've been capable of putting in the money for Bear had less capacity 6 months later. Lehman was also a bigger company, and it would've cost more equity. There had been another six months of continued runoff, continued deleveraging, and continued falling asset prices. All the institutions were doing more hoarding of their own cash, and they were watching their own equity cushions decline. They didn't have, at that point in the cycle, the capacity to step up and do much.

I don't know if you would call this a political consideration or simply a question: Where do you draw the line between what's the central bank's responsibility and what's the fiscal authority's responsibility? All along, the Fed was incredibly conscious of that distinction, even if others were not. Which is why it always asked for excess collateral. It's not that it didn't take some risk; it did. It always wanted excess collateral. It always preferred whenever possible to have somebody in an equity position ahead of it.

The Fed is a lending institution. When the Fed buys and sells securities, it's about monetary policy and can't buy and sell risky securities. When the Fed lends, that's about liquidity provision. That's what central banks do. Having

the central bank do other things that much more overtly put taxpayer money at risk, explicitly taking equity positions in financial institutions for example, is wrong. First of all, it's illegal. The Fed couldn't do it. But secondly, they wanted, whenever possible, to avoid the perception of overstepping their mandate. That's partly a legal thing, but it's also partly political perception.

YPFS: **How has your thinking about the Fed's role in the functioning of markets evolved as a result of all this?**

Mosser: I did a lot of work on this topic after the crisis. I did some on crisis reform. Much of it was in the form of advising someone in the government, who wanted to know how markets would react to a particular change. How would this affect market structures? I advised on topics ranging from derivatives reform, to lender of last resort, to housing finance reform (particularly Fannie and Freddie), to the regulatory designation and oversight of SIFIs. I ended up doing a fair amount of that for a couple of years after the crisis, and later I did a lot of work on financial stability. I went to the Treasury department for a couple of years before I came here to Columbia. I think the most important change needed is to think about the financial system much more holistically. It's not just banks, or insurance, or asset managers, or AIG, or Lehman—it is how the entire system works together and how it can break.

Before the financial crisis, we tried to do that at the Desk in a sort of a market monitoring way, to explain to policy makers what they ought to care about. But it wasn't adequate. We didn't think about risks across the entire system as carefully as we should have, and what the cascading effects could be. We knew there was the possibility of runs; bank runs and panics are endemic to financial systems. But it's been a very long time since the United States has had a big one, so before the crisis I think we were complacent in thinking we figured out how not to have those anymore, which wasn't true.

We need more thinking through carefully about what the risks are when you look in a market and say, "That's risky; what is this new instrument?" But one also has to think through carefully all of the instrument's interconnections to other markets, the economy, and other institutional players and then imagine how a cascade of good things could happen and how a cascade of bad things could happen. That adjustment in analyzing financial risks has been a sea change for central banks and for regulators all around the globe.

Central bankers and others sometimes used to say, "We don't know what to do about financial stability in our mandate." I comment: "Well, if you do lender of last resort, financial stability is your mandate." If you're there in the bad times lending, then you better be watching it beforehand closely. Having financial stability be an important part of what central banks and monitoring authorities pay attention to, ex-ante, all the time, not just in bad times, seems to me the biggest change. With respect to the Fed, you can see that in the

structure and the research that the staff is doing, the attention that's paid at the Federal Reserve Board, and at the FOMC, on thinking carefully about the systemwide risks that are most important. That's completely different than the attitude before 2007–2009. There was certainly some of that at the Fed before the crisis. It was less frequent. It was less systematized. It was less front and center in what the Fed does. That's the most important change and for the good.

YPFS: Any other observations?

Mosser: The only things I was going to say are two observations that we have spent a lot of time on. First of all—and I said this at the Brookings event back in September 2018—we spent a lot of time talking about the Fed lending programs, et cetera. The Fed was increasingly creative and increasingly took more risk as the crisis went on. But ultimately, what stopped the run and truly slowed down the panic in the fall of 2008 were government guarantees; it was not the lender-of-last-resort actions. The money market fund guarantee was critical, because money funds pulling away from buying commercial paper made the run worse and much more contagious everywhere.

When the Reserve Fund broke the buck after Lehman, money fund investors were running away from money funds. Money funds had to close out, even if the thought they had good paper on their books. They had to stop lending to financial institutions and others. That just quintupled the run on banks, securities firms, etc. You can see that in the data. There's a great picture that some authors have in a paper a couple years ago.[6] They show a picture of commercial paper and repo as a percent of M2 in the United States. It began to fall slowly in the fall of 2007. Then, they mark September 10th, 2008, and after that the chart is a straight vertical line down. I put that chart up to my students, and I say "you want to know what a run looks like? That's a run."

Even more important than the money fund guarantee—and a program that gets almost no attention—is the FDIC's guarantee program, the Temporary Liquidity Guarantee Program [TLGP]. The FDIC used a systemic risk exception in the fall of 2008 to guarantee the short-term debt of any financial institution in the US who came to them with appropriate documentation and applied[7], for a fee. That was a US government guarantee of any of the short-term liabilities of any US financial institution; I kid you not. It's an unbelievable guarantee. It was deposit insurance for the entire liability side of any financial institution

[6] See Figure 3 in Adrian, Tobias, and Hyun Song Shin. 2009. "Prices and Quantities in the Monetary Policy Transmission Mechanism." *International Journal of Central Banking* 5, no. 4. December 2009. https://www.ijcb.org/journal/ijcb09q4a7.pdf

[7] The TLGP utilized an op-out structure to avoid adverse selection. All eligible participants were automatically enrolled. See Davison, Lee. 2019. "The Temporary Liquidity Guarantee Program: A Systemwide Systemic Risk Exception," *Journal of Financial Crises* 1, no. 2, 1-39. https://elischolar.library.yale.edu/journal-of-financial-crises/vol1/iss2/1

who walked in. They guaranteed enormous amounts of debt. Up to three years in maturity were issued. It stopped the run. Full stop. Because it was a credible US government guarantee**.**

In short, the guarantees were really important. Certainly, the lending programs the Fed did help out, but to quote Douglas Diamond from the University of Chicago, who wrote the most famous paper about the importance of deposit insurance, "credible government guarantees will trump even very well designed lender of last resort, every time." Because it's a guarantee. It's not a "I'm going to lend to prop you up." It's: "I'm going to guarantee your liabilities."

YPFS: **Why didn't it receive more attention?**

Mosser: I don't think the FDIC wanted to advertise it. They did it very reluctantly. The chair—Sheila Bair at the time—did it as a last resort. When it became necessary, she did it. But her basic stance was to be much less interventionist than any of the other major regulators at the time. The irony is that the program the FDIC put in place was the thing that really stopped it. There is a picture, in the chartbook that Brookings and the Yale Program on Financial Stability put together, for the 10-year anniversary of the financial crisis conference on September 11–12, 2018. The chart that shows the size of the programs, either lending or guarantees, to the financial system by the US government broadly defined, "Government Commitments: Guarantees, Other Programs, TARP, Fed Liquidity." By far, the highest bar on the chart is for guarantees, the largest of which by far was TLGP.[8] By the end of 2008, the total amount of guarantees and liquidity provided by the US government was over $6 trillion. Of that, more than half of it was TLGP.

One of the ironies in all this, of course, is that the TARP line is very small. It's an example of the saying that there is often an inverse correlation between political flak and size and importance of emergency programs.

On the subject of guarantees, Fannie and Freddie are worth talking about. They are always a political question, not an economic question. Economically, they've been a systemic risk from the get-go. This is the third time Fannie Mae has failed. The way that the US government decides to subsidize homeowners, including multiple houses of wealthy homeowners, and in particular decides to subsidize the shareholders of companies like the GSEs [government-sponsored enterprises] is a weird way to promote housing, but it's very persistent, and doesn't seem to be going away any time soon.

[8] See "Charting the Financial Crisis: U.S. Strategy and Outcomes." 2018. The Brookings Institution and the Yale Program on Financial Stability, PDF p. 66. https://ypfs.som.yale.edu/node/3936

The inability to get Fannie and Freddie restructured and out of conservatorship is a massive political problem—frankly, a failure. But it's nothing new. Reforming Fannie and Freddie—well, everybody claims it needs to get done and nobody ever does it. This is a subject on which I have worked since the '90s. It was clear, if house prices are going to go down 30%, then Fannie Mae or Freddie Mac was going to fail. They didn't have enough capital. They held 45 basis points of capital to buy a mortgage; a bank that bought the same mortgage had to hold four percentage points of capital. Almost ten times as much.

YPFS: But wouldn't the time to address them be when house prices have rebounded?

Mosser: Absolutely. The truth is the reforms are not hard to do, and they could've done them several years ago. It would've been hard to do them right at the point of Dodd-Frank because parts of the markets were so distressed. But there are a number of solutions that have been proposed for what to do with Fannie and Freddie, including one I did with my former colleagues at the FRBNY, way back in 2010.[9] In fact, there's a decent consensus about what to do about them, but politically it's very difficult.

Political will is very hard. Political consensus is even harder. That's an interesting issue to talk about. I think that the people who were at the Treasury when they were put in conservatorship are probably better placed to talk about that stuff than I am.

The last thing I'll talk about is to circle back to an area I have spent a huge amount of my own personal time on, which is swap lines. During the crisis, I ran the international desk, and we did all the swap lines. We designed the structures and executed them and negotiated with the central banks. International lender last of resort is one of the gaps that hasn't been filled since the crisis. Of the Fed lending programs, the largest single lending program the Fed had was the swap lines. In December 2008, it was almost $600 billion. Separately, something like two-thirds of the dollars that were loaned inside the US by the Federal Reserve went to non-US institutions. If you put those two figures together, three-quarters of the dollars were basically to institutions whose home bases were outside the US. Some of them had sizeable US businesses. That's not to say all the dollars flowed out. But when I said at the beginning that there was a liquidity shortage outside the United States and it was much worse than the liquidity shortage within the United States, that's another piece of evidence of that.

[9] Dechario, Toni, Patricia C. Mosser, Joseph S. Tracy, James I. Vickery, and Joshua Wright. 2010. "A Private Lender Cooperative Model for Residential Mortgage Finance." Federal Reserve Bank of New York Staff Report No. 466, August 6, 2010. Available at http://dx.doi.org/10.2139/ssrn.1653907

The fact that a foreign bank can borrow in the United States if they have a branch, and they're well capitalized, and their home country regulators say they're okay, and they behave according to Basel capital standards, that's an international standard. US banks doing business in Europe can walk in and borrow euros the same way from the ECB. But when a foreign financial institution is troubled, and you don't know if it's solvent or not, the host central bank is in an awkward position lending to them because, you're reliant on the home country supervisor from another country to say, "Yes, they're solvent, you can go ahead and lend to them." But we're not exactly quite sure whether they are or not. That's a very tricky situation. One of the reasons the Fed likes the structure of swap lines is because it much prefers to have the ECB as a counterparty risk than to have a euro-area bank come in directly, particularly if they think there's any chance that they're troubled.

In a financial crisis, it's incredibly difficult to tell—unless you really dig down deeply to know—who the healthiest or more troubled institutions are. The shorthand for this in central banking circles is the home/host problem. And it's been known for a long time. In fact, it was one of many, many reasons that the first Basel in the '80s was put together. It's the idea that everybody better have the same minimum standards. First of all, because you don't want to create unlevel playing fields in global finance. That's not very smart. But another reason—much further down the list—is, if you're going to have a global financial system with global banks in different countries, then they're going to have to be able to borrow from several different central banks, not just their home central bank. You better have some assurance if you're the host country that this institution coming to you is playing by the same rules of the game that your local banks are playing by, otherwise you're going to be more reluctant to lend to them.

The problem is in practice, in a crisis, it's really hard to do. If you think it's hard for regulators to be honest within their country, it's even harder for them to be when it's an international conversation. That's another issue that hasn't really been resolved completely. It's better with the swap lines. The swap lines are a big step in the right direction. It could stand some more work at the international level.

YPFS: **Did that go smoothly?**

Mosser: It actually went very smoothly. The only difficulty became when there were concerns that a foreign government was going to put their bank into some sort of receivership. At that point the question becomes: Did they let the other central banks know just how distressed this institution was before they proceeded to make a loan to them through their discount window?

When you're in a crisis situation, I get it: A regulator's or central bank's first concern is getting your ducks in a row locally, not internationally. That was

definitely a concern, and I know sometimes that prompted international telephone calls.

YPFS: **Thanks, Trish.**