

Peak Oil and the Continuing Financial Crisis

By Gail E. Tverberg, FCAS, MAAA

Abstract:

Regardless of what governments tell us, the financial crisis is not over. The leveling of oil production has been a major contributor to the recent financial crisis. Going forward, we can expect more disruption, since oil supply, net of the energy used in production, is already contracting.

One of the big issues is that the size of the economy will almost certainly contract, as oil and other resources contract. This has profound impacts. Debt becomes much more difficult to repay in a declining economy. This causes financial institutions including banks, insurance companies, and pension funds to have financial problems.

Government entitlement programs, as for the aging, also become much more difficult to fund. Governments, because of both debt problems and problems with entitlement programs, can be expected to have increasing financial problems, with some defaulting.

Debt has ramped up greatly since 1970. This growth in debt has helped boost spending and demand. But with more debt defaults, we can expect the reverse of this: a huge decline in debt, leading to reduced spending and reduced demand.

Going forward, it is quite possible we will encounter a scenario not too different from some of the more adverse scenarios of the "Limits to Growth" analysis of the 1970s. Governmental and other defaults may lead to reduced international trade. The benefits of globalization may eventually be lost, including the ability to make high tech goods.

Peak Oil and the Continuing Financial Crisis

By Gail E. Tverberg, FCAS, MAAA

October 21, 2010

Today, I would like to talk to you about the connection between peak oil and the financial crisis—or really the continuing financial crisis.

Comparison Between Growing and Declining Economy

We are hearing from our governments that the recession is over. But I think what is happening is a very major change, as we shift from a growth economy to a declining economy. We can envision a growth economy as a series of larger and larger disks, with each disk representing the amount of goods and services that can be made with the resources available at a given point and time.

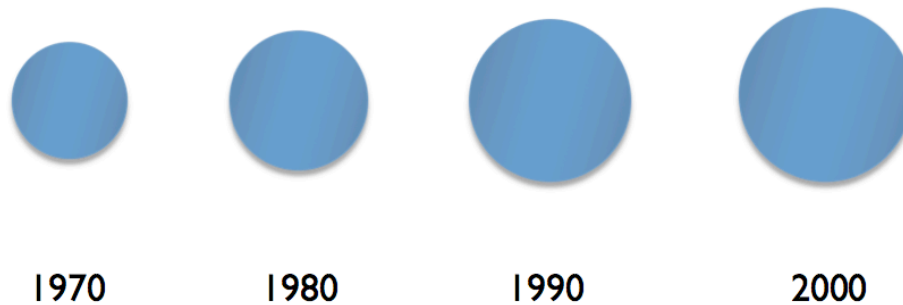


Figure 1 – Representation of a Growing Economy

As the economy grows in real terms, so does the amount of goods and services available for each person. We all have to share in the output at a given point in time, but as long as it is growing, it is fairly easy to have enough for everyone—workers, retirees, stockholders, bondholders, and those planning to invest in new energy infrastructure, to name a few.

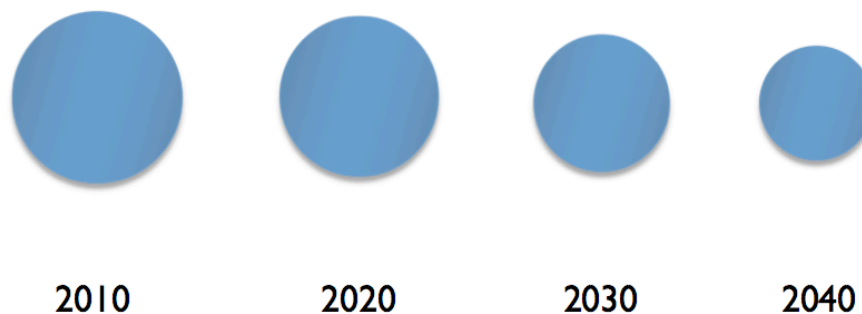


Figure 2 – Representation of a Declining Economy

But going forward, we know that the amount of oil is likely to be declining. In fact, if we think of oil on a net basis—net of the oil used to produce and distribute the oil, the quantity of oil available is probably already declining, since the total amount of oil produced each year has been flat since 2005, and the amount of oil required for extraction of oil likely has been increasing, as oil from more difficult locations is accessed.

As the net amount of oil that is produced each year decreases, the amount of goods and services that we can produce with that oil is likely to decline as well, although perhaps not at exactly the same rate as the oil decline. Somehow, all of those needing goods and services will need to share in whatever size circle is available at a given point in time.

Overview of Presentation

Where does a declining oil supply lead us? I see several implications:

1. Oil shortages lead to **economic** decline – what we think of as recession
2. Economic decline leads to **lots** of debt defaults
3. **Lots** of debt defaults leads to a **troubled** financial system
4. Governments are also likely to get into financial difficulty, and some may default on their debts
5. A major “**credit unwind**” is likely ahead. Debt will become less common.
6. A **major downturn** is not too far away. Some of you may be familiar with the book *Limits to Growth* from the 1970s. It forecast a range of scenarios that might happen when the world hits growth limits. It looks to me as though we may be headed a fairly severe scenario of the type that they modeled. In particular, we may see severe shortages of capital, international financial problems, a decline in globalization, and perhaps even a decline in our ability to make high tech goods that require imports from around the world.

If I have time at the end, I will show a few more slides regarding what happened recently.

How Oil Shortages Lead to Economic Decline

First, let's talk about how **oil shortages lead to economic decline**. If there is a shortage of oil, the price of oil may increase, as it did over the period 2003 to 2008. And even now, oil is at a high price, compared to what it was prior to 2008.

The problem when oil prices increase is that quite few prices tend to increase at the same time. For example: food, gasoline or diesel, and home heating oil. The cost of other fuels may increase, too, as they did in 2008, and the cost of metals may increase. The problem is that even though all these prices are rising, people's salaries are not rising nearly as much.

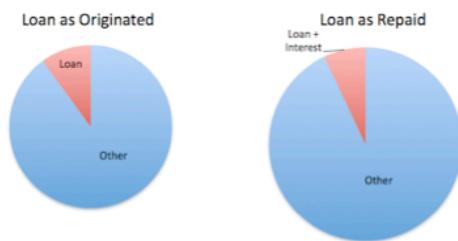
Food is essential, and gasoline for commuting is essential, so people will cut back on discretionary spending—things like going out to restaurants, or taking vacations, so that they have enough funds to cover their basic needs. They may forego buying a new car, or a new bigger fancier house. This lack of spending tends to cause recession, and people get laid off from work, because people are not buying as many discretionary goods. It also tends to cause a *decline* in housing prices.

The extent to which oil prices need to rise to cause recession will vary depending how much oil a country uses. A country like China that uses little oil, may not have difficulty with recession until the price is quite high. But in the US, where we use a lot of oil, analysis by Dave Murphy of The Oil Drum staff suggests that an oil price of \$80 or \$85 barrel in today's dollars is all that is required to cause recession.¹

Some people believe that efficiency improvements may be sufficient to offset a decline in oil supply. I question whether this will happen. We have a huge number of cars and trucks and much machinery that is already in use. If we are in a recession, we will replace relatively few of these each year, so it will be difficult to make much progress in terms of efficiency.

Why Economic Decline Causes Lots of Defaults

Repaying loans is easy in a growing economy



Repaying loans is much more difficult in a shrinking – or flat - economy

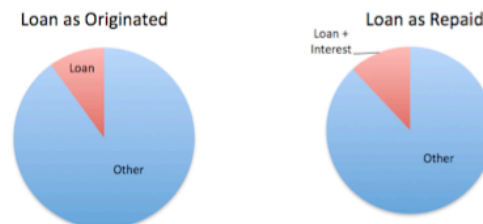


Figure 3 – Why repaying loans is easier in a growing economy

¹ David Murphy, "Further Evidence of the Influence of Energy on the U. S. Economy", *The Oil Drum*, 16 April 2009, <http://netenergy.theoil Drum.com/node/5304>

Next, let's talk about why ***economic decline causes lots of debt defaults***. Let's think about the disks I showed at the beginning. If we are moving from a small disk to a larger disk, it is a lot easier to find the funds to prepay the loan, plus pay the interest, than when we are moving to a situation where the future holds less and less resources, and these must be stretched farther. After we have repaid the loan plus interest, we find we have less left over than we expected, when we took out the loan, and this means we will likely have to cut back on something else.

Clearly if an economy is shrinking, this same principle holds with government-funded pensions for the elderly. When the size of the pie was growing, it may have looked like there would be plenty of money to fund future promises, but once the pie started shrinking, then it became much harder to have enough funds to go around.

Thinking About the Economy in General

As long as there is a ***growing economy***, a huge number of things seem to go well:

- Property values rise, since there is demand for more homes and businesses
- Layoffs are relatively rare
- Business margins are good
- Government revenue is up
- Easy to implement efficiency improvements – pay for new labor-saving machines, or more energy efficient cars
- Easy to borrow money for capital
- Stock market tends to rise – easy to fund retirement plans
- The funds people have available to spend are ***increased above*** just what their salaries indicate because of several sources of funds:
 - Increased debt (for example, a person can buy a car even without savings)
 - Rising stock market (don't need to save much for retirement, so can spend money elsewhere)
 - Rising home prices (refinance and pull out the equity)

The catch is that with a ***declining economy***, pretty much everything that went well before, now goes badly:

- Property values fall, since there is less demand for homes and businesses
- Layoffs are common

- Business margin are low
- Much more difficult to implement energy improvements – if there is no need to add new equipment, why spend a lot of money on new *efficient* equipment?
- Hard to borrow money for capital
- Stock market tends to decline
- The funds people have available to spend are ***decreased below*** what their salaries indicated because of
 - Decreased debt (for example, credit card company won't allow any new credit, but expects you to payoff old balance)
 - Declining stock market
 - Declining home prices

Why Lots of Defaults Lead to All Financial Institutions Being in Trouble

The problem is that financial institutions—whether banks or insurance companies, or pension plans—are not set up for lots of defaults. Their equity is quickly eroded. The government can try to cover up the situation for a while—as they have been doing recently—but eventually the truth will come out.

While there are various types of insurance programs set up to handle bankruptcies of financial institutions, they are not set up to handle a situation where problems are widespread. The assumption that is always made in funding these programs that bankruptcy is a very rare independent event.

The Debt Problem is Essentially Unfixable in a Declining Economy

The problem is that loan defaults will always be very high in a declining economy, because many people will be unemployed, and not be able to repay their loans, and because business revenue will tend to decline. There is a way of building these costs into the interest rates through what are called “insurance charges”, but then the interest rates will be very high, so few can afford them.

Long term, I expect many fewer loans will be made. The majority of the loans that are issued will be for very short terms—for example, a loan to cover goods that have been shipped, but for which payment is not expected for 30 days. Even mortgages may be hard to get.

Governments are Becoming Financially Troubled, Too

We are seeing this in a number of European countries now, including Spain. While the underlying reason is oil shortages that flow through the economy in ways we discussed earlier, and these oil shortages cause recession and debt defaults, the way

this shows itself in government finances is in banks that need bailing out, and in entitlement programs that are becoming more and more difficult to fund, and in low tax revenue.

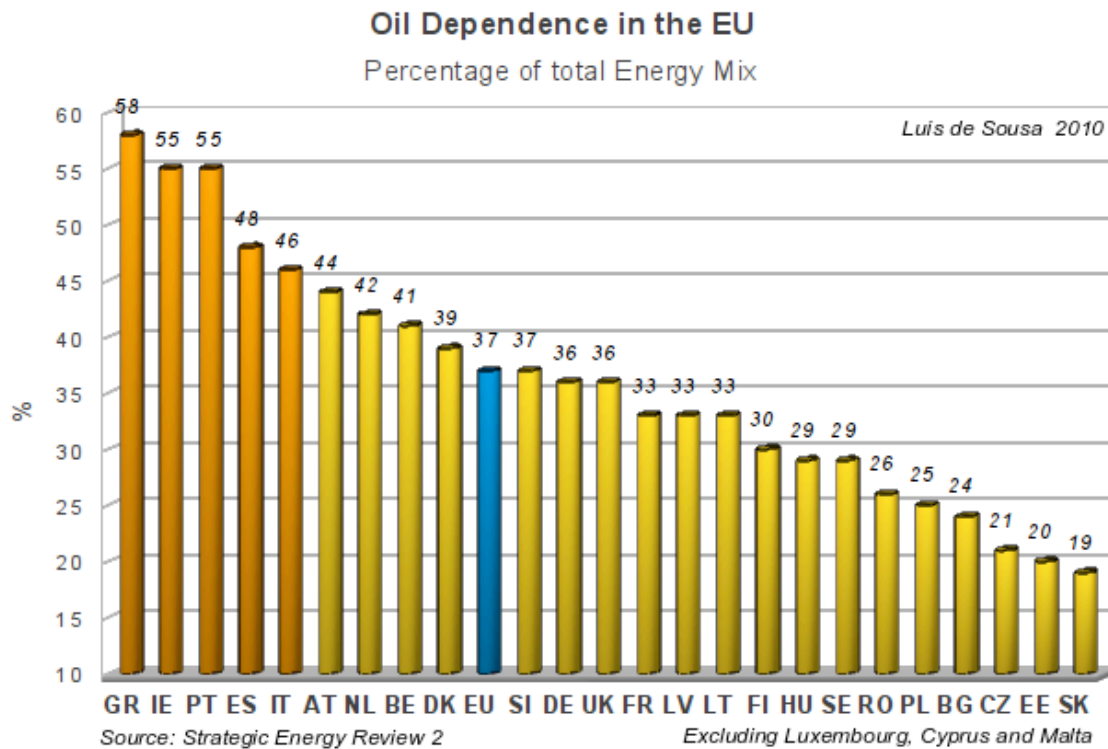


Figure 4 – EU countries ranked by their ratio of “oil energy” to “total energy”. Note that the five PIIGS countries use a higher percentage of oil than the other countries of the European Union. By Luis de Sousa. <http://europe.theoil Drum.com/node/7001>

There has been publicity about the PIIGS (Portugal, Ireland, Italy, Spain and Greece) having debt problems. It turns out that the countries that are in most serious financial condition are precisely the ones that get largest percentage of their energy from oil—that is, the once for which the ratio of **oil energy** to **total energy** is highest. The country with the highest ratio is Greece. The second highest is Ireland, and the third highest is Portugal.

There is no easy way out, either, because raising taxes tends to cause more recession, and more debt defaults.

A Major Debt Unwind is Still Ahead

While there has been some reduction in household and business debt, it hasn't gone very far yet, and there has been a big increase in governmental debt to offset the reductions.

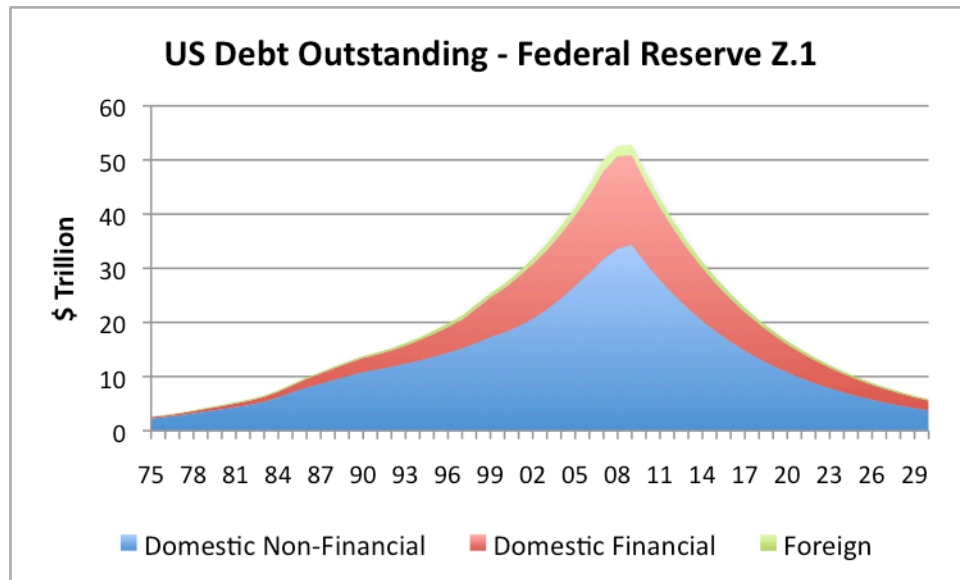


Figure 5 – One possible scenario with respect to US debt

Eventually, though, there will have to be a major reduction in debt. I am doubtful that this will be done through a single debt jubilee, however. More likely, some debt will be charged off, a bit at a time, or new delayed payment plans will be provided. Some countries may refuse to sell any more goods (including oil) to counties with obvious problems paying their bills.

One of my concerns is that as this debt unwind takes place, the reduction in debt will tend to have a negative effect on the amount people have available to spend each year, as we discussed earlier. Also, as debt disappears, the usual way of financing new business endeavors will disappear. This will make it much more difficult to fund new energy projects of any kind—oil or natural gas or wind turbines, or new investment in energy efficiency. And nations with debt problems may suddenly find it much more difficult to buy imports, like oil. So the impact of this unwind in debt could be very widespread.

One thing I find interesting is that US consumer debt hit a peak in July 2008, and started declining the same month that oil prices did. Mortgage debt is only published on a quarterly basis, but it hit a peak about the same time. Both continue to decline, with nearly every new report.

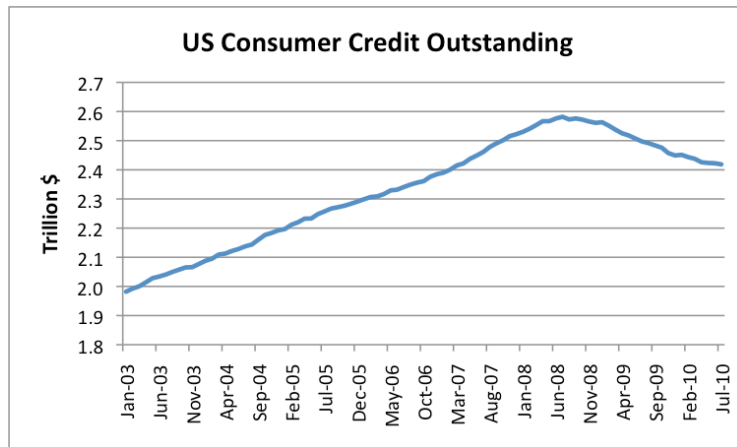


Figure 6 Consumer Credit Outstanding from US Federal Reserve Z.1 Report

Substitutes may Decline at the Same Time as Oil – Because of the Debt Unwind

It seems to me that a reduction in debt is likely to reduce demand in general, and this will have an unexpected effect—reducing the demand (and hence supply) of the energy products that might act as substitutes for oil – natural gas, coal, and even nuclear, wind and solar.

Since this isn't very obvious, let's talk about it a bit. Because of less debt availability, fewer people will be able to afford new cars, or new houses, or other big purchases. The result is likely to be a cutback in demand for the fuels used in the manufacturing and transport of these big purchase items--and therefore lower prices for these fuels. This would include oil and natural gas, but it would also include fuels for electricity, including coal and wind and uranium.

Also, with the lower prices, the businesses producing these fossil fuels will have less cash flow (and less profits) to reinvest in their businesses. With the lower market prices, it won't make sense to extract oil, or natural gas, or uranium from the most expensive locations. If locations where low priced fuel can be obtained are mostly tapped out (as they are for oil and natural gas, and even uranium), this means that there will be fewer suitable sources for extraction at prices customers can afford. Even coal may be affected, if there is less electricity used.

With less demand for electricity, utilities can be expected to have less need for new generation of any kind, so nuclear, wind, and solar purchases of the size utilities can be expected to make may be scaled back. There may also be difficulty financing these new sources of electricity, if debt is hard to obtain.

Solar panels are often added to new homes, but if there are few new homes being built, there will be fewer solar panels as well. Homeowners considering adding solar panels may find it difficult to obtain financing for solar panels, too.

I might mention that the extent of the recession and debt unwind may vary around the world. Countries that use little oil (like China and India) may have less of this impact. So they may continue to increase their demand for coal, even as developed countries are cutting back, because of recession. So coal use may not fall worldwide, even though OECD countries are likely to see a cutback in its use.

Major Downturn Likely not Far Away

Because of the many issues that I have outlined, it seems to me that a major downturn is not far away. I think we will be seeing more and more debt defaults, and that even some countries may default.

One of my concerns now is that governments really need to raise taxes, if they are to pay for all of the promised entitlements, and also not default on their debt. The problem is that if they do raise taxes, then citizens and businesses will need to cut back on their spending. This is likely to lead to more recession and more debt defaults.

I am afraid all of this will be very detrimental to **capital availability** for all kinds of investments—oil, or natural gas, or wind, or new factories. One of the major reasons is that debt is likely to be very high priced or not available at all. We are so used to debt financing now, that a cutback in debt is likely to be a huge problem.

It seems to me that if there are a lot of debt defaults, the international financial system may cease to function in the way we are accustomed. Sellers of products, such as oil, may decide that they do not want to trade with buyers who haven't had enough money in the recent past, and may not have enough in the future. This might mean that a country like Greece, or a much bigger country with financial problems, might start encountering problems in buying goods that they were accustomed to buying in the past.

Globalization Needed for High Tech Products

I am concerned that eventually, the globalization that we need for high-tech products may become less available, over a fairly short time-period. We don't think about it, but high tech goods, such as computers and portable telephones, require imports from around the world—oil, several kinds of metals, and sometimes even rare earth minerals. And to get these necessary materials requires expertise from around the world—for example, a specialist in handling a particular type of problem in drilling oil wells.

Theoretically, if international trade were reduced, we could get along by using recycled materials—perhaps metal from old cars, or from pipes in shopping centers. But these metals would not be as pure. They would work for some goods, but not for others.

World May Change Greatly

It seems to me that the world may change greatly in the next 10 to 20 years, especially if there are major interruptions to international trade. For a while, the difference won't be too great—if something breaks, we will just be able to cannibalize parts from a similar device. But eventually, we will find that the equipment that we use to pull fossil fuels and uranium out of the ground is broken, and cannot be easily replaced, or that wind turbines have stopped working for lack of replacement parts.

It would seem to me that in such a situation, world population would be likely to decline because fuels are not available to produce adequate food and water. There would likely be still some vestiges of globalization for many years, but it would be scaled back greatly.

In many ways, what we experience might be similar to what the Limits to Growth models from the early 1970s suggested might happen, under some of the more adverse scenarios. The problem would be too many people to support with the resources available. We could not keep up our existing level of complexity with our reduced oil supply.

The Past Financial Crisis

If we have a couple of minutes more, I would like to do a flashback, and talk about what happened in the past few years, with respect to the financial crisis. Many people think that oil had nothing to do with what we experienced, but I think they are incorrect.

If we think back to what happened in the US in the early 2000s, the price of oil began rising in quite early in this period. Some of the early response was to try to make debt more available, so as to encourage growth, even if it wasn't "real" growth.

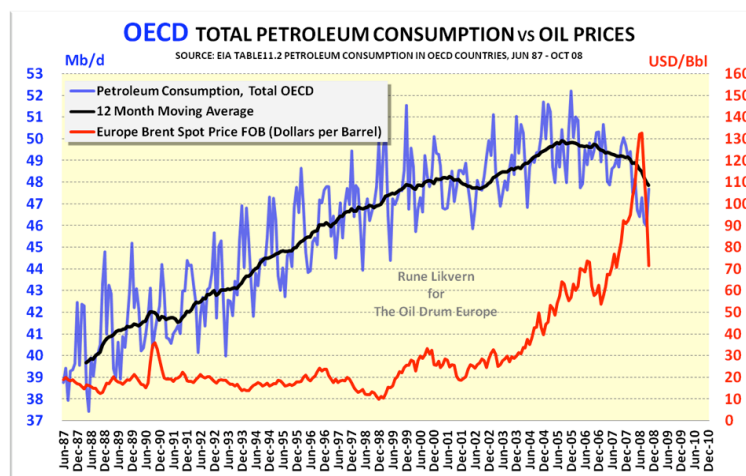


Figure 7 – OECD Oil Consumption (blue) compared to Price (red) (Graph by Rune Likvern of www.theoil Drum.com)

By 2004, high oil prices were viewed as a problem. The Federal Reserve started raising interest rates, and kept raising them each month, in an attempt to choke back the rise in the price of petroleum products and food. This was in the minutes of their meetings.

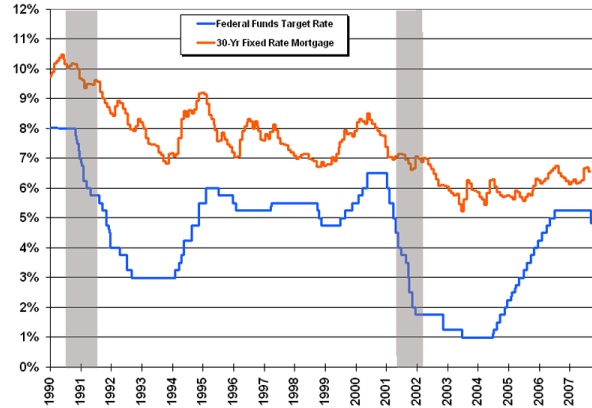


Figure 8 – US Federal Funds rate (blue) and average 30 year fixed mortgage rate, based on data of research.stlouisfed.org.

Looking back at Figure 7, by 2006, oil consumption of OECD had started declining. I would argue that part of this partly in response to the higher oil prices in this period, and partly in response to the Federal Reserve’s higher target interest rates, which were indirectly the result of higher oil and food prices. So people found themselves with higher costs on home improvement loans, and on business loans, at the same time that oil and food prices were rising.

The Fed—who had raised target interest rates—got a good deal more than it was looking for, because by about the time oil consumption started declining—that is 2006—so did home prices. (Oil prices really didn’t come down.)

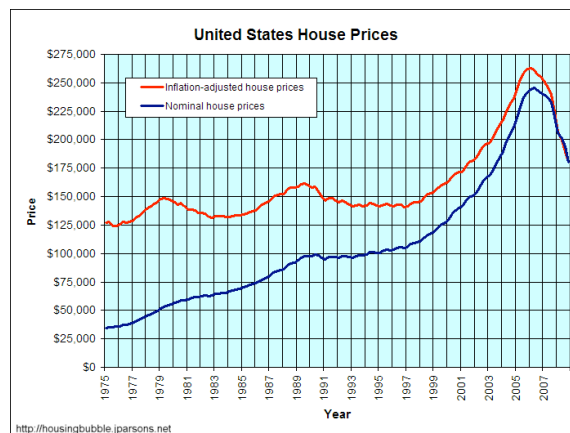


Figure 9 – United States Housing Prices from housingbubble.jparkers.net

The stories in US newspapers talked about how home prices in the distant suburbs were particularly affected. Subprime borrowers were particularly affected, but one

would expect subprime borrowers to be particularly affected, since any change in the amount of money that they had available to spend would quickly be translated into a cutback somewhere else—and for many, that meant missing mortgage payments.

In 2008 and 2009, we know quite a bit of the story. Oil prices increased to a high of \$147 a barrel in July 2008, but, needless to say, salaries didn't rise accordingly. High oil prices led to a cutback in discretionary spending, and caused people to default on their debts. By July 2008, the tension between the need for higher oil prices and people not being able to afford the high prices was broken, and oil prices began falling. As we saw earlier, credit availability peaked at the same time as oil prices peaked.

It seems to me that oil prices don't just keep rising. Instead, they tend to hit an affordability threshold, and then come back down again. The affordability threshold seems to be related to Energy Return on Energy Invested (EROI). Based on work of Dave Murphy (mentioned earlier), this threshold seems to be in the \$80 to \$85 barrel range for the United States—still too low a level to make most alternatives profitable.

In late 2008, oil prices dropped far below the \$80 - \$85 barrel range, but now it appears that oil prices are again back up to the problem range. So we can expect more defaults, both in the US and in other countries. And, as I said earlier, it looks to me as though we are likely headed for a major downturn in not too many years, similar to what Limits to Growth models from the 1970s suggested.