

SPEECH

What the Fed Did and Why

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In my remarks this morning, I would like to look back over the events of the past several years and offer my perspective on what were the essential drivers of the financial crisis and the Federal Reserve's interventions.¹ I will review the changes that have been taking place in the U.S. financial system and how these changes created the conditions conducive to the crisis. I will then discuss the developments in residential real estate financing that provided the catalyst for the crisis.

With this background, I will outline the interventions that were carried out to mitigate the crisis, focusing on those conducted by the Federal Reserve. I will direct my remarks to the facilities that were created rather than to the actions taken for individual institutions since these have been discussed extensively elsewhere. The lessons learned from the crisis are important for the design of the policy response aimed at reducing the likelihood that the U.S. economy ever again experiences this degree of trauma.

I begin with the simple exercise of what name we should assign to this past crisis. At first blush, this may not seem like a useful exercise. But, as Shakespeare reminded us, names are important as they convey a sense of our understanding of the event. One name that has gained popularity is the "Great Recession," which is dated as beginning with the bankruptcy of Lehman Brothers on September 15, 2008. This name conveys both the severity of what occurred, as well as the calamity of what was avoided. The contraction in real output in the six months following the demise of Lehman Brothers exceeded in size any other post World War II recession—in that sense, it was a great recession. However, aggressive monetary and fiscal policy actions both domestically and abroad were successful in preventing a complete meltdown of the U.S. and the world economy. In that sense, the name also emphasizes what the crisis was not. However, the name tends to focus one's attention too much on the effect and not the cause of the crisis.

An alternative name is the "Panic of 2007," which is dated as beginning with the announcement by BNP Paribas on August 9, 2007, of its suspension of redemptions for three of its investment funds. This name stresses the financial crisis as the precipitating event leading up to the severe decline in real economic activity slightly more than a year later. The name conveys that at its very basic level, the crisis was a form of a banking panic. The parallel to the name "Panic of 1907" is also a reminder to us that history has a way of repeating itself unless we learn and apply its lessons well. For this reason, it is useful to take a moment to recall the events of 1907.

At the turn of the 20th century there was no Federal Reserve System. Banks then as today borrow short term in order to lend long term, making their profit on the difference in rates. At the time, the banks' short-term liabilities took the form of demand deposits. If depositors began to worry about the quality of a bank's loans and its ability to pay back its depositors, a run on the bank could develop. Once started, no bank on its own can stop a run by its depositors. To deal with these liquidity problems, the banks developed a clearinghouse system whereby member banks could backstop each other. This system would work well as long as banking problems were sufficiently localized so that unaffected member banks could provide liquidity to those member banks facing a liquidity problem.

The problem in 1907 was that credit was also being supplied by trust companies that operated outside of the clearinghouse system. Many of these trusts, including the Knickerbocker Trust, lent money to speculators in the copper market, which was experiencing a boom. So long as copper prices kept rising, these loans paid off. However, when copper prices began to fall, there was a wave of loan defaults leading to a run on the trusts that could not be stopped by the clearinghouse system. The resulting credit contraction sent the economy into recession, transmitting the problems to the banking sector. In the end, more than 240 banks failed even though the problem started outside of the banking sector.

The basic mechanics of a bank run have remained the same over time. Due to the maturity mismatch involved in credit intermediation, banks in particular and financial institutions in general must rely on trust by their "depositors" that the institution's assets will provide the ability to pay back the depositors. The fundamental connection between liquidity and trust was well described by Walter Bagehot in 1873:

"Every banker knows that if he has to prove that he is worthy of credit, however good may be his arguments, in fact his credit is gone."²

There are two problems that depositors face. The first is that they typically know very little about a particular bank's investments. This reflects both the lack of transparency in how banks are investing their funds, and a lack of incentive by individual borrowers to expend effort to try and learn this information—what economists call a public goods problem. The second problem is that a depositor does not know what other depositors think about the solvency of the bank. A bank may be solvent and a depositor may be convinced of that fact, but if most other depositors think differently and decide to withdraw their funds, then the bank will have to sell its assets and will likely become insolvent leaving the patient depositor unable to reclaim his funds—what economists call a coordination failure problem. The combination of these two problems implies that increases in uncertainty regarding values of assets on a bank's balance sheet create an environment susceptible to deposit runs.

The failure of the clearinghouse system in 1907 was a catalyst for the formation of the Federal Reserve System and its power as a lender of last resort. The problem of deposit runs was effectively solved in 1934 with the institution of deposit insurance. Insurance solves the public goods and coordination failure problems discussed above. A depositor need not invest resources in determining which bank is a safe place to put his funds. Additionally, the depositor is guaranteed to get his funds back regardless of whether other depositors decide to withdraw their funds. The moral hazard problems created by deposit insurance necessitated that the banks covered be subject to supervision and that a mechanism was established so that problem banks could be resolved quickly in order to safeguard the taxpayers' money.

There are many parallels between the Panic of 1907 and the events of 2007. In both cases, credit intermediation had shifted outside of the core banking sector. An investment boom preceded each panic—the earlier in copper and the later in housing—with much of the credit being funded by sources outside of any existing liquidity protections. When the bubbles began to deflate and prices began to fall, loan defaults quickly developed precipitating funding runs on the institutions involved in extending this credit. What seemed like large liquidity buffers by individual firms were quickly drawn down. Funding withdrawals precipitated asset sales, which put further downward pressure on asset prices. The resulting credit contractions adversely affected the real economy, setting up an adverse feedback loop that exacerbated the initial losses.

Given the parallels between the events of 1907 and 2007 and, more importantly, the similarities of the lessons learned from those episodes, I believe the most instructive name for our latest financial crisis is the "Panic of 2007." In the rest of my remarks, I will explore in greater detail the factors behind the panic, as well as the responses by the Federal Reserve.

The first question to explore is the extent to which the financial system had evolved over the past several decades.³ Over this period, demand deposits lost their market share to money market mutual funds, which, while considered safe, are not guaranteed like deposits. This made it increasingly difficult and less profitable for banks to fund loans on their balance sheets using deposits. Securitization markets developed where loans could be funded through the market by investors. In addition, money market mutual funds, securities lenders, institutional investors and businesses needed a safe way to deposit funds where they would earn interest but retain ready access to their funds. Repurchase agreements or "repos" developed to serve this need. A repo is a short-term collateralized loan that shares many characteristics with a demand deposit except that repos are not guaranteed. At the same time, large firms increasingly raised funds by issuing commercial paper in the market rather than relying on bank loans—with the money market mutual funds being large investors in this paper. Large banks, as well, came to rely at the margin on non-deposit funding through the interbank funding market. The Fed acted as the lender of last resort for this market.

This system of market-based credit intermediation has been called the "shadow banking system." The shadow banking system grew at a very fast rate over the past several decades. **Chart 1** shows that by 1990, mortgage originations in the shadow banking system equaled originations in the banking system, and grew to more than double the level in the banking system by 2008. **Chart 2** highlights the growth in securitization across many different asset categories besides residential mortgages, such as commercial real estate loans, auto loans, credit card loans and student loans. A direct consequence of this growth was that the short-term liabilities associated with the shadow banking system—repos and commercial paper—exceeded the level of demand deposits as seen in **Chart 3**. Despite this rapid transformation of the financial system, the liquidity protections put in place for demand deposits (deposit insurance and access to the Fed's discount window) were not available to these new funding sources.

This lack of liquidity protection was a source of systemic risk that was building in the financial system—akin to underbrush that builds up in a forest over time increasing the risk of a major fire. The Panic of 2007, however, required a trigger—a spark to ignite the fire. As I will describe in more detail in a moment, subprime mortgages provided the spark. Once the fire was started, the Fed was confronted with fighting the fire using a set of tools designed for a 20th century banking crisis—not a 21st century shadow banking crisis. As a result, the Fed had to improvise and design new tools as it battled the financial blaze. Another choice would have been to let the fire burn on the theory that this is the best way to clear away the underbrush that has built up over time. The great risk with this strategy is that the fire burns out of control creating considerable collateral damage in the process. If the choice is to fight the fire, then once the fire is extinguished the job remains to aggressively act to remove the underbrush—thus the urgent need for regulatory reform.

There were two necessary ingredients for a catalyst for a financial panic in the shadow banking system. The first was the realization by investors of the possibility of incurring significant losses on some securities. The second was uncertainty over which securities would sustain these losses and consequently who held these securities. This uncertainty enabled the financial crisis to

also impact the banking system. Finding a way to reduce this uncertainty would prove to be a key step to dealing with the crisis.

The housing boom had pushed house values significantly above fundamental values in some markets, creating the possibility of substantial losses on mortgages written on houses in these markets. The largest run-ups in house prices occurred in the "sand states" of Arizona, California, Florida and Nevada. One approach to measuring the degree to which houses had become overvalued is to compare the evolution of house prices to their replacement costs. For housing markets such as Las Vegas, which are surrounded by open land, the price of houses should not differ significantly from the cost of building a new house. These markets are characterized by what economists call a horizontal long-run housing supply curve.

Chart 4 shows the ratio of house prices to estimated replacement costs over time for the four sand cities of Las Vegas, Vallejo, Phoenix and Miami.⁴ In all four cities, prices relative to estimated replacement costs largely stayed in a tight range between 0.8 and 1.2 over the 1980s and 1990s. However, by 2002 to 2003, house prices broke out of this range and reached values well in excess of 200 percent of the replacement cost in Vallejo and Miami, and 180 percent of replacement costs in Las Vegas and Phoenix. When the bubble burst in these markets, house prices were likely to drop by a large magnitude.

Two factors were important in creating uncertainty over which assets were going to suffer losses given a burst of the housing bubble. The first is that not all housing markets experienced a boom. **Chart 5** shows the ratio of house prices to replacement costs for Dallas and Chicago. This ratio never broke above 1.2 for Dallas, and peaked at 1.4 for Chicago. An implication is that the default risk on a mortgage (as well as the loss given default) depended not just on the risk profile of the borrower, but also on the specific location of the property. The second factor contributing to the uncertainty over the value of mortgage securities was the lack of transparency in their design. Key information about the specific mortgages was lost in the process of securitizing mortgages in the first place, and then later repackaging these mortgage securities into collateralized debt obligations (CDOs) and CDOs-squared.⁵ In addition, the complexity of the securities meant that it would be difficult to understand the risks even if an investor had access to all of the relevant mortgage-level information. Investors in AAA rated mortgage-backed securities were initially sanguine about these information problems since these securities were thought to have a very low loss probability as determined by the credit rating agencies. Once that assumption was no longer true, it was very difficult to acquire and process that information.

How did house prices manage to depart so significantly from their fundamental value in some housing markets? Asset booms and busts have been a feature of financial markets for centuries as documented by Reinhart and Rogoff in their recent book *This Time is Different*.⁶ During a boom, a strong motivation for purchasing an asset is the expected price appreciation on the asset. In the case of housing, rising prices however should ration demand through two constraints. The first is the downpayment constraint. For a given required downpayment percentage, as house prices increase a borrower must come up with more cash for the downpayment. The second is the cash flow constraint. For a given interest rate and downpayment percentage, as house prices increase, the mortgage payment relative to the borrower's income increases making the mortgage less affordable.⁷ If lenders had maintained minimum downpayment percentages and maximum debt-to-income ratios as the housing boom began, then rising prices would have done a better job of rationing demand, thereby limiting the duration of the bubble and the extent of overvaluation in the markets.

However, as Reinhart and Rogoff demonstrate repeatedly, "this time is different" so house prices were expected to continue to increase, which "justified" lenders' decisions to lower the downpayment percentages and raise the allowable debt-to-income ratios. In 2001, at least half of new subprime mortgages had downpayments of 20 percent or less, and at least a quarter had downpayments of 11 percent or less. By 2006, at least half of new subprime mortgages had downpayments of 10 percent or less, and at least a quarter had no downpayment at all. Similarly, in 2001, 42 percent of new subprime mortgages had debt-to-income ratios that exceeded 34 percent (which is considered a high ratio meaning borrowers may face some payment stress), while by 2006 this had increased to 62 percent.⁸ The continued increase in house prices eventually came to a stop when lending standards could not be eased any further to offset the effects of the higher prices.

The turndown in house prices quickly led to a significant increase in subprime mortgage defaults. This happened for two reasons. First, most subprime mortgages were designed in a way that created rollover risk. The typical subprime mortgage was a hybrid adjustable rate mortgage with the initial "teaser" interest rate fixed for two or three years, and then adjusting every six months thereafter. The first rate adjustment could be quite substantial and provided a strong incentive for the borrower to refinance the mortgage at that point in time. So long as house prices were rising, borrowers were able to refinance and roll over the loan. However, when house prices began to decline, lenders were unwilling to refinance, and as a consequence, borrowers were often unable to pay the higher interest rates, which prompted defaults. Second, as the housing boom continued, an increasing share of new purchases were by investors (declared or undeclared) rather than by borrowers who intended to live in the house. The default decisions by investors are much more sensitive to declining house prices than those by owner-occupied borrowers.

The vast majority of subprime loans were financed by investors through placing the loans into securities that were sold onto the market. Most of the securities derived from these subprime mortgages were deemed to be AAA rated by the rating agencies. The subprime mortgage securities differed in an important way from those based on prime conforming mortgages. For prime conforming mortgage-backed securities, the degree of credit protection for the AAA investors is fixed in advance. In contrast, for subprime mortgage-backed securities, the degree of credit protection for AAA investors started out "thin" and built up over the

initial couple of years so long as mortgages did not default early in their life.⁹ At the peak of the housing boom, not only was leverage high for the individual subprime borrower, but leverage was high for the investors in lower rated subprime mortgage securities.¹⁰ This dynamic buildup of credit protection worked well so long as house prices kept increasing, but proved to be disastrous for investors in AAA subprime securities when house prices began to decline.

The AAA rated subprime securities were then used as collateral against repurchase agreements. Given how safe the assets were thought to be, very small haircuts were required for these loans. In addition, the composition of repo loan terms shifted toward overnight, reaching 75 percent in 2008.¹¹ These small haircuts implied that the broker dealers could use considerable leverage themselves in purchasing these securities. So, leverage was high at all levels of the financial chain from the individual subprime borrowers, to the investors in the lower rated securities, and to the broker dealers who invested in the highly rated securities. At their peak, subprime mortgage related securities amounted to only around \$1.2 trillion dollars—a relatively small size given the overall size of the repo market. Leverage, however, amplified the losses as house prices began to decline.

Why did the point at which house prices peaked and started to fall in some housing markets spark a run on the repo market? Additionally, why did the problems in subprime mortgage assets spread quickly to other assets? Gary Gorton uses the analogy of an E. coli breakout.¹² Suppose that E. coli is thought to have infected a small quantity of the country's meat supply. The difficulty is that no one knows which batches of meat have been infected. If eating infected meat will cause the individual to become very sick, then the natural reaction is for everyone to immediately stop eating meat altogether. This will continue until the entire meat supply has been recalled and inspected. Subprime mortgage defaults were the E. coli that infected the financial system. Some mortgage assets would lose significant value as a result, but it was difficult to know which mortgage assets were "infected" and who was holding these assets. The natural response was to pull back from these assets.

In a deposit run, when the quality of a bank's assets is brought into question, depositors immediately withdraw their funds from the bank. In the case of the repo market, lenders raised the haircuts required for the repo loans or refused to roll over the repo loans collateralized by subprime mortgage assets. This is equivalent to a partial or a complete withdrawal of funds from the market by the lenders.¹³ In addition, the higher haircuts forced the owners of the assets to come up with additional cash which typically meant that they were forced to sell assets. Given that there was little appetite to purchase mortgage-related assets, high-quality assets had to be sold in order to raise this cash. This put downward pressure on the prices of these assets and increased the uncertainty regarding their future values leading to demands for higher haircuts on these assets, as well. The haircut spiral, can be seen in **Chart 6**. A fire sale dynamic developed, which depressed asset prices further leading to additional upward pressure on haircuts.

The rapid deleveraging of the shadow banking system as the run progressed led to a sharp contraction in credit. We saw this earlier in Chart 2 with the near complete collapse in the asset-backed security market. Banks were also adversely affected by this run on securitization markets since they used these markets as well to fund many types of loans. Several banks had to bring onto their balance sheets previously off-balance sheet entities that they had used to securitize loans. This used up balance-sheet capacity making it more difficult for banks to make up for the credit contraction going on outside of the banking system. The problems in the financial system spread to the real economy. When Lehman Brothers declared bankruptcy, a money market mutual fund—the Reserve Fund—"broke the buck." The unanticipated losses incurred by the Reserve Fund expanded the bank run to the money market mutual funds. Since these funds were significant investors in the commercial paper market, this transmitted the strains to the commercial paper market. Dollar funding pressures were also increasing for firms operating outside the United States as their ability to access dollars through the foreign exchange markets began to become strained. The subprime "E. coli scare" had effectively been transmitted far and wide across financial markets.

Let me turn now to the interventions used to combat the financial crisis. The Fed knew much less back in the autumn of 2007 than we know now about how far and wide the financial crisis was to spread and the implications this would have for the real economy. The initial response by the Fed was to use its traditional liquidity tools. On August 10, 2007, the Federal Open Market Committee (FOMC) issued a statement indicating that the discount window was available as a source of liquidity to those firms that had access to the window. A week later, the FOMC cut the discount rate (the interest rate charged on discount window loans) by 50 basis points (a half of a percentage point) and extended the available term for these loans from overnight to 30 days. Given that the liquidity strains were affecting many firms that did not have direct access to the discount window, a key for this intervention to be helpful was that depository institutions would pass the liquidity on to those firms that needed it the most. Using the earlier forest fire analogy, it was as if the Fed could not drop water directly on the burning section of the forest; rather, it had to drop the water on an adjacent section of forest and hope that somehow the water got to where it was needed.

Several problems became apparent with this strategy. First, few discount loans were being taken out. There is a history of "stigma" associated with borrowing from the Fed's discount window. Given the high degree of uncertainty in the financial markets in the autumn of 2007, this stigma effect likely became amplified. Second, given uncertainty about their own future liquidity needs, banks developed a strong "precautionary demand" for liquidity. This implied that they were less willing to lend out liquidity to other financial firms. Finally, it was becoming increasingly difficult to assess the credit risk associated with lending to other firms even if only for short terms. To use a medical analogy, the progression of a fever can be measured by a person's temperature. The progression of problems in the interbank lending market can be measured by the spread between LIBOR and the overnight index

swap (OIS) rates for a given term. **Chart 7** shows the 3-month LIBOR/OIS spread. Prior to the onset of the financial crisis, this spread had been very narrow. Very soon after the BNP Paribas announcement, the "fever" shot up dramatically.

The first new liquidity facility that was introduced to deal with these problems was the Term Auction Facility or TAF on December 12, 2007. The TAF program was designed to deal with the stigma problem associated with the discount window and also to make it easier for the New York Fed to sterilize the liquidity injections into the financial system. The TAF program auctioned off a fixed quantity of term funding to depository institutions using the same collateral to back up the loans as can be pledged at the discount window. Since the quantity of funding was set in advance, it made it much easier than for discount window borrowing to offset this liquidity injection. More important, however, was the design concept: term funding priced and distributed in a competitive auction would hopefully avoid any stigma for the winning participants of the auction. The TAF auctions were essentially a better way to dump more water on the same section of the forest covered by the discount window. However, the fire was still burning elsewhere.

The inadequacy of the Fed's traditional liquidity tools and their recent enhancement with the TAF came to the forefront in the spring of 2008. Conditions were deteriorating for several primary dealers, including Bear Sterns. The Board of Governors of the Federal Reserve System (all of the governors are appointed by the U.S. president and confirmed by the Senate) decided to activate a little known or used section of the Federal Reserve Act—section 13(3)—which gives the Fed the ability lend to any "individual, partnership or corporation" in "unusual and exigent circumstances."

On March 11, 2008, the Fed announced the establishment of the Term Securities Lending Facility (TSLF). This program allowed primary dealers to swap a broad range of what had become illiquid assets for Treasury securities that could be easily financed. This program leveraged the Fed's large holdings of Treasury securities. The TSLF, however, came too late for Bear Sterns. On March 14, the Fed again using its section 13(3) emergency powers approved the takeover of Bear Sterns, the fifth largest investment bank, by JPMorgan Chase. Without the acquisition by JPMorgan Chase, Bear Sterns would have had to file for bankruptcy since they were essentially cut off from market funding. Two days later, on March 16, the Primary Dealer Credit Facility (PDCF) was introduced, essentially providing discount window access to all primary dealers in an effort to provide a backstop to their liquidity needs. Like discount window lending, PDCF loans had to be "secured to the satisfaction" of the Fed. **Chart 8** shows borrowing from the PDCF in comparison to borrowing from the discount window. With the TSLF and PDCF, the Fed was now better able to direct water directly to where the fires were burning the hottest.

At the same time that the Fed was using its traditional liquidity and new liquidity tools, it was also aggressively cutting the federal funds rate, which is its primary instrument for stimulating the real economy. In the summer of 2007, the fed funds rate was at 5.25 percent. By March 18, 2008, the FOMC had reduced the federal funds rate by three percentage points to 2.25 percent—including two unusual 75 basis point reductions one on January 22, 2008, and the other on March 18. The FOMC was well aware of the impact that the financial crisis could have on the real economy and was actively trying to offset these adverse effects. The FOMC made an additional 25 basis point reduction in the federal funds rate on April 30, and then held the policy rate constant over the summer at 2 percent.

The Panic of 2007 turned into the Great Recession of 2008 following the bankruptcy of Lehman Brothers on September 15 and the Fed's emergency assistance to American International Group, Inc. In response, the Fed reduced the federal funds rate to essentially zero by mid-December, instituted swap lines to provide dollar liquidity to foreign central banks, added new liquidity facilities to target specific sectors of the shadow banking system and began to expand its balance sheet through asset purchases. To deal with problems in commercial paper market, the Fed introduced on October 27 the Commercial Paper Funding Facility (CPFF) to backstop issues of commercial paper. In an effort to restart the securitization market, on November 25, the Fed announced the Term Asset Backed Securities Loan Facility (TALF).¹⁴ In December, the FOMC announced that it would begin to significantly expand its balance sheet through purchases of long-term assets including agency debt, agency mortgage-backed securities and long-term treasuries – the Large Scale Asset Purchase or LSAP program. Other interventions were taking place directed by different agencies and in conjunction with the Treasury. At the same time, fiscal policy was engaging with Congress approving the \$750 billion Troubled Asset Relief Program (TARP) program. Policy had entered the "whatever it takes" phase in an effort to keep the Great Recession from becoming something much worse.¹⁵

By the spring of 2009, the various guarantees and backstop liquidity facilities covering different sectors of the shadow banking system were in place. The last element required to deal with the Panic of 2007 was to address the uncertainty over the viability of the large systemically important financial institutions. A horizontal review of the 19 largest financial firms was conducted to assess their capital needs under a "worse-than-anticipated economic scenario"—this was called the Supervisory Capital Assessment Program or SCAP (you can tell that we are fond of acronyms).

There were two design features of the SCAP program that were essential for its ability to reduce the uncertainty in financial markets. First, the process was designed to be transparent with both the methodology published up front and the firm-by-firm results published at the conclusion. Second, if a firm was deemed to need capital but was unable to raise it in the market, Treasury pledged to provide the capital. The SCAP program was successful in restoring a degree of confidence in financial markets and in enabling these financial firms to raise capital on their own.

By the second half of 2009, the financial fever from the Panic of 2007 had finally broken with the 3-month LIBOR/OIS spread

narrowing back to pre-crisis levels.¹⁶ The economy began to grow again. Having served their purpose, the Fed's special liquidity facilities have been wound down. The policy focus has shifted to regulatory reforms and how to prevent a future financial crisis. To be successful, these reforms must deal with the run dynamics in the shadow banking system, as well as devise ways to limit the leverage cycle that is an integral part of asset booms and busts that can trigger a panic. If the lessons from the panics of 1907 and 2007 are incorporated into the reforms, we may well avoid the Panic of 2107.

¹ These views are my own and do not necessarily reflect the views of the Federal Reserve Bank of New York or the Federal Reserve System.

² Walter Bagehot, 1873. *Lombard Street*. London: Henry S. King and Co.

³ For a good review, see Tobias Adrian and Hyun Song Shin. 2010. "[The Changing Nature of Financial Intermediation and the Financial Crisis of 2007-2009](#)." Federal Reserve Bank of New York *Staff Reports*, no. 439, Revised April.

⁴ These charts were created by Joseph Gyourko, Wharton Real Estate Group.

⁵ See Gary Gorton. 2008. "[The Panic of 2007](#)." Prepared for the Federal Reserve Bank of Kansas City, Jackson Hole Conference, August.

⁶ Carmen Reinhart and Kenneth Rogoff. 2009. *This Time is Different: Eight Centuries of Financial Folly*. Princeton: Princeton University Press.

⁷ For speculators, the downpayment constraint is likely to be the more relevant since they do not intend to hold the mortgage for very long.

⁸ Andrew Haughwout, Richard Peach and Joseph Tracy. 2008. "Juvenile Delinquent Mortgages: Bad Credit or Bad Economy?" *Journal of Urban Economics* 64 (September): 246-257.

⁹ Gary Gorton. "The Panic of 2007." Prepared for the Federal Reserve Bank of Kansas City, Jackson Hole Conference, August 2008.

¹⁰ You can think of the investors of the lower rated tranches as "buying" all of the subprime mortgages contained in the securities and borrowing funds from the investors in the highly rated securities. The thinner the initial credit protection, the higher the initial leverage that was being used to essentially purchase the underlying subprime mortgages. Repackaging these securities into CDOs and CDO-squared securities further increased the effective leverage.

¹¹ An overnight repo loan as compared with a longer term repo loan is the closest in nature to a demand deposit. See Tobias Adrian, Christopher Burke and James McAndrews. 2009. "[The Federal Reserve's Primary Dealer Credit Facility](#)." *Current Issues in Economics and Finance* 15, no. 4 (August).

¹² Gary Gorton. 2010. "Questions and Answers about the Financial Crisis." National Bureau of Economic Research, Working Paper No. 15787, February.

¹³ Gorton, *ibid*.

¹⁴ See Brian Sack. 2010. "[Reflections on the TALF and the Federal Reserve's Role as Liquidity Provider](#)." Remarks at the New York Association for Business Economists, June 6.

¹⁵ David Wessel. 2009. *In Fed We Trust*. New York: Crown Business.

¹⁶ Recently the spread has widened with the onset of concerns over Greece.