

## Example 12.5

# The 2008 Financial Crisis

The financial crisis that hit the United States in the fall of 2008 and quickly spread to Europe and beyond was a grim reminder that financial markets are fragile and can easily fall apart. The crisis of 2008 has its own particular story to tell, but the plot line was essentially the same as that for many other financial crises throughout history. As a general rule, a financial crisis is a witches' brew with four main ingredients:

1. An asset bubble that bursts
2. A central externality within financial markets
3. Debt financing
4. The inability of financial institutions to adequately insure against risky debt-financed purchases of the asset experiencing the bubble and other assets related to it.

All four ingredients were central to the financial crisis of 2008.

The federal government responded to the crisis with a series of monetary and fiscal policies that were literally unprecedented in U.S. history. These policies are typically covered in courses in Macroeconomics and Money and Banking, and will only briefly be mentioned here. The response does pose one risk, however, that was featured in **Chapter 12** and deserves comment: a form of **moral hazard** that can greatly increase the probability of yet another financial crisis developing once this one subsides. One of the main public policy issues for the U.S. and all other countries is how to regulate financial markets to prevent the moral hazard from taking hold.

### THE INGREDIENTS

#### The Asset Bubble: Housing Prices and Related Assets

An *asset bubble* occurs when investors, driven by what former Fed Chairman Alan Greenspan termed an irrational exuberance, bid up the price of an asset way beyond any

value that could reasonably be supported by the so-called fundamentals that normally determine the asset's value. The bubble this time was in housing prices. Housing prices in the U.S. had been rising steadily since the early 1990s and then really exploded from 2003 to 2006. The sharp increase beginning in 2003 was spurred on by a very expansionary monetary policy in response to the tepid recovery of the U.S. economy from the recession of 2001. The expansionary monetary policy kept interest rates very low, which then encouraged people to take out mortgages to finance new homes. The demand for homes outstripped the supply and prices rose at a rate that was unsustainable. The bubble burst in 2007; housing prices declined sharply in 2007 and 2008, and are projected to keep falling through most of 2009 as well.

The mortgages taken out by households led to the creation of still other financial assets related to the mortgages during the years that the bubble was expanding. The mortgage market is quite fluid in the United States, with almost any institution able to write mortgages. A common transaction that evolved was for a mortgage broker to create the mortgage with the household/borrower and then place the mortgage with a financial institution, typically a bank, in return for a fee. A serious weakness of this arrangement is that the brokers do not much care whether the borrower can actually pay the monthly debt service – principal plus interest – on the mortgage. Once the broker passes the mortgage on to a bank and receives his fee it is no longer his concern. Consequently, many problematic mortgages were written without appropriate checks on the income of the borrowers. Low-income borrowers would be enticed with extremely low teaser interest rates that they could afford. But then the rates would adjust 'balloon' after two years to levels that they could not afford. These mortgages are called *subprime mortgages* because they have a high risk of default – that is, of nonpayment by the borrower. A mortgage is secured by the house it is financing. Therefore, when the mortgage goes into default, the ownership of the house transfers to the institution that holds the mortgage. The institution is said to *foreclose* on the house.

Two quasi-government agencies, the Federal Home Loan Mortgage Corporation ("Freddie Mac") and the Federal National Mortgage Association ("Fanny Mae"), purchase about half the mortgages that are issued. The funds they use to purchase the mortgages are obtained in part by issuing debt that is backed by the U.S. Treasury. In this way, Freddie Mac and Fanny Mae provide funds to banks and other financial institutions that can be used to issue more mortgages.

The other half of the mortgages that are not passed on to Freddie Mac and Fanny Mae remain in the private financial markets. They gave rise during the bubble years to two additional financial assets that became the centerpiece of the financial crisis: the *mortgage backed security* (MBS) and the *credit default swap* (CDS).

The banks that held the mortgages knew that they were receiving mortgages from the mortgage brokers that varied greatly in their riskiness, all the way from subprime mortgages to mortgages issued to very high-income borrowers who would almost

certainly never default on their payments. In an attempt to spread their risks, the banks divided their mortgages up by risk into what are called *tranches* (French for ‘slices’), repackaged the individual mortgages into groupings, and created a new bond for each grouping – the MBS. The MBS is referred to as a *derivative asset*, because the payments to the purchasers of these bonds are derived from the monthly debt service payments on the mortgages contained in the MBS. With housing prices rising through 2006, these MBSs became very popular with financial institutions of all kinds—banks, investment banks, hedge funds, brokerage houses, and so forth. Freddie Mac and Fannie Mae also issued MBSs to obtain more funds to buy mortgages. The risk of default on mortgages was viewed as very low. Moreover even if a default occurred, the bank, having foreclosed on the house, could always sell it for a higher price than the value of the outstanding mortgage and make good on the loan contained in the related MBS.

Still, there was always a risk that the mortgages underlying an MBS could default, especially if the MBS contained one or more subprime mortgages. Also, because an MBS contains a mix of mortgages with varying degrees of risk it is very difficult to price. Consequently, in a desire to protect themselves, the holders of the MBSs turned to another financial instrument called the credit default swap, which had been invented by J.P. Morgan in the 1990s. A CDS is contract that looks very much like a standard insurance contract and is designed to provide value protection against bonds of all types. There are a variety of CDS contracts whose general form is as follows. The issuer of a CDS against a particular bond agrees to pay the par value of the bond should the bond decrease in value either because of a default, or because the bond receives a lower rating, or for whatever other value-lowering event is stipulated by the contract. The issuer either buys the bond at par value if the buyer owns the bond, or pays the buyer the par value without purchasing the bond if someone besides the buyer owns the bond being insured. In return for this protection, the issuer receives periodic premium payments from the buyer of the CDS. A CDS is usually a 5-year contract, which is terminated if the contract pays off. The mortgages and their derivative MBSs and the CDSs were at the heart of the financial meltdown.<sup>1</sup>

## The Externality

Financial institutions such as investment banks, brokerage houses, and hedge funds are in the business of attracting funds from investors and managing or investing the funds in their behalf. In doing so, the institutions face a nasty externality problem: their ability to attract funds depends not only on how well they perform for their investors but also on how well their competitors do for their investors. An investment bank could earn high returns for its investors, but if other investment banks and hedge funds are earning even higher returns for their investors, the investment bank risks losing its investors to its

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<sup>1</sup> Descriptions of the MBS and CDS can be found on Investopedia: [www.investopedia.com](http://www.investopedia.com).

competitors. With everyone's fortunes tied together in this way, each financial institution has a powerful incentive to increase its returns however it can. And the easiest way to increase returns is to borrow – that is, to debt finance the assets it purchases for its investors, which is exactly what they all did. Debt financing became the next ingredient in the witches' brew.

## Debt Financing

Borrowing or issuing debt to purchase assets can greatly increase the returns to investing. It is said to *leverage* the returns on the asset, a term derived from the increase in force made possible by using a fulcrum and lever to lift some object. In 2004, the Securities and Exchange Commission (SEC) gave five of the largest investment banks and brokerage firms (Goldman Sachs, J. P. Morgan Chase, Bear Stearns, Lehman Brothers, and Merrill Lynch) enormous leeway to pursue this option when it allowed them to increase their leverage ratios from 12:1 to 30:1. The *leverage ratio* is the ratio of debt to an institution's own funds (its equity or capital) used to purchase an asset.<sup>2</sup> There is a serious downside to debt financing, however: it greatly increases the purchasers' exposure to risk.

The following example illustrates both the rewards and the risk inherent in borrowing to purchase assets. It assumes a leverage ratio of 30:1, in line with the SEC regulations.

### *Leverage example*

Suppose you buy an asset for \$31,000 today entirely with your own money and sell it one year from now. If the value of the asset increases by \$3,100 to \$34,100 one year from now, you earn 10% on the asset, a return of \$3,100 on your \$31,000 investment. Conversely, if the value of the asset decreases by \$3,100 to \$27,900, you lose 10%, a loss of \$3,100 on your \$31,000 investment.

Suppose, instead, that you have only \$1,000 to invest but want to buy the \$31,000 asset, so you borrow \$30,000. The leverage ratio is 30:1, the ratio of the amount debt financed to your equity or capital. To illustrate the leverage principle as simply as possible, assume first that you do not have to pay interest on the loan (perhaps you borrowed the money from a friend). You pay back the loan in one year when you sell the asset. If the value of the asset rises by 10%, or \$3,100, to \$34,100 in one year, you sell the asset, pay back the \$30,000 loan, and you are left with \$4,100. You started with \$1,000, your capital or equity in the \$31,000 asset that you purchased, and you now have \$4,100. You received a gain of \$3,100 on your \$1,000 of capital, a return of 310%. Debt

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<sup>2</sup> Hedge funds are a special case. They are not required to report their transactions and are therefore exempt from the SEC regulations on leverage ratios. They presumably had similarly high or even higher leverage ratios, however, given the enormous returns that some of the funds were reputed to have earned for their investors before the housing bubble burst.

financing has leveraged a 10% return on the asset into a 310% return on your capital. Your 1/31 equity stake in the asset increases your return by a factor of 31. This is the reward to debt financing.

The risk is that the leverage principle is symmetric on the downside. Suppose the asset declines in value by 10%, or \$3,100, to \$27,900 one year from now. After paying back the \$30,000 loan, you are left with -\$2,100, a loss of \$3,100 relative to your original \$1,000 of capital. You have leveraged a 10% decline in the value of the asset into a 310% loss on your capital.

The reward/risk properties of debt financing turn sharply towards risk if you have to pay interest on the loan, which is of course the standard case. Leveraging becomes decidedly asymmetric when borrowing with interest. Suppose you borrow at an interest rate of 10%, so that in one year you must pay back \$33,000, equal to the \$30,000 of principal (the loan amount) plus \$3,000 (10% of \$30,000) in interest. If the value of the asset rises by 10% or \$3,100, to \$34,100, you pay back \$33,000 and are left with \$1,100. You have earned \$100 on your \$1,000 of capital, or 10% return. The advantage of debt financing has disappeared on the upside. The principle illustrated is that to achieve leverage on the upside, the value of the asset must increase by more than the interest rate on the loan. (We leave it to the reader to show the leveraging of the return if the value of the asset rises by more than 10%.)

On the downside, if the value of the asset falls by 10% or \$3,100 to \$27,900, you are left with a loss of \$5,100 after paying back the \$33,000. You have lost \$6,100 relative to your original \$1,000 of capital, a loss of 610%. The principle illustrated is that even a small decrease in the value of a debt-financed asset can lead to a huge loss of an investor's capital.

### The Inability to Insure Against Risk

As noted above, the financial institutions tried to protect themselves against the risk of their investments related to the housing market in two ways: by repackaging individual mortgages into MBSs, and by buying CDSs against the MBSs they were holding. Many of the institutions were even using the CDS market to hedge in both directions, buying CDS protection against some of the bonds they held and issuing CDSs against bonds held by other institutions. But when the housing price bubble burst, there turned out to be little or no protection at all. This was so for a number of reasons.

Start with the CDSs. A CDS differs from a standard insurance contract in one important respect: unlike an insurance company issuing life insurance or automobile insurance, the issuer of a CDS does not have to have reserves on hand in case it has to pay off on a CDS. Therefore, the ability of the issuer of a CDS to pay off on the contract depends only on the issuer's overall financial viability. Even worse, many of the CDSs issued were nothing more than third-party bets against the value of a bond, instances of pure speculation that are much like betting on a sporting event. When the housing bubble

burst, many investors bet that defaults and foreclosures on mortgages would rise, and lead to declines in the value of the derivative MBSs. The standard way to place a bet that the value of a bond such as an MBS will decrease in the future is by means of a short sale of the bond: agree to sell a particular MBS at its current price sometime in the future, say, six months from now. The sale is said to be short because the bettor does not currently own the MBS. At the end of six months, the bettor is forced to buy the MBS and sell it at the agreed-upon price. If the bettor has guessed right, he buys the MBS at a depressed price, sells it at its price of six months ago, and makes a profit.

The emergence of the CDS market gave thebettors another option: buy a CDS against the value of the MBS and if the MBS declines in value collect on the CDS (depending on the exact terms of the contract). This option was simpler because the bettor did not have to bother with buying the bond. As a result of these side-bets or speculations, the value of the CDS market grew to an estimated \$47 trillion by mid-2007, approximately twice the value of all U.S. companies' stocks at the time.<sup>3</sup> Also, CDSs could be traded once created, and the CDS market was so active that a CDS was traded on average 10 to 15 times among financial institutions.

When the bubble burst, issuers of CDSs realized that the premiums they were receiving were much too low—they had badly underestimated the probability of default on MBSs and other bonds they were insuring. The buyers of CDSs were not necessarily better off either. The value of a CDS is directly related to two probabilities: the probability that the asset being insured by the CDS will default and the probability that the issuer will be able to pay off on the contract if the default happens. With housing prices falling and foreclosures increasing, the first probability increased but the second probability decreased as the balance sheets of the issuers became stressed.

Next, add in the huge leverage ratios of the financial institutions who were playing in the markets for the MBSs and CDSs. When housing prices were rising sharply, and traders carried the false expectation that they would continue to rise, the value of the MBSs and CDSs were well supported. There were few defaults on mortgages and therefore few payouts on the CDSs. Everyone won, and won big. People and firms were willing to lend to the financial institutions to purchase these derivative assets even though the borrowers had leverage ratios of 30:1 because they were 'certain' that the value of the assets would hold. The leverage principle worked its wonders on the upside.

When the bubble burst, however, the downside risk to borrowing reared its head. Defaults and foreclosures on mortgages increased, especially on the subprime mortgages, and the banks could not sell the houses they now owned at a price that would cover the value of the mortgages. Consequently, the value of the MBSs began to decline, and the underlying mortgage defaults triggered payments on the CDSs meant to insure them. The

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<sup>3</sup> The estimated value of the CDS market is from International Swaps and Derivatives Association, as reported in Janet Morrissey, "Credit Default Swaps: the Next Crisis?", *Time Magazine*, 3/17/08. [www.time.com/time/business/article/0,8599,1723152,00.html](http://www.time.com/time/business/article/0,8599,1723152,00.html)

fact that the U.S. economy was in recession by 2008 meant that the values of bonds of all kinds were falling, triggering CDS payments on those bonds as well.

Once an asset bubble bursts, lenders start to get nervous and begin to issue calls on their loans. Unlike mortgages, the loans to the financial institutions are typically unsecured loans – *i.e.*, the lender does not receive any particular asset if the borrower defaults on the loan payments. Therefore, to protect themselves, lenders write a call feature into the loan, meaning that they have the right to demand immediate repayment of the loan at any time (*i.e.*, they can call the loan). But, as the example above indicates, when the value of debt-financed assets decreases, borrowers with leverage ratios of 30:1 can lose big when paying back the loan. As in the example, they may not have enough capital to cover the loan, in which case they have to sell assets to pay back the loan. But if enough firms sell off assets of the same kind, such as their holdings of MBSs, then the value of the MBSs falls still further and a process referred to as *deleveraging* can occur. This means that after selling assets to pay back loans, the value of the remaining assets has declined to such an extent that the ratio of the firms' assets to its liabilities (debts) falls even more. This makes lenders even more nervous so they call in more loans and the downward cascade of asset sales and loan repayment continues. Ever more financial institutions become insolvent and finally the financial markets cease to function.

By mid-September of 2008, such storied Wall Street firms as Lehman Brothers, Bear Stearns, and Merrill Lynch had either failed (Lehman) or were failing and bought by other firms (Bear Stearns by J.P. Morgan Chase, Merrill Lynch by Bank of America). AIG, the largest issuer of CDSs, was also failing and received an \$85 billion loan from the Fed, and then another \$67.5 billion from the Fed and the Treasury in November. By early October, the credit markets in the U.S. were essentially frozen. People and institutions were refusing to lend to anyone, except perhaps overnight loans at high interest rates, because they could no longer be confident that the borrowers would be able to pay them back.

In short, with virtually every institution highly leveraged, with many if not most of them holding large amounts of MBSs that had sharply declined in value, and with many of them both owning and issuing CDSs, the attempt to insure against risk cannot work. As indicated in Chapter 12, insurance can protect against risk only if the risks being insured are independent; *e.g.*, insurance companies will write automobile insurance for you and me because the probability that I have an automobile accident is independent of the probability that you will have an automobile accident. But in the world of finance, all the financial institutions are more or less interconnected. To give one example, with many firms both owning and issuing CDSs, the provision of insurance essentially becomes circular. Firm A is insuring some of the assets of firm B, which is insuring some of the assets of firm C, which is insuring some of the assets of firm A. More generally, the fortunes of the financial institutions tend to rise and fall together. There are no independent insurable risks.

Worse yet, financial markets are truly global. Therefore, when the U.S. financial system ground to a halt, the U.S. is such a big player in the global financial markets that its difficulties quickly spread worldwide. Everyone lost, even a country such as Brazil, which had built up large reserves of dollar-denominated assets and was extremely conservative with its investments. The notion that the financial institutions could really protect themselves through such instruments as MBSs and CDSs can only be attributed to Greenspan's irrational exuberance when the asset bubble was expanding.

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## THE U.S. GOVERNMENT'S RESPONSE

The federal government's response to the financial crisis has been truly unprecedented. Fed Chairman Ben Bernanke is one of the world's leading macroeconomists and his particular expertise is the analysis of financial crises. His research had convinced him that when financial markets get into trouble the government should intervene in a massive way to head off a complete financial collapse. This is exactly what the federal government has been doing, with both its monetary and its fiscal policies.

### Monetary Policy

A primary responsibility of the Fed or any central bank is to ensure that the economy has sufficient liquidity 'to grease the wheels of commerce'. As students of Economics know, the standard way the Fed does this is to provide reserves to the commercial banking system by buying outstanding Treasury securities from the securities dealers at a few large financial institutions who trade in Treasury securities. The commercial banks then use the reserves to make loans to the nonblank public.

Since September, the Fed has greatly expanded its powers and the scope of its operations, instituting a large number of new loan and investment programs designed to add liquidity to the economy and to increase the liquidity of the financial institutions (*i.e.*, the ability to sell their assets for cash to pay back loans). Among the Fed's initiatives are:

- Trading some of the Treasury securities it holds with financial institutions other than banks in exchange for the depressed MBSs (now commonly referred to as toxic assets)
- Offering to buy up to \$500 billion of MBSs backed by Fannie Mae and Freddie Mac
- Offering to issue \$200 billion in loans secured by derivative assets that are backed by credit card debt, and automobile, student, and small business loans
- Offering to buy up to \$1.4 trillion of *commercial paper* directly from financial and nonfinancial firms.

The purchase of commercial paper is especially noteworthy. Commercial paper is a loan contract issued by firms to cover imbalances between operating revenues and expenses. These are usually short-term loans, with maturities of six months or less. In agreeing to buy commercial paper, the Fed is in effect acting as a public bank for the real economy – something it has not done since the 1930s.

The Fed has also agreed to unlimited currency trades, as needed, with the equally beleaguered foreign central banks. The result of these and other initiatives has been that from September until early December of 2008, when this example was written, the Fed created a nearly four-fold increase in its assets, which translates into the same increase in liquidity injected into the economy. And Bernanke has pledged to inject still more liquidity into the economy if necessary. No one had ever seen a policy response from the Fed even remotely like this.<sup>4</sup>

### Fiscal Policy

Congress and the administration agreed in September to commit \$700 billion of taxpayer's money to support the financial industry, with \$250 billion to be released immediately. The bill was nicknamed TARP, for Troubled Asset Relief Program, because the original intent was to use the funds to buy distressed MBSs from the financial institutions. Shortly after passage of the bill, however, Treasury followed the lead of Britain's Gordon Brown and decided to purchase preferred stock in the financial institutions, as a means of inserting capital directly into the industry. The Treasury Secretary may also use the funds for other purposes, and as this is written, it may well decide to give \$25 billion to the struggling U.S. auto industry.

Suffice it to say, the federal government is taking what are truly historic measures to prop up and unfreeze the U.S. financial system and help moderate the recession that started in December of 2007. The success of these initiatives remains to be seen at the time of writing. It certainly does not help that the recession is deepening and housing prices continue to fall. Lenders in the credit markets will have trouble issuing loans with the money they have received from the Fed and the Treasury if people and businesses are unwilling to borrow. The demand for loans always declines during a recession. And the falling housing prices will continue to depress the value of the MBSs and put pressure on the issuers of the CDSs that were meant to insure them.

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### MORAL HAZARD

Using monetary and fiscal policies to bail out financial institutions that made reckless, debt-financed bets that an asset bubble would continue is a highly risky strategy. It

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<sup>4</sup> A full account of the Fed's actions can be found at [www.federalreserve.gov](http://www.federalreserve.gov), under monetary policy. An additional move not mentioned in the text was placing Freddie Mac and Fannie Mae, which were both failing, under the conservatorship of the Federal Housing Finance Agency in September.

generates a dangerous moral hazard by giving financiers a powerful incentive to behave in exactly the same way should another asset bubble form, and with the same consequences. If financiers can count on the government to bail them out, they don't have to worry that their own attempts to insure against the risky positions they have taken are likely to fail. The government, by acting as the insurer of last resort, removes all the downside risk of making debt-financed bets. This is why the new Obama administration is being charged with designing a set of financial regulations that will remove the moral hazard, so that the reckless behavior of the past few years is not repeated.

This is much easier said than done, however. On the one hand, it is difficult to know what set of regulations will do the trick. It is probably wise not to allow the financial institutions to have 30:1 leverage ratios. Even the original 12:1 ratios may be too high. Also, requiring some kind of reserve fund or collateral to back up CDS-type contracts seems prudent as well, so that these contracts become more like standard insurance policies. What more should be done is unclear, however. The ingenuity of financiers should never be underestimated: they are highly likely to find ways to keep one step ahead of the regulations and circumvent whatever restrictions Congress and the administration might try to impose on them.

On the other hand, tightly regulating the financial markets might not be such a good idea even if the regulations could be enforced. For example, it might be tempting to return to the days before the Monetary Decontrol Act of 1980 in which only savings banks could issue mortgages and the mortgages were held by the banks until they were paid off. This may not be wise, however. Innovations such as the MBSs did have the effect of making much more money available for mortgages, the vast majority of which were issued to households who did not default on their payments. Financial innovations do help transfer funds between ultimate savers and ultimate investors in an economy, and increase the overall amount of saving and investment in the process. More saving and investment, in turn, promotes a more productive economy and increases a nation's standard of living. The regulations should not be so restrictive that they prevent all forms of financial innovation.

Therefore, regulating financial institutions comes with a trade-off. Tighter regulations may well reduce the moral hazard that could lead to another financial meltdown, but probably only at the cost of reducing saving, investment, and long-run economic growth. President Obama's economic advisers will be hard pressed to design a set of regulations that strike a reasonable balance between their potential benefits and costs.