

SPEECH

Modern Recipes for Financial Crises

December 4, 2015

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Remarks at the University of Iowa, December 4, 2015

As prepared for delivery

Introduction¹

Franklin Delano Roosevelt, in his first fireside chat on March 12, 1933, cogently explained the mechanisms that led to the complete collapse of the banking system in the United States earlier that month:

“First of all, let me state the simple fact that when you deposit money in a bank, the bank does not put the money into a safe deposit vault. It invests your money in many different forms of credit—in bonds, in commercial paper, in mortgages and in many other kinds of loans. In other words, the bank puts your money to work to keep the wheels of industry and of agriculture turning around. A comparatively small part of the money that you put into the bank is kept in currency—an amount which in normal times is wholly sufficient to cover the cash needs of the average citizen. In other words, the total amount of all the currency in the country is only a comparatively small proportion of the total deposits in all the banks of the country.

“What, then, happened during the last few days of February and the first few days of March? Because of undermined confidence on the part of the public, there was a general rush by a large portion of our population to turn bank deposits into currency or gold—a rush so great that the soundest banks couldn’t get enough currency to meet the demand. The reason for this was that on the spur of the moment it was, of course, impossible to sell perfectly sound assets of a bank and convert them into cash, except at panic prices far below their real value. By the afternoon of March third, a week ago last Friday, scarcely a bank in the country was open to do business. Proclamations closing them, in whole or in part, had been issued by the Governors in almost all the states. It was then that I issued the proclamation providing for the national bank holiday, and this was the first step in the Government’s reconstruction of our financial and economic fabric.”²

Roosevelt understood the recipe for a banking crisis: fractional reserve banking and an undermined confidence by the public in banks, which led to widespread runs on banks. In turn that led to panic prices on bank assets and bank closures. During the Depression, the basic elements for the prevention of banking panics were put in place or strengthened: an extensive and well-designed system of federal deposit insurance, broad access by banks to the discount window, and sound supervision of banks.³

After 1933, the United States did not experience another major broad financial crisis for 74 years, until 2007. Even through significant macroeconomic upheavals, and the savings and loan crisis of the 1980s, the Continental Illinois failure in 1984, the Long-Term Capital Management crisis of 1998, and the dot-com crash in the early 2000s, a widespread financial crisis did not occur. Although the savings and loan crisis was very costly to taxpayers, for the most part the system of deposit insurance, discount window access, and supervision prevented runs and large spillovers into the real economy.

The bank runs during the Great Depression have been the subject of extensive research. Economic theory provided increasingly compelling explanations for the mechanisms that lead to bank runs. The widely cited work by Douglas Diamond and Philip Dybvig in 1983 explained the economic logic behind why banks exist and what makes them vulnerable to runs. In their model, banks fund illiquid assets with liabilities payable on demand and provide an important form of insurance for depositors. So long as the demand of depositors for currency withdrawals are relatively uncorrelated, the bank provides a safe place for housing one’s savings while earning a rate of return higher than that available to people simply by storing currency. However, coordination failure, such as an instance when everyone thinks that everyone else will withdraw their deposit today, can give rise to instability and lead to bank runs. That general theory has been extended in many ways. One of the lessons of that work is that deposit insurance (backed by the government’s money creation power) and discount window access can mitigate or even eliminate bank runs.

So why did we experience a crisis in 2007, one in which we in the United States did not observe widespread instances of depositors lined up outside of their banks demanding currency?⁴ During the decades from 1933 to 2007, and especially since the rapid growth of the market intermediated financial system in the 1980s, the financial system in the United States has grown in complexity and in reliance on financial institutions that aren’t commercial banks. Those institutions intermediate corporate bond markets, money markets for short-term credit, stock markets in which firms can issue equity claims, and derivative markets. All of these markets rely on non-banks such as dealers, finance companies, insurers, and many other types of specialists. It is important

to recognize that the financial crisis of 2007-09 in the United States did not include widespread runs on bank deposit accounts, the hallmark of the crisis in the early 1930s. However, there has been a growing recognition that the financial system as a whole can be fragile beyond banks, and that runs can occur on a wide range of financial intermediaries.

So what is a modern recipe for a financial crisis?

Menu

What is a financial crisis?

First, let's define a financial crisis. There are many types of financial crises including currency crises in which the value of a country's currency plummets, as happened in Iceland in 2008 along with its major banking crisis; fiscal crises in which a country's government defaults on its debt or has the debt restructured, as happened in Greece in 2010 and 2014; and general financial crises, often called banking crises, which occurred in several parts of the world in 2008-09.⁵ What is a banking crisis, specifically? The economists Luc Laeven and Fabián Valencia (2012) have a clear definition, but similar definitions have been offered by other researchers:

A banking crisis is defined as systemic if two conditions are met:

- 1) Significant signs of financial distress in the banking system (as indicated by significant bank runs, losses in the banking system, and/or bank liquidations)
- 2) Significant banking policy intervention measures in response to significant losses in the banking system.

To be clear, and to apply this definition to the U.S. crisis in 2007-09, I'll expand it from the banking system to the financial system more broadly, as many financial firms that experienced distress during the most recent crisis weren't licensed as banks. It may seem odd to include policy interventions to be counted as a sign of a financial crisis, but when deposit insurance and lender of last resort services are available, a crisis may not kick off a bank run. That means the government must intervene to keep the stress from worsening, and so extraordinary action by the government can itself be a gauge of the severity of a crisis. Laeven and Valencia review the frequency of financial crises around the world and count 147 crises since 1970.

What problems are caused by a financial crisis?

The clearest outcome of a financial crisis is a loss of output—in other words, a severe and long-lasting recession. Using the same dataset they used to identify crises, Laeven and Valencia found that in advanced-economy nations, the median cumulative decline in output accompanying a financial crisis was 33 percent of annual gross domestic product, or one-third of an economy's output for a year. In addition, the median growth in government debt was 21 percent of GDP, and the median fiscal cost of the crisis-related spending was 3.8 percent of GDP.

Other studies confirm these grim statistics. Reinhart and Rogoff (2009) point out that recoveries from financial crises are weaker and slower than recoveries from recessions that don't accompany a financial crisis. Employment growth is slower during recoveries from financial crises, and the associated higher unemployment can have long-lasting effects on a whole generation of young workers who sustain long spells of joblessness. There are many other maladies that come along with financial crises.

Ingredients

Several economic researchers agree that one crucial ingredient in creating the vulnerabilities that can foster a financial crisis is a buildup of debt.⁶ In particular, a "credit boom," that is, a high and fast-growing ratio of credit to GDP, is one of the precursors to a financial crisis. Other, somewhat less reliable precursors include a prior financial liberalization or deregulation, housing price booms, and external imbalances (in practice, large inflows of capital from outside the country).

The complication is that while most financial crises have been preceded by a credit boom, not all credit booms have been followed by a financial crisis. In fact, a credit boom has been followed by a financial crisis in only about 30 percent of the cases.⁷

Consequently, there are good booms, which don't end in a crisis, and bad booms, or "booms gone wrong" that do end in a crisis.

Given that credit booms often accommodate the real and pressing needs of a growing economy, simply preventing credit booms, if that were even possible, could have the effect of choking off desirable growth and thus be more costly for society over the longer run.

Nevertheless, it is difficult a priori to distinguish good and bad booms, and, furthermore, to determine the mechanisms that generate crises when the economy has become vulnerable to one, that is, when the economy has high debt, a weakening macroeconomy, and other such elements. Even so, as previous studies have indicated, debt growth shifts the conditional distribution of economic outcomes to put more weight on events in which debtors must unexpectedly cut back their spending plans to repay debt, a vulnerability that is not present in the absence of debt. Therefore, as I'll explain later, forward-looking comprehensive supervision of the financial system is a key element in attempting to distinguish a healthy expansion of credit from a more dangerous and fragile buildup of debt.

Recipes

In what follows, I'll outline recent findings on some of the possible mechanisms that can generate a modern financial crisis, one that is not characterized, like the U.S. banking crisis in 1931-33 by depositors demanding currency from their banks. In particular, I'll focus on two strands of research that identify mechanisms that can amplify small initial disturbances in the economy to produce significant financial distress. My review is selective, as I don't aim to cover all the possible factors that researchers have suggested can contribute to financial crises, but instead to focus on two topics that reveal some of the main mechanisms at play.

The first mechanism is the procyclicality of financial intermediary leverage; banks and other financial intermediaries, notably broker-dealers, increased their leverage during the growth years of the 2000s, issuing increasing amounts of debt, but little equity. But as financial volatility increased in 2007, they began to deleverage, a process that produced stresses for many institutions and people throughout the economy, much like the distress caused by classic bank runs.

The second mechanism I'll review is the role played by the private sector in creating money-like assets, such as repos, commercial paper, and other short-term and ostensibly safe assets. When able to issue such assets, private issuers pay a very low interest rate, as others in the economy demand the apparent safety that those assets provide. That situation gives the private financial sector strong incentives to issue money-like claims. However, the excessive issuance of such instruments can lead, at some point, to a loss of confidence in them. In turn, that can reduce demand for these instruments and lead again to a rapid deleveraging by the issuers of these instruments. Much like the case that F.D.R. discussed for banks in the 1930s, the runs on these short-term debt instruments can lead to fire sales of assets by the institutions that were relying on the issuance of money-like instruments to finance their portfolios—and those sales cause distress for many others throughout the economy.

Procyclical leverage of financial intermediaries

In a series of papers, Tobias Adrian and coauthors have made a number of findings about the behavior of financial intermediaries, that is, banks, broker-dealers, and other financial companies, and how their leverage varies over time. So rather than focusing on the debt burden of the government, or households, or nonfinancial corporations, this line of work focuses on the debt burden of the financial sector itself.⁸ It is important to mention that, in a series of studies, Atif Mian and Amir Sufi have proposed a complementary mechanism in which they focus on the increase in household debt as a strongly predictive factor in explaining the depth of the recession associated with the financial crisis.⁹ Across the United States, regions in which household leverage was fueled by more aggressive lending tended to have larger subsequent busts. Hence the procyclicality of household and financial sector leverage were tightly intertwined.

The first and central finding is that financial intermediary balance sheet growth is highly procyclical. This finding is broadly consistent with how we think banks operate and the role they perform in providing financing to households and firms: As the economy expands, banks find more potentially profitable projects to which to lend, and also find it relatively easy to attract more funding, as households and businesses have more savings to invest. A more cautionary finding is that the size of bank balance sheets tends to forecast aggregate economic volatility. Consequently bank lending booms may portend more mixed economic outcomes.

Other studies in this vein suggest some of the mechanisms that might be behind the greater future volatility. First, banks have procyclical leverage: lending booms by banks are financed by debt, not equity. Consequently, the increased leverage of banks can result in a deterioration of the quality of bank lending through a type of moral hazard that can occur if debt becomes too easy for the banks to raise or if volatility in financial markets is suppressed. Another finding by Adrian and his coauthors is that banks' incentives and ability to lend becomes highly sensitive to financial market volatility. When the economy is in the upside of the cycle, volatility and other measures of risk may be low precisely because of the abundance of debt financing, masking the level of underlying risk in the economy, which may lead to excessive, and eventually unsustainable, growth in bank lending.

The procyclical leverage of banks is associated with other features of the financial economy and its dynamics. For example, the leverage of financial intermediaries influences the pricing of assets: once again, this feature can impart procyclicality to asset pricing. When risk measures are low during a growth and boom phase of the cycle, asset prices tend to be supported, but during the contractionary phase, asset prices can drop, with risk premia rising, which, in turn, can lead to further contractions in credit by lenders, resulting in a negative feedback loop that can amplify the initial shock to asset prices.

Finally, the procyclical leverage of financial intermediaries is tied to systemic risk, suggesting that the leverage of financial intermediaries is a key factor behind economy-wide financial crises. Once again, a potential "macroprudential" regulator—one that is attempting to reduce the risk of a financial crisis but also attempting to stabilize the macroeconomy—would face a risk-return tradeoff: Allowing a buildup in financial intermediary leverage as the economy grows can assist in achieving macroeconomic objectives such as full employment, but risks a more severe downturn if such leverage growth becomes excessive. Making those judgments is inherently difficult.

The benefit of being a money issuer

Society demands money for many purposes. Money provides a good way for people to store value safely, and it can be used as a means of exchange. These are classic and enduring features of money. For the purpose of this talk, by “money” I mean a broad definition of money—what some would call “money-like” assets that can provide the monetary functions of storing value and serving as a medium of exchange. Those include both short-term government debt and short-term borrowing by financial intermediaries, especially borrowing that is designed to be extremely safe, such as repurchase agreements, or repos.

A repo is a fairly modern instrument that I’ll describe in a bit more detail, as repos played an important role in the buildup of intermediary leverage and the issuance of private-sector money-like instruments during the lead-up to the crisis of 2007-09. A repo is a sale of a security with an agreement to buy it back on a later date (the most common term for a repo is overnight, but the term can be for a longer period, such as one-month as well). The difference in the purchase and sale prices constitutes a rate of interest paid by the institution that is borrowing the money (or selling the security). The advantage of the sale and resale arrangement is that, in the event that the borrower does not return the money it owes, the party that purchased the security can keep it, avoiding the costs, delays, and uncertainty associated with making its claim in bankruptcy court; these advantages are confined to certain types of securities and has been allowed by supporting legislation.

Repos are just one such way that a private intermediary can provide a high degree of safety to its lenders, and others include asset-backed commercial paper, money market mutual fund shares, and auction-rate securities. However these private money-like assets are created, those that succeed in providing that elusive money-likeness confer significant benefits on their creators. A now widely confirmed finding regarding the issuance of money-like assets is that they can be issued at lower interest rates than other types of debt, saving the issuer from greater interest expense.

That result comes in two steps. First, a number of studies show that short-term Treasury bills (which are a publicly provided type of money-like asset) enjoy a “liquidity premium,” especially when the supply of Treasury bills is relatively low.¹⁰ Short-term Treasury bills can provide various money-like services for larger institutions because they are so safe. Deposit insurance is limited (currently it is limited to deposits of \$250,000) so large institutions that want to hold funds safely for short periods cannot find that safety directly with bank deposits. Instead, short-term Treasury bills can provide a convenient way for large institutions to hold wealth in a safe form. Because the Treasury bills are short-term, their prices don’t experience much variation, and they are easily transferred and used as collateral. Hence, they provide those features of money I mentioned earlier, namely a good store of value and a means of exchange.

A second finding from these studies is that when the U.S. Treasury issues relatively smaller amounts of Treasury bills, the private-sector issuance of money-like assets increases, taking advantage of the liquidity premium that large institutions are willing to pay for their safety and convenience. So when the government funds itself with relatively more long-term debt, firms fill the resulting gap by issuing more short-term debt.¹¹

In related work, Jeremy Stein (2012) points out that, notwithstanding their private benefits, there are systemic risks involved when the private sector creates money-like assets. For many reasons, if private intermediaries run into difficulty issuing those assets or in rolling over their short-term debt, then they must deleverage abruptly. In fact, the crisis of 2007-09 was characterized by runs on all four of the money-like instruments I mentioned earlier, namely repo, asset-backed commercial paper, money market mutual fund shares, and auction-rate securities. Those runs can lead to selling off the loans or securities that were financed by the issuance of those instruments and also may initiate fire sales.

A fire sale is caused when assets are sold at a time when many of the likely buyers of those assets do not have the capacity to purchase them, leading to severe downward price adjustments. These price movements create additional problems for other financial sector players, as the declining value of the securities that were sold often means that the value of the securities that they hold are also marked down, reducing their ability to obtain or retain financing to hold their portfolio of securities. This can lead to additional sales, worsening the fire sale conditions, in a negative feedback loop that amplifies the initial shock to the financial sector.

The emphasis on fire sales when private intermediaries encounter difficulty rolling over their short-term debt is complemented by research that posits that the role of banks is to create and preserve liquidity of their money-like liabilities such as deposits, repos, and other short-term debt.¹² In normal times, these instruments are very safe and it is believed by people and institutions that invest in them that no special monitoring of those instruments is needed. Consequently, investors remain ignorant of the precise condition of the intermediary to whom they are lending, or of the securities that back their loan. However, once conditions worsen, suddenly the nature of the debt changes, in that the people and institutions that hold the debt realize they must expend resources to monitor their borrower. But, at that point, they are not in a good position to monitor that firm, so they simply refuse to extend the loan to it when the loan comes due, greatly amplifying the initial cause of the need to monitor further. This has the effect of the old-style bank run: suddenly the financial intermediary is caught short of the ability to finance its portfolio, and must reduce its indebtedness quickly, again, possibly triggering fire sales and creating negative externalities to others.

Setting the Table

Classic and modern crises

In the financial crisis that initiated the Great Depression, we saw a classic banking panic. At the peak of an economic expansion, a stock market crash signaled a revision to growth expectations, or possibly a change in the willingness of people to assume risk. Around the country many banks (whose deposits were not insured) experienced difficulty in meeting depositors' withdrawal demands, and bank runs began to occur, at first sporadically. In these runs, depositors formed lines stretching from teller windows to outside the bank, clearly indicating to the public that the bank was in distress. Bank runs waxed and waned for a few years prior to the generalized runs that preceded F.D.R.'s declaration of a bank holiday. F.D.R. explained well the consequences of a bank run: the banks that were run could only close their doors, or sell their assets at panic prices. Either of those actions conferred negative externalities on the economy more broadly. With the closure of a bank, the community lost access to credit and to a safe place into which it could deposit its paychecks and savings. The knowledge about borrowers and their creditworthiness was lost, and even if other banks would expand their business, that loss of information was costly to the efficiency of the economy, and in notable research Ben Bernanke (1983) measured the very negative effect that bank closures had on economic performance.

In the U.S. financial crisis of 2007-09, there were no widespread bank runs: in general depositors did not line up at their bank and request their deposits, even for banks that were widely reported to be in poor financial condition. This is likely the case because of the widespread understanding of U.S. federally insured deposit insurance, which protects depositors' funds up to the current limit of \$250,000, and the presence of the discount window, by which banks can increase their cash holdings to meet withdrawal demands without having to sell assets at panic prices.¹³

However, the financial crisis of 2007-09 manifested another type of run on banks as well as non-banks, a run on the short-term, non-deposit debt issued by the intermediaries. This is a point made clearly by Gary Gorton (2012). These runs weren't clearly and easily visible to the public, and this fact impeded the quick understanding of the severity and potential consequences of the run that was underway.

I've outlined two strains of thought that provide models for us to understand the mechanisms that amplify what might initially be small shocks into large and dangerous events for the economy: the procyclical leverage of financial intermediaries and their sensitivity to measures of financial risk, such as volatility, and the potential for private intermediaries to issue money-like instruments. When the economy is vulnerable to a financial crisis—that is when the levels of debt are high and the macroeconomy is at or past a peak, and in some cases, a housing boom is ending—then financial intermediary leverage and the issuance of money-like debt instruments can become excessive. Such excess can lead to a rapid scramble to deleverage—that is, to reduce levels of debt, causing fire sales and failures of financial intermediaries, which, in turn, confers further distress on the financial economy and the working of the macroeconomy generally, as important sources of credit are blocked from reaching households and firms.

In essence, I've argued that there are two views of the mechanisms that could lead to a crisis: one is about excessive leverage or the scarcity of loss-bearing capacity that builds up in an expanding economy and the other is about the excessive provision of liquidity in the private sector, or excess private money creation. Of course, liquidity and leverage go hand in hand: Private money creation enables firms that issue it to take on high leverage, both in the financial and the nonfinancial sectors. Part of the puzzle of the crisis of 2007-09 was that the excessive leverage and private money creation took place outside of commercial banks, and outside of firms that were subject to broad consolidated supervision—in the “shadows” as some have put it. It is important that we recognize that in the modern era the conditions for a financial crisis can be created by nonbanks.

A lesson of the crisis of 2007-09 was that financial crises, modern ones, do not have to be characterized by lines from bank teller windows in which depositors are withdrawing cash, or even be centered in banks. Instead, in a more market-oriented, in contrast to bank-oriented financial system, different sources of stress come to the fore. While employing a different recipe, the flavors of the crises are the same: financial intermediaries, through having overextended credit or engaged in an over-reliance on the issuance of short-term debt, or in the midst of a general panic, have difficulty in raising funds and are forced to sell off positions abruptly, putting further downward pressure on prices, worsening the situation systematically.

Preparing for (Unwanted) Guests

In response to the 2007-09 crisis, the policies of the Federal Reserve were focused primarily on liquidity injections, which can be thought of as replacing the privately created money that was being withdrawn from circulation as intermediaries delevered. The U.S. Treasury and the Federal Deposit Insurance Corporation extended guarantees for money market mutual fund shares, issuance of certain types of debt by bank holding companies and unlimited amounts of deposits in transactions accounts of commercial banks. Later, with the passage of the TARP legislation, the federal government addressed the excessive leverage and shortages of loss-bearing capacity through the injections of capital in October 2008 and in April 2009 in conjunction with the Supervisory Capital Assessment Program, or stress test of the major U.S. bank holding companies.

Ultimately, the 2007-09 crisis was about both leverage and liquidity in the financial system as a whole, and not only in the tightly supervised sector of banking firms. This suggests that official sector efforts should aim at forward-looking monitoring of financial vulnerability that take both leverage and maturity transformation into account, and to broaden supervision to include broader

coverage of the financial sector. In addition to many other efforts, the Federal Reserve is conducting tests of exactly that sort through its capital and liquidity assessments, the Comprehensive Capital Analysis and Review, or CCAR, and the Comprehensive Liquidity Analysis and Review, or CLAR. CCAR is the Federal Reserve's annual process for evaluating capital adequacy of large and complex financial firms under normal and stressed conditions. CLAR is the Federal Reserve's annual, horizontal exam to evaluate the liquidity position and liquidity risk management practices of those firms. CCAR and CLAR are applied to bank holding companies, firms that now include many of the broker-dealers and other nonbank intermediaries involved in the market-based system of intermediation. Both of these forward-looking assessments attempt to gauge the vulnerability to a crisis by examining the capital and liquidity resources the largest bank holding companies have to withstand the stresses that accompany a severe economic downturn.

Presentation [PDF](#)

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¹ The author wishes to thank Tobias Adrian and Thomas Eisenbach for helpful discussions and comments on the text of the speech. The views expressed are those of the author and do not necessarily represent the views of the Federal Reserve Bank of New York or of the Federal Reserve System.

² Franklin Delano Roosevelt, “Fireside Chat on Banking,” March 12, 1933. Transcript available from University of California, Santa Barbara, American Presidency Project, <http://www.presidency.ucsb.edu/ws/?pid=14540>.

³ Congress greatly broadened the lending powers of the Federal Reserve Banks in 1932 and again in 1933. The Federal Deposit Insurance Corporation was created in 1933. See Meltzer (2003) and Sastry (forthcoming).

⁴ IndyMac did experience a run in which depositors were, in some instances, unable to withdraw their deposits as their branch closed for the day. See Kristoff and Chang, “Federal Regulators Seize Crippled IndyMac Bank,” *Los Angeles Times*, July 12, 2008, <http://articles.latimes.com/2008/jul/12/business/fi-indymac12>.

⁵ Recently, a group of economists agreed to and published a “consensus narrative” of the causes of the eurozone financial crisis, focusing on the external imbalances across countries within the eurozone, which led to a sudden stop in lending, and the flow of capital, across those countries. See <http://www.voxeu.org/article/ez-crisis-consensus-narrative> and <http://www.voxeu.org/content/eurozone-crisis-consensus-view-causes-and-few-possible-solutions>.

⁶ See Borio, Drehmann, and Tsatsaronis (2011), Schularick and Taylor (2012), and Reinhart and Rogoff (2011).

⁷ See Dell’Ariccia, Igan, Laeven, and Tong (2015), and Gorton and Ordonez (2015).

⁸ See Adrian and Shin (2008, 2010, 2014), Adrian, Boyarchenko, and Shin (2015), Adrian, Moench, and Shin (2010, 2014), Adrian, Etula, and Muir (2014), and Adrian and Boyarchenko (2012, 2013, 2014).

⁹ See Mian and Sufi (2010, 2014).

¹⁰ See Greenwood, Hansen, and Stein (2010, 2015), Krishnamurthy and Vissing-Jorgensen (2012), and Carlson et al. (2014).

¹¹ This finding is further supported by the finding that the share of safe assets in the economy has been relatively steady since the 1950s. Others confirm those results and show that the substitution of privately-created short-term debt for the Treasury’s supply of short-term debt has been a consistent feature of the U.S. financial system since 1875. See Gorton, Lewellen, and Metrick (2012), and Krishnamurthy and Vissing-Jorgensen (2015).

¹² See Dang, Gorton, and Holmstrom (2009, 2012).

¹³ Prior to October 3, 2009 the FDIC limit on deposit insurance was \$100,000, but was raised on that day to \$250,000, for a temporary period. The Dodd-Frank Act made the expansion in the insurance limit permanent.