

The Global Financial Crisis: Overview

Charles I. Jones*

A Supplement to *Macroeconomics* (W.W. Norton, 2008)

May 22, 2009

OVERVIEW

In this chapter, we learn

- the causes of the financial crisis that began in the summer of 2007 and where the economy currently stands.
- how the current financial crisis compares to previous recessions and previous financial crises in the United States and around the world.
- several important concepts in finance, including *balance sheet* and *leverage*.

*Graduate School of Business, Stanford University. Preliminary — comments welcome. I am grateful to Jules van Binsbergen, Pierre-Olivier Gourinchas, Pete Klenow, James Kwak, Jack Repcheck, Josie Smith, and David Romer for helpful suggestions.

Wednesday is the type of day people will remember in quant-land for a very long time. Events that models only predicted would happen once in 10,000 years happened every day for three days.

— Matthew Rothman, global head of quantitative equity strategies, Lehman Brothers, August 2007.¹

1. Introduction

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, marking the end of an era for 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 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 April 2009, the unemployment rate had risen to 8.9%, up from its low of 4.4% before the recession. Forecasters expect this rate to rise to 10% or even higher in 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. 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 introduce several important financial concepts, especially balance sheets and leverage. Clearly,

¹Quoted in Kaja Whitehouse, “One ‘Quant’ Sees Shakeout For the Ages – ‘10,000 Years’” *Wall Street Journal*, August 11, 2007.

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. Finally, the balance sheets of both the U.S. government and the Federal Reserve play starring roles in current events. The Congressional Budget Office projects that federal debt as a ratio to GDP will double over the next decade, from 41% to 82%, in part because of the financial crisis.² And the Federal Reserve has already more than doubled the size of its balance sheet, pursuing unconventional means to ensure liquidity in financial markets. In this sense, the current crisis is tightly linked to balance sheets throughout the economy — for financial institutions, for households, for governments, and for the Federal Reserve.

2. Recent Shocks to the Macroeconomy

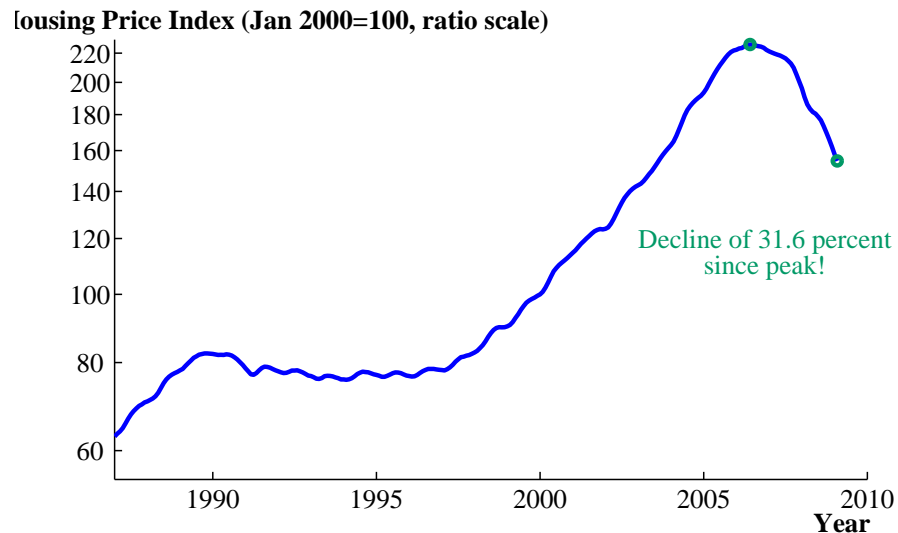
What shocks to the macroeconomy have caused the global financial crisis? A natural place to start is with the housing market, where prices rose at nearly unprecedented rates until 2006 and then declined just as sharply. We also discuss the rise in interest rate spreads (one of the best ways to see the 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 30 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.

²Congressional Budget Office, “A Preliminary Analysis of the President’s Budget and an Update of CBO’s Budget and Economic Outlook,” March 2009.

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).

Alarming, the national index for housing prices in the United States declined by 31.6% between the middle of 2006 and February 2009. 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 shift in the macroeconomics of a number of developing countries, especially in Asia. Prior to the crises 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 17), 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.

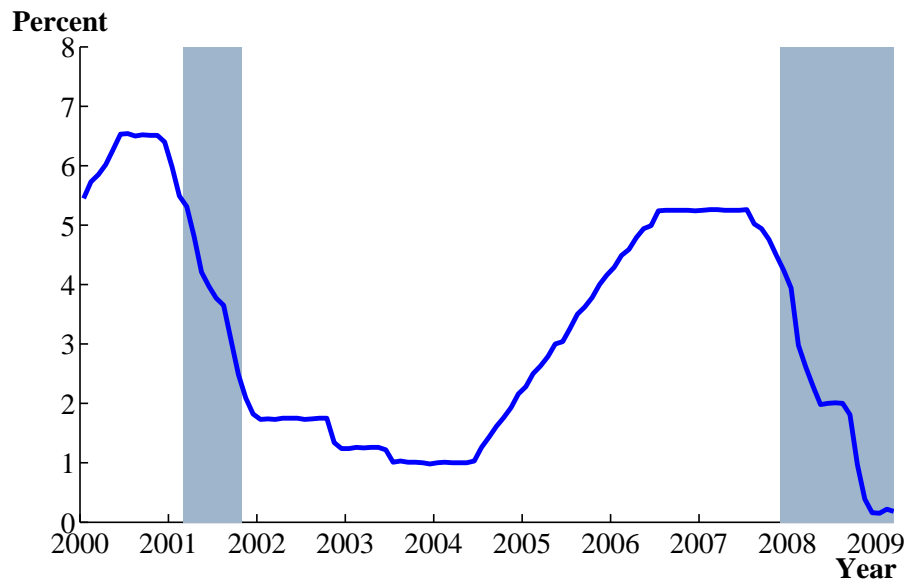
2.3. Subprime Lending and the Rise in Interest Rates

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.³

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

³An 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. Source: FRED (Federal Reserve Economic Data), courtesy of the Federal Reserve Bank of St. Louis: <http://research.stlouisfed.org/fred2/>.

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.⁴ Since that time, the problem has spiraled as low housing prices led to defaults, which lowered housing

⁴Ben S. Bernanke, “The Recent Financial Turmoil and its Economic and Policy Consequences” October 15, 2007.

prices even further in a vicious cycle.

2.4. The Financial Turmoil of 2007-20??

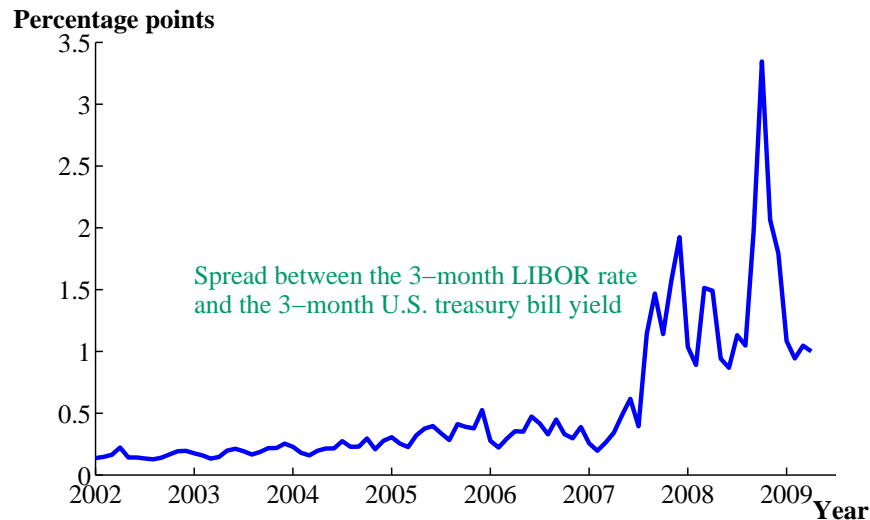
To understand the financial turmoil that followed, it helps to appreciate a (generally valuable) innovation in finance known as **securitization**. Like a decadent buffet at an expensive hotel, securitization involves lumping together large numbers of individual financial instruments such as mortgages 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).⁵

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 to even more defaults. 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 rates that they charged one another: 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 — gov-

⁵A quick visit to [Wikipedia](#) can provide more details on these and other financial instruments.

Figure 3: Liquidity and Risk Shocks since August 2007

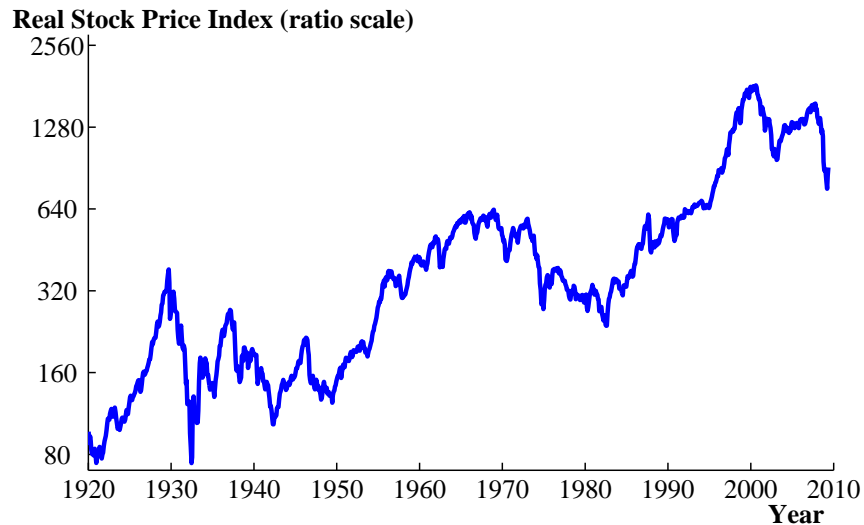


Note: The rate at which banks borrow and lend to one another rose sharply in August 2007 during the subprime crisis and then spiked in September 2008 with the collapse of Lehman Brothers. Source: EconStats.com.

ernment bonds that mature in one year or less, sometimes called “T-bills” — instead of lending to other banks. As a 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 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

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



Note: The real value of the S&P500 stock price index declined by more than 50 percent between its peak in November 2007 and March 2008 before recovering somewhat in recent months. Source: Robert Shiller, <http://www.econ.yale.edu/~shiller/data.htm>

met with Congressional leaders to outline the \$700 billion Troubled Asset Relief Program (TARP), with Bernanke warning, “If we don’t do this, we may not have an economy on Monday.”⁶

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

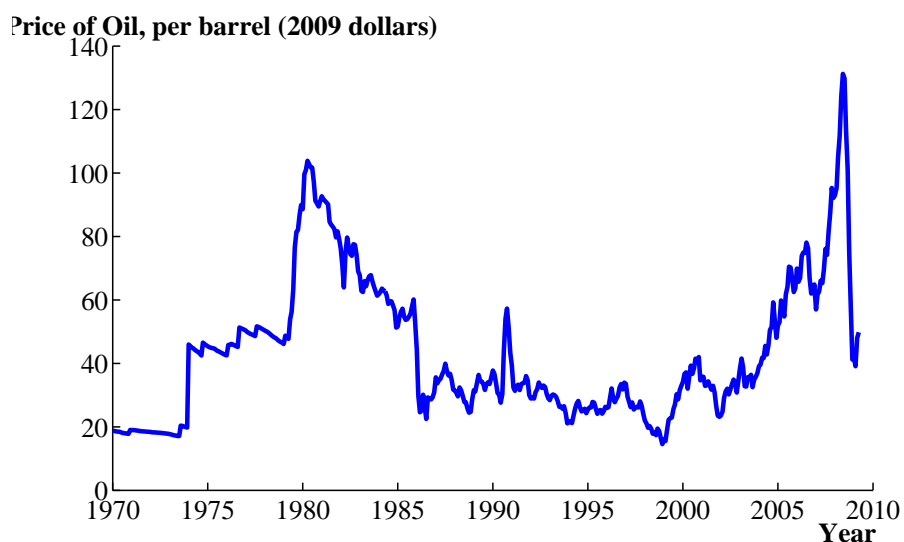
2.5. Oil Prices

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

⁶This 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

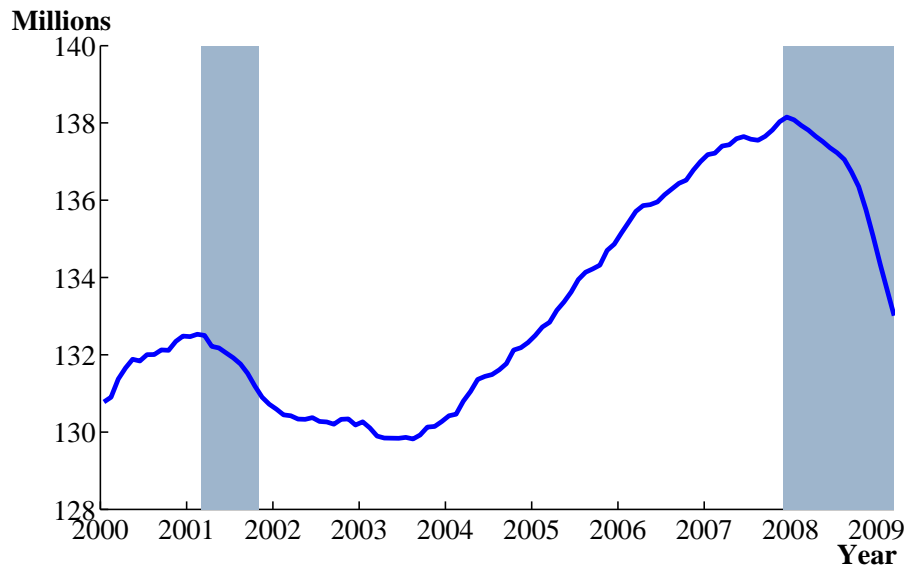


Note: Oil prices rose by more than a factor of 6 between 2002 and July 2008, roughly comparable to the increase in the 1970s. Remarkably, prices then fell off a cliff, returning to the \$40 per barrel range. Source: The FRED database.

1970s. Other basic commodities such as natural gas, coal, steel, corn, wheat, and rice 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 relieved this demand pressure, at least partially, which goes some way toward explain-

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 5.7 million jobs have been lost since then. Source: The FRED database.

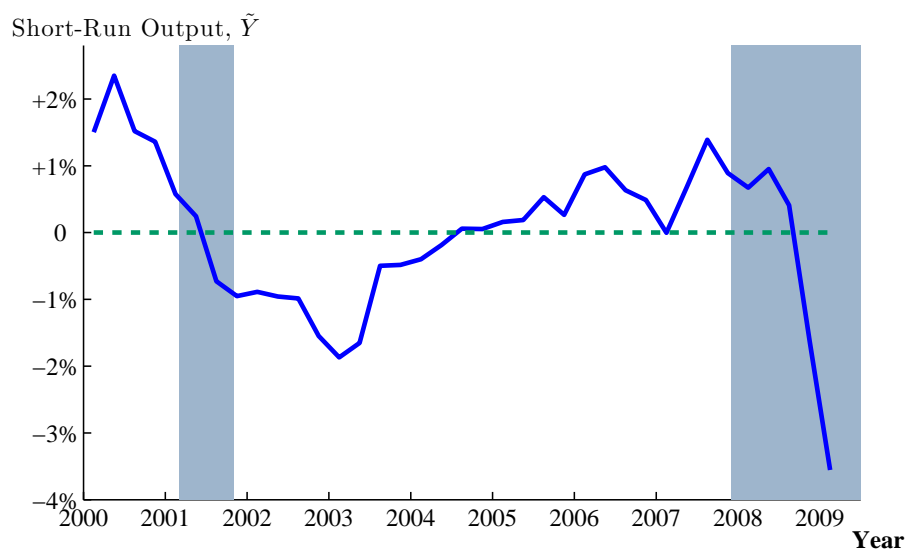
ing the recent declines. Nevertheless, it is difficult to justify both \$140 per barrel in the summer of 2008 and \$40 per barrel more recently as both being consistent with fundamentals; some speculative elements may have played a role as well.⁷

3. Macroeconomic Outcomes

Following the sharp increase in oil prices, 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 5.7 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 slightly positive at the start of 2008. By the start of 2009, however, output

⁷On 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 first quarter of 2009, GDP was 3.6% below potential. Source: The FRED database and author's calculations.

is 3.6% below potential. The recession can also be seen in the unemployment rate in Figure 8. From a low in 2007 of 4.4 percent, the unemployment rate has been rising sharply, reaching 8.9% in April 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 first quarter of 2009, GDP in the current recession had already fallen by 2.4%. This number seems sure to worsen in the coming quarters as the recession continues.

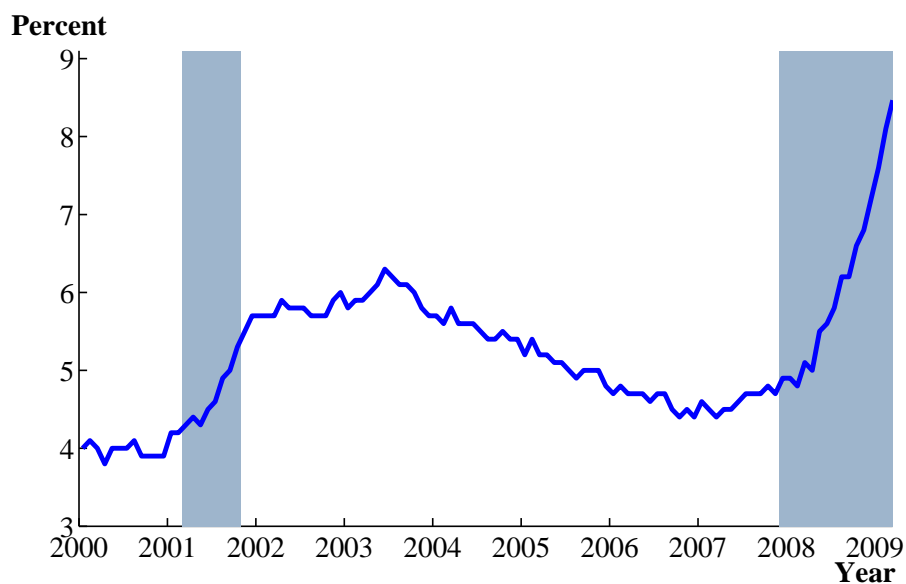
The employment measures clearly indicate that this recession is worse than usual. Nonfarm employment is down by 4.2%, compared with a typical fall of 2.1%. Similarly, the unemployment rate in the current recession is up by 4.0 percentage points, compared with 2.5 percentage points in the average recession.

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

	Average of previous recessions since 1950	Current recession (as of April 2009)
GDP	-1.7%	-2.4%
Nonfarm Employment	-2.1%	-4.2%
Unemployment Rate	2.5	4.0
<i>Components of GDP</i>		
Consumption	0.4%	-1.0%
Investment	-14.7%	-25.3%
Government Purchases	1.2%	2.2%
Exports	-1.5%	-10.2%
Imports	-4.4%	-16.6%

Note: The current recession has 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: The FRED database.

Figure 8: The U.S. Unemployment Rate

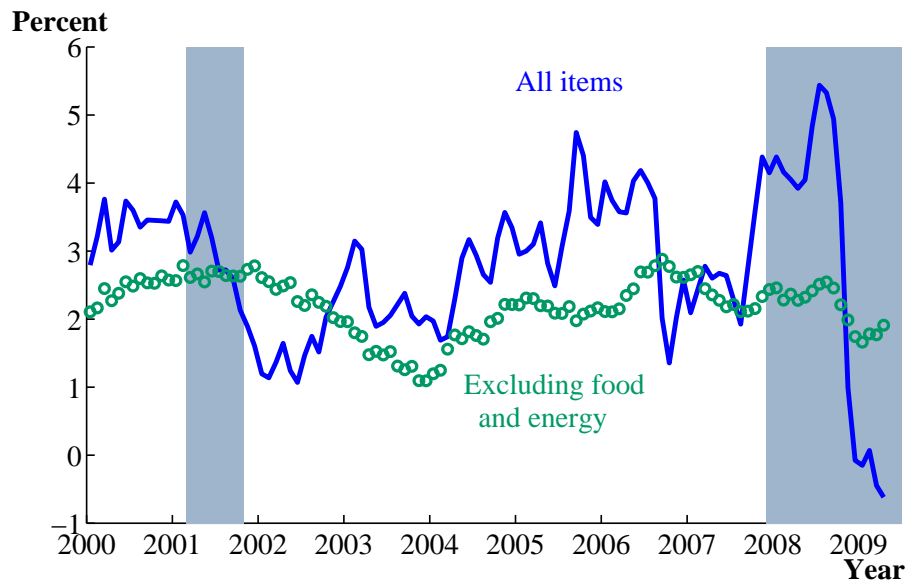


Note: The unemployment rate has risen sharply since 2007, reaching 8.9% in April 2009. Source: The FRED database.

The remainder of Table 1 explores the components of GDP and shows an important 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. The severity of the current recession is already evident in consumption, which has fallen by 1.0%. 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.

Investment and exports are also down sharply, much more than in the typical recession. Government purchases of goods and services is the one bright spot, having risen by a modest amount.

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.

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 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 2008. As of April 2009, the overall CPI had fallen by 0.6% over the previous twelve months.

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 declined slightly, and the rate as of April 2009 was 1.9%.

— Case Study: A Comparison to Other Financial Crises —

How does the U.S. experience so far compare to outcomes in other financial crises,

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%

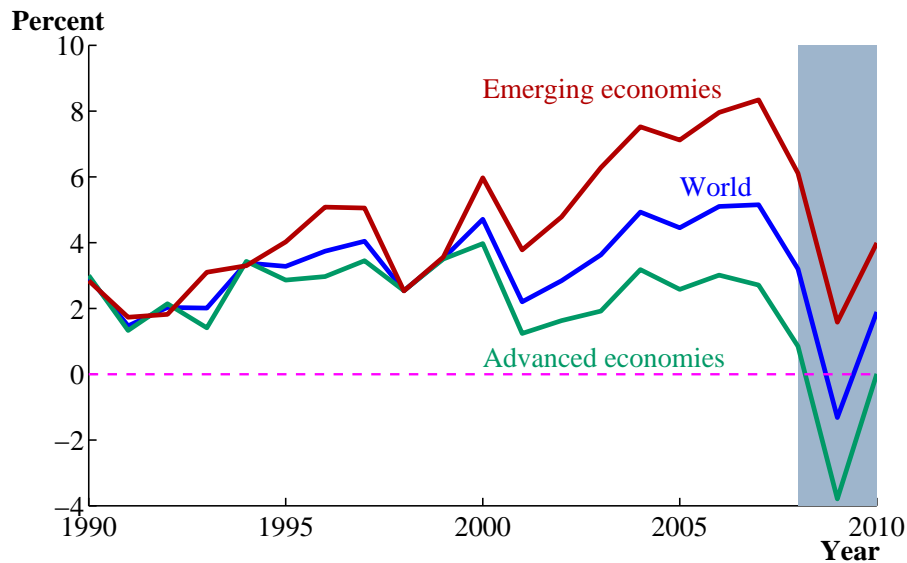
Note: Financial crises are typically quite long and very costly. Source: Carmen Reinhart and Kenneth Rogoff, “[The Aftermath of Financial Crises](#)” Harvard University working paper, December 2008.

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 a 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 average 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 indicate 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 ————

Figure 10: Economic Growth around the World, Historical and Forecast



Note: The IMF forecasts that world GDP growth in 2009 will be -1.3%, its slowest rate since World War II. Source: International Monetary Fund, "World Economic Outlook Update Global Economic Slump Challenges Policies," April 2009.

3.3. 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 — including Japan, Germany, the U.K., and France — are all in or headed for deep recessions. Recently, for example, Japan announced that GDP in the first quarter of 2009 fell at an annualized rate of more than 15%, its sharpest decline since 1974.

Figure 10 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 actually decline in 2009, falling by 1.3%. The forecasts for individual countries are also grim: GDP is projected to fall by 4.0% in the European Union and by 6.2% in Japan. Growth in emerging markets, including China, is 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 for any other country. In the 1990s, Japan could hope that demand

from the rest of the world would 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 in many countries. Second, the global nature of the crisis emphasizes that this recession is markedly different from much of what has come before.

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 is determined, and the important concept of leverage and how it makes companies and individuals very sensitive to relatively small declines 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.⁸ 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 liability of most banks are the deposits that households and businesses have made. These

⁸To see their actual balance sheets, take a look at <http://finance.yahoo.com/q/bs?s=BAC>, for example.

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

Assets		Liabilities	
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.

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! 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.⁹ 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 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.

Before the financial crisis, major investment banks had leverage ratios that were even higher than in these examples. For example, when Bear Stearns collapsed, its leverage was 35 to 1.¹⁰ Roughly speaking, the major investment banks owned complex investment portfolios, including significant quantities of soon-to-be toxic assets, that were financed with \$3 of their own equity and \$97 of borrowing. Given such extraordinary leverage, major investment banks were in a precarious position where a relatively small aggregate shock could send them over the insolvency edge.

4.3. Bank Runs and Liquidity Crises

Another classic version of a financial crisis that is easy to understand using balance sheets 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

⁹The 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.

¹⁰Roddy Boyd, "The Last Days of Bear-Sterns" *Fortune* March 31, 2008.

their deposits back. Looking at the balance sheet in Table 3, 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 — potentially all the way to insolvency.

4.4. Financial Wrap-Up

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 inevitably catches you in a slip of the tongue.

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 **systemic 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.¹¹

5. Summary

1. The U.S. economy has suffered several major shocks in recent years. Initially these shocks included a large declining in house prices and a spike in the prices of oil and other commodities.
2. The decline in house prices reduced the value of mortgage backed securities. Because of leverage, this threatened the solvency of a number of financial institutions, including major investment banks. Risk premiums rose sharply on many kinds of lending, and the stock market lost about half its value.
3. These shocks have combined to put the U.S. economy and many economies throughout the world into a financial crisis and a deep recession, likely the largest since the Great Depression.
4. Balance sheets are an accounting device for summarizing the assets, liabilities, and net worth (or equity) of an institution. This can be a bank, a household, or a government, for example.
5. Leverage is the ratio of liabilities to equity. Financial institutions are typically highly leveraged; for example, \$10 of assets may be financed by \$1 of equity and \$9 of debt, a leverage ratio of 9 to 1. Major investment banks before the financial crisis were even more highly leveraged, on the order of 35 to 1.
6. Leverage magnifies both returns and losses, so that small percentage changes in the value of assets or liabilities can be enough to entirely wipe out equity, causing

¹¹Deborah Solomon, “Market Leader: Questions for Paul O’Neill” *New York Times*, March 30, 2008.

an institution to become insolvent, or bankrupt.

7. During the height of the financial crisis, the solvency of numerous financial institutions was called into question. Because financial firms are interlinked through a complex web of loans, insurance contracts, and securities, problems in a few financial institutions can create problems in many others, which is called systemic risk.

6. Key Concepts

assets, balance sheets, bankruptcy, capital, capital requirements, equity, the global saving glut, insolvency, leverage, liabilities, net worth, securitization, systemic risk

7. Review Questions

1. By roughly how much have housing prices fallen during the financial crisis? What about the stock market?
2. How severe is the current recession? What pieces of economic data would you cite to support your answer?
3. What is a balance sheet? What is net worth?
4. What is leverage, and why is it so important in understanding the financial crisis?

8. Exercises

1. **The latest data on the financial crisis:** Pick two figures from this chapter and update them to include the latest available data. What does this tell you about how the economy has evolved in response to the financial crisis?
2. **The current state of the European economy:** By now, you are relatively familiar with recent economic events in the United States. But what about Europe? Write a bit about the state of the economy in the Euro area (to keep the question manageable) over the last several years. What has happened to inflation, real GDP

growth, and unemployment? What about a key policy interest rate set by the European Central Bank (ECB) (Hint: the ECB sets several key interest rates including a “deposit rate” — the interest rate the ECB pays on deposits from banks — and a “lending rate” — the interest rate it charges for overnight loans. All are useful and interesting. To keep us all on the same page, let’s look at the lending rate)? An extremely helpful resource for this exercise is the ECB’s Statistical Data Warehouse: <http://sdw.ecb.europa.eu>. (You may find it convenient to make a brief table of this data or even to copy some of the ECB’s graphs.)

3. **Leverage in the financial system:** Choose two financial institutions and look up their balance sheets online (for example, Yahoo Finance provides this data in an easily-accessible form at <http://finance.yahoo.com/q/bs?s=GS>). What is the leverage ratio of the two companies you’ve chosen? For each \$100 of assets, how much is financed with equity and how much with debt? By what percentage would assets have to decline in value in order to bankrupt these financial institutions?

4. **Systemic risk:** Consider the following balance sheets for two hypothetical financial institutions, Bank B and Bank C:

Bank B’s Balance Sheet

Assets		Liabilities	
Cash	1000	Deposits	1400
Loan to Bank C	500		
<i>Total Assets:</i>		<i>Total Liabilities:</i>	
	???		???
		<i>Equity (net worth)</i>	???

Bank C's Balance Sheet

Assets		Liabilities	
Mortgage backed securities	800	Deposits	200
		Loan from Bank B	500
<i>Total Assets:</i>	???	<i>Total Liabilities:</i>	???
		<i>Equity (net worth)</i>	???

- Fill in the missing entries in the balance sheets, denoted ???.
- What is the leverage ratio in each bank?
- Suppose housing prices fall sharply and the mortgage backed securities held by Bank C fall in value to only \$500. What happens to Bank C's net worth?
- The shortfall in Bank C's equity means that it cannot repay the loan it received from Bank B. Assume Bank C pays back as much as it can, while still making good on its deposits. What happens to the net worth of Bank B?
- Discuss briefly how this is related to systemic risk.