



Where Is Oil Production Headed?: An Adverse Scenario

Posted by [Gail the Actuary](#) on March 4, 2009 - 10:22am

Topic: [Supply/Production](#)

Tags: [oil production](#), [peak oil](#) [[list all tags](#)]

A lot of us have an image in the back of our mind of Hubbert's peak. Based on this peak, we assume that oil production will decline in much the same pattern as it rose. For example, in an [analysis](#) performed several years ago, Luis de Sousa shows this graph, based on the application of Hubbert's model to crude oil data available through 2004. Based on this analysis, he concluded that oil production was expected to peak around the Summer Solstice of 2006.

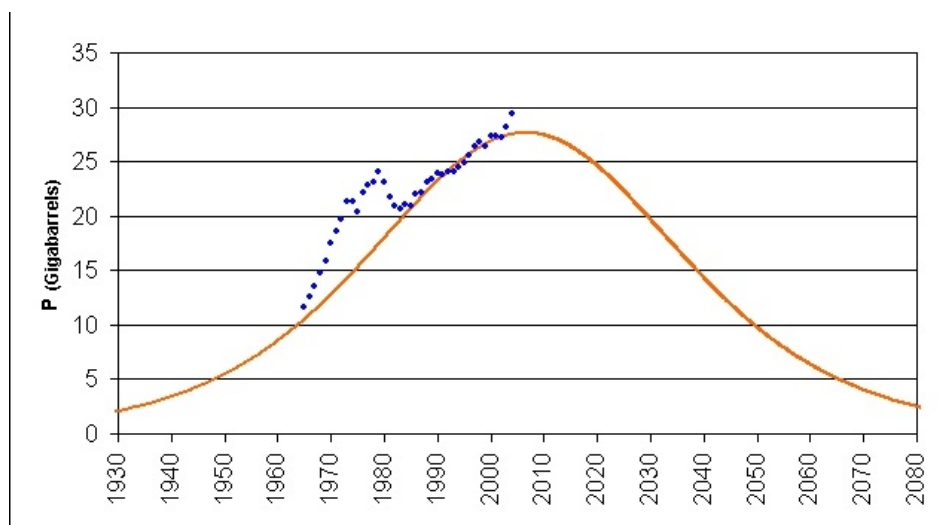


Figure 1. Hubbert's Curve fitted to data through 2004, from [Wolf at the Door](#).

This graph is kind of scary, but it is also somewhat comforting. A person gets the idea that while there will be a decline, production will not go down too rapidly. Because of the apparently slow decline rate, it looks like we should be able to get along pretty well with a little adaptation--perhaps some electric cars.

I am concerned that the actual downside of the curve may look very different from the shape envisioned by Hubbert. The problem is that the limiting factor is likely not geology, but the failure of complex networked systems, particularly the financial system. Below the fold I show one view of what future oil production could look like, assuming the current unwind in world debt destabilizes the world financial system, and it becomes necessary to rebuild the system almost from scratch.

I obviously don't know precisely what would happen to world crude oil production if the world's financial system crashes, but here is one possibility:

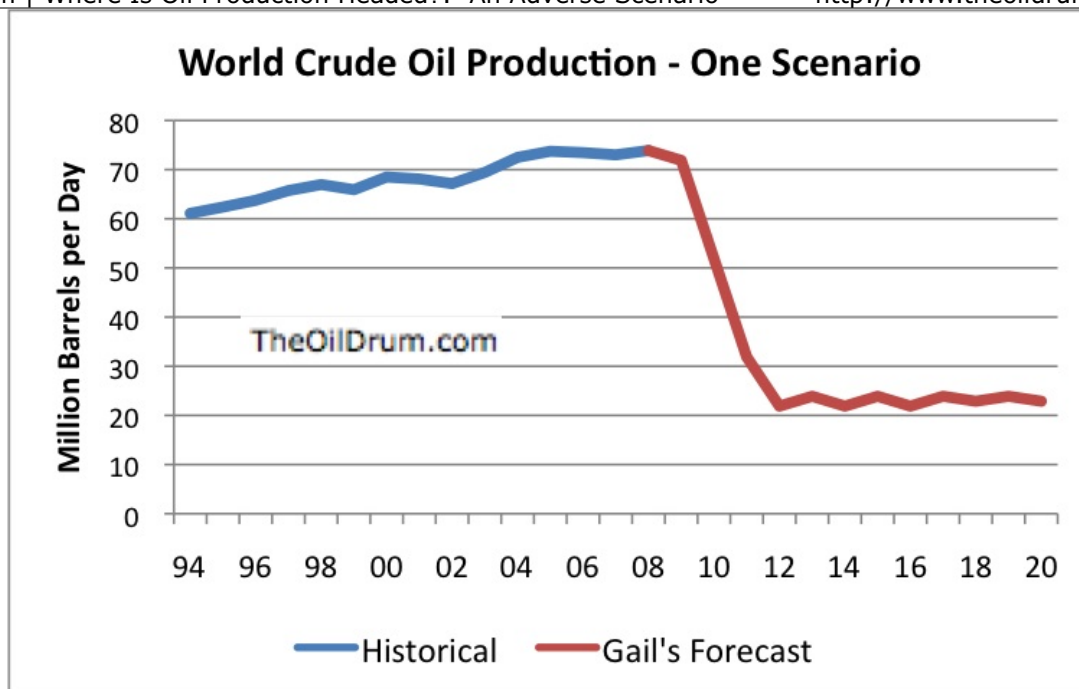


Figure 2. One view of expected future crude oil production, after a world financial crash.

Hubbert's curve gives us an idea of what maximum oil production might be, given geologic constraints. My forecast is more at the opposite end of the range--what the worst case might look like, if the current debt unwind results in a major world-wide financial collapse. It is impossible to assign a probability to this type of event happening, but even if the probability is very low--say 1%--it would affect planning models that consider a range of outcomes.

Background

Our financial system is debt based. Since 1971, the financial system has no tie to gold or any other physical standard. Instead, in our fractional reserve banking system, money is formed through the issuance of debt. The more debt that is issued, the more money there is, and the more demand there is for goods and services. As long as the system is growing, the system works well, because paying back debts with interest does not put too great a strain on the system.

Repaying loans is easy in a growing economy

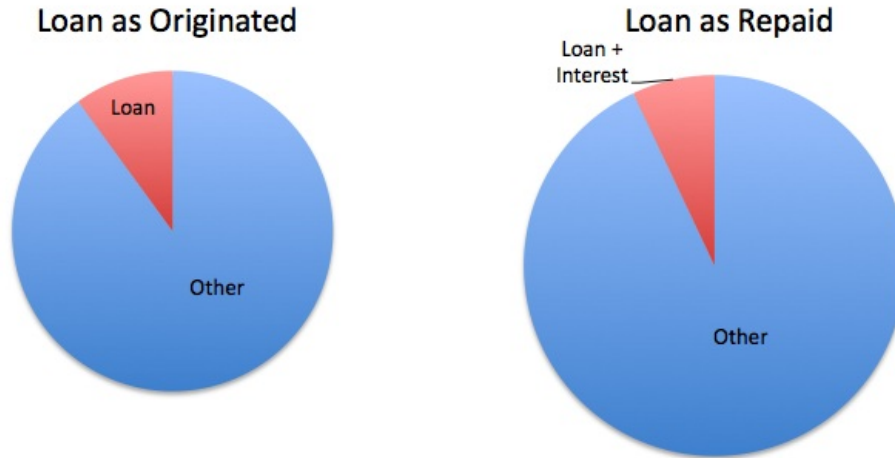


Figure 3.

When the economic system is growing, it is possible to pay back debt with interest, because even after paying interest, there is enough money left for other things. For a business or government rolling over debt, cash flow continues to increase.

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

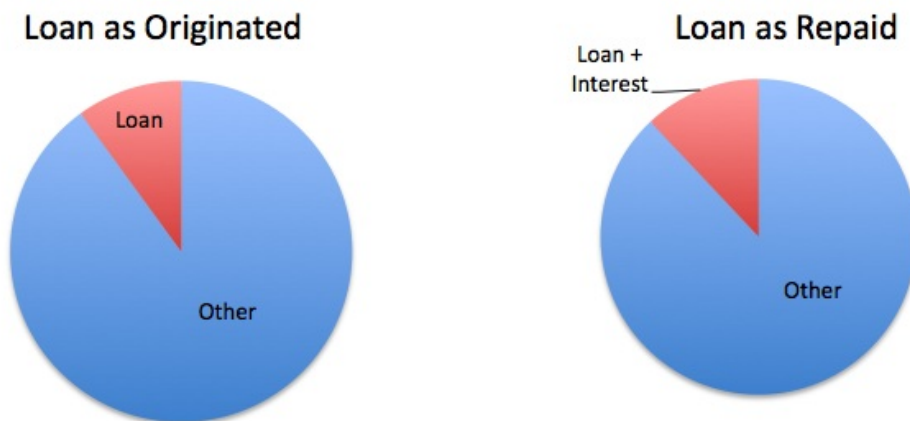


Figure 4.

When the economy hits limits, such as an oil supply that cannot grow fast enough to support the growth needed to keep the treadmill going, repaying the debt with interest becomes a huge burden. We have been reaching that point in the last few years, as oil production remained approximately flat and oil prices rose. Food prices rose as well, but real wages did not rise fast enough to keep the treadmill going. Soon defaults on debts started.

Once defaults started on debts, we suddenly shifted into a new cycle:

Peak oil -> higher oil prices, but little additional production-> stagnant wages -> defaults on debt -> banks not in a position to lend as much because of losses on loans -> debt harder to obtain -> lower demand -> lower prices on oil -> layoffs and less investment.

If it were only the oil industry with problems, one would think the problem would be self correcting, since less investment should lead to less production, and eventually prices would go back up, and at least part of the cycle would be fixed.

The problems caused by peak oil and resource limits are much more widespread than just with respect to oil. Besides the above cycle, we also have a more general cycle:

Peak oil -> higher oil prices, but little additional production-> stagnant wages -> little discretionary income -> cutbacks in buying many discretionary items -> layoffs (restaurants, newspapers, many businesses)-> more loan defaults -> banks not in a position to lend as much because of losses on loans -> debt harder to obtain -> lower demand -> lower prices on other commodities, like food -> more defaults and layoffs -> banks in even worse shape -> etc.

These cycles are leading to a huge unwind of debt that has barely begun. There are also a large number of derivative contracts outstanding, and some of these may generate huge payments (as has already happened at AIG). These also have barely begun to unwind.

It is not too hard to envision a situation where the worldwide banking system collapses, and it is necessary to start over, perhaps almost from scratch, with new currencies and new international treaties. As the result of such changes, there is at least the possibility that the world's financial system may function at only a minimal level, and world oil production will take place at only a very low level.

Some Thoughts on What May be Ahead

At this time, there is vastly more debt than there are assets to pay back the debts. Many times, two or three or four people or organizations think they have claims on the same assets. Think of a house. An investor buys the house, and rents it out. The renter pays his rent, and has a claim on the house. The investor is the "owner", so he has a claim on the place. The mortgage on the property is likely added to a package of other mortgages, and sliced and diced and resold to other investors. Each of them indirectly believes that they have some sort of claim to the property. There also may be an insurer guaranteeing the debt that also has some type of claim. The Federal government, through one of its loan or debt guarantee programs may also depend on the underlying assets. In addition, if the owner doesn't pay his taxes, the local government may also feel it has a claim to the property.

With all of the debt defaults, and the inability to settle all of the debts equitably, some sort of debt jubilee may be necessary. This may start with some small countries, like Iceland and perhaps the [Ukraine](#) defaulting on their debts. Gradually more and more countries will default, and their currencies will sink lower and lower.

After a certain point, it may become clear that virtually every economy in the world is in this mess together. There will be no way that more debt can be issued as "stimulus" to get the world out of this problem. The only thing that can be done is to start canceling debt, in some sort of debt jubilee, and to start over.

The problem with a debt jubilee is that there would be many too many claimants for many of the world's assets. If a wind turbine owner's debt is cancelled through a debt jubilee, who then "owns" the turbine--the original owner, or the lender whose debt was cancelled? If the debt of a factory making replacement parts for a wind turbine is cancelled, who runs the factory--the original owner of the factory, or the investor whose debt was cancelled?

The debts that are cancelled are likely to cross country borders, making for international disputes. Furthermore, countries may want to retaliate for a loss of one of their overseas investments by grabbing a business located in its own country that has overseas owners. In not very long, relationships among countries are likely to sink to deteriorate, and international trade will be at much lower levels than in the past. War may even break out, or border disputes.

"Demand" will be at new low levels, because there is likely to be very little cross-border trade, except with a few trusted partners. Without this trade, it will not be possible to manufacture goods, other than those using only local products. In this kind of scenario, prices (to the extent the monetary system continues to function) would continue to be very low, because of the low demand. (A factory that is not operating doesn't need raw materials!)

The credit market would be close to non-existent, because creditors will expect that any debt that is issued could easily be cancelled. New investment would be limited to what can be financed by cash flow. With low prices, this cash flow would be very low, further limiting investment.

It is possible that in some parts of the world, the monetary system will cease to function all together, and barter would become necessary. Because barter is so cumbersome, this is likely to have a further limiting impact on trade.

In such a scenario, I would expect that oil production would be significantly lower than the physical resource available. If nothing else, it will be difficult for the whole chain from local production to pipeline to refinery to distribution pipeline to consumer to function properly. Countries that previously exported oil overseas will see that their chances of getting paid are less than 100%, and may reduce their production to match what they can sell through arrangements with trusted parties.

Production of many other goods may decline as well, as the lack of an adequately functioning monetary system limits the ability of long supply lines to function properly. Natural gas and coal production may decline, as well as oil production. Food through mechanized farming may decline, as Liebig's Law of the Minimum makes itself known.

On Figure 2, I show only a slight decline in production in 2009, but then large decreases in 2010, 2011, and 2012 to a level not much above 20 million barrels a day. If it reaches such a low level, due to a widespread failure of the financial system, I would expect electricity to be affected in many locations, and because of electricity, water and sewer systems. Some large cities may become uninhabitable.

Under such a scenario, I expect all of this would take a while to get sorted out. If there is a widespread failure of the monetary system, it is possible that many governments would be replaced. Some countries may fall to pieces, in the manner of the Soviet Union after its collapse in 1991. Governments may not have much faith in other governments--except perhaps with a few trusted trade /strategic partners. New monetary systems will likely be put in place, but many will not be any better than the previous ones, so bubbles and further collapses may occur.

In such an environment, international businesses will find it virtually impossible to survive.

Businesses are likely become much smaller and more local. As I have shown on Figure 2, it may be many years before oil production begins to rise again. In fact, it may never rise again, if international trade stays at a low level.

I would expect that the renaissance, when it comes, would begin with basic human needs, in local communities and local agriculture. People will grow their own food, and trade with others in their community. There will be small shops that make shoes and clothing and cooking utensils. People may begin to raise animals for transportation.

People will still need energy for heating their homes and for cooking. The initial impulse will be to cut down trees for these purposes, but with the world's large population, this will tend to produce deforestation. Neo-environmentalists may urge people to use other products for this purpose--such as coal or oil, if these can be obtained. There may be some local electricity produced, particularly water generated, if transmission systems can be kept in good enough repair.

If this scenario happens, it is difficult for me to see much of a future for large complex systems that require specialized parts from around the world. Thus, I would expect large wind turbines to fall into disrepair in a few years, and solar PV panels to be very difficult to obtain, after such a crash scenario. Smaller windmills, similar to what a person sees on old farms, may come back into popular use, as may coal operated steam engines (at least in the US, where coal is still plentiful).

If you have been following the interconnected threads of what is occurring in our system, you are aware that the above scenario is at least a possibility. Due to the complexities involved, it is impossible to estimate a percentage likelihood of this particular trajectory, but the odds are increasing of something like it.

If such a scenario should happen, it could result in our world becoming a very different place in a very short time. If the odds of this happening are more than very slight, what should our response be? Should we be devoting all of our efforts towards avoiding this scenario, or allocating some resources towards adapting to it?



This work is licensed under a [Creative Commons Attribution-Share Alike 3.0 United States License](http://creativecommons.org/licenses/by-sa/3.0/).