Recession!

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January 6, 2010

An earlier version of this paper was prepared for the Economics Teaching Conference of the Gulf Coast Economics Association, November 5-6, 2009, Savannah, GA.

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Introduction

During the Great Moderation, motivating the teaching of macroeconomics, at least with a focus on business cycles, became difficult. That is no longer the case. We now have an all-too-obvious example to illustrate that the business cycle phenomenon lives. This paper chronicles events of the recent recession and relates them to the theory taught in intermediate-level courses in macroeconomics.

A first draft of this paper was written in Spring 2009, when I taught intermediate macroeconomic theory. At that time the recession was in progress, but the textbook that I used, *Macroeconomics*, 6th edition, by Abel, Bernanke, Croushore (hereafter, *ABC*), was necessarily lagging in its coverage of current events. My purpose was not just to cover current events in a news reporting fashion, but to use the developing recession as a vehicle for developing an appreciation for the theory in the textbook. While intended for an audience taking intermediate macroeconomic theory, much of the paper is readable for a more general audience.

All recessions are in some respects similar, but they also differ. Our most recent recession was preceded by a housing bubble and subsequent bust, and was, in its early stages, accompanied by a panic in financial markets. Events leading up to the recession were widely reported and clearly observable. While it is potentially helpful to observe events that appear to have triggered the recession, it also presents challenges in teaching. The connection between observable events and more abstract theoretical concepts is not always obvious.

The *ABC* textbook is in many respects a conventional one. It offers both classical and Keynesian theoretical variants in the context of an IS-LM, AS-AD framework. The textbook theory offers a number of candidates for shocks that might cause aggregate fluctuations. The possibilities include productivity shocks, monetary shocks (both supply and demand), shifts in government spending, changes in expectations, changes in wealth, and variations in animal spirits. The list does not (directly) include market bubbles, mortgage defaults, banking panics, asymmetric information, moral hazard, or the breakdown of trust. The textbook also does not give much, if any, attention to hedge funds, the shadow banking system, subprime mortgages, securitization, collateralized debt obligations, credit default swaps, or structured investment vehicles. A typical student might easily conclude that, once again, economics is irrelevant for the real world. Another way of stating my purpose is to say that I want to explain why that is not the case.

The paper will begin by offering a short summary of macroeconomic facts to describe the progress of the recession. It then reviews the key elements of the macroeconomic theory in the *ABC* textbook. By providing such an overview, I hope to remind students of the overall structure of the theory and the questions it is meant to address. The paper provides a list of shocks that might induce business cycles in the

theory and offers brief descriptions of transmission mechanisms. After the review of theory, I present a chronological summary of some key events in the history of the recession, including the housing bubble and bust and the associated financial crisis. Some attention is given to how market failures may have played a role in these events. I then consider how the narrative can be translated into a story about macroeconomic shocks in the classical and Keynesian variants of the textbook theory. The final task is to consider policy issues. The current recession has evoked some interesting and controversial policy responses, and students should have some understanding of what has motivated these responses.

In addition to providing a theoretically motivated account of the recession in the text of the paper, I have organized some supplementary materials that should be useful for those teaching macroeconomics at various levels. These materials include a chronology of important events and a glossary.[1]

Recession Facts

As this paper is written in November of 2009, the US economy appears to have just emerged from the trough of a recession. According to the National Bureau of Economic Research, an organization that dates the peaks and troughs associated with recessions, the recession began in December 2007. Real GDP growth was negative in five of the next six quarters, including a rate of -5.4% for the fourth quarter of 2008. The unemployment rate has increased from 4.8% at the beginning of 2008 to 10.2% in October 2009. The Dow Jones Industrial Average exceeded 14,000 in October of 2007, but plunged to less than 8000 a year later.

The impact of the recession can be seen in the movements of other variables as well. Real consumption has fallen in four of the last six quarters, with an especially large 20.3% fall in the consumer durables category in the fourth quarter of 2008. As consumption fell, the personal saving rate increased from 0.8% in early 2008 to 5.9% by the middle of 2009. Both residential and non-residential fixed investment fell at rates close to 40% in the first quarter of 2009, and business inventories have fallen throughout 2008 and 2009. Nominal wages have risen slightly during the recession, but at a rate that has been declining; real wages have declined in 2009.[2] The inflation rate, measured according to either the GDP deflator or the consumer price index, has been subdued. According to the consumer price index exclusive of food and energy, inflation has been consistently at 2% or less in 2008 and 2009.While inflation has been low, both the M1 and M2 measures of money have surged, and the Federal funds rate, the rate directly targeted by the Federal Reserve (the Fed), is approaching zero.

[1] I have additional materials, including a voiced-over PowerPoint presentation, available online at http://professorchappell.com/Econ322/recession.htm.

[2] The latter inference is based on non-farm hourly compensation deflated by the consumer price index.

Recently, there have been signs that the recession may be ending. The growth rate of productivity (non-farm output per hour) was sluggish from late 2007 through the first quarter of 2009, but increased dramatically to 6.9% and 9.5% rates in the second and third quarters of 2009. The stock market has also recovered some of its losses, and real GDP growth was positive at 2.8% in the third quarter of 2009.

Most of the facts for the current recession conform to typical business cycle patterns. Productivity and the various components of GDP generally move together, in procyclical fashion.[3] Real wages are mildly procyclical and unemployment is strongly countercyclical. Inflation has moderated at least slightly, as it often does in recessions. Although money growth is typically a procyclical variable, it is subject to "long and variable" lags. Rapid money growth and the near-zero funds rate are indicative of the Federal Reserve's counter-cyclical policy stance.

Macroeconomic Theory

This section of the paper provides a brief overview of macroeconomic theory, following the *ABC* text. Some of my discussion is couched in terms of the models and terminology of that text; however, most of the discussion is not text-specific. The presentation is intended for an intermediate macroeconomics audience, but principles-level students should also find it to be readable. Through most of the discussion, I will employ a closed economy model.

A Classical Model

Our textbook model contains three sectors: a "supply side" sector that includes the labor market and an aggregate production function, a goods market sector, and an asset markets sector. Within this structure, we first consider a classical variant of the theory, in which labor, goods, and asset markets are presumed to be competitive and to quickly move to equilibria.

The classical model specifies equilibrium conditions to be satisfied for each sector in the model. In the labor market, we suppose that the real wage adjusts to clear the labor market, so that the quantity of labor supplied is equal to the quantity of labor demanded. In the goods market, our equilibrium condition requires that desired spending (on output) be equal to the output produced, or equivalently, that desired saving should equal desired investment (in the closed economy).[4] In the asset market sector, we require demand-

[3] Government spending has continued to increase during the recession, but the rate of increase has fallen, and is near zero for state and local governments.

[4] This condition is not a typical demand-supply equilibrium condition. I interpret it as a "demand consistency" condition. When output is produced, this generates income, which in turn generates spending. This demand consistency condition requires that the spending generated be sufficient to buy the goods produced (the condition says nothing, in itself, about whether a particular output could feasibly be produced).

supply equilibria; in particular, the quantity of money demanded should equal the quantity of money supplied.

One can think about the workings of the classical model in the following way. First, the labor market determines employment and the real wage. With the labor market in equilibrium, the economy is at full employment. Given the equilibrium quantity of labor, the economy's aggregate production function determines output.[5] Then, given an equilibrium output, the goods market equilibrium condition determines the real rate of interest. The real rate of interest affects both consumption and investment spending and must reach a level that equates aggregate desired spending to the output level determined by the labor market. Finally, in the money market, the central bank determines the nominal supply of money, but equilibrium requires that individuals be willing to hold that quantity of money. Because the price level affects the demand for money, movements in the price level will equilibrate the money market (given levels of output and the real interest rate previously determined by the labor and goods markets). Diagrammatically, we can depict an equilibrium at the intersection of IS, LM, and FE curves or at the intersection of AD and AS curves.[6]

A Keynesian Model

To describe the workings of a Keynesian model, much of the basic structure of the classical model is preserved, but we alter our assumptions about market equilibrium. In particular, we no longer assume the existence of a conventional market-clearing demand-supply equilibrium in the labor market. Keynesian models generally assume that the existence of price and/or wage rigidity keeps markets from quickly equilibrating. In our Keynesian model, we regard the price level as fixed within a period. Then, the money and goods markets simultaneously determine output demanded and the real interest rate. Actual output is assumed to be demand-determined in the short-run. Given output, employment is determined by the production function; i.e., the amount of labor employed is the amount that the production function requires if the output demanded is to be produced. This amount of labor is not necessarily found on a labor supply curve, nor is it necessarily a consequence of profit-maximizing choices of competitive firms. In the Keynesian model, justifications for these apparently ad hoc assumptions about price and wage rigidity and the demand-side determination of output can be offered by appealing to efficiency wage theory for the labor market and the existence of imperfect competition in goods markets. Diagrammatically, the difference in Keynesian and classical models is reflected by the shape of the aggregate supply curve. In the classical model, AS is vertical, reflecting the independence of output and the price level. In the Keynesian short run, AS is horizontal, reflecting price level stickiness.

[5] Capital, other resources, and the state of technology are also taken to be given.

[6] Abel-Bernanke-Croushore use the vertical FE (full-employment) line to indicate the natural rate of output in the same diagram displaying IS and LM.

There are several important differences in the implications of Keynesian and classical theories. In a classical model, fluctuations in output must originate on the supply side of the model. Shocks that might lead to business cycles include variations in input availability and productivity shocks (changes in the production function that affect the effectiveness with which output is produced from given inputs). In response to shocks, the economy adjusts, but is constantly in a state of general competitive market equilibrium. Competitive equilibria are efficient, so, in the view of classical economists, demand management polices that would attempt to alter the response of the economy to shocks would misguided. Further, the power of such policies to affect output is limited in the classical view, so manipulation of aggregate demand would not be effective in stabilizing cycles (and could be destabilizing for prices).

In Keynesian models, supply shocks have impacts, but so do demand shocks. Demand shocks would include changes in policy variables (the money supply, government spending, and possibly taxes) and also shocks that originate in the private sector. For example, changes in expectations about future income or wealth will affect private spending and aggregate demand. Keynesians have often emphasized the importance of "animal spirits," or waves of optimism or pessimism that might sweep through an economy, affecting expectations. In the Keynesian view, recessions have substantial welfare costs and policy actions that might stabilize the economy are usually viewed favorably.

Possible Causes of Business Cycle Fluctuations

As we have noted, our theory has three sectors, a labor market and production sector, a goods market sector, and an asset market sector. Shocks might originate in any of these three sectors. In Table 1, I have listed some shocks that might initiate business cycle fluctuations. We can think of this as a tentative list of candidates for explaining the start of the current recession.

Causes of the Recession: Preliminary Thoughts

I will defer most discussion of the causes of the recession until I have more thoroughly discussed the facts. However, I will make several observations in advance. In a classical model, productivity shocks are the primary cause of business cycle fluctuations. In the recession at hand there has been no obvious source of technological regress, although I will explore the possibility later in the paper. Increased oil prices can also be interpreted as a supply shock, and sharp increases in oil prices preceded or accompanied several previous recessions.[7] Oil prices again rose sharply from mid-2007 to mid-2008, suggesting a possible role in the current recession. However, the increase

[7] A high price of energy induces firms to substitute away from energy inputs, implying less energy for given capital and labor inputs, and consequently less output. In our theory, this is seen as causing a downward shift in the production function, and lower marginal products for capital and labor inputs. In the textbook theory, this results in lower demand for labor, lower employment, and lower output via the supply side. Oil price shocks and recessions occurred in the mid 70s, early 80s, 1990-1991 and 2000-2001.

was quickly reversed, and most observers look elsewhere to explain the recession.[8] On the demand side, neither contractionary monetary nor fiscal policies provide a plausible explanation for the onset of the recession.

In describing animal spirits, Keynesians emphasize the instability, unpredictability, and perhaps, the lack of rationality of expectations about the future. Rising animal spirits might explain the emergence of the housing bubble, and a reversal of animal spirits might explain the panic and the recession. The waves of optimism or pessimism that sweep through an economy may themselves be inexplicable, but Keynesians would argue that their consequences are not—shifts in aggregate demand are a source of fluctuations in output. While variations in animal spirits provide a device for explaining the recession, the explanation is not fully satisfying—if animal spirits are inexplicable, then the root causes of the recession are inexplicable as well. In later portions of this paper, further attention is given to possible explanations for expectational changes.

Housing, Mortgages, Bubbles and Panic

There is broad agreement that the current recession is related to events that have occurred in housing, mortgage, and related financial markets. In this section I provide some background on these topics. A more detailed chronology of events is provided in Table 2. A glossary of terms is also provided at the end of the paper.

Old-Fashioned Mortgages

When buying a house, most of us borrow money by taking out a mortgage. At times in the past, your mortgage relationship might have involved only you and your bank (or other financial institution). The bank would originate your loan and service it. Every month, as you made payments, you would provide the bank with a stream of revenues that would provide the source for its profits. The ability of banks to make loans was ultimately dependent upon their ability to attract checking and savings deposits from local depositors.

Securitization

Since at least the 1970s, mortgage operations have usually worked differently. When you obtain a mortgage loan, you initially work with a mortgage originator. The originator arranges the terms of the contract, and organizes appraisals, inspections, and evaluations of your ability to pay. However, originators typically do not maintain an ownership interest in the mortgage over time. The mortgage on your home will be sold to another entity, perhaps one of the government sponsored enterprises (GSEs) Fannie Mae

[8] Hamilton (2009), while agreeing that other factors were involved, argues that the oil price shock made a material contribution to the current recession.

or Freddie Mac.[9] These firms were created by the government to support housing markets and mortgage finance, but are private enterprises.[10] Your mortgage and others are then bundled together and sold to investors as securities.

There are potential advantages to bundling through securitization. For a lender, an individual mortgage can be risky in terms of chances of repayment. If a borrower loses his job or has a serious health problem, he may default. However, in a large pool of mortgages, the number of defaults usually will be small and predictable, so risk to lenders is reduced by pooling over mortgages for many homes in varied locations. Mortgage-backed securities may be purchased by banks or other financial institutions. It is the owners of these firms (or purchasers of securities they have issued) who are ultimately the lenders providing funding for your mortgage loan.

Slicing and Dicing Mortgages

In the late 1980s, a new financial innovation, the collateralized debt obligation, or CDO, was developed. Once mortgages have been pooled, they generate a stream of payments to the owners of the bundle. CDOs divide the flow of payments into distinct ownership shares (tranches) that differ in terms of the priority of their claims to payments. For example, if losses from default are larger than expected, then "senior" tranches might still receive a specified income flow while lower priority tranches would not.

Now consider a pool of mortgages of the sub-prime variety (implying that borrowers are of higher than normal risk). When underlying mortgages are risky, the senior tranche of a CDO might still be considered rather safe. After all, in a pool of subprime borrowers, not all borrowers will default, and the senior tranches of the CDO have a claim on the income flow from the performing mortgages. CDOs that bundled subprime mortgages might produce senior tranches that were rated "AAA," implying that ratings agencies judged the risk of loss to be very low. Some institutional investors, including pension funds and insurance companies, only buy AAA securities, but senior tranches of CDOs built on subprime mortgages could satisfy this requirement. Lower tranches were necessarily risky, but given that subprime borrowers paid high rates of interest and high upfront fees, and given that expected price appreciation was likely to reduce the risk of foreclosure and default, even lower rated tranches could be sold to investors willing to take on more risk. By 2004, a much larger fraction of all new mortgages were of the sub-prime variety.

[9] Fannie Mae is the Federal National Mortgage Association; Freddie Mac is the Federal Home Loan Mortgage Corporation.

[10] Currently both enterprises have been placed under the conservatorship of their regulator, the Federal Housing Finance Agency (FHFA).

Boom and Bust

As housing prices leveled off and then fell in 2006, so did the performance of subprime mortgages. Borrowers who could afford low teaser rates found that they could not afford their mortgage payments at higher, post-teaser rates. Many homeowners had negative home equity, and lenders were hesitant to refinance loans with home prices falling. Further, for homeowners who recognized that a home's value might be less than the balance on the loan, foreclosure could be a more appealing option than continuing to pay. Foreclosures began to accelerate, and the forced sale of foreclosed homes added to the downward pressure on home prices. Eventually, it became clear that even the more senior tranches of CDOs were vulnerable to loss. A complicating factor was that the complexity of the new structured finance products like CDOs made them opaque—it was it was difficult to discern how their values were affected by losses occurring in the mortgage market.

Leverage and the Shadow Banking System

When house prices began to fall in 2006, mortgage defaults rose, and holders of mortgage-backed securities took losses. Many of the owners were non-bank financial intermediaries, for example, hedge funds or structured investment vehicles (SIVs).[11] These non-bank intermediaries are sometimes collectively referred to as the "shadow banking system." Hedge funds bought mortgage backed securities, but often financed their purchases with short term borrowing—they did not obtain funds from insured depositors like banks do. Many of these funds were highly-levered, meaning that their asset purchases were heavily funded by borrowing.

Leverage can magnify returns. Consider an example for an individual. If you buy a $200,000 home, perhaps you make a down-payment of $20,000 and borrow $180,000 at an interest rate of 5%. Now suppose that you sell the house one year later for $220,000. The price has gone up 10%. After paying interest of $9,000 you still net a profit of $11,000 on your initial investment of $20,000. As a consequence of leverage, your rate of return is 55% even though the appreciation rate of the home was only 10%. Highly-levered hedge funds magnify their returns in similar fashion.[12]

However, negative returns are also magnified by leverage, and this increases the odds that a fund will become insolvent (lacking assets to cover its debts). When a hedge fund's mortgage-backed securities lost value, investors who had been lending to them on a short-term basis became reluctant to lend further. If lenders refused to extend loans,

[11] Banks sometimes sponsored "off-balance sheet" SIVs that held asset-backed securities. Banks avoided stringent capital requirements by moving activities off of their balance sheets, but they were nevertheless subject to high risk of loss. For example, a bank might extend an affiliated SIV a line of credit that would result in a loan loss for the bank if the SIV failed.

[12] The degree of leverage employed by hedge firms is much higher. In the example, the homebuyer's down payment represented 10% of the value of the asset purchased. For hedge funds, shareholders' equity might normally amount to only 2% of the value of assets in the fund portfolio.

then borrowers could be forced to liquidate assets in order to repay existing loans. If many funds' assets were simultaneously offered on the market, prices would be likely to spiral downward, exacerbating the funds' losses.

Premonitions of Panic

Problems with hedge funds exposed to investments in mortgage-backed securities became apparent by May 2007, when UBS, a Swiss bank, announced it was shutting down a hedge fund that had suffered heavy losses related to investments in subprime mortgages. In June, Bear-Stearns, an investment bank and brokerage firm, announced that it had pledged a loan to "bail out" one of its own hedge funds. By July, two of its hedge funds had lost almost all of their value. In early August, the French banking firm BNP Paribas suspended withdrawals from three funds after announcing that it could not fairly value the funds' underlying assets. Later in August, Countrywide Financial, a huge U.S. mortgage banking firm, "expressed concerns" over liquidity because of the decline of the secondary market for securitized mortgage obligations. Depositors fled and share prices fell. Countrywide was later absorbed by Bank of America. In September, Northern Rock PLC, a British bank, experienced a run on deposits. It sought support from the Bank of England and was later nationalized. In March of 2008, Moody's downgraded mortgage-backed debt issued by a Bear-Stearns Fund, and rumors circulated that Bear faced "liquidity problems." JPMorgan Chase, in conjunction with the New York Fed, provided Bear with an emergency loan with a term of 28 days. By the end of March, JPMorgan had aquired Bear for $10 per share. Clearly problems were emerging, but even at this point the panic seemed to be contained.

Accelerating Panic

By the summer of 2008, losses on loan portfolios were mounting at the GSEs, Fannie Mae and Freddie Mac. Both firms engaged in purchasing and bundling mortgages, and also selling them to investors. Both also held inventories of unsold mortgages. Like other players in the mortgage market, Fannie and Freddie were highly levered and heavily dependent on short term financing. Many investors who lent to the GSEs were under the impression that there was an implicit U.S. government guarantee of their debt obligations, and this belief would prove to be accurate. The Fed first offered Fannie and Freddie emergency loans. Then, in July, the government passed legislation to recapitalize the firms with government funds, and created a new regulatory agency, the Federal Housing Finance Agency, to oversee them. On September 7, 2008, the FHFA placed Fannie Mae and Freddie Mac into conservatorship, a state akin to a temporary and limited nationalization.

On September 15, 2008, Lehman Brothers, a financial services firm, declared bankruptcy. The problems were much like those that had earlier beset Bear-Stearns. Lehman faced heavy losses on mortgage-backed securities, and it was unable to continue to roll over its short-term debt. The Fed had facilitated a rescue for Bear, but attempts to secure a private rescue for Lehman failed, and the Treasury and Federal Reserve declined to provide guarantees that might have supported such a rescue. With the Fed failing to

step in as a lender of last resort, the panic heightened. With hindsight, some have suggested that the failure of the Fed to act on Lehman was an extraordinary error that created uncertainty about the Fed's willingness to act as a lender of last resort. Had the Fed acted, the panic might have been contained.

The next crisis involved American International Group, or AIG, a huge insurance company. AIG's problems arose in part from its holdings of mortgage-backed securities, but, perhaps more catastrophically, from sales of credit default swaps (CDSs). By selling credit default swaps, AIG effectively sold insurance to protect the holders of mortgage-backed CDOs from losses. Once mortgage default rates rose, AIG was liable for huge payouts, even though many of the insured CDOs had once been highly-rated. AIG faced liquidity problems, and on September 16, the Federal Reserve announced that it was making $85 billion in credit available to AIG (collateralized by AIG assets). In doing so, the Fed relied upon powers conferred upon it by Article 13.3 of the Federal Reserve Act, which gives it considerable discretion to offer loans in "unusual and exigent" circumstances.

On September 25, 2008, Washington Mutual Bank (WaMu) failed after facing a run on uninsured deposits (those in excess of $100,000). The bank was seized by regulators and placed into receivership of the Federal Deposit Insurance Corporation (FDIC). Eventually its assets were sold to JPMorgan Chase. On September 29, Wachovia followed. A run on large deposits triggered a crisis, and the FDIC intervened to arrange a takeover by Citigroup with government guarantees against losses. Ultimately Wachovia received a better offer from Wells Fargo, and was purchased by Wells without government aid. On October 3, The Emergency Economic Stabilization Act of 2008 was passed. This legislation was the primary vehicle authorizing subsequent bailouts through the Troubled Asset Relief Program (TARP). On October 13, 2008, Treasury Secretary Henry Paulson met with the CEOs of the nine largest U.S. banks. After some prodding, the banks agreed that the Treasury would use TARP funds to buy equity stakes in each bank, injecting $250 billion into those banks and others to ease the credit crunch. The government had become a major shareholder in what had previously been privately owned institutions.

By this time concerns over the economy were not limited to those closely related to housing. The Dow Jones Industrial Average had peaked above 14,000 in late 2007, but fell below 8,000 a year later as confidence eroded. Wealth, in the form of both housing and the value of U.S. corporations, had declined precipitously.

Institutional Failure

We earlier described how the process of bundling and reselling mortgage-backed securities changed over time. The existence of these innovations played a role in the bubble and panic. However, we have also noted that these innovations offered the potential to reduce risk and spread it more efficiently. By themselves such changes need not have directly led to either housing market bubbles or collapse and panic. In this

section I will offer a conceptual look at how and why events like these may have occurred.

Principal Agent and Moral Hazard Problems

As we have described, a mortgage loan is no longer a simple deal between a borrower and a lender, perhaps through a single intermediary. A mortgage transaction involves a borrower, a mortgage originator, a mortgage servicer, a mortgage bundler, a mortgage insurer, bond rating agencies, home appraisers and inspectors, credit reporting agencies, and others. Most of these parties provide specialized services, and specialization can aid in efficiency. However, the incentive of most of these actors is to see that more deals are done. So long as you do not have a stake (or do not *perceive* that you have a stake) in the residual flow of income from a mortgage, you may not be especially worried about the outcome. An originator gets fees, regardless of whether a loan is repaid. So does an appraiser; so does a ratings agency. In some cases, these parties surely failed in their responsibilities because they did not have strong incentives to meet them. For example, we know that mortgage originators sometimes accepted, and perhaps solicited, false claims about the financial status of loan applicants.

In economics, this type of misalignment of incentives is called a principal-agent problem. One party (the principal) contracts with another party (the agent) to complete a task, but is unable to costlessly verify that the task has been satisfactorily completed. Moreover, if a party does not bear all of the risks associated with his actions, his behavior may be excessively risky, increasing the odds of an undesirable outcome. The latter situation is referred to as a problem of "moral hazard." We should note that these problems involving principals and agents and moral hazard had existed for some time, so their presence cannot fully explain why the crash occurred when it did.

Moral Hazard and the Housing Boom

So long as home prices were soaring, the existence of these incentive problems seemed not to matter much. Even if a homeowner defaulted, rising home prices left a lender with valuable collateral. In hindsight, it seems obvious that house prices could not possibly have maintained the trajectory they were on, but an eventual smooth landing, rather than a crash, was a plausible possibility. As it turned out, the landing was not smooth. Once housing prices were falling the undesirable consequences of moral hazard were quickly exposed. The interaction of falling home prices and pre-existing, but ignored, incentive problems triggered the panic.

Asymmetric Information

We have described how the peak and decline of prices led to loan defaults, foreclosures, and losses for holders of mortgage-backed securities. In part because of the complexity of the composition of many mortgage-backed securities, it became difficult to assess their values. This problem was magnified by the uncertainty surrounding the potential for losses. In such situations the owner of a security might have more

information about its quality than potential buyers (or lenders), and we say that "asymmetric information" exists. If there is a tendency for only the lowest quality assets to be offered for sale by sellers, then buyers naturally are reluctant to purchase. Similarly, lenders become reluctant to finance borrowers when the quality of collateral is suspect. Normal lending patterns between financial firms began to break down.

Bank Runs: An Analogy

In traditional banking markets, bank runs were once common. Banks accepted customer deposits, and then loaned a portion of the deposits to borrowers. Loans were extended for long terms, but deposits were subject to withdrawal upon demand. If depositors feared that a bank might not have funds sufficient to cover their deposits, they would rush to withdraw funds. At times the expectation of bank failure became self-fulfilling; depositors withdrew funds, banks had insufficient liquidity to cover the withdrawals, leading to panic by depositors and even further withdrawals. If a bank were forced to try to liquidate long-term assets quickly, it could fail. The problem of bank runs in the U.S. eventually led to institutional changes in the form of deposit insurance and the establishment of the Federal Reserve as a lender of last resort. As a consequence, bank runs became much less common.

Leading up to the panic of 2008, mortgage-backed securities were often purchased by non-banks; e.g., hedge funds, and financed with short term debt. When the securities lost value, investors would not renew funding. The flight of lenders is analogous to the flight of depositors in a bank run. This phenomenon contributed to crises and/or failures for Bear-Stearns, Lehman brothers, AIG, and others.

Origins of the Boom

The housing boom and bust seems to have been a proximate cause of the panic and recession. We have also seen that incentive problems in the mortgage process exacerbated the boom phase as home prices rose; this set up a bigger fall when the bust arrived. But how did the housing boom get its start? There is no obvious answer, but there are suggestions. Public policy had long promoted home-ownership and, with political support, financial institutions increasingly extended new loans to less credit-worthy borrowers. Politicians who advocated reigning in Fannie and Freddie were ignored. Observers have suggested that expansionary monetary policy also played a role, with low interest rates over a long period eventually leading to an asset price inflation. Others have pointed to an international savings glut that kept world-wide interest rates low and provided funding for mortgages. Some combination of these factors led to an initial appreciation of housing, and the bubble was sustained by induced changes in animal spirits. People observed rising home prices, and came to expect even higher ones.

Greed

Some of the behavior that occurred in the boom might have been narrowly selfish, irresponsible, or event fraudulent. This has led some to conclude that "greed" was a

cause of the panic. There is little doubt that self-interest plays a role in economic activity, including recent events. In economics, we regularly assume that individuals would prefer to have more wealth rather than less. We also know that when actors are motivated by self-interest, but play by the rules in an appropriate institutional setting (like a competitive market), good outcomes can result. In any case, it seems either misleading, or vacuous to claim that greed has caused the current crisis. Has there really been an *increase* in greed to explain what has happened?

Macroeconomics Revisited

With some knowledge of events and institutions that are important for the current recession, I now return to the topic of macroeconomic theory. Once again, I will ask how we might, in textbook fashion, explain the recession as the response to a shock, or perhaps a collection of shocks.

Animal Spirits, Wealth, and Riskiness of Non-Money Assets

Referring back to Table 1, at least three entries seem to have some relevance given the chronology of events observed in the recession. First, the housing bubble and bust might was certainly associated with shifts in confidence that could be described as animal spirits. The discussion in the previous section explains how specific events in housing and mortgage markets may have contributed to shifts in confidence. Second, optimism that initially led to spending on housing and rising home prices led to increases in wealth, and Table 1 lists wealth as a potential shock variable. As wealth rose, desired spending increased. Some of the added spending may have been directly related to the ability of homeowners to borrow against home equity credit lines. Expectations of even higher housing prices encouraged more households to buy homes and led financial institutions to relax lending standards. Then, once housing prices and the stock market peaked and fell, wealth was reduced, spending fell, output and employment declined, and the unemployment rate rose. As borrowers defaulted on loans, investors in mortgage backed securities also faced losses, and wealth and confidence eroded further. Third, the panic also led individuals to perceive a heightened risk for holding non-money assets, which should lead to an increase in money demand, a higher interest rate, and contractionary pressure on aggregate demand.[13]

The Credit Crunch

As the panic and recession were underway, we heard a great deal about a "credit crunch." This phenomenon refers to the inability or unwillingness of lenders to extend credit to businesses and consumers, and is seen as distinct from interest rate effects on borrowing. By all accounts, it has become more difficult to get a bank loan. *ABC* has

[13] While the increase in risk for non-money assets was important, the textbook theory would suggest that the resulting increase in interest rates could easily have been offset by an expansion of the money supply. This turned out not to be the case, as rates controlled by the Federal Reserve departed from interbank lending rates.

some discussion of what might be called credit crunches (see pp. 552-3 6th edition on the credit channel). According to *ABC*, in addition to interest rate effects, a monetary tightening lowers bank reserves. Loan expansion is restricted, and firms dependent on bank loans to support spending must spend less, reducing aggregate demand. Moreover, at high interest rates or under recessionary conditions, firms who receive loans are at higher risk of default. This means that any given loan looks riskier from a bank's perspective, and fewer loans will be made.

In the current recession, we have not had contractionary monetary policy. However, the recession and turmoil in financial markets have produced feedback effects like those described above. Worsening economic conditions and growing information asymmetries have increased the riskiness of loans, and banks may be more concerned with restoring the health of their balance sheets than extending new loans to customers. So we observe what appears to be a credit crunch for potential borrowers.

A Financial Market Supply Shock

From a classical perspective, we have noted that the usual explanation for business cycles involves "productivity" or "supply" shocks. The economy's aggregate production function shifts upward or downward with changes in technology. At first glance, it is difficult to see exactly what might have happened recently to shift the production function. Plant and equipment has not been destroyed, engineering knowledge has not been forgotten; all of those foreclosed homes still have value (in terms of offering the potential to house people). So it might seem that the animal spirits argument and the Keynesian story have some advantage in explaining the recession. However, economists do not give up on their favored theories easily.

We still have factories, natural resources, and skills, but we have seen consequential and persistent institutional failure in financial markets. It is possible to treat institutional failure in financial markets as a supply shock. Financial markets exist to facilitate transactions, to direct resources from lenders to borrowers, and to take advantage of opportunities for efficient risk-pooling. If financial markets work efficiently, then more mutually beneficial transactions will take place. However, financial market transactions almost always involve trades in promises and there are risks that promises will not be fulfilled. When these risks are high, fewer potentially beneficial transactions take place. Institutions may evolve to help insure that promises are frequently kept, and trust may be high in normal times. However, evaporation of trust can cause substantial harm as trade, including trade between lenders and borrowers, breaks down. In effect, we would get less output from given amounts of labor and capital inputs in a world with poorly functioning financial markets.[14]

As an example to illustrate the importance of promises and trust, suppose that my house needs painting. If I am a plumber, I am probably better at plumbing than house-

[14] To imagine the consequences of a world without financial institutions, once might consider the economic performance of the Soviet Union under a regime of central planning for capital allocation.

painting. I can hire a painter, meaning that he will promise to paint my house and I will promise to pay him when he is finished. He might be concerned that after he finishes the paint job, I will renege on my promise to pay. He proposes that I pay him first, and then he will paint the house. But I will be worried that he will take my money and leave my house unpainted, or perhaps he will paint it, but he will do a sloppy job. In the absence of trust or effective legal recourse, the promise-based transaction might not take place. I will then need to devote some of my time to painting my house, even though I could produce more highly valued output if I were instead plumbing. When trade is foregone, real income falls. Transactions involving lending and borrowing are, for obvious reasons, reliant on promises, and, consequently, easily disrupted when trust deteriorates or institutions fail.

In the current recession, some of the seizing of activity in financial markets is related to uncertainty about the value or quality of collateral. Owners of assets may have more information about the quality of those assets than potential buyers or lenders; we have termed this asymmetric information. If the willingness of a firm to sell an asset or offer it as collateral signals that the asset is of poor quality; this becomes a reason to "distrust" the seller/borrower, and to avoid completing the transaction.

Todd Vermilyea, an Assistant Vice President of the Federal Reserve Bank of Philadelphia who has expertise in the area of credit cards, provides an example of adverse selection in the retail cards market.[15] Vermilyea says that, in the current recessionary environment, that if you initiate an effort to obtain a credit card, you will probably be turned down. The act of seeking a card indicates to the issuer that, because you need credit, you are likely to be poor risk. However, if you respond to a solicitation, or if you apply in response to a promotional event staged by the bank, you are more likely to be approved. A randomly approached person is a better risk than one who seeks a card.

Charles Evans, President of the Chicago Federal Reserve Bank and a member of the Federal Open Market Committee (FOMC), concurs in the view that financial market disruptions are a result of increasing information asymmetries and adverse selection.[16] He goes on to argue that it might also be reasonable to model those disruptions as supply-side shocks in modern classical macroeconomic models. He says: "A financial market shock may have some characteristics of a DSGE TFP shock: The cost of producing an intermediate input—credit intermediation—has become more expensive." (DSGE TFP refers to a total factor productivity shock in a dynamic stochastic general equilibrium model; i.e., a productivity shock in a modern classical model).[17] According to our

[15] Speech by Todd Vermilyea to the University of South Carolina Economics Society, September 24, 2009.

[16] "Challenges that the Recent Financial Market Turmoil Places on our Macroeconomic Modeling Toolkit," remarks by Charles Evans at the Swiss National Bank Research Conference, Zurich, Switzerland, September 19, 2008. Available at http://www.chicagofed.org/news_room/speeches/2008_9_19_snb_speech.cfm.

[17] In our textbook model, an analog is provided by the treatment of an oil price shock as a productivity shock (oil also being an intermediate good).

textbook model, negative productivity shocks result in falling output and employment. The production function shift directly lowers output, and employment falls because labor demand declines with the reduction in the marginal product of labor.

If the recession is the consequence of a supply shock, some uncomfortable questions arise. Supply shocks can be brief, persistent, or permanent. However, they are not likely to be fully cured by ordinary demand management policies or short-term financial rescues. If we have suffered technological regress in financial markets, then institutional changes may be needed to achieve a proper repair. President Evans summarizes the problem nicely:

> Can markets easily work around the disruptions to the credit intermediation process that channels funds from savers to borrowers? Or have we experienced a permanent destruction in something we might want to think about as the financial sector capital stock? If so, does the economy need to develop entirely new infrastructures for some types of intermediation, or perhaps will reviving earlier more traditional approaches suffice once the turmoil has abated?[18]

Which Theory is Correct?

It is natural to ask whether classical or Keynesian explanations work best at explaining the recent recession. Some have suggested that the housing bubble and bust are clearly a manifestation of Keynesian animal spirits and that the recession was caused by the resulting slump in demand. As the remarks of Chicago Fed President Evans indicated, one can also point to poorly functioning financial markets as the source of a negative supply shock in a classical model.

Typically demand shocks produce procyclical price movements while supply shocks do the reverse, so the observation that inflation has softened as output has dropped would seem to favor the Keynesian view. This conclusion remains in doubt for at least three reasons. First, the economy may have been simultaneously subjected multiple shocks with different sources and effects; for example, both oil and house price shocks occurred. Second, while shocks may originate on the supply-side in classical models, they also shift demand when they affect wealth and the expected future marginal product of capital. A negative productivity shock can reduce desired investment spending, a component of demand, with possible negative (procyclical) impacts for prices. Third, conclusions about the correctness of competing theories should not be determined only by the most recent observations, but by the accumulation of evidence over multiple cycles and long time horizons.

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[18] Remarks by Charles L. Evans , "Challenges that the Recent Financial Market Turmoil Places on our Macroeconomic Modeling," Swiss National Bank Research Conference Zurich, Switzerland, September 19, 2008.
Source: http://www.chicagofed.org/news_room/speeches/2008_9_19_snb_speech.cfm.

Policy Responses to the Recession

There have been both ordinary and extraordinary responses by government to the ongoing recession. I will first discuss the more ordinary aspects of fiscal and monetary policies. I will then discuss aspects of monetary policy relevant in a zero interest rate setting. Next, attention is given to bailouts in the financial sector. Related to this, I will consider another example of moral hazard that arises when large financial institutions anticipate bailouts. Finally I offer comments on regulatory reform.

Fiscal Policy Responses

In Keynesian theory, policies designed to shift aggregate demand can influence macroeconomic outcomes. If wealth shocks associated with unfavorable animal spirits have reduced aggregate demand, expansionary monetary and fiscal policies can be used to stimulate aggregate demand in a countervailing fashion. In best-case scenarios, countercyclical government policy actions might eliminate, or greatly ameliorate, a recession. While demand responses might be effectual in the Keynesian view, this is not the case in the classical theory—in the classical theory, output is supply determined. Our discussion of monetary and fiscal policy issues will therefore momentarily adopt a predominantly Keynesian view.

In February of 2009, only a month into his presidency, President Obama signed a major fiscal policy stimulus plan (the American Recovery and Reinvestment Act of 2009). The legislation called for spending increases and tax cuts valued at $787 billion. It added spending on education, health care, and infrastructure, and increased transfers for unemployment benefits and other social welfare programs. It offered reduced payroll taxes for individuals and a variety of targeted tax credits, including credits for home purchases by first-time buyers.

Needless to say, economists disagree on matters of theory, and they also disagree on matters of policy. Some advocate fiscal stimulus in the form of government spending, since spending is a direct component of aggregate demand. There are also arguments against increased spending. As a practical matter, it is difficult to quickly spend newly appropriated dollars. Consider infrastructure investment, like spending to build or repair a highway or bridge. Someone must select projects, design them, and choose contractors. Selected contractors must then gear up for production. Much of the production (and the resulting income flows) will be greatly delayed. It is possible that once spending is flowing freely, the recession will already have ended, and the countercyclical macroeconomic objectives will no longer be relevant.

Another argument against increased spending is that the spending itself may not be worthwhile. Given political motivations, one must be skeptical of the value of projects selected for purposes of stimulating the economy. If wind farms are judged to be unprofitable and inefficient in normal times, then the existence of a recession, by itself, is not a strong argument for new construction of new wind farms. Many economists are

hesitant to favor countercyclical spending in recessions, arguing instead that government spending decisions should consistently be based on an assessment of costs and benefits.

If spending is to be employed as a tool it would seem that a good strategy would be to spend on one-time infrastructure projects that would eventually have been undertaken anyway. That is, if a bridge will have to be repaired in the next few years, it is sensible to go ahead and repair it today when the spending also plays a role in macroeconomic stabilization. If the federal government transfers funds to the states to avoid layoffs of state workers, this may also be reasonable. States had already hired these workers to perform tasks judged to be worthwhile, and the spending works quickly since employees are already in place. Much of the spending in the stimulus bill seems to be reasonable on these grounds, although critics have had no difficult finding items to complain about.

Tax cuts provide an alternative policy option that might stimulate demand. One advantage of using tax cuts is that spending power is placed in the hands of households, who will spend on items judged to be valuable. This advantage is less powerful when the tax cuts are directed only at targeted spending areas. A disadvantage of broad-based tax cuts is that households may not spend a large portion of their tax savings. Ricardian equivalence (discussed in *ABC*, p. 124-126) suggests that households who recognize that current tax cuts may imply future tax increases will not feel wealthier, and will save rather than spend. Milton Friedman's permanent income hypothesis suggests a similar result.[19] A 2009 Congressional Budget Office study suggested that only about 40% of 2008 Bush-era rebates were spent, while the remaining 60% was saved.[20]

Deficits and Debt

Spending increases and tax cuts result in deficits and higher levels of debt. The ratio of the government debt to GDP in the U.S. is currently approaching 70%. In comparison to other countries, this ratio is not exceptionally large, and the current debt level is probably not a matter of crisis proportions.[21] However, there is no free lunch. Ultimately debt must be repaid (i.e., bondholders expect a stream of future payments with a present value as great as the purchase price of the bond) or it must be repudiated (perhaps by the inflation resulting from monetization of the debt). Some economists, for example Alan Meltzer, have suggested that the risk of depression has been exaggerated

[19] Friedman argued that the propensity to spend out of temporary income increases will be lower than the propensity to spend out of permanent income increases; the consumption smoothing motive provides a rationale for this view.

[20] See "Did the 2008 Tax Rebates Stimulate Short-Term Growth?" Economic and Budget Issue Brief. Congressional Budget Office, June 10, 2009.

[21] The trajectory of growth in unfunded liabilities related to Medicaid, Medicare, and Social Security makes the longer run fiscal outlook perilous regardless of the impacts of the current recession.

and that fiscal stimulus is an over-reaction.[22] On the other hand, Nobel winner Paul Krugman has argued that the Obama stimulus has been far too small.[23]

Cash for Clunkers

While it is of modest importance for macroeconomcs, I will briefly discuss the Cash for Clunkers program. Officially known as the Car Allowance Rebate System (CARS), the Cash for Clunkers program was passed in a supplemental appropriations act in 2009. The popular program offered new car buyers rebates of up to $4500 if they traded in a vehicle with low fuel efficiency for one with higher fuel efficiency. The program required that the older, fuel-inefficient vehicle be scrapped.

While successful in the sense that it generated considerable spending on cars for at least brief period, this legislation reveals much of what is undesirable about politically motivated fiscal stimulus. Because it was temporary, the program shifted the timing of auto purchases around within the year, but it may not have had much impact on either auto demand or aggregate demand over a longer time frame. The program was costly, however. Each trade resulted in the scrapping of vehicles worth as much as $4500 on the used car market. Moreover, the plan was inequitable. Rebates went to car buyers who happened to own clunkers, but not to car buyers who previously had owned more fuel-efficient cars. There were no rebates for car buyers who had purchased autos just before the program went into effect or for those who would purchase later. People who bought worthwhile items other than cars received nothing. The plan favored the rich (who can afford new cars) and harmed the poor (who saw a portion of the supply of used cars relegated to scrap). Further, it favored auto dealers and manufacturers, but not sellers of other goods. For a program so lacking in economic efficiency, one would at least hope for greater equity![24]

Conventional Monetary Policy Responses

As we have noted, expansionary monetary policy, involving increased money growth and lower short term interest rates, is frequently advocated to help to stabilize recessions. In accordance with this prescription, the money supply has grown and the Federal funds rate, the rate most directly controlled by the Federal Reserve, fell from 5.25% in September 2007 to near zero by December of 2008. Low interest rates should encourage households and firms to spend (especially on interest-sensitive items like housing, durable consumption goods and investment), increasing aggregate demand and output.

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[22] "What Happened to the 'Depression'?" by Allan H. Meltzer, *Wall Street Journal*, Online Edition, August 31, 2009.

[23] "Mission Not Accomplished," by Paul Krugman, *New York Times*, October 2, 2009, p. A31.

[24] Some of these criticisms would also apply to programs offering tax credits to first time home buyers.

While there has been little complaint about interest rate policies after the onset of the recession, there has been criticism of policies that preceded it. Specifically, the extended period of low interest rates following the 2000-2001 recession may have fueled spending that produced the housing bubble. *Ex post*, this criticism may have some validity. However, if the key goal of the central bank is to maintain overall price stability, then the Fed has not done too badly. The Fed has influence over the average level of prices, but much less power to affect prices specific sectors like housing.

A more general criticism can be levied by those who favor "rules" over discretion in monetary policy. Many economists have argued that the central bank should normally follow simple rules in the setting of money growth or interest rate targets. If it were to do so, it could avoid the most egregious policy errors, probably including the excessively easy money that preceded the current crisis. John Taylor is an advocate of setting interest rates in accord with a "Taylor Rule" that specifies that the Federal funds rate target should fluctuate in a prescribed and formulaic countercyclical fashion in response to business cycle conditions (see Taylor, 1993, and *ABC*, p. 554). According to the Taylor Rule prescription, the Fed was too easy after 2001.

Monetary Policy in a Zero Interest Rate Environment

The Federal funds rate has been targeted at 0.0% to 0.25% since December of 2008. Once the rate reaches zero no further reductions are possible and the economy may find itself in a liquidity trap (see *ABC*, p. 424). In this situation, individuals are willing to hold any additional money provided by the central bank, since the opportunity cost, the nominal rate of interest, is zero. If money is held rather than spent, then monetary expansions have little stimulative impact. In terms of our theory, the relevant portion of the money demand curve is flat, which implies that the LM curve is flat, which in turn implies that an expansionary monetary policy has little power to shift the aggregate demand curve.

Interestingly, Fed Chairman Ben Bernanke is on record regarding what the Fed should do if confronted with a liquidity trap, and spoke about this back in 2004 (see *ABC*, p. 424-427). Bernanke offered three prescriptions. First, the Fed should try to convince the public that interest rates will be low for a long time, so that long rates (which more directly affect spending) will also be low. Second, it should attempt to influence the yield curve directly by purchasing longer term, rather than very short-term securities. Third, it should increase the size of its balance sheet, by expanding purchases of securities, and expanding the money supply, rather than exclusively focusing on the level of interest rates.

The Fed has adopted each of these strategies. First, in December 2008, the FOMC's minutes recorded an intention to leave the target Federal Funds rate near zero for a prolonged period, presumably in an effort to influence expectations and long term rates. That language has stayed in the directive since then. Second, the Fed has used its Term Auction Facility (TAF) to make loans to depository institutions over somewhat longer terms than its usual discount window loans. Also, beginning in March 2009, the

Fed has purchased treasury bonds as well as bills (bonds have longer terms). Third, the Fed launched the Term Asset Backed Securities Loan Facility (TALF) to directly provide credit supporting the issuance of asset-backed securities collateralized by student loans, auto loans, credit card loans, and small business loans, and it created the Commercial Paper Funding Facility (CPFF) to lend to a variety of companies by purchasing commercial paper.[25] In doing so, the Fed has dramatically increased the size and diversity of its balance sheet.

In addition to tweaking the term structure of interest rates, the Fed's enhanced lending options were intended to directly confront the breakdown in lending during the panic. As the panic developed, much of the normal lending between institutions seized up because of the uncertainty surrounding the financial health of counterparties. As an indication of increased counterparty risk, observers have pointed to the unusual gap that developed, beginning in 2007, between the Federal funds rate, an interest rate charged on overnight interbank loans, and the LIBOR rate, an interbank rate averaged over slightly longer terms.[26] By offering borrowers credit over longer horizons, the Fed intended to free up lending between institutions. One bank will lend more freely to another if it knows that the borrower has high quality collateral or can borrow from the Fed in order to repay. Wessel (2009, Kindle location 2807) describes the rationale for TSLF (the Term Securities Lending Facility, a program that permitted the Fed to exchange Treasury securities for mortgage-backed securities for up to 28 days):

> The thinking behind the move was simple: Bernanke was trying to unclog what he dubbed the "credit channel." Since the investment houses' collateral was increasingly suspect, he reasoned, giving them a chance to replace bad paper with something nearly as good as cash would get credit flowing again.

Unclogging Credit Markets: An Example

Keister and McAndrews (2009) have presented a simple example, replicated here, to illustrate how Fed lending can directly affect credit availability and economic activity when interbank lending markets are disrupted. Suppose that each of two banks has $10 in capital and $100 in deposits. Also, suppose that each bank must hold 10% of deposits in the form of reserves and that each bank also holds $10 in government securities However, the banks have differing loan-making opportunities. Bank A makes $50 of loans to businesses, while Bank B makes $130 in loans. In order to finance the added loans, Bank B borrows $40 from Bank A. As the balance sheets below illustrate, these operations leave zero excess reserves in the aggregate (total reserves are $20, and total deposits $200).

[25] Commercial paper refers to short-term unsecured debt issued by corporations.

[26] LIBOR refers to the London Interbank Offered Rate, an average of interbank lending rates over short-term horizons.

Bank A

Assets		Liabilities & NW	
Reserves	10	Deposits	100
Loans	50		
Loan to Bank B	40		
Securities	10	Capital	10

Bank B

Assets		Liabilities & NW	
Reserves	10	Deposits	100
Loans	130		
		Loan from Bank A	40
Securities	10	Capital	10

Now suppose that market disruptions cause bank A to view loans to Bank B as excessively risky. When its short-term loan to B is due, it will not roll over the loan. In response, Bank B would normally need to reduce its loans to businesses to pay off Bank A. However, to avoid this outcome, the central bank instead loans $40 to Bank B and Bank B uses the funds to pay off the loan from bank A. As a result, the interbank loan from A to B disappears from both bank balance sheets, but Bank B now owes $40 to the central bank and Bank A has increased its reserves. The balance sheets below illustrate these results.

Bank A

Assets		Liabilities & NW	
Reserves	50	Deposits	100
Loans	50		
Securities	10	Capital	10

Bank B

Assets		Liabilities & NW	
Reserves	10	Deposits	100
Loans	130	Loan from CB	40
Securities	10	Capital	10

The example illustrates a simple, but important result. By lending to Bank B, the central bank avoids a contraction of aggregate bank lending and, perhaps, a related reduction in private sector spending. The example also indicates that excess reserves, specifically those held by Bank A, have increased. While banks normally have incentives to lend out excess reserves, this may not the case in a near-zero interest rate environment.[27] Our conclusion is that a "quantitative easing" can be effective even when

[27] In October 2008, the Fed began paying interest on reserve deposits, further reducing the incentive to loan out excess reserves.

interest rates are zero and when excess reserves are rising. These are exactly the conditions that have been recently observed.[28]

What about Those Bailouts?

In the midst of the panic, actions taken by the Treasury and the Federal Reserve have included more radical interventions, including bailouts of potentially failing firms in the financial sector. Many of these firms comprised what has been called the shadow banking system, in which firms pursued bank-like activities, but in a more highly levered and less regulated environment. For banks, deposit insurance and the presence of the Federal Reserve as a lender of last resort have historically been effective in preventing runs. However, high leverage, lack of regulation, and the absence of a (clear) lender of last resort left the shadow banking system vulnerable to a run, and that was the result once losses were suffered in mortgage investments.

When the panic materialized, bailouts became a vehicle for making the Federal Reserve the lender of last resort for much of the shadow banking system. The actions of the Fed and the Treasury in providing capital directly (purchasing shares of stock), making loans to institutions (and accepting mortgage-backed securities as collateral), and purchasing suspect assets directly were all intended to alleviate the crisis and induce firms to resume normal activities in financial intermediation.

It is reasonable to ask whether these actions were appropriate, or whether the government and the Federal Reserve should have stepped aside and let financial institutions fail. A strong case can be made in favor of the general direction that was taken. In principle, the Federal Reserve acted as a lender of last resort, while extending its purview beyond the traditional banking sector. The mortgage market is huge, many institutions were directly involved, and even more were indirectly involved. Once several financial institutions have failed, then the banks and other institutions who lent to them would be at risk. And if those firms failed, others would likely follow. Even institutions that had been rather well-behaved and prudent would be at risk. In the event of a epidemic of collapse, the government, as the insurer of bank deposits, would be obliged to cover huge losses, and sorting through the wreckage of a collapse would itself have been very costly.[29]

A small indication of the potential costs of failure to act was provided by the events that followed the Lehman bankruptcy. When the Fed failed to save Lehman, it was quickly confronted by crises at AIG, WaMu, and Wachovia. These crises may have been inevitable, but perhaps they were not. The Great Depression also provides a reminder of the possible consequences of failing to act. Avoiding collapse is worth a great deal.

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[28] Some have suggested that the accumulation of excess reserves is an indication that Fed actions have not affected lending. The example shows that this reasoning is not correct. Although bank lending did not rise, the action from the central bank avoided a reduction in lending.

[29] As of October 24, 106 U.S. banks had failed in 2009, despite the actions that have been taken.

We should also remember that the costs of undertaking the bailout may not turn out to be as high as some have suggested. After all, assets the Fed has acquired have value, and many loans the Fed has made will be repaid.

And What about the GM Bailout?

If the government is bailing out banks and financial institutions, should it also bail out a failing automobile company? Here the answer is probably no. The failure of an auto company, even one as large as General Motors, would not have the same potential for systemic risk as the collapse of financial institutions. Bankruptcy is one effective way of reorganizing a company like GM so that it can become a viable competitor.[30] For financial firms, bankruptcy is a less effective option. GM can continue to manufacturer automobiles while it undergoes bankruptcy, but financial firms in bankruptcy proceedings would find it very difficult to attract funds from lenders or depositors.

Moral Hazard Revisited

Moral hazard is important in another aspect of the banking crisis and it leads to an important argument that can be made against bailouts. The basic problem of moral hazard is that individuals or firms may take inordinate risks when they do not bear the full brunt of the loss in the event of a bad outcome. Many actors who took part at various stages of the mortgage process perceived that they would not ultimately bear the burden of a loss even in worst-case scenarios. Now add the possibility that the government is expected to bail out institutions that are deemed "too large to fail." That is, in the event of a systemic catastrophe, the losses of risk-taking lenders will be covered by a government rescue. For financial institutions, this is a situation of "heads I win, tails you lose." Risk takers see high profit on the upside, without the possibility of large personal losses on the downside. An important negative consequence of bailout may be the continued expectation that government will bailout losers in the future, leading firms to continue risky behaviors. Under current circumstances, the government would like to be able to "clean up the mess" with a bailout and to simultaneously promise never to bail anyone out again. But without a means of commitment, such a promise will be seen as empty.

Future Inflation Risks

There is yet another problem with the financial bailout and the expansion of the Fed's balance sheet through its new lending operations. The Federal Reserve's primary concern today is avoiding collapse, but in the future it will need to reverse its accommodating actions. It will need to sell assets it has added to its balance sheet, limit growth of the money supply, and let interest rates rise. If it fails to do so in a timely manner, increases in the money supply might someday fuel inflation. The government's fiscal condition adds to the risk. At some point the Fed may be pressed to monetize the

[30] After receiving bailout funds, General Motors ended up in bankruptcy anyway.

government debt (i.e., purchase government bonds by printing money), which would also add inflationary pressure.

Monindustrial Policy?

By intervening to provide loans to or purchase equity in firms engaged in specific activities, but not others, the government and the Federal Reserve are indirectly picking winners and losers. In normal times, such decisions are normally left to the impersonal workings of markets. John Taylor has coined this non-neutral aspect of the interventions as monindustrial policy (combining monetary policy and industrial policy). If such interventions to become a permanent feature of policy, then the direction of economic activity could become both more politicized and less efficient.

Regulatory Reform

Because of the potential for bank runs and the existence of moral hazard, banks have long been regulated in an attempt to insure that they do not undertake excessive risk. There are multiple regulating agencies, and sometimes institutions can choose among regulators. In the recent panic, much of the problematic activity arose in unregulated or lightly regulated sectors. The adeptness of banks in innovating around regulatory constraints has also weakened the effectiveness of regulation. Moreover, while each regulating agency has oversight over a particular group of institutions, no single authority has been explicitly been charged with responsibility for systemic risk. Recent events make it clear that these arrangements are not fully satisfactory.

There is widespread agreement that regulatory changes are needed to prevent a reoccurrence of the events that led to the panic. Designating an entity with oversight of systemic risk would be one desirable action; such reforms are being considered.[31] Regulations to improve transparency of opaque financial products might also be wise, as would limitations on leverage permitted for non-bank financial intermediaries, especially for firms that are judged to be too large or too interconnected to fail. Stricter enforcement of current mortgage loan requirements would be desirable, and perhaps mortgage loans should be accompanied by larger mandatory down-payments. In practice, successful financial system reform is likely to be difficult, especially if firms continue to find ways to circumvent regulation.

In November 2009, Senator Christopher Dodd introduced a financial regulation reform bill that would create a consumer financial protection agency, create a new independent agency to oversee systemic financial risk, and consolidate bank regulation into a single agency. It is likely that the bill will change significantly before passage so, as this paper is written, the future shape of regulation is an unknown.

Ultimately, successful reform of institutions surrounding financial markets will be critically important. Institutional quality affects productivity and our standard of living

[31] Bank "stress-testing" was carried out by a multi-agency task force on a one-time basis in the spring of 2009, but whether this will become a regular activity is not clear.

just as engineering knowledge does. Indeed, variations in levels of productivity across countries are probably much more closely associated with institutional quality than with differences in technology. Technology flows across borders very easily and quickly, while institutional reform is difficult and slow.

Conclusions

The current recession shares many similarities to earlier ones, although the specific nature of the coincident financial crisis is somewhat unique. Economists of classical and Keynesian bents still disagree over how to best model the shocks causing the recession, as well as appropriate policy actions to undertake. Although aspects of the cycle seem to fit nicely with fluctuations in animal spirits that are Keynesian in flavor, it is not possible to rule out an explanation of cycles based on productivity shocks, perhaps shocks related to institutional failure in financial market activities.

Classical economists tend to favor minimal macroeconomic policy responses, arguing that results of demand-side expansionary policies may be ill-timed, counterproductive, and costly. Keynesians argue that the potential for calamity requires an active policy response. Unfortunately (from a scientific point of view) we cannot run the recession twice, employing different policy choices and observing the consequences. One area where most economists agree is that the existing regulatory framework for financial institutions has been inadequate and that institutional changes might be able to improve matters.

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Table 1. Shocks that Can Cause Fluctuations

Source of Shock	*Impacts*	*Current Recession*
Productivity	A productivity (technology) shock directly affects output by shifting the production function and the FE curve.	Although technology in the usual interpretation has not regressed, real disruption in the financial services sector might be modeled as a productivity shock.
Price of oil	Oil does not directly enter the model, but a higher oil price, reflecting increased oil scarcity, reduces the output that can be produced from given labor and capital inputs. This can be modeled as a negative productivity shock.	There was an oil price run-up prior to the recession; however, the price quickly fell to a much lower level.
Wealth	In the Keynesian model, an increase in wealth, or expected future income, can increase aggregate demand and output. In the classical model wealth is a result of permanent productivity shifts and capital accumulation over time (it is a consequence of shocks, but not a shock in and of itself).	Increased housing wealth may have sustained high spending prior to the recession; decreased wealth in housing and the stock market probably contributed to the downturn.
Animal Spirits	In the Keynesian model, waves of optimism or pessimism about future income or profits can affect current consumption and investment and, as a result, aggregate demand.	One might explain the housing bubble and bust and related spending effects as consequences of changes in animal spirits.
Government Spending	In the classical model, higher government spending can have wealth effects, affecting labor supply and output. In the Keynesian theory, government spending affects output by adding to aggregate demand.	There were no major spending shifts prior to the recession. There have been spending changes in response to the recession.

Taxes	In the classical model, with Ricardian equivalence, an increase lump-sum taxes has no impacts. In the Keynesian model, higher taxes reduce desired spending.	There were no major tax policy shifts prior to the recession. There have been some tax cuts in response to the recession.
Money Supply	In the classical model, an increase in the money supply does not affect output, but does affect the price level. In the Keynesian model an increase in the money supply lowers the interest rate and increases aggregate demand and output.	Contractionary monetary policy was not a cause of the recession. Some have argued that excessively easy monetary policy might have played a role in the boom phase of the housing bubble. In response to the recession, monetary policy is expansionary.
Money Demand	In the classical model, an exogenous increase in money demand only affects the price level. In the Keynesian model, an increase in money demand increases the interest rate and reduces aggregate demand and output.	There were no changes in basic money holding preferences or transactions technologies that caused the recession. However, see the next entry.
Increased Riskiness of Non-money Assets	Increased risk associated with non-money assets will increase the demand for money, increasing the rate of interest and reducing AD and output.	Non-money assets did become riskier as the panic developed, and, this may have increased money demand.

Table 2. Recession Chronology

8/2006	Housing prices peaked (according to the Case-Schiller National Index) and began to fall.
5/3/2007	UBS (UBS), a Swiss bank, announced it was shutting down its Dillon Read Capital Management hedge fund. The fund lost $123 million related to U.S. subprime mortgage market investments.
6/22/2007	Bear Stearns announced that it had pledged a loan of up to $3.2 billion to "bail out" one of its own hedge funds and was negotiating loans with banks for another fund. The funds had invested in collateralized debt obligations (CDOs) backed by subprime mortgages. Bear losses would produce a crisis in March 2008 (see later entries) and a subsequent takeover by J.P. Morgan Chase.
8/9/2007	BNP Paribas, a French banking company, announced that it could not fairly value the underlying assets in three funds as a result of exposure to U.S. subprime mortgages. It suspended withdrawals from the three funds.
8/16/2007	Countrywide Financial, a large mortgage lender, "expressed concerns" over liquidity because of uncertainty in the secondary market for securitized mortgage obligations. Depositors fled and share prices fell. Later (1/11/2008) Countrywide was purchased by Bank of America.
9/14/2007	Northern Rock PLC, a British bank, sought and received liquidity support facility from the Bank of England, following "problems" in the credit markets and a run on deposits. In February 2008 the bank was, at least temporarily, nationalized.
9/18/07	The Fed began rate cuts with a move in target Federal Funds rate from 5.25 to 4.75.

12/12/2007	The Term Auction Facility (TAF) was created by the Federal Reserve. Under TAF the Fed auctions collateralized loans with terms of 28 and 84 days to depository institutions. The program was motivated by a desire to reduce the spread between interest rates on overnight and longer term lending rates. The FOMC also authorized arrangements (swap lines) with the European Central Bank (ECB) and the Swiss National Bank (SNB) so that these banks could expand lending of dollars in Europe as needed.
1/11/2008	Bank of America announced it had agreed to buy Countrywide for $4 billion in an all-stock transaction.
3/10/2008	Moody's Investors Service downgraded debt issued by a Bear Stearns fund. Rumors began to circulate in the market that there were "liquidity problems."
3/11/2008	The Term Securities Lending Facility (TSLF) was announced. Under this program, the Fed would accept up to $200 billion worth of mortgage-backed securities and exchange them for U.S. Treasury bills for up to twenty-eight days.
3/14/2008	J.P. Morgan Chase, in conjunction with the Federal Reserve Bank of New York, agreed to provide an emergency loan, up to 28 days, to Bear Stearns.
3/16/2008	Bear Stearns signed a merger agreement with JP Morgan Chase in a stock swap worth $2 a share (less than 10 percent of Bear Stearns' market value just two days before).
3/24/2008	A new agreement was reached that raised JPMorgan Chase's offer to $10 a share, up from the initial $2 offer. On May 29, Bear Stearns shareholders approved the sale to JPMorgan Chase at the $10-per-share price.
6/2008	Price of oil rose to $134 per barrel, double what it had been a year earlier.

7/1/2008	On July 1, 2008, Bank of America Corporation completed its purchase of Countrywide Financial Corporation.
7/2008	Losses on mortgage portfolios mounted for the GSEs, Fannie Mae and Freddie Mac. The Fed granted Fannie and Freddie access to Federal Reserve low-interest loans. Despite these efforts, by August 2008, share prices for both Fannie Mae and Freddie Mac had fallen 90% from year-earlier levels.
7/24/2008	The Housing and Economic Recovery Act of 2008 was passed by the Congress and subsequently signed into law by President Bush (on July 30). The act created the FHFA (The Federal Housing Finance Agency) with expanded regulatory authority over Fannie Mae and Freddie Mac.
9/7/2008	The FHFA placed Fannie Mae and Freddie Mac into conservatorship. A conservatorship is akin to "temporary" nationalization.
9/11/2008	AIG (American International Group) CEO, Robert Willumstad, notified New York Fed President Timothy Geithner that the company was having difficulty obtaining short-term loans.
9/15/2008	Lehman Brothers declared bankruptcy. In 2008, Lehman faced losses from holdings mortgage-backed securities. In contrast to the Bear Stearns event, government did not step in with a rescue when possible private takeovers fell through. Wessel (2009) attributes this, in part, to seeming intransigence from Treasury Secretary Henry Paulson.

9/16/2008	The Fed bailed out AIG for $85 billion. AIG's losses had stemmed from its sales of credit default swaps ("insuring" collateralized debt obligations that had by that time declined in value). The proximate crisis occurred when AIG's credit rating was downgraded and the company was required to post additional collateral with its trading partners. This led to a liquidity crisis. The Fed announced the creation of a secured credit facility to enable enabling AIG to make payments or post collateral related to credit default obligation transactions. The government received warrants (options to buy) for a 79.9 percent equity stake in AIG. The credit facility was created under the auspices of Section 13(3) of the Federal Reserve Act.
9/25/2008	After a bank run in which Washington Mutual (WaMu) lost 9% of its deposits in ten days, the Federal Office of Thrift Supervision seized the bank and placed it into receivership of the Federal Deposit Insurance Corporation (FDIC). Its assets were sold to J.P. Morgan Chase. This was the largest bank failure in U.S. History.
9/29/09	Wachovia was the next to go. Several businesses and institutional depositors withdrew money from their accounts in order to drop their balances below the $100,000 insured by the FDIC (a silent run). Wachovia began talks with Citigroup and Wells Fargo. The FDIC decided to sell Wachovia's banking operations to Citigroup, and offered to absorb Citigroup's losses above $42 billion.
10/3/2008	Although Citigroup was providing the liquidity that allowed Wachovia to continue to operate, Wells Fargo and Wachovia announced on October 3, 2008 they had agreed to merge in an all-stock transaction requiring no FDIC involvement. On October 9, 2008, Citigroup abandoned their attempt to purchase Wachovia's assets, allowing the Wachovia-Wells Fargo merger to go through without any government guarantees.
10/3/2008	The Emergency Economic Stabilization Act of 2008 was enacted This legislation established TARP (the Troubled Asset Relief Program), to be administered by the department of the Treasury. The program was initially announced as a plan to purchase troubled assets. However, later the funds were instead used to purchase equity in major banks (see 10/13/2008)

10/13/2008	Treasury Secretary Henry Paulson met with the heads of the nine largest U.S. banks. The banks agreed that the Treasury would buy equity stakes in each bank, injecting $250 billion in capital. This amounted to a revision of the original stated plan for the TARP program, with the government buying shares in banks rather than directly buying troubled assets.
10/27/2008	The Commercial Paper Funding Facility was created as a special purpose vehicle (SPV) to permit the Fed to lend (indirectly) to a variety of companies. The SPV was permitted to purchase 3-month unsecured and asset-backed commercial paper.
11/20/2008	The price of oil fell below $50 a barrel for the first time in three and half years.
11/25/2008	The Term Asset-Backed Securities Loan Facility (TALF) was created. The Treasury agreed to provide $20 billion from TARP and the Fed contributed $180 billion. This fund would be used to make loans collateralized by securities backed by student loans, auto loans, credit card loans, and loans guaranteed by the Small Business Administration.
11/10/23008	The U.S. Treasury announced it would purchase $40 billion in newly issued AIG senior preferred stock, under the authority of the Emergency Economic Stabilization Act's Troubled Asset Relief Program.
12/16/2008	The Fed cut the Federal funds rate to a range of 0 to 0.25 percent.
12/19/2008	The White House agreed to a $17.5 billion bail-out for General Motors and Chrysler under TARP (even those these are not financial institutions).
1/1/2009	Band of America closed its deal to purchase Merrill Lynch. Shortly after, BofA received additional government funded loans.
1/20/2009	Barack Obama was inaugurated.
1/28/2009	An FOMC policy directive reported that “The Committee anticipates that weak economic conditions are likely to warrant exceptionally low levels of the federal funds rate for some time.”
2/17/2009	President Obama signed the $787 billion economic stimulus plan (the American Recovery and Reinvestment Act of 2009).

2/27/2009	Announcement: The U.S. economy shrank 6.2 percent (later revised) in fourth quarter of 2008.
3/2009	In March 2009, AIG announced that they were paying out $165 million in executive bonuses.
3/23/2009	The U.S. unveiled a trillion-dollar "Public-Private" plan to take toxic assets out of banks. From the Treasury website: Using $75 to $100 billion in TARP capital and capital from private investors, the Public-Private Investment Program will generate $500 billion in purchasing power to buy legacy assets – with the potential to expand to $1 trillion over time. Source: http://www.treasury.gov/press/releases/tg65.htm
5/7/2009	Results of bank "stress tests" undertaken by the Federal Reserve and other regulators were announced. Although tests showed capital deficiencies for some large banks, the results were primarily viewed as being better than expected.
11/10/2009	Senator Chistopher Dodd introduced a bill to reform financial regulation. The bill would create a consumer financial protection agency, create an independent agency to oversee systemic financial risk, and consolidate bank regulation into a single agency.

Recession Glossary

American Recovery and Reinvestment Act of 2009	This is Obama Stimulus Bill. The bill offered $787 billion in tax cuts and funding for spending in response to the recession.
CDO	Collateralized Debt Obligation Collateralized debt obligations (CDOs) are asset-backed securities whose value and payments to owners are derived from underlying assets like mortgages. CDO payment streams are divided into "tranches" with differing claim priorities on income flows. Senior tranches have higher priority claims. Junior tranches have lower priority claims, but pay higher returns in the absence of losses in the underlying assets.
CDS	Credit Default Swap A credit default swap (CDS) is a contract in which the buyer of the CDS pays the seller and, in exchange, receives a payoff if a credit instrument (like a CDO) goes into default.
CPFF	Commercial Paper Funding Facility The Federal Reserve Board created the Commercial Paper Funding Facility (CPFF), to help provide liquidity to commercial paper markets. Commercial paper includes unsecured notes issued by banks or corporations. According to the Fed, "The commercial paper market has been under considerable strain in recent weeks as money market mutual funds and other investors, themselves often facing liquidity pressures, have become increasingly reluctant to purchase commercial paper, especially at longer-dated maturities. By eliminating much of the risk that eligible issuers will not be able to repay investors by rolling over their maturing commercial paper obligations, this facility should encourage investors to once again engage in term lending in the commercial paper market." Source: http://www.federalreserve.gov/newsevents/press/monetary/20081007c.htm

Emergency Economic Stabilization Act of 2008	The Emergency Economic Stabilization Act of 2008 was the legislation that created TARP, the tool for much of the "bailout" of large financial sector firms. The act authorized Secretary of the Treasury to spend up to $700 billion to purchase "distressed assets" and make capital injections into banks.
Fannie Mae and Freddie Mac	Fannie Mae (the Federal National Mortgage Association) and Freddie Mac (the Federal Home Loan Mortgage Corporation) are government sponsored enterprises (GSEs) created to expand funding for mortgage lending in the U.S. and to promote securitization of mortgages. Debt issued by Fannie and Freddie was thought by many to have implicit government backing.
Federal Reserve Act Article 13.3	This article of the Federal Reserve Act states that: "In unusual and exigent circumstances, the Board of Governors of the Federal Reserve System, by the affirmative vote of not less than five members, may authorize any Federal reserve bank … to discount for [make loans to] any individual, partnership, or corporation, notes, drafts, and bills of exchange when such notes, drafts, and bills of exchange are indorsed or otherwise secured to the satisfaction of the Federal Reserve bank." In emergencies, the Fed has the ability to make loans to almost anyone!
FDIC	The Federal Deposit Insurance Corporation is the agency responsible for insuring deposits at banks.
FHFA	The Federal Housing Finance Agency was created as a regulatory agency by passage of the Housing and Economic Recovery Act of 2008. In particular, the agency assumed oversight of Fannie Mae and Freddie Mac.

Central bank liquidity swaps	Central bank liquidity swaps permit central banks to exchange currencies while also agreeing to reverse the transaction at some time in the future. During the financial crisis liquidity swap lines were established to assure that foreign central banks could access dollars to lend abroad.
Hedge Fund	A private investment fund that trades and invests in a variety of assets that might include securities, commodities, currency, and derivatives on behalf of its clients.
SIV	Structured investment vehicles (SIVs) are funds, often created by banks but operated “off-balance sheet. The strategy of these funds was to borrow money by issuing short-term debt and then lend by buying longer-term securities (often asset-backed securities).
Shadow Banking System	This term refers to the broad collection of non-bank financial intermediaries who have had increasing importance in world-wide lending activities. These institutions do not accept deposits like banks do, but have often been funded by issuance of short-term debt.
TAF	The Fed’s Term Auction Facility (TAF), the Fed provides collateralized loans to depository institutions over somewhat longer terms (28 to 84 days) than its usual discount window loans.
TALF	Term Asset-Backed Securities Loan Facility The Fed launched the Term Asset Backed Securities Loan Facility (TALF) to directly provide credit supporting the issuance of asset-backed securities collateralized by student loans, auto loans, credit card loans, and loans guaranteed by the Small Business Administration (SBA).
TARP	The Troubled Asset Relief Program (TARP) was created by the Emergency Economic Stabilization Act of 2008. It permits the U.S. government to purchase or insure assets necessary to promote financial stability. The TARP program was the largest component of the government's measures in 2008 to address the subprime mortgage crisis.

TSLF	The Term Securities Lending Facility (TSLF) was created by the Federal Reserve to temporarily exchange treasury bills owned by the Fed for mortgage-backed securities for up to 28 days. The facility was intended to improve liquidity by providing firms with high-quality collateral.