

# The Global Financial Crisis of 2007–20??

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## Abstract

This note provides a macroeconomic analysis of the global financial crisis that began in 2007 and continues to this day. What caused the crisis, where does the economy currently stand, and what are the prospects going forward? One way to view recent events is as a balance sheet crisis, both among financial institutions and households. The associated recession is already long and deep. And while the economy will surely recover at some point, the prospects for a recovery in the near term do not look good. This note reviews key macroeconomic facts, provides an introduction to balance sheets and various financial concepts, and studies the financial crisis through the lens of some standard macroeconomic models.

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## 1. Introduction

The world economy is currently beset by more macroeconomic uncertainty than at any time in the last 25 years. The financial crisis that started in the summer of 2007 and intensified in September 2008 has remade Wall Street. Financial giants such as Bear-Stearns, Lehman Brothers, Merrill-Lynch, AIG, Fannie Mae, Freddie Mac, and Citigroup have either disappeared or been rescued through large government bailouts. Goldman-Sachs and Morgan-Stanley converted to bank holding companies in late September, perhaps marking the end of investment banking in the United States.

While the U.S. economy initially appeared surprisingly resilient to the financial crisis, that is clearly no longer the case. The crisis that began on Wall Street has migrated to Main Street. The National Bureau of Economic Research, the semi-official organization that dates recessions, determined that a recession began in December 2007. By the start of 2009, the unemployment rate had risen to 7.6%, up from its low before the current recession started of 4.4%. Forecasters expect this rate to rise to 9% or even higher by 2010, and it seems likely that this will go down in history as the worst recession since the Great Depression of the 1930s.

This chapter provides an overview of these events and places them in their macroeconomic context. How did we get here, what are policymakers doing, and, most speculatively, where is the economy headed? We begin by documenting the macroeconomic shocks that have hit the economy in recent years. Next, we consider data on macroeconomic outcomes like inflation, unemployment, and GDP to document the performance of the economy to date.

The chapter then studies how financial factors impact the economy. We begin by introducing several financial concepts, especially balance sheets and leverage. Clearly, there is a crisis among financial institutions tied to a decline in the value of their assets and the effect this has on their solvency in the presence of leverage. But the crisis has also struck household balance sheets through a decline in their assets, notably housing and the stock market. As a result, households have cut back their consumption, reducing the economy's demand for goods and services. In this sense, the current crisis is tightly linked to balance sheets, both on the firm side and the household side.

The chapter then turns to augmenting the IS/MP and Aggregate Supply / Aggregate

Demand (AS/AD) frameworks of *Macroeconomics* to study recent events. In particular, we show how the financial crisis has generated a wedge between the relatively low interest rates set by the Federal Reserve and the interest rate at which firms in the economy can borrow. These higher interest rates reduce investment. At the same time, there is the balance sheet crisis on the household side: a large decline in household wealth, both through the value of housing and through the decline in the stock market. Together with a substantial increase in uncertainty faced by firms and households, these factors combine to represent a very large negative shock to aggregate demand in the economy.

The chapter concludes with a discussion of the various policy actions that are taking place in response to the crisis, ranging from the enormous expansion of the Fed's balance sheet in an effort to stimulate lending to the recent \$787 billion fiscal stimulus package passed as the American Recovery and Reinvestment Act of 2009.

## **2. Recent Shocks to the Macroeconomy**

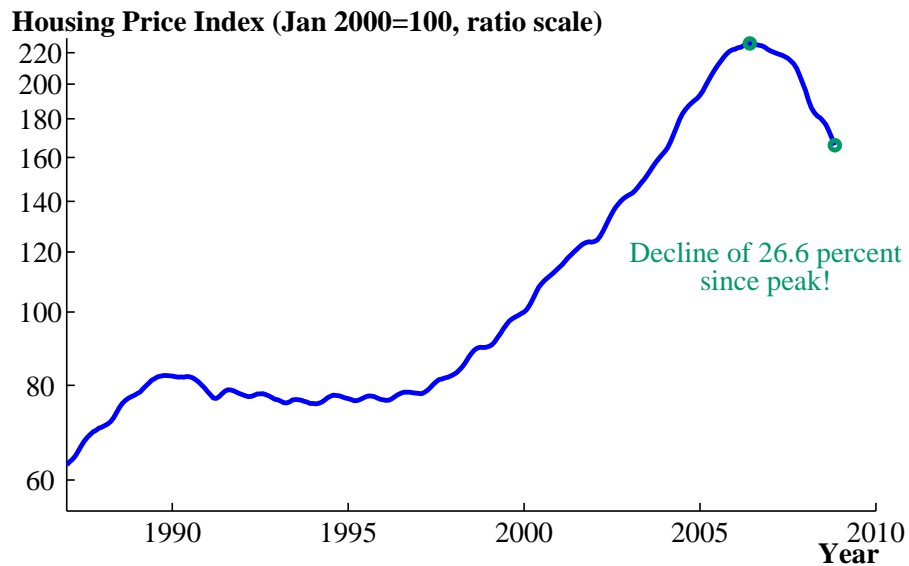
What shocks to the macroeconomy have caused the global financial crisis? A natural place to start is with the housing market, where prices rose at nearly unprecedented rates until 2006 and then declined just as sharply. We then discuss the rise in interest rate spreads (one of the best ways to see the financial crisis in the data), the decline in the stock market, and the movement in oil prices.

### **2.1. Housing Prices**

The first major macroeconomic shock in recent years is a large decline in housing prices. In the decade leading up to 2006, housing prices grew rapidly before collapsing by more than 25 percent over the next three years, as shown in Figure 1. Fueled by demand pressures during the “new economy” of the late 1990s, by low interest rates in the 2000s, and by ever-loosening lending standards, prices increased by a factor of nearly 3 between 1996 and 2006, an average rate of about 10% per year. Gains were significantly larger in some coastal markets, such as Boston, Los Angeles, New York, and San Francisco.

Alarming, the national index for housing prices in the United States declined by

Figure 1: A Bursting Bubble in U.S. Housing Prices?



Note: After rising sharply in the years up to 2006, housing prices have since fallen dramatically. Source: The S&P/Case-Shiller U.S. 10-City monthly index of housing prices (nominal).

26.6% between the middle of 2006 and the end of 2008. This is remarkable because it is by far the largest decline in the index since its inception in 1987. By comparison, the next largest decline was just 7% during the 1990-91 recession.

What caused the large rise and then sharp fall in housing prices? The answer brings us to the financial turmoil in recent years.

## 2.2. The Global Saving Glut

In March 2005, before he chaired the Federal Reserve, Ben Bernanke gave a speech entitled “[The Global Saving Glut and the U.S. Current Account Deficit.](#)” With the benefit of hindsight, we can now look at this speech and see one of the main causes of the sharp rise in asset prices. The genesis of the current financial turmoil has its source, at least to some extent, in financial crises that occurred a decade ago.

In this speech, Governor Bernanke noted that financial crises in the 1990s prompted an important change in the macroeconomic position of a number of developing countries, especially in Asia. Prior to the crisis many of these countries had modest trade and

current account deficits: essentially, they were investing more than they were saving, and this investment was financed by borrowing from the rest of the world. For rapidly growing countries, this approach has some merit: they will be richer in the future, so it makes sense to borrow now in order to maintain consumption while investing to build new highways and equip new factories.

For a variety of reasons (discussed in more detail in Chapter 15), these countries experienced a series of financial crises in the 1990s: Mexico in 1994, Asia in 1997–1998, Russia in 1998, Brazil in 1999, and Argentina in 2002. The result was a sharp decline in lending from the rest of the world, steep falls in the value of their currencies and stock markets, and significant recessions. After the crises, these countries increased their saving substantially and curtailed their foreign borrowing, instead becoming large lenders to the rest of the world — especially to the United States. While developing countries on net borrowed \$88 billion in 1996 from the rest of the world, by 2003 they were instead saving a net \$205 billion into the world’s capital markets.

Bernanke argued that this reversal produced a **global saving glut**: capital markets in advanced countries were awash in additional saving in search of good investment opportunities. This demand for investments contributed to rising asset markets in the United States, including the stock market and the housing market. One way this happened was through the creation of mortgage-backed securities, as we see in the next two sections.

### 2.3. Subprime Lending and the Rise in Interest Rates

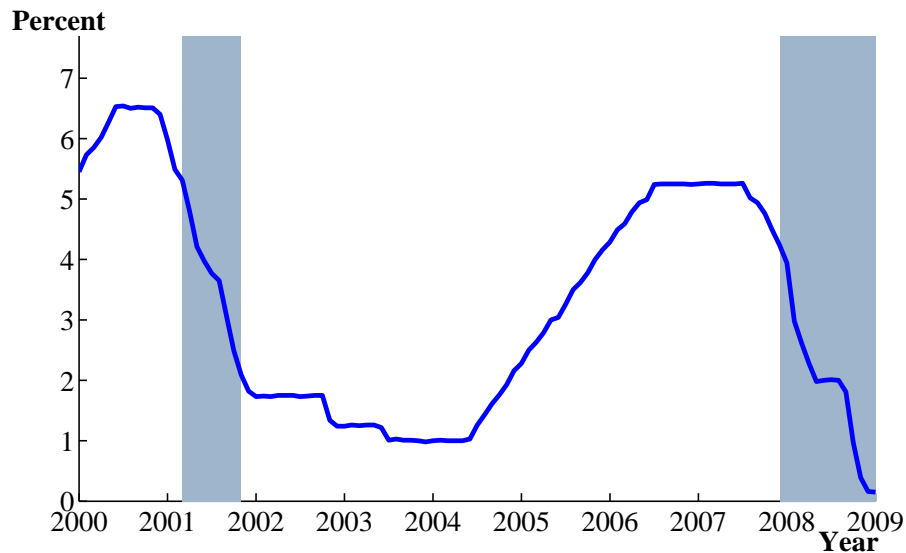
Lured by low interest rates associated with the global saving glut, by increasingly lax lending standards, and perhaps by the belief that housing prices could only continue to rise, large numbers of borrowers took out mortgages and purchased homes between 2000 and 2006. These numbers include many so-called “subprime” borrowers whose loan applications did not meet mainstream standards, for example because of poor credit records or high existing debt-to-income ratios. According to *The Economist*, by 2006, one fifth of all new mortgages were subprime.<sup>1</sup>

Against this background and after more than two years of exceedingly low inter-

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<sup>1</sup>An excellent early summary of the subprime crisis and the liquidity shock of 2007 can be found in “CSI: Credit Crunch” *The Economist*, October 18, 2007.

Figure 2: The Fed Funds Rate



Note: After keeping interest rates very low from 2002 to 2004, the Fed raised rates sharply over the next two years. Following the financial turmoil that began in August 2007, the Fed cut interest rates even more sharply.

est rates, the Federal Reserve began to raise its fed funds target — the rate charged for overnight loans between banks — as shown in Figure 2. Between May 2004 and May 2006, the Fed raised its interest rate from 1.25% to 5.25%, in part because of concerns over increases in inflation. (This was arguably a reasonable policy — according to the Taylor Rule, interest rates were too low in the preceding years and the Fed raised them to a more reasonable level. This will be discussed further below.) Higher interest rates generally lead to a softening of the housing market, as borrowing becomes more costly. In an environment with subprime borrowers facing mortgages whose rates were moving from low teaser rates to much higher market rates, the effect on housing prices was even more severe. According to Chairman Bernanke, by August 2007, nearly 16 percent of subprime mortgages with adjustable rates were in default.<sup>2</sup> Since that time, the problem has spiraled as low housing prices led to defaults, which lowered housing prices even further in a vicious cycle.

<sup>2</sup>Ben S. Bernanke, “The Recent Financial Turmoil and its Economic and Policy Consequences” October 15, 2007.

## 2.4. The Financial Turmoil of 2007-2009?

To understand the financial turmoil that followed, it helps to appreciate a (generally valuable) innovation in finance known as **securitization**. Like a decadent buffet at an expensive hotel, securitization involves lumping together large numbers of individual financial instruments such as mortgages and then slicing and dicing them into different pieces that appeal to different types of investors. A hedge fund may take the riskiest piece in the hope of realizing a high return. A pension fund may take a relatively safe portion, constrained by the rules under which it operates. The resulting pieces go by many names and acronyms, such as mortgage-backed securities, asset-backed commercial paper, and collateralized debt obligations (CDOs).<sup>3</sup>

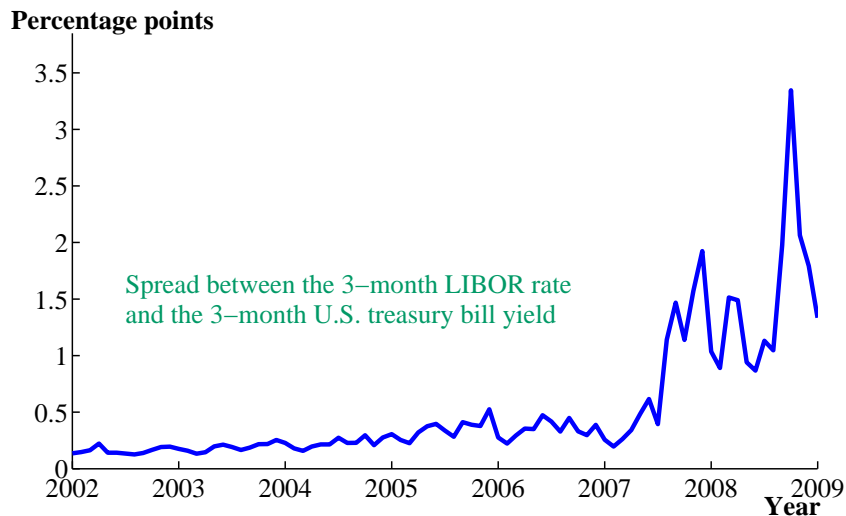
In principle, combining large numbers of assets can diversify the risk associated with any individual asset. For instance, one subprime mortgage may be especially risky, but if you put thousands together and only a few default, the aggregate instrument will be mostly insulated. In the case of the subprime crisis, however, the underlying mortgages proved to be significantly riskier than most investors realized. Banks that generated the mortgages sold them off and did not have to bear the consequences if their particular mortgages went bad; as a result, lending standards deteriorated. Moreover, securitization is based to a great extent on the supposition that a large fraction of mortgages will not go bad at the same time. After all, the history of the U.S. housing market was that while some regions experienced large declines, the overall national market was relatively stable. When the Fed raised interest rates, more and more subprime mortgages went under, housing prices fell nationwide, and this led even more mortgages to go under. Securitization did not (and cannot) insulate investors from aggregate risk.

As sophisticated financial instruments were developed and traded, it became difficult to know how much exposure an individual bank had to this risk. In August of 2007, these forces came to a head and banks sharply increased the interest rate that they charged to each other for anything other than very short-term loans: If Bank A worries that Bank B is backed by a large number of bad mortgages, it will demand a premium to lend money or may not lend at all. There was a “flight to safety” as lenders decided to place their funds in U.S. Treasury bills — government bonds that mature in one year or less, sometimes called “T-bills” — instead of lending to other banks. As a

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<sup>3</sup>A quick visit to [Wikipedia](#) can provide more details on these and other financial instruments.

Figure 3: Liquidity and Risk Shocks since August 2007

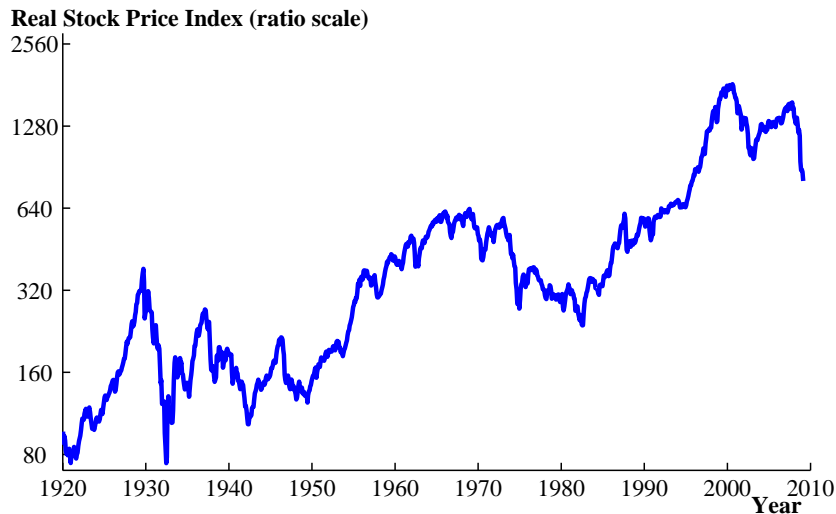


Note: The rate at which banks borrow and lend to one another rose sharply in August 2007 during the subprime crisis and then spiked in September 2008 with the collapse of Lehman Brothers. Source: EconStats.com.

result, the spread between T-bill yields and interbank lending rates rose dramatically, as shown in Figure 3. What had been a modest premium of 0.2 to 0.4 percentage points rose sharply to between 1.0 and 1.5 percentage points. If the yield on treasuries was 2.0%, banks might lend to one another at 2.3% before the crisis. Once the crisis started, these rates rose to as much as 3.5%, and the amount of lending dropped, producing a classic example of a **liquidity crisis** — a situation in which the volume of transactions in some financial markets falls sharply, making it difficult to value certain financial assets and thereby raising questions about the overall value of the firms holding those assets. In September 2008, the crisis intensified and the risk premium exploded from around 1.0 percentage point to more than 3.5 percentage points. Panic set in, and the end of Wall Street investment banking was nigh.

In the course of two weeks in September 2008, the government took over of the mortgage companies Fannie Mae and Freddie Mac, Lehman Brothers collapsed into bankruptcy, Merrill-Lynch was sold to Bank of America, and the Federal Reserve organized an \$85 billion bailout of AIG. Treasury Secretary Henry Paulson and Fed Chair Ben Bernanke met with Congressional leaders to outline the \$700 billion Troubled As-

Figure 4: The S&amp;P 500 Stock Price Index (Real)



Note: The real value of the S&P500 stock price index declined by 48 percent between its peak in November 2007 and February 2008. Source: Robert Shiller, <http://www.econ.yale.edu/~shiller/data.htm>

sets Relief Program (TARP), with Bernanke warning, “If we don’t do this, we may not have an economy on Monday.”<sup>4</sup>

Financial markets declined sharply during this time, as shown in Figure 4. The S&P 500 stock price index fell by nearly 50% from its recent peak in 2007, placing it below levels from a decade earlier.

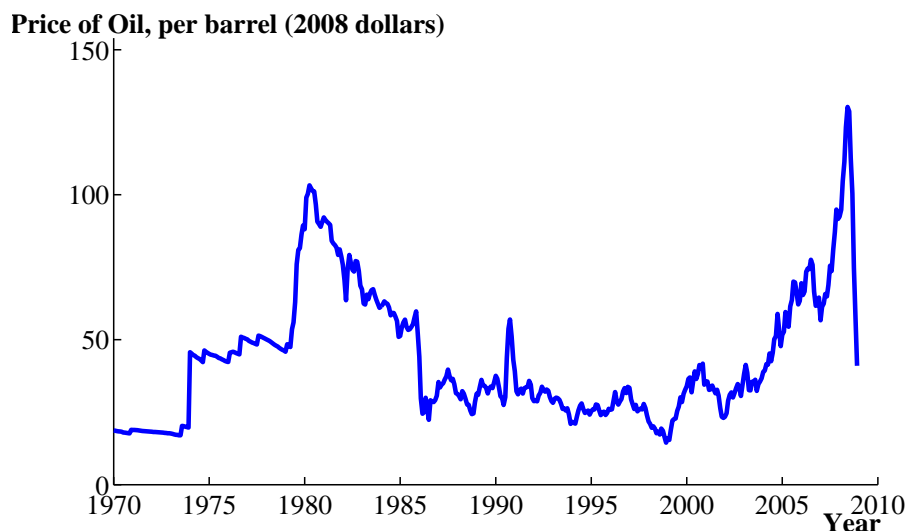
## 2.5. Oil Prices

If the decline in housing prices and the financial crisis were not enough, the economy also suffered from large movements in oil prices.

After nearly two decades of relative tranquility, oil prices rose in mid-2008 to levels never seen before. These prices are shown in Figure 5. From a low of about \$20 per barrel in 2002, oil prices peaked at more than \$140 per barrel during the summer of 2008. This seven-fold increase is comparable in magnitude to the oil shocks of the 1970s. Other basic commodities such as natural gas, coal, steel, corn, wheat, and rice

<sup>4</sup>This crisis period is laid out in vivid detail in Joe Nocera, “As Credit Crisis Spiraled, Alarm Led to Action,” the *New York Times*, October 1, 2008.

Figure 5: The Price of Oil



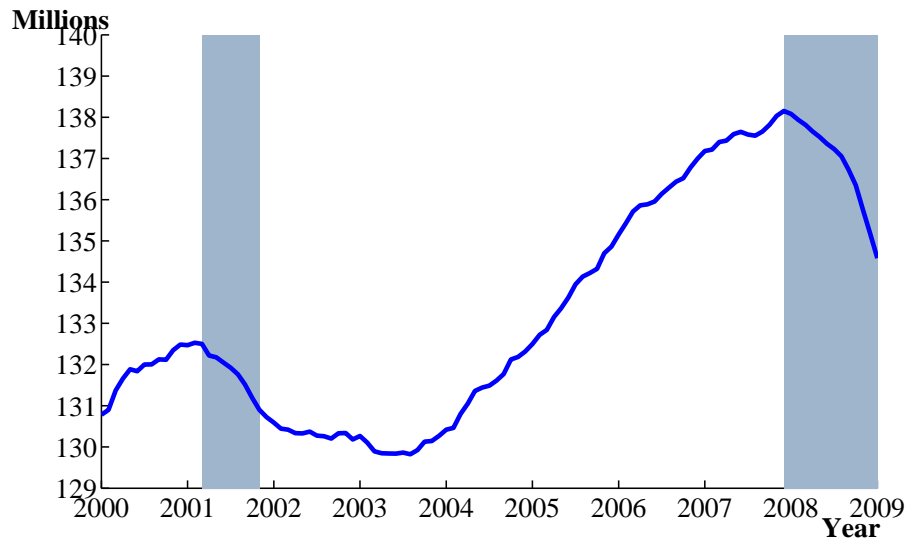
Note: Oil prices rose by more than a factor of 6 between 2002 and July 2008, roughly comparable to the increase in the 1970s. Remarkably, prices then fell off a cliff, returning to the \$40 per barrel range. Source: Federal Reserve Economic Data (the FRED database) from the Federal Reserve Bank of St. Louis.

also featured large price increases.

Then, spectacularly, oil prices declined even more sharply so that by the end of 2008 they hovered around \$40 per barrel.

Why did these prices rise and then fall so sharply? It is instructive to consider the case of oil more carefully. The first fact to appreciate is that world oil consumption has increased significantly during this same period of sharply rising prices. For example, during the first half of 2008, a decline in oil consumption among OECD countries (including the United States) was more than offset by increases in China, India, and the Middle East. Rising prices coupled with rising quantities are a classic sign of an outward shift in demand, and it appears that rising demand — throughout the world but especially among some rapidly growing emerging economies — is a major driving force behind the increase in the prices of basic commodities. Shorter-term factors such as supply disruptions, macroeconomic volatility (in the United States, China, and elsewhere), and poor crop yields appear to have played a role in exacerbating the price movements. The economic slowdown associated with the global financial crisis then

Figure 6: Employment in the U.S. Economy



Note: Total nonfarm employment peaked in December 2007, the date the recession is said to have started, at more than 138 million. More than 3.5 million jobs have been lost since then. Source: The FRED database.

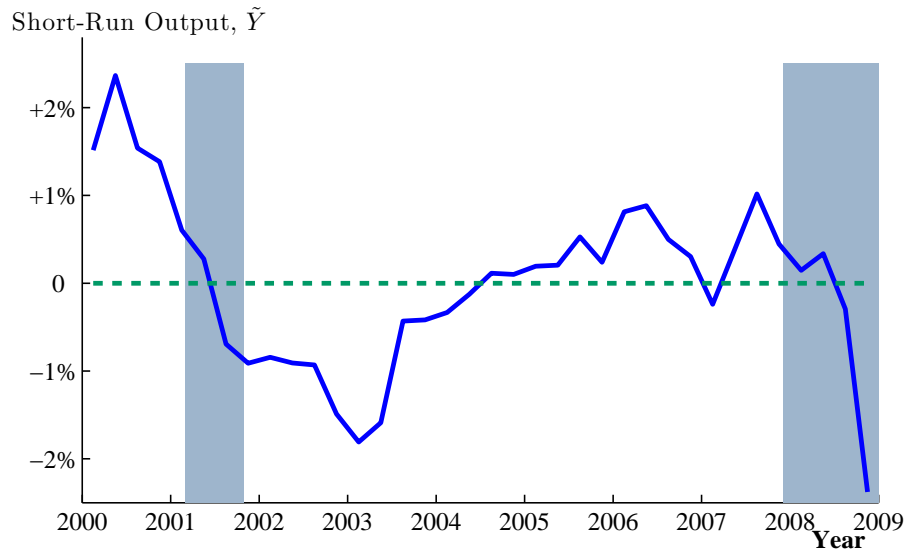
relieved this demand pressure, at least partially, which goes some way toward explaining the recent declines. Nevertheless, it is difficult to justify both \$140 per barrel in the summer of 2008 and \$40 per barrel more recently as both being consistent with fundamentals; some speculative elements seem to have played a role as well.<sup>5</sup>

### 3. Macroeconomic Outcomes

Following the large decline in housing prices and the ensuing financial turmoil, the macroeconomy entered a recession in December 2007. The recession first showed up in employment, as shown in Figure 6. Total nonfarm employment peaked at 138 million in 2007. Since then, more than 3.5 million jobs have been lost.

The recession shows up a bit later in short-run output. As seen in Figure 7, short-run output is close to zero at the start of 2008. By the end of the year, however, output is 2.4% below potential. The recession can also be seen in the unemployment rate in

<sup>5</sup>On the recent sharp swings in oil prices, see James Hamilton's "Oil Prices and Economic Fundamentals" online at Econbrowser, July 28, 2008 and his more detailed study, "Understanding Crude Oil Prices" NBER Working Paper 14492, November 2008.

Figure 7: U.S. Short-Run Output,  $\tilde{Y}$ 

Note: After its initial resilience to the financial crisis, the real economy has declined sharply. By the fourth quarter of 2008, GDP was 2.4% below potential. Source: The FRED database and author's calculations.

Figure 8. From a low in 2007 of 4.4 percent, the unemployment rate has been rising sharply, reaching 7.6% in January 2009 and likely heading higher.

### 3.1. A Comparison to Previous Recessions

Table 1 provides an alternative perspective on the current recession. This table shows some key statistics in two ways: averaged over previous recessions going back to 1950 and for the current recession. For example, during the typical recession, GDP falls by about 1.7%. As of the fourth quarter of 2008, GDP in the current recession has only fallen by 0.8%. This number is sure to worsen in the coming quarters as the recession continues.

The employment measures, however, already suggest that this recession is worse than usual. Nonfarm employment is down by 2.6%, compared with a typical fall of 2.1%. Similarly, the unemployment rate in the current recession is up by 2.7 percentage points, compared with 2.5 percentage points in the average recession.

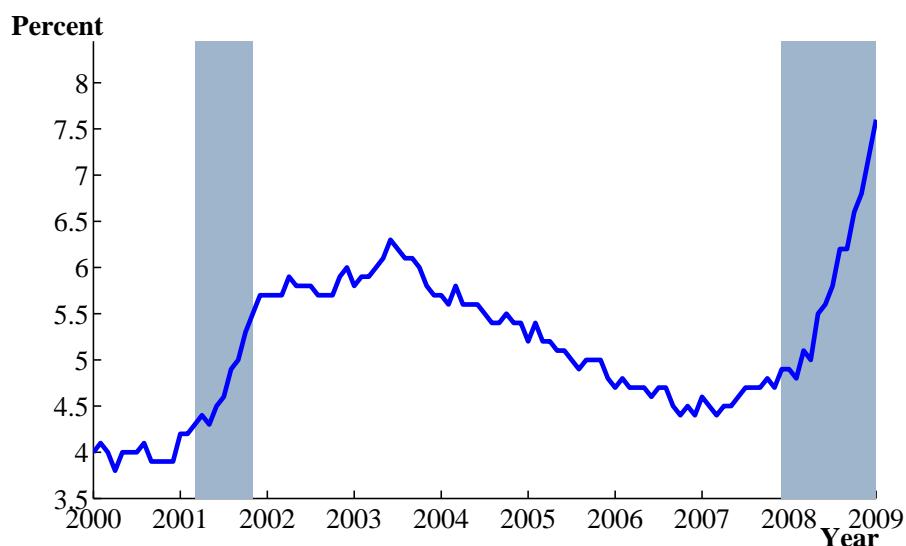
The remainder of Table 1 explores the components of GDP and shows an impor-

Table 1: Changes in Key Macroeconomic Variables: Previous Recessions and the Current Recession

	Average of previous recessions since 1950	Current recession (as of January 2009)
GDP	-1.7%	-0.8%
Nonfarm Employment	-2.1%	-2.6%
Unemployment Rate	2.5	2.7
<i>Components of GDP</i>		
Consumption	0.4%	-1.5%
Investment	-14.7%	-9.8%
Government Purchases	1.2%	3.3%
Exports	-1.5%	-1.8%
Imports	-4.4%	-7.1%

Note: The current recession has only recently begun to show up in GDP but is already large in terms of employment. It also features a particularly large decline in consumption. Source: See earlier figures.

Figure 8: The U.S. Unemployment Rate



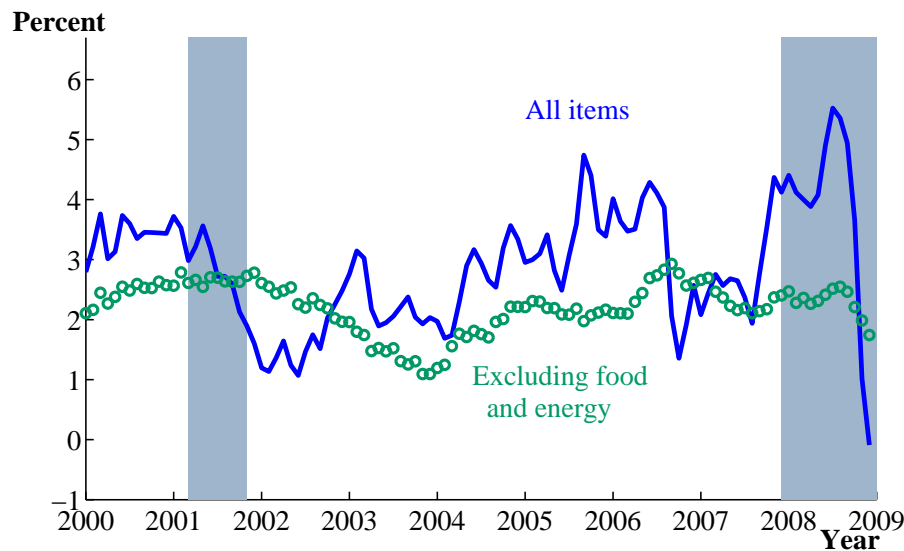
Note: The unemployment rate has risen sharply since 2007, reaching 7.6% in January 2009. Source: The FRED database.

tant way in which the current recession is atypical. On average during the last half century, recessions are characterized by a relatively stable level of consumption — it actually rises by a small amount of 0.4% in past recessions — and by sharp declines in investment, averaging 14.7%. In contrast, the most surprising number in Table 1 is that consumption has already fallen by 1.5% — by more than GDP itself. In most recessions, households seek to smooth their consumption even though GDP is declining. This recession, however, has been led in part by declines in consumption itself. One explanation for this behavior is that the large declines in housing and the stock market have reduced household wealth substantially. This is a decline in permanent income, and consumption has fallen accordingly.

### 3.2. Inflation

Figure 9 shows inflation since 2000, both for “all items” and for the so-called “core” inflation rate that excludes food and energy prices. The overall inflation rate shows a sharp swing in 2008, driven in large part by the movements in energy prices. The rise in the price of oil in the first half of the year leads the inflation rate to peak at about

Figure 9: Inflation in the United States (CPI)



Note: 12-month inflation rates rose sharply during the first half of 2008, driven largely by the price of energy and food, peaking in July 2008 at 5.5%. Declining oil prices have reversed this trend, and prices actually declined between December 2007 and December 2008. Excluding food and energy, inflation has been substantially more stable, though even this core inflation rate declined in recent months. Source: The FRED database.

5.5% in the middle of the year. The sharp decline in the price of oil actually produces a negative inflation rate by the end of the year.

In contrast, the core inflation rate has been much smoother. Core inflation was just over 2.0% during the last several years. In the current recession, inflation has begun to decline, and the rate as of December 2008 was 1.7%.

### — Case Study: A Comparison to Other Financial Crises —

How does the U.S. experience so far compare to outcomes in other financial crises, and what might the future hold? Carmen Reinhart and Ken Rogoff have gathered data on many of the major financial crises that have hit the world in the last century, including the Great Depression, Japan in the 1990s, Sweden in 1991, and the Asian financial crisis of 1997. They've studied closely how the financial crisis affects the macroeconomy along a number of key dimensions. Their results are summarized in Table 2.

The bottom line of their historical study is that financial crises are typically quite long and very costly to the economy. For example, the unemployment rate rises on av-

Table 2: Average Outcomes of a Financial Crisis

Economic Statistic	Average Outcome
Housing prices	-35%
Equity price	-56%
Unemployment	+7 percentage points
Duration of rising unemployment	4.8 years
Real GDP	-9.3%
Duration of falling GDP	1.9 years
Increase in real government debt	+86%

Note: Financial crises are typically quite long and very costly. Source: Carmen Reinhart and Kenneth Rogoff, “[The Aftermath of Financial Crises](#)” Harvard University working paper, December 2008.

erage by 7 percentage points over the course of almost 5 years, government debt nearly doubles, and real GDP declines by close to 10%. While there is variation around these averages — some crises are shorter and shallower while others are longer and deeper — these data suggest that during the “typical” financial crisis, outcomes are much worse than what we’ve seen to date in the United States. This could mean that the current crisis will not be as severe, but it seems more likely that further declines in the real economy are coming over the next year.

———— End of Case Study ————

#### 4. Some Fundamentals of Financial Economics

To understand the financial crisis, it is helpful to have some familiarity with several basic concepts in finance. As mentioned earlier, the current crisis is in many ways a balance sheet crisis. This section explains what a balance sheet is, how the equity or net worth of a company or individual is determined, and the important concept of leverage and how it makes companies and individuals very sensitive to relatively small declines

Table 3: A Hypothetical Bank's Balance Sheet (billions of dollars)

<b>Assets</b>		<b>Liabilities</b>	
Loans	1000	Deposits	1000
Investments	900	Short-Term Debt	400
Cash and reserves	100	Long-Term Debt	400
<i>Total Assets:</i>	2000	<i>Total Liabilities:</i>	1800
		<i>Equity (net worth)</i>	200

Note: The net worth of a company is the difference between its total assets and its total liabilities. Because net worth is usually small relative to assets, a modest decline in the value of assets can render a company bankrupt.

in asset prices.

#### 4.1. Balance Sheets

Many of the basic issues involved in the financial crisis can be illuminated by focusing on the **balance sheet** of financial institutions, other companies, and households. As an example, consider the balance sheet of a hypothetical bank, displayed in Table 3. This hypothetical bank is modeled very loosely on the large commercial banks, like Citigroup or Bank of America.<sup>6</sup> A balance sheet consists of two columns. On the left are the **assets** of the institution — items of value that the institution owns. On the right are the **liabilities** — items of value that the institution owes to others.

In our example, the bank has three categories of assets. It has \$1000 billion of loans that it has made (such as mortgages or loans to businesses). It has \$900 billion in investments — for example, the bank may own some Treasury bonds, some mortgage-backed securities, and some collateralized debt obligations. Finally, the bank has \$100 billion in cash and reserves — including reserves that it is required to hold on deposit with the Federal Reserve. The total assets of the bank are therefore \$2000 billion, or \$2 trillion.

On the liability side, our hypothetical bank also has three categories. The main lia-

<sup>6</sup>To see their actual balance sheets, take a look at <http://finance.yahoo.com/q/bs?s=BAC>, for example.

bility of most banks are the deposits that households and businesses have made. These deposits are a liability to the bank — they are funds owed to someone else. In our example, the bank has \$1000 billion of deposits. It also may have borrowed funds from other financial institutions, which are another kind of liability. Here, the bank has \$400 billion in short-term debt (for example, 30-day commercial paper) and \$400 billion in long-term debt (such as 10-year corporate bonds). These liabilities total \$1800 billion.

The reason this is called a balance sheet is that the two columns must balance. And the key category that makes them balance is called **equity** or **net worth** or even sometimes simply **capital**. Equity is the difference between total assets and total liabilities and represents the value of the institution to its shareholders or owners (and hence is owed to someone else, which is why it is reported on the liability side of the balance sheet). In our example, the bank has a net worth of \$200 billion.

Banks are subject to various financial regulations, for reasons that will become clear in a moment. For example, a **reserve requirement** mandates that banks keep a certain fraction, such as 3%, of their deposits in a special account (“on reserve”) with the central bank. Similarly, a **capital requirement** mandates that the capital (net worth) of the bank be at least a certain fraction of the bank’s total assets, such as 6%. For the hypothetical bank shown in Table 3, the bank appears to have about 10% of its deposits held in reserves (and cash), and capital is 10% ( $=200/2000$ ) of total assets. So this bank satisfies the reserve requirement and the capital requirement in our example.

## 4.2. Leverage

In an unforgettable scene from the 1967 movie, *The Graduate*, Dustin Hoffman plays a young man, Benjamin, who gets career advice from one of his father’s business associates, Mr. McGuire:

Mr. McGuire: I want to say one word to you. Just one word.

Benjamin: Yes, sir.

Mr. McGuire: Are you listening?

Benjamin: Yes, I am.

Mr. McGuire: Plastics.

If this scene were playing out today as an explanation for the financial crisis, the one word would be “leverage.” This word is largely responsible for the financial regulations outlined above and is at the heart of how a relatively small shock to the entire wealth of the United States can be turned into a global financial crisis.

**Leverage** is the ratio of total liabilities to net worth. For our hypothetical bank, this leverage ratio is 9 ( $=1800/200$ ). For every \$10 of assets the bank holds, \$9 is essentially financed by borrowing and only \$1 is financed by money put up by the shareholders. Leverage then magnifies any changes in the value of assets and liabilities in terms of the return to shareholders.

To see why, consider what happens to our bank if it has a good year and its investments go up in value by \$100b, from \$900b to \$1000b. These investments have earned a return of 11% ( $=100/900$ ). After the good year, the bank’s total assets are now \$2100b and its equity rises from \$200b to \$300b. The gain of \$100b in equity, however, represents a 50% increase in equity! The 11% return on investments gets magnified into a 50% return to shareholders because of leverage.

A more familiar example of leverage is associated with a homeowner’s mortgage. The new homeowner may put 20% down and borrow 80% of the value of the new home. If the house initially costs \$500,000, the homeowner starts with \$100,000 in equity in the house. Now think about what happens if the price of the house rises by 10%, to \$550,000. Now the homeowner has \$150,000 of equity and has made a 50% gain on his or her investment. The reason the 10% price increase turns into a 50% gain to the homeowner is because the original investment is leveraged through the mortgage.

That’s the great appeal of leverage: when prices are going up, a modest gain on a house or other investment can be turned into a huge gain on the owner’s initial equity. But of course there is a downside to leverage as well. In the mortgage example, the downside is easy to see: if house prices fall by 10% instead of rising by 10%, the homeowner loses 50% of his or her equity.<sup>7</sup> If prices fall by 20%, the entire equity is lost. Leverage magnifies both the gains and the losses on investments.

Returning to our bank example, suppose market prices were to fall sharply so that the bank’s investments were worth \$600b instead of \$900b. Total assets would also fall

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<sup>7</sup>The price of the house falls from \$500,000 to \$450,000, resulting in a loss of \$50,000. The homeowner’s equity therefore declines from its original level of \$100,000 to \$50,000, a 50% loss.

by \$300b, to a new level of \$1700b. Even though the total value of assets has only fallen by 15%, this change in market prices would entirely wipe out the bank's equity: net worth would go from +\$200b to -\$100b. The assets owned by the bank would no longer be large enough to cover the liabilities that the bank owes to others. In this situation, we say the bank is **insolvent** or **bankrupt**. When a bank or firm is highly leveraged, a given percentage change in the value of its assets has a much larger proportional effect on its net worth. This magnification is a result of leverage.

### 4.3. Bank Runs and Liquidity Crises

Another classic version of a financial crisis that is easy to understand using the balance sheet is a **bank run**. During the Great Depression of the 1930s, depositors worried about the possibility that banks might go under and not be able to return their deposits. At times, this led all depositors to converge on the bank at once to demand their deposits back. Looking at the balance sheet in Table 3, however, one can see the problem. The bank only has \$100 billion in cash and reserves on hand to repay the depositors. The majority of the bank's assets are held in loans and investments, relatively illiquid forms that are hard to turn into cash quickly at fair value. To repay all of its depositors, the bank may be forced to call in outstanding loans and to sell some of its investments quickly. To the extent that these actions lead the values of these assets to fall, the bank run itself may cause the bank to have negative equity, a kind of self-fulfilling prophecy. In 1933, the Federal Deposit Insurance Corporation (FDIC) was set up to provide government insurance for deposits, a measure that has largely eliminated this kind of bank run.

A related problem on the liability side has occurred in the recent financial crisis, however. In this case, it is not the deposits that were the problem, but rather the short-term debt. Financial institutions often have relatively large amounts of short-term debt, in part to provide liquidity as they manage their deposits, loans, and investments. An example is commercial paper, which is often traded with maturities of one week or less. Banks may borrow in the commercial paper market to fund the "cash" entry on the asset side of their balance sheet, which is used to manage their day-to-day commitments. In the last months of 2008 following the collapse of Lehman Brothers, financial institutions became extraordinarily worried about lending money via commercial

paper to other financial institutions that might become insolvent. Interest rates on commercial paper rose sharply by more than 5 percentage points, and access to this form of liquidity was sharply curtailed. To fund their daily operations, banks may then be forced to sell some of their less liquid assets at “fire sale” prices, reducing their net worth. For this reason, a problem like this is called a **liquidity crisis**.

#### 4.4. Summary

Leverage is like the genie that emerges from the magic lamp. When asset prices are rising, leverage can turn a 10% return into a 50% return. In the period leading up to the current financial crisis, the genie was granting wishes and financial institutions earned huge profits by expanding their leverage. When firms take leveraged bets that pay off 9 times out of 10, they can have long runs of seemingly amazing returns.

The problem occurs when the genie catches you in a mistake. The declines in housing prices since 2006 and the decline in the stock market have combined with leverage to threaten the solvency of many financial institutions. Because the financial system is so integrated — financial institutions borrow and lend large sums with each other every day in normal times — problems in a few banks can create a **systematic risk** for the financial system as a whole. Paul O’Neill, a former Treasury secretary under President Bush, summarized this risk with a nice analogy: if you have ten bottles of water and one is poisoned, but you don’t know which, no one drinks water.<sup>8</sup>

## 5. Financial Considerations in the Short-Run Model

How do we incorporate these financial considerations into our Short-Run Model of the macroeconomy?

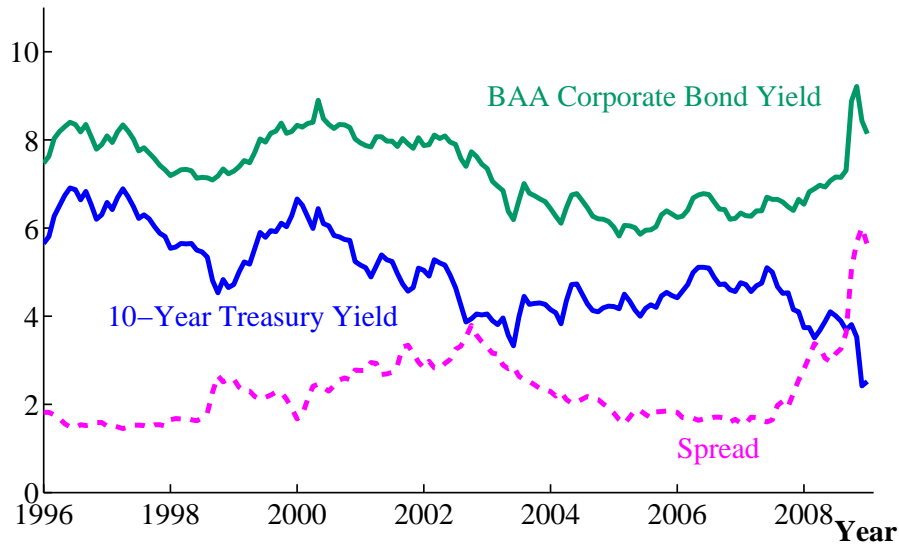
### 5.1. A Risk Premium

In Chapters 9 through 12, we assumed that the Fed could effectively set the real interest rate at which firms borrow and lend. As a starting point — and in normal times — this is a good assumption. But as we documented above in Figure 3, one of the key

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<sup>8</sup>Deborah Solomon, “Market Leader: Questions for Paul O’Neill” *New York Times*, March 30, 2008.

Figure 10: The Spread between Corporate Bonds and Ten-Year Treasuries



Note: Despite the large decline in the interest rate on government securities, the interest rate for corporate borrowing has risen rather than declined during the financial crisis. Source: The FRED database.

channels through which the financial crisis has affected the economy is by creating a substantial spread between the interest rate on government securities and the interest rate at which firms borrow.

While Figure 3 showed this spread for loans with a 3-month maturity, Figure 10 illustrates it for corporate bonds of a much longer maturity. BAA-rated corporate bonds (investment grade bonds with a “medium” grade for risk) typically have a yield that is about two percentage points higher than 10-year Treasury bonds. Between 2007 and 2008, however, this spread rose sharply, reaching more than six percentage points in December 2008. Ten-year Treasury yields fell substantially between 2006 and 2008 as the Fed cut interest rates. But contrary to their usual historical pattern, the required yield on corporate bonds rose instead of fell.

This spread illustrates that even though the Fed was cutting interest rates in an effort to stimulate the economy, the rate at which firms and households borrow to finance investment was rising instead of falling. Despite the efforts of the Federal Reserve to stimulate the economy, interest rates were moving in the opposite direction.

In order to incorporate this phenomenon into our Short-Run Model — and motivated by our discussion of balance sheets — we introduce a **risk premium**. In particular, let  $\bar{p}$  represent the exogenous risk premium that sits between the fed funds rate  $R^{\text{ff}}$  and the real interest rate at which firms borrow in financial markets:

$$R = R^{\text{ff}} + \underbrace{\bar{p}}_{\substack{\text{risk} \\ \text{premium}}} \quad (1)$$

During normal times, we will assume  $\bar{p}$  is zero, and the Fed can set the real interest rate precisely by setting the fed funds rate. During a financial crisis, however,  $\bar{p}$  rises and interferes with the Fed's ability to stimulate the economy.

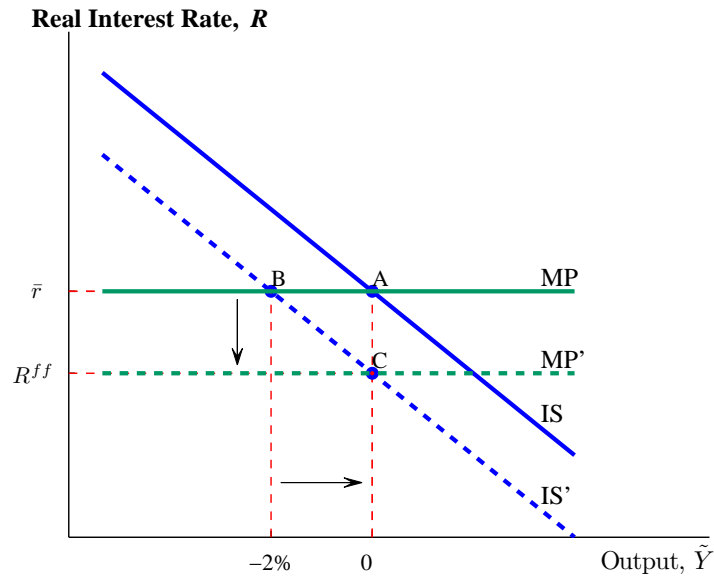
## 5.2. A Rising Risk Premium in the IS/MP Framework

To see this risk premium at work, let's revisit a timely example from Chapter 11 of *Macroeconomics* (pp. 270–272): stabilizing the economy after the bursting of a housing bubble. In this example, a collapse in housing prices leads to a decline in household wealth and a fall in consumption. In the IS/MP framework, this can be represented by a decline in  $\bar{a}$  — a negative aggregate demand shock — that causes the IS curve to shift down and in. Panel (a) of Figure 11 shows the effects of this shock. In the absence of any action by the Fed, the shift in the IS curve would lead to a recession, moving the economy to point *B*. Recognizing this, the Fed lowers the interest rate to stimulate the economy, potentially preventing the recession and pushing the economy back to point *C*.

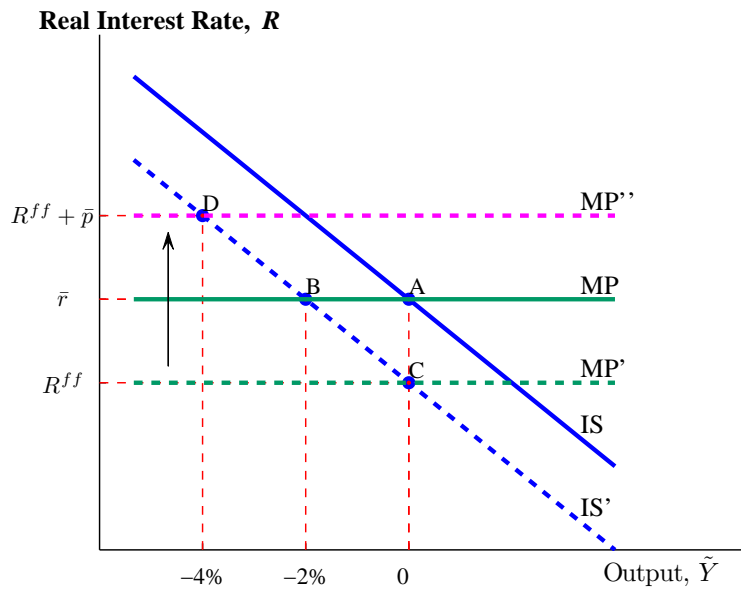
Now consider what happens if the collapse in housing prices also leads to a financial crisis that causes  $\bar{p}$  to rise substantially. In particular, recall the plot of corporate bond rates in Figure 10, where we saw that the borrowing cost to firms rose sharply during the financial crisis despite the huge reductions in the fed funds rate.

Panel (b) of Figure 11 shows what happens if the rise in the risk premium is enough to cause the real interest rate to increase, despite the Fed's actions. In this case, the economy moves to a point like *D*, where the recession is deepened by the conspiring of the two shocks. The decline in consumption pushes the economy to *B*, and the rise in the real interest rate causes output to fall even further below potential.

Figure 11: A Housing Bubble and a Financial Crisis



(a) The collapse of a housing bubble causes the IS curve to shift back, producing a recession at point  $B$ . In response, the Fed lowers the fed funds rate, pushing the economy back to its potential at point  $C$ .



(b) The financial crisis raises interest rates despite the Fed's efforts, producing a deep recession at point  $D$ .

What should the Fed do under these circumstances? The astute reader will notice that a natural answer is that the Fed should take additional actions and cut the fed funds rate even further, so that the final real interest rate is sufficiently low. In the current financial crisis, in fact, this is what the Fed has been doing. However, this approach has run into a problem: the fed funds rate is now essentially at zero, so there is no room for the Fed to cut the rate further! This is one of the factors that leads many economists to support some kind of fiscal stimulus package.

### 5.3. The Risk Premium in the AS/AD Framework

We can also include the risk premium in our AS/AD framework. Recall that this framework allows us to study the dynamics of short-run output and inflation together in a single graph. The aggregate demand (AD) curve combines the IS/MP analysis with a standard monetary policy rule, and the aggregate supply (AS) curve is a standard Phillips curve.

How does the risk premium fit into this analysis? From the previous section, we know that the risk premium shows up in our Short-Run Model via the IS curve: while the Fed sets the fed funds rate, the rate at which firms and households can borrow is equal to this rate *plus* the risk premium.

Because the IS/MP structure feeds into the aggregate demand curve, it may not surprise you that in the AS/AD framework, the risk premium functions just like a negative aggregate demand shock. In particular, an increase in the risk premium shifts the AD curve down and to the left. We derive this result carefully in the accompanying Case Study, but at a basic level, the intuition for this result should be clear: the risk premium works through investment in the IS curve, so it shifts the AD curve, just like a decline in  $\bar{a}$ .

#### — Case Study: Deriving the new AD curve —

Recall from Chapter 12 of *Macroeconomics* that the AD curve is derived by combining the IS/MP analysis with a standard monetary policy rule. In the presence of a risk premium, the key equations for this derivation are

The IS curve:  $\tilde{Y}_t = \bar{a} - \bar{b}(R_t - \bar{r})$

The monetary policy rule:  $R_t^{\text{ff}} - \bar{r} = \bar{m}(\pi_t - \bar{\pi})$

The risk premium equation:  $R_t = R_t^{\text{ff}} + \bar{p}$

Combining the risk premium equation and the monetary policy rule gives

$$R_t - \bar{r} = \bar{p} + \bar{m}(\pi_t - \bar{\pi}).$$

Substituting this into the IS curve yields the new AD curve:

<p>The new AD curve: <math>\tilde{Y}_t = \underbrace{\bar{a} - \bar{b}\bar{p}}_{\text{AD shock}} - \bar{b}\bar{m}(\pi_t - \bar{\pi})</math></p>	(2)
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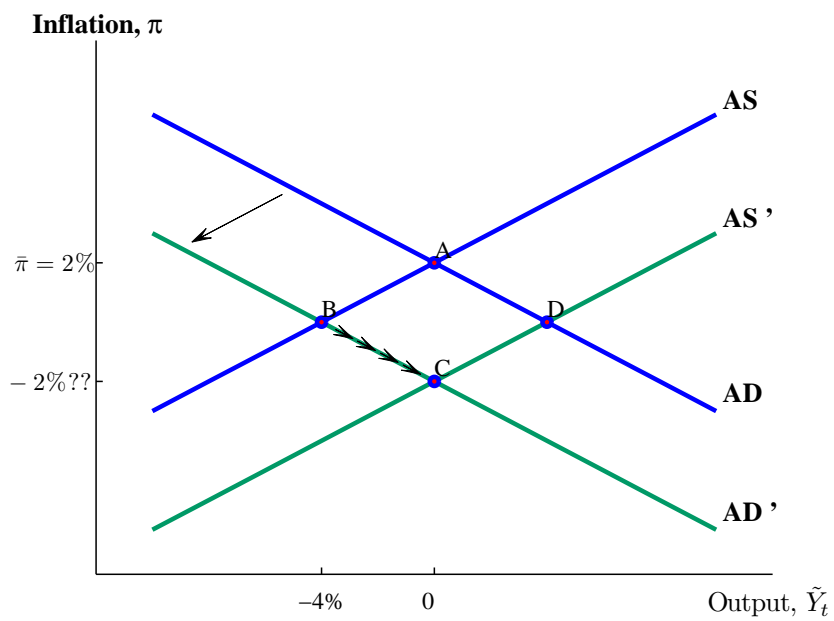
Notice that this equation looks exactly like our familiar AD curve (for example, take a look back at page 299) except that now the risk premium acts like another shock. A higher risk premium works just like a negative shock to aggregate demand (a decline in  $\bar{a}$ ).

———— End of Case Study ————

Figure 12 shows how the economy responds in the AS/AD framework to current events. In particular, we think of current events as entailing two related shocks: (1) a decline in housing prices and equity prices that reduces household wealth, and (2) a rise in the risk premium at which firms and households borrow. Both shocks cause the AD curve to shift down and to the left. The result is a deep recession that leads the inflation rate to fall below its target. Over time, the AS curve gradually shifts down as the recession leads firms to reduce their price increases.

This analysis also makes clear an important further risk associated with the current crisis. Inflation was already low — somewhere around 2% — when the recession began. In the AS/AD framework, the recession leads inflation to fall further, raising the possibility that inflation might become negative — a situation known as **deflation** that turns out to be fraught with danger.

Figure 12: The Financial Crisis in the AS/AD Framework



Note: The large negative AD shock associated with the financial crisis and the decline in consumption causes a deep recession, and the economy moves from *A* to *B*. The recession causes inflation to fall over time, shifting the AS curve down and moving the economy gradually to point *C*. Because inflation was already relatively low at 2% before the financial crisis, this decline could potentially lead to deflation.

## 5.4. The Dangers of Deflation

To motivate our concern about deflation, we need look no further than the worst macroeconomic disaster in U.S. history, the Great Depression. The shocks that caused the Great Depression were magnified by deflation, and it is very likely the case that had there been no deflation, there would have been no Great Depression.

To understand why, recall the Fisher equation that relates real and nominal interest rates:

$$i_t = R_t + \pi_t,$$

where  $i_t$  is the nominal interest rate,  $R_t$  is the real interest rate, and  $\pi_t$  is the rate of inflation. We can rearrange this equation to solve for the real interest rate, as this is the key rate that feeds into the IS curve and influences the real economy:

$$R_t = i_t - \pi_t. \quad (3)$$

When inflation is positive, it lowers the real interest rate. However, notice what happens when inflation is negative: it raises the real interest rate. Why is this? When there is deflation, the price level is falling. So when you have to repay a \$100 loan in a year, you will be paying it back with dollars that are worth more than when you borrowed them. The ensuing rise in the real interest rate then has the usual effects familiar from our analysis of the IS curve: it reduces investment and pushes output further below potential.

In normal times, this problem is relatively easy to handle. After all, the central bank sets  $i_t$ , and it can just lower  $i_t$  to keep the real interest rate low. However, there are two situations in which problems can arise.

The first occurred during the Great Depression. In the 1930s, the Federal Reserve was excessively concerned with bubbles in financial markets and was reluctant to ease monetary policy and lower the nominal interest rate. Deflation therefore raised the real interest rate sharply, helping to turn a recession into the Great Depression. It was only after 1933, when the Federal Reserve lowered the nominal interest rate (and pursued other expansionary monetary policies — in particular, leaving the Gold Standard) that the economy turned around.<sup>9</sup>

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<sup>9</sup>A fascinating and very readable overview of the Great Depression can be found in Christina D. Romer,

The second and more pernicious situation in which deflation can lead to problems occurs when the nominal interest rate is already low. To see why, we first note something quite remarkable: nominal interest rates cannot be negative. Why not? Suppose your bank tried to pay you an interest rate of -3% on your deposits. That is, if you leave \$100 in the bank for the year, they return \$97 to you rather than paying you a positive rate of interest. What would you do? Well, you can always keep your money at home and earn a nominal interest rate of zero. This possibility makes it difficult for the Fed to lower interest rates once the **zero lower bound** is approached. But this means deflation will raise the real interest rate, because the central bank cannot lower nominal rates further.

Progress in understanding monetary policy means we have successfully avoided the first situation. But nominal interest rates are already very low. For example, the fed funds target rate is currently between zero and 0.25%. So one danger of deflation is that it could raise the real interest rate faced by firms and households because the Fed might have trouble reducing nominal rates further.

Let's first discuss a bit more why this would be a problem and then consider the tools that the Fed has at its disposal to make sure something like this does not happen.

The problem is easiest to see in the IS/MP framework. In fact, the effects of deflation very much mimic the analysis of the risk premium that we have already conducted: deflation causes the real interest rate to rise, which reduces investment and pushes the economy deeper into a recession. Take a look back at Figure 11 to see an example.

What is truly pernicious about deflation, however, is that these dynamics can *destabilize* the economy. Deflation may result from a recession that makes inflation negative through the standard short-run dynamics. But the deflation then raises the real interest rate, which deepens the recession. This in turn causes inflation to become even more negative, which raises the real interest rate further and makes the recession even worse. This situation is known somewhat ominously as a **deflationary spiral** precisely because the usual stabilizing forces of the macroeconomy no longer come into play.

What can be done to avoid such a situation? The first remedy is to stimulate the economy with monetary policy to the extent that this is possible. When the zero lower bound becomes a problem, though, other policies may be needed. This is one of the

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"The Nation in Depression" *Journal of Economic Perspectives* Spring 1993, 7(2), pp. 19–39.

key justifications for a fiscal stimulus. Central banks may also attempt to use monetary policy in nonstandard ways. For example, they can print money and either give it to consumers directly — a so-called “helicopter drop” discussed originally by Milton Friedman — or buy financial securities like long-term nominal bonds and seek to lower interest rates at longer horizons.

## 6. Current Risks and Current Policies

### 6.1. The Taylor Rule and Monetary Policy

A natural place to start in evaluating current policies is with the Taylor Rule. Recall that the Taylor Rule is very much like the monetary policy rule we used in Chapter 12. Our simple policy rule specifies the fed funds rate as a function of the gap between the current inflation rate and some target rate. The Taylor Rule goes further by letting the current level of short-run output also influence the setting of the fed funds rate. Figure 13 shows both the actual fed funds rate and the rate predicted by a Taylor Rule. In addition, the figure shows the data on inflation and short-run output that are used in the Taylor Rule.

There are three important things to take away from this graph. First, at least on the surface, current monetary policy appears to be quite expansionary, with the fed funds rate essentially at zero. This rate is even lower than what the Taylor Rule would suggest, and this has been true throughout the recession. However, this view is somewhat misleading. Because of the risk premium, what appears to be a low fed funds rate has not translated into lower interest rates for firms and households; for instance, recall Figure 10.

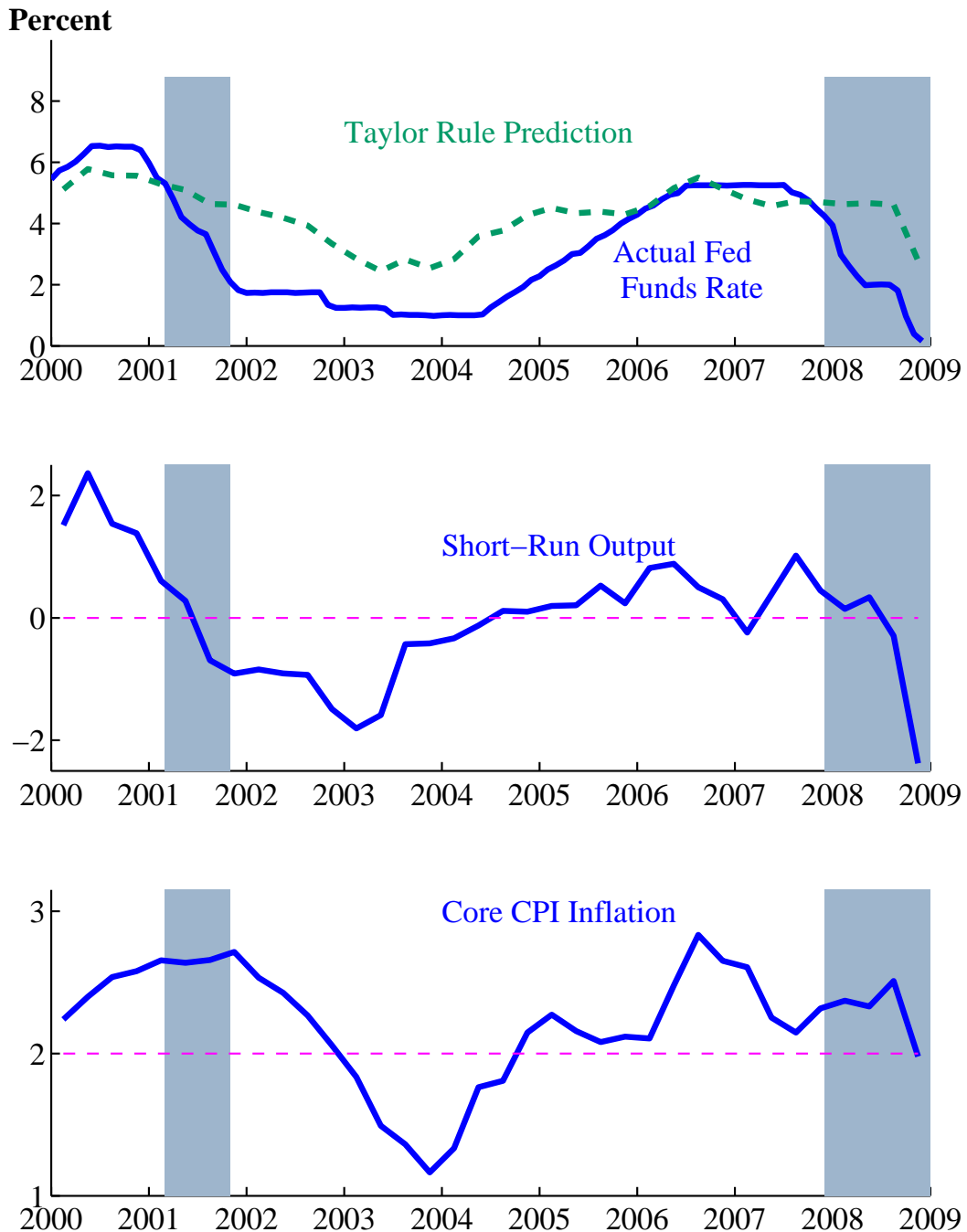
Second, if there is a problem with Fed policy in the years leading up to the financial crisis, it may be that the fed funds rate was kept too low for too long. Between 2003 and 2006, for example, the fed funds rate was substantially lower than the prescription of the Taylor Rule. Together with the global saving glut, these low rates may have contributed to the run-up in housing prices.<sup>10</sup>

Finally, one of the reasons given for the low fed funds rate in 2003 was that the Fed

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<sup>10</sup>This point is developed more fully in John Taylor, “[The Financial Crisis and the Policy Responses: An Empirical Analysis of What Went Wrong](#),” Stanford University working paper, November 2008.

Figure 13: The Fed Funds Rate and the Taylor Rule



Note: The first panel shows the actual fed funds rate and the target suggested by a mainstream Taylor Rule that includes both inflation and short-run output. In particular, the Taylor Rule puts equal weights of 1/2 on inflation and short-run output in determining the real interest rate and is based on a target rate for inflation of 2%; in nominal terms, the rule can be expressed as  $i_t = 1\% + 1.5\pi_t + 0.5Y_t$ . Inflation is measured for the last 12 months using the CPI excluding food and energy, converted to a quarterly frequency. Source: The FRED database.

was very concerned about the possibility of deflation at that time. The reasons for such a concern are apparent in Figure 13. The macroeconomy remained quite weak throughout 2002 and into 2003, and this had a large effect on inflation. The inflation rate fell from more than 2.5% at the start of 2002 to just over 1% at the end of 2003.

This serves to emphasize the current worry about the possibility of deflation. The monthly data on core CPI inflation (the data in Figure 13 are quarterly; look back at Figure 9 for the monthly data) already indicate an inflation rate below 2%. Short-run output is now negative and seems likely to stay that way throughout 2009, potentially putting even more downward pressure on inflation.

## 6.2. The Money Supply

In their famous treatise *A Monetary History of the United States* published in 1963, Milton Friedman and Anna Schwartz attributed the Great Depression to excessively tight monetary policy by the Federal Reserve and the deflation that resulted. An important piece of evidence in their argument was that the money supply declined sharply between 1929 and 1933.

In the current environment with nominal interest rates close to zero, the economy in a deep recession, and a looming possibility of deflation, data on the money supply can be a useful indication of where inflation is headed. Figure 14 shows the growth rate of various measures of the money supply, ranging from a narrow measure that just counts currency to the broader measures of M1 and M2 that include checking accounts, savings accounts, and certificates of deposit (CDs). Reassuringly, each of these measures exhibited rapid growth by the end of 2008, suggesting that the Federal Reserve is focused on preventing a deflation and stimulating the economy. Other actions by the Fed also indicate an attempt to coordinate inflation expectations on a positive rate of inflation around 2%, thus helping to avoid a deflation.<sup>11</sup>

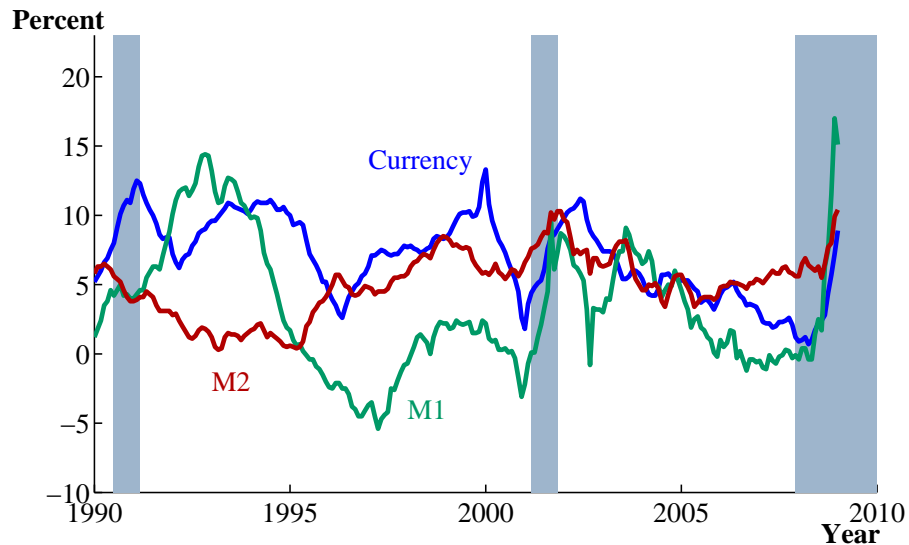
Speaking in 2002 at a celebration of Milton Friedman's 90th birthday, then-Governor Bernanke had this to say:<sup>12</sup>

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<sup>11</sup>For example, the Federal Open Market Committee (FOMC) recently began reporting their expectations of inflation between four and six years from the date of their policy meetings. This was interpreted as an effort to coordinate expectations on positive rates of inflation. See <http://www.federalreserve.gov/monetarypolicy/fomcminutes20090128ep.htm>.

<sup>12</sup>Ben Bernanke, "On Milton Friedman's Ninetieth Birthday," November 8, 2002.

Figure 14: The Growth Rate of Various Money Supply Measures



Note: Each of the different measures of money exhibits rapid growth by the end of 2008. Source: Percentage changes over the preceding twelve months. The FRED database.

Let me end my talk by abusing slightly my status as an official representative of the Federal Reserve. I would like to say to Milton and Anna: Regarding the Great Depression. You're right, we did it. We're very sorry. But thanks to you, we won't do it again.

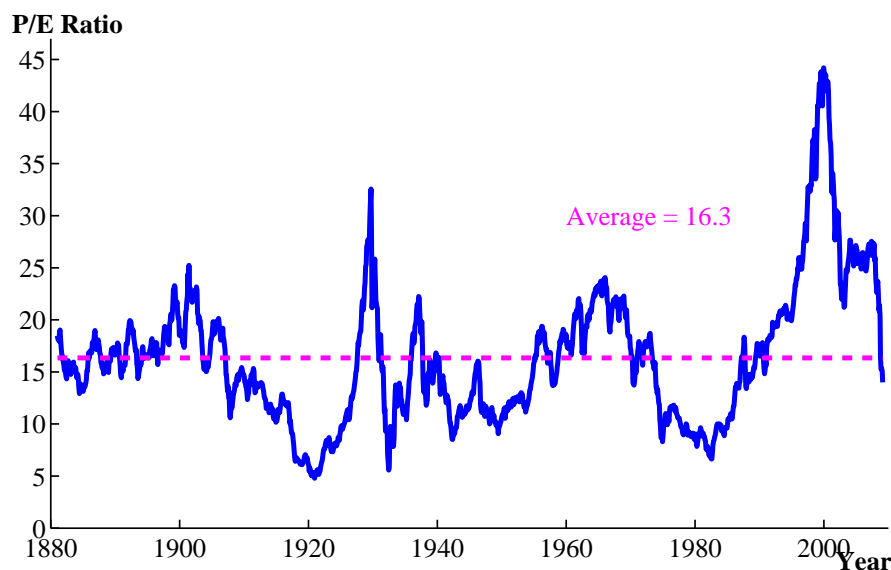
Certainly no one anticipated that the Fed would be put to the test again so soon after Bernanke spoke. And while the outcome of this test is not entirely certain, at least the measures of money growth that drew the attention of Friedman and Schwartz suggest that Bernanke is being true to his word.

#### — **Case Study: Should Monetary Policy Respond to Asset Prices?** —

With the benefit of hindsight, it appears to most observers that there was a bubble in the housing market in the mid-2000s. What should monetary policy do if policymakers suspect there may be a bubble? Should they raise interest rates in an effort to bring asset prices down?

Following the dot-com crash in stock prices in 2000, then-Governor Bernanke gave a speech entitled “**Asset-Price ‘Bubbles’ and Monetary Policy**” (Federal Reserve speech,

Figure 15: The Price-Earnings Ratio in the Stock Market

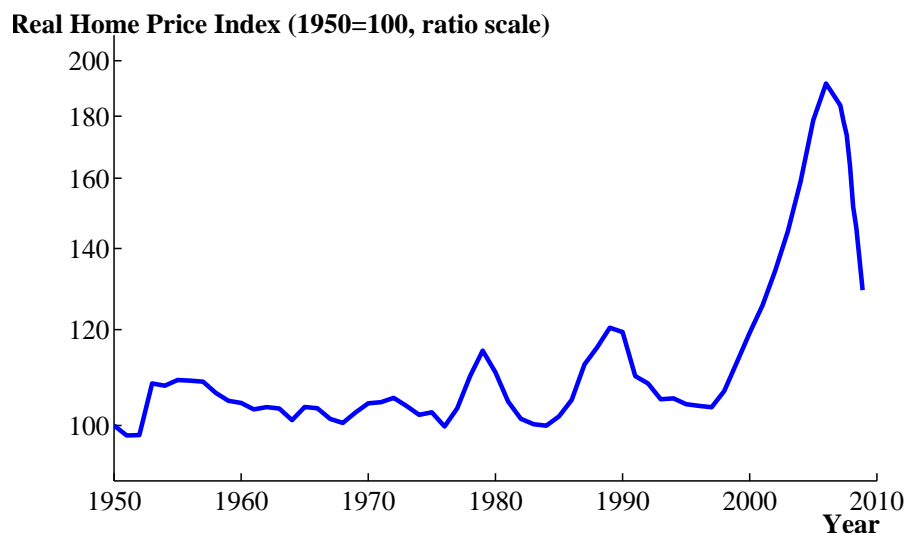


Note: Whenever the ratio of stock prices to company earnings gets too far away from its mean, it tends to revert back. Notice that this measure reached its two highest peaks in 1929 and 2000. Source: Robert Shiller, <http://www.econ.yale.edu/~shiller/data.htm>

October 15, 2002). There, Bernanke reviewed this question in light of the stock market crash of 1929 and the Great Depression. In particular, he argued that (a) it is often difficult to tell if there is a bubble in real time, and (b) even if it is known that there is a bubble, standard monetary policy is too coarse an instrument to be used to manage bubbles. For example, excessive concern by policymakers about bubbles was an important cause of the Great Depression, in Bernanke's view.

Figure 15 shows the ratio of stock prices to "earnings" (an average of dividend payments over the preceding decade). This kind of statistic has been used by Robert Shiller of Yale University (and the author of a best-selling book called *Irrational Exuberance*) to argue that there was a bubble in the stock market in the late 1990s. In financial economics, stock prices are supposed to equal the present discounted value of future dividend payments. Shiller points out that whenever the price-dividend ratio gets exceptionally high, prices usually come back down to restore the ratio to something like its average value. Notice that the price-dividend ratio was even higher in 2000 than in 1929!

Figure 16: Real Home Prices in the United States



Note: By nearly any measure, the appreciation of home prices between 2000 and 2006 was quite unusual. Source: Robert Shiller, <http://www.econ.yale.edu/~shiller/data/fig2-1.xls>

A similar picture can be drawn for the housing market, which certainly makes it appear that there was a bubble by 2006. For example, Figure 16 shows real home prices — home prices deflated by the consumer price index — back to 1950. The period since 2000 is clearly exceptional. Moreover, previous episodes of rapidly-rising real home prices were often followed by real declines.

Bernanke suggests that instead of using monetary policy to manage bubbles, policymakers should use more precise instruments, such as capital requirements and the regulation of lending standards.

———— End of Case Study ————

### 6.3. The Fed's Balance Sheet

The Federal Reserve and the Treasury have created a myriad of new policies to provide liquidity and capital to financial institutions. Examples include allowing them to swap less liquid financial instruments for treasury securities, the provision of liquidity to the large government-sponsored mortgage companies Fannie Mae (the Federal

Table 4: The Federal Reserve's Balance Sheet (billions of dollars)

	<b>Assets</b>		<b>Liabilities</b>		
	<i>May 2007</i>	<i>Feb. 2009</i>	<i>May 2007</i>	<i>Feb. 2009</i>	
U.S. Treasuries	790	475	Currency	814	890
Loans	0	546	Treasury accounts	5	237
Other	116	861	Reserves	7	603
			Other	80	152
<i>Total Assets:</i>	906	1,882	<i>Total Liabilities:</i>	906	1,882

Note: The Federal Reserve has expanded its balance sheet by nearly \$1 trillion to fight the financial crisis. Source: Federal Reserve Release H.4.1. See also James Hamilton's *Econbrowser* blog entry "[Federal Reserve balance sheet](#)", December 21, 2008.

National Mortgage Association) and Freddie Mac (the Federal Home Mortgage Corporation), and direct capital injections through the Treasury Asset Relief Program (TARP).

Because so many different programs are involved, it can be difficult to get a sense of the overall magnitudes involved. One illuminating exercise is to consider the balance sheet of the Federal Reserve system as a whole. This balance sheet is summarized in Table 4 at two different points in time: May 2007, before the financial crisis began, and February 2009 using the latest available data.

In May 2007, the Fed's balance sheet was relatively straightforward. Total assets and total liabilities were \$906 billion. The bulk of the assets were U.S. Treasury securities and the bulk of the liabilities consisted of currency held by the public. This situation reflects the basics of monetary policy, whereby the Fed essentially buys and sells U.S. government bonds in exchange for currency.

In responding to the financial crisis, however, the Fed dramatically reshaped its balance sheet. First, the size of the balance sheet — total assets and liabilities — more than doubled, growing by nearly \$1 trillion. Second, the composition of assets and liabilities changed significantly. On the asset side, the Fed expanded its lending to the rest of the economy, not only to financial institutions but also to nonfinancial corporations. This lending has come either in the form of loans or through the purchase of securities like

commercial paper.

On the liability side, it is important to note that by and large the Fed has not financed this additional lending by printing money. The amount of currency outstanding, for example, is higher by only about 10%, or \$75 billion. Instead, these funds have come from two sources: borrowing from the U.S. Treasury and excess reserves from the banks themselves. In essence, the Fed is buying commercial paper or securitized loans from financial institutions and paying for these purchases by crediting the reserve accounts of the financial institutions. These banks are then holding the funds as reserves with the Fed rather than lending them out again, in part because they are worried about their own balance sheets.<sup>13</sup> Interestingly, these actions by the Fed have been much larger in magnitude than the funds made available by the Treasury through the TARP, which to date have been about \$350 billion.

#### 6.4. Repairing the Financial System

Most economists agree that restoring the basic functions of the financial system — intermediating deposits as loans to businesses and households as efficiently as possible — is one of the highest priorities. There is much less agreement on the best way to accomplish this goal. Broadly speaking, three types of policies are being considered and implemented to various degrees.

**1. Purchases of “toxic” assets.** One factor limiting lending by banks is that they have significant quantities of so-called “toxic” assets on their balance sheets. These are securities whose values are greatly reduced but also uncertain because the usual markets in which they trade have dried up. Mortgage-backed securities are a canonical example from this financial crisis. One idea in the original TARP was that the government would purchase many of these assets from financial institutions. The difficulty, however, lies in knowing at what price the purchase should be made. If the price is too high, taxpayers are on the line for the overpayment. If the price is too low, it doesn't help the banks.

**2. Capital injections into financial institutions.** If the main problem with lending is that banks are undercapitalized, then injecting capital directly into the banks may be useful. This is what the original TARP actually ended up doing: the government in-

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<sup>13</sup>Another reason is that the Fed is now paying interest on excess reserves.

vested \$25 billion in each of many large financial institutions and took equity stakes in these firms. By some estimates, however, losses in the financial sector may be measured in the trillions of dollars, much larger than the equity injections that have taken place so far. Because of leverage, each dollar of equity can in principle be turned into \$10 of loans, which is part of the appeal of this option.

**3. Wholesale reorganizations of financial institutions.** A standard remedy when liabilities exceed assets in a firm is for the firm to file for bankruptcy. The government steps in and reorganizes the firm if possible so that it can resume its business. The essential way the reorganization works is as follows. Equity (net worth) is already zero or even negative, so the stockholders have lost their entire investment. Debt is then “reorganized” into new equity claims. That is, debt is written down to zero and the former debtholders are given equity claims in the newly reorganized firm. Essentially, the value of the debt at the time of bankruptcy becomes the new equity in the new firm. In the context of the financial crisis, this last option has a number of appealing features. First, the stockholders and bondholders in the financial firms that have magnified the crisis bear the brunt of the cost of putting the financial institutions back on their feet; there is no cost to taxpayers. Second, the banks are recapitalized and should emerge with a willingness and an ability to lend.<sup>14</sup>

Economists worry about the “moral hazard” implications of these actions by the government — especially the purchases of toxic assets or the direct equity injections. These actions signal a willingness of the government to step in and provide liquidity and capital when large financial institutions find themselves in trouble. The worry is that by insulating them from the downsides of their actions, these policies can lead financial institutions to undertake excessively risky investments in the future. There is no doubt that this is a valid concern and a cost of intervention. The government’s position is that the costs of intervention thusfar have been significantly lower than the costs of *not* intervening — for example, in terms of an even more severe financial crisis that could have ensued.<sup>15</sup> Some kind of further intervention to restore the functioning of the financial system seems both necessary and inevitable. One merit of the reorgani-

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<sup>14</sup>Susan Woodward and Robert Hall discuss a version of this plan in which the financial institutions are first divided into “good banks” and “bad banks,” which should help preserve lending during a reorganization. See “[The right way to create a good bank and a bad bank](#),” February 23, 2009 on their blog, “Financial Crisis and Recession.”

<sup>15</sup>For example, see Frederic S. Mishkin, “[Global Financial Turmoil and the World Economy](#)” July 2, 2008.

zation approach (the third proposal above) is that it minimizes moral hazard concerns, as shareholders and bondholders see their claims reduced in value.

## 6.5. Fiscal Stimulus

On February 17, 2009, President Obama signed into law the American Recovery and Reinvestment Act of 2009, a \$787 billion package designed to stimulate aggregate demand in the economy. The final plan includes more than \$250 billion in tax cuts and more than \$500 billion in new government spending on such things as unemployment benefits, infrastructure, education, health care, and aid to state and local governments. According to the Congressional Budget Office, about \$185 billion of the stimulus will occur in 2009, with another \$400 billion coming in 2010.

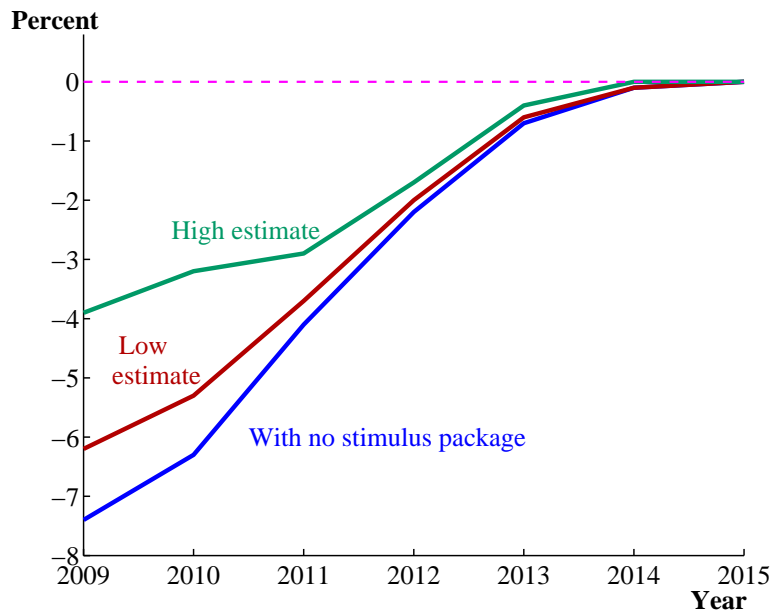
Given the macroeconomic situation, many economists support some kind of fiscal stimulus. With the fed funds rate at zero, short-run output turning sharply negative, and deflation a possibility, a large fiscal stimulus seems prudent. The main areas of disagreement among economists concern the types of spending and the relative weight on tax cuts versus new spending.

The Congressional Budget Office (CBO) provides estimates of the impact of the fiscal stimulus package on the macroeconomy. These estimates come in the form of forecasts for short-run output and the unemployment rate and are shown in Figure 17.

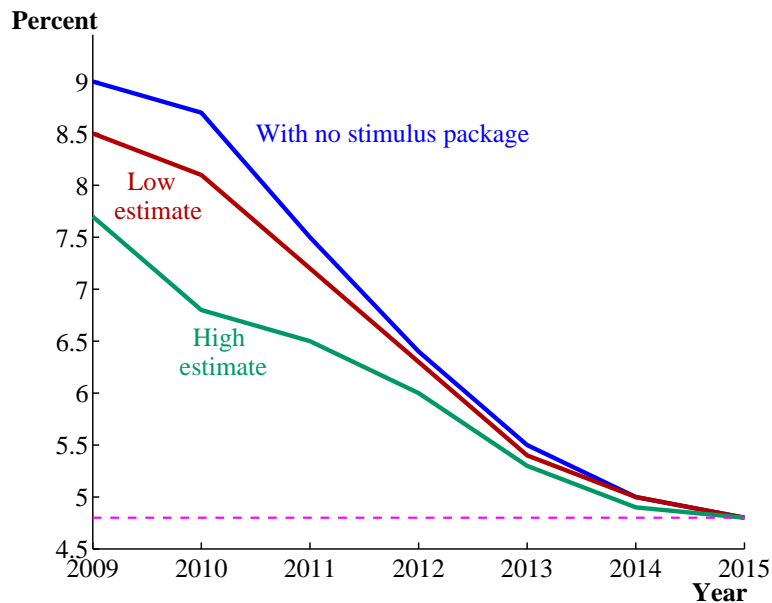
In the absence of a stimulus package, the CBO forecasts are troubling, with short-run output reaching -7.4% in 2009 and the unemployment rate peaking at 9.0%. The CBO then provides two forecasts including the impact of the stimulus, a “low estimate” based on pessimistic assumptions about the effects of the package and a “high estimate” based on optimistic assumptions. Notice that even in the best case scenario, the recession is long and deep, with output staying below potential until around 2013. Nevertheless, the fiscal stimulus is estimated to improve the economy substantially relative to the case of no stimulus package.

These effects are somewhat reminiscent of the fiscal stimulus employed by Japan following its financial crisis and deflation in the 1990s. There, the ratio of government debt to GDP rose from about 13% in 1991 to 90% in 2006, as government spending exploded sharply to stimulate the economy. On the surface, Japan’s slow growth in the 1990s might be taken as evidence of little payoff from its fiscal stimulus. On the other

Figure 17: Forecasts from the Congressional Budget Office



(a) Short-run output



(b) The unemployment rate

Note: While the CBO forecasts that the American Recovery and Reinvestment Act will have a significant impact on the economy, short-run output is still predicted to remain very low and unemployment very high in the coming years. The graphs show the forecasts with no stimulus package and for both a low estimate and a high estimate of the impact of the stimulus. Source: Congressional Budget Office, "Estimated Macroeconomic Impacts of H.R. 1 as Passed by the House and by the Senate," Letter to the Honorable Judd Gregg, February 11, 2008.

hand, Japan did not experience a depression in the 1990s despite enormous collapses in the stock market and the housing market. Perhaps the fiscal stimulus did its job in preventing the “lost decade” from becoming something worse.

— **Case Study: The Impact of the Economic Stimulus Act of 2008** —

In early 2008, the United States federal government enacted a smaller and more targeted stimulus package, the Economic Stimulus Act. Stimulus payments ranging from \$300 to \$600 per taxpayer were distributed to low and middle-income taxpayers in the 2nd and 3rd quarters of 2008. In the aggregate, these one-time payments amounted to more than \$100 billion, or nearly 1% of GDP.

While a careful study of the effect of this stimulus has yet to be completed, the superficial facts do not suggest the stimulus had a large effect. For example, consider Figure 18, based on an argument by John Taylor.<sup>16</sup> The fiscal stimulus sharply increased disposable (that is, “after tax”) income during the middle months of 2008, but this seemingly had little impact on personal consumption expenditures. This is exactly what standard consumption theory predicts: according to the permanent income hypothesis, the stimulus payments should raise consumption by a small amount for many quarters rather than by a large amount at a point in time. This example reveals that the nature of the spending and tax cuts matters greatly for the ultimate stimulus to the economy.

———— End of Case Study ————

## 6.6. The Rest of the World

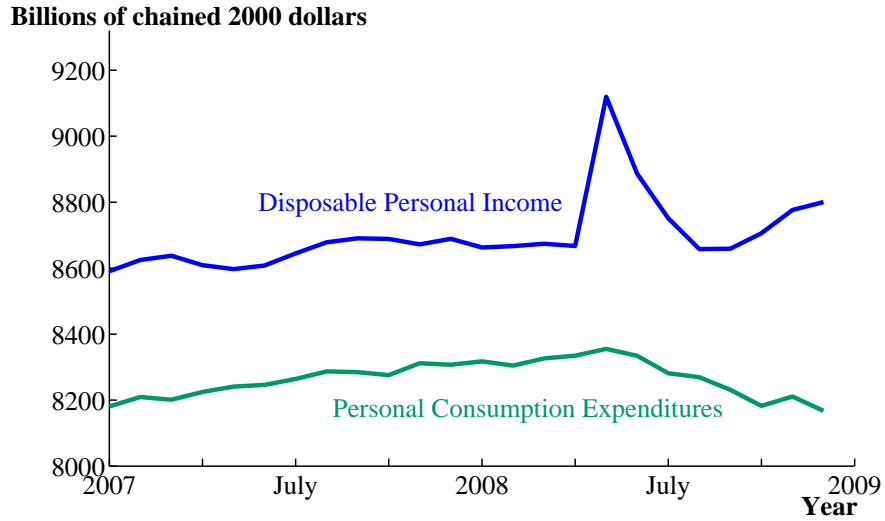
Another important feature of the current financial crisis is that it is now global in scope. The advanced countries of the world — such as Japan, Germany, the U.K., and France — are all in or headed for a deep recession. Recently, for example, Japan announced that GDP in the fourth quarter of 2008 fell at an annual rate of 12.7%, its sharpest decline since 1974.<sup>17</sup>

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<sup>16</sup>John B. Taylor, “The Financial Crisis and the Policy Responses: An Empirical Analysis of What Went Wrong” Stanford University working paper, November 2008.

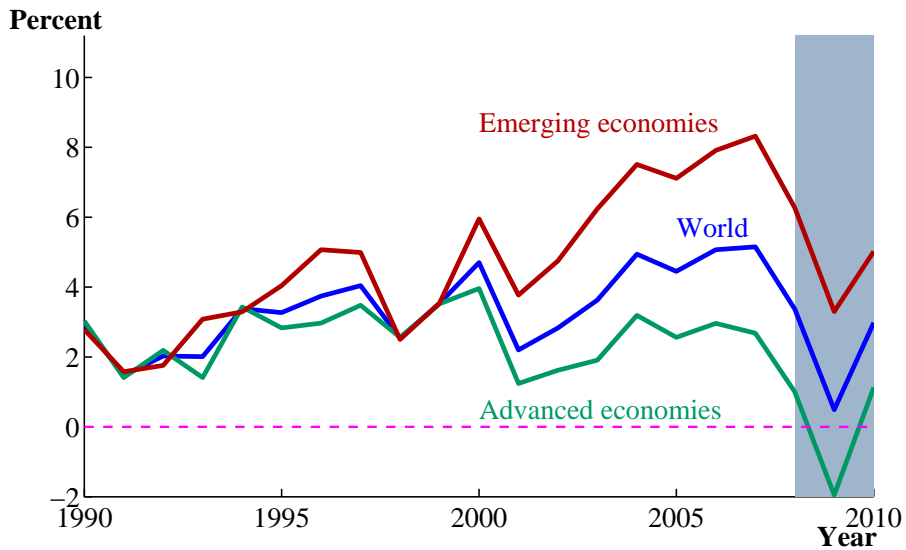
<sup>17</sup>A fascinating journalistic account of Iceland — a small country of 300,000 people whose losses in the banking sector likely exceed its entire GDP — is provided by Michael Lewis, “Wall Street on the Tundra”

Figure 18: The Economic Stimulus Act of 2008



Note: The Economic Stimulus Act of 2008 raised disposable income but seemingly had very little effect on consumption. Source: The FRED database.

Figure 19: Economic Growth around the World, Historical and Forecast



Note: The IMF forecasts that world GDP will grow by only 0.5% in 2009, its slowest rate since World War II. Source: International Monetary Fund, "World Economic Outlook Update Global Economic Slump Challenges Policies," January 28, 2009.

Figure 19 shows GDP growth for the world as a whole going back to 1990, together with forecasts by the International Monetary Fund (IMF) for 2009 and 2010. The IMF forecasts that world GDP will grow by only 0.5% in 2009, its slowest rate since World War II. Growth in emerging markets, including China, is also forecast to slow significantly.

There are at least two important implications of the global nature of this financial crisis. First, it means that exports are not going to be a major source of demand for the United States or any other country for that matter. In the 1990s, Japan could hope that demand from the rest of the world would help to mitigate its slump. Such hope is not available for the world as a whole. In fact, declines in export demand from the rest of the world will likely be an important drag on GDP growth. Second, the global nature of the crisis emphasizes that this recession is different from much of what has come before.

## 7. Conclusion

The global financial crisis will very likely go down in history as the largest recession in the United States and the rest of the world since the Great Depression. Rudi Dornbusch, a famous professor of economics at M.I.T. in the late 20th century, once remarked of U.S. recessions, “None of the postwar expansions died of old age, they were all murdered by the Fed.”<sup>18</sup> What Dornbusch meant is that the Federal Reserve engineered most of the postwar recessions in order to bring down inflation.

The current recession is different. It was not intentionally engineered by the Fed to lower inflation. Instead, it is a balance sheet crisis, both on the firm side and on the household side and is much more reminiscent of the Great Depression than any other recession in postwar history.

Macroeconomic performance over the next five years is very uncertain. The Great Depression was extraordinary by all measures, with unemployment peaking in 1933 at an astounding rate of 25%. No economist expects an outcome that even approaches this magnitude. But an unemployment rate of half that amount is a distinct possibility, something no economist would have expected just two years ago.

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*Vanity Fair*, April 2009.

<sup>18</sup>Quoted in “Of Shocks and Horrors,” *The Economist*, September 26, 2002,

Whatever happens in the coming years, it is worth remembering a key fact about the Great Depression, in evidence on the cover of the *Macroeconomics* textbook and displayed more clearly in Chapter 1 in Figure 1.6. Even something as earth-shaking as the Great Depression essentially left the long-run GDP of the United States largely unaffected. Something so seemingly world changing was, in the end, only temporary.

## 8. Useful Readings

- *The Economic Report of the President, 2009*, Council of Economic Advisers, Chapter 2, “Housing and Financial Markets.” *A detailed overview of the financial crisis and the government’s policy response.*
- Peter Boone, Simon Johnson, and James Kwak, “The Baseline Scenario for 2/9/2009,” <http://baselinescenario.com/2009/02/08/baseline-scenario-2909/>. *A very useful summary of where things currently stand in the financial crisis, particularly from a global perspective.*
- Doug Diamond and Anil Kashyap, “Everything You Need to Know About the Financial Crisis,” on the *Freakonomics* blog, October 15, 2008. *An excellent overview of the key spike in the financial crisis in September of 2008, together with the government’s early proposals about how to respond.*
- Ben S. Bernanke, “The Crisis and the Policy Response,” January 13, 2009 (Federal Reserve speech). *Chairman Bernanke’s overview of the Fed’s actions and the powerful tools that it still retains.*
- Ben Bernanke “Asset-Price ‘Bubbles’ and Monetary Policy” October 15, 2002 (Federal Reserve speech). *Bernanke looks back at the Great Depression in arguing that monetary policy is too coarse an instrument for responding to possible bubbles; capital requirements and proper regulation may be more effective.*
- Blogs that are helpful in remaining up to date on current events:
  - Baseline Scenario: <http://baselinescenario.com/>.
  - Greg Mankiw: <http://gregmankiw.blogspot.com/>
  - The Wall Street Journal’s Real Time Economics: <http://blogs.wsj.com/economics/>

– Econbrowser: <http://www.econbrowser.com/>