

## What's Ahead? Lower Oil Prices, Despite Higher Extraction Costs

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Nearly everyone believes that oil prices will trend higher and higher, allowing increasing amounts of oil to be extracted. This belief is based on the observation that the cost of extraction is trending higher and higher. If we are to continue to have oil, we will need to pay the ever-higher cost of extraction. Either that, or we will have to pay the high cost of some type of substitute, if one can be found. Perhaps such a substitute will be a bit less expensive than oil, but costs are still likely to be high, since substitutes to date are higher-priced than oil.

Even though this is conventional reasoning based on experience with many substances, it doesn't work with oil. Part of the reasoning is right, though. It is indeed true that the cost of extracting oil is trending upward. We extracted the easy to extract oil, and thus "cheap" to extract oil, first and have been forced to move on to extracting oil that is much more expensive to extract. For example, extracting oil using fracking is expensive. So is extracting Brazil's off-shore oil from under the salt layer.

There are also rising indirect costs of production. Middle Eastern oil exporting nations need high tax revenue in order to keep their populations pacified with programs that provide desalinated water, food, housing and other benefits. This can be done only through high taxes on oil exports. The need for these high taxes acts to increase the sales prices required by these countries—often over \$100 barrel ([Arab Petroleum Investment House 2013](#)).

Even though the **cost of extracting oil is increasing**, the feedback loops that occur when oil prices actually do rise are such that oil prices tend to quickly fall back, if they actually do rise. We know this intuitively—in oil importing nations, deep recessions have been associated with big oil price spikes, such as occurred in the 1970s and in 2008. Economist James Hamilton has shown that 10 out of 11 US recessions since World War II were associated with oil price spikes ([Hamilton 2011](#)). Hamilton also showed that the effects of the oil price spike were sufficient to cause the recession of that began in late 2007 ([Hamilton 2009](#)).

In this post, I will explore the reasons for these adverse feedback loops. I have discussed many of these issues previously in an academic paper I wrote that was published in the journal *Energy*, called "Oil Supply Limits and the Continuing Financial Crisis" (available [here](#) or [here](#)).

If I am indeed right about the path of oil prices being down, rather than up, the long-term direction of the economy is quite different from what most are imagining. Oil companies will find new production increasingly unprofitable, and will distribute funds back to shareholders, rather than invest them in unprofitable operations. In fact, some oil companies are already reporting lower profits ([Straus and Reed 2013](#)). Some oil companies will go bankrupt. As an example, the number two oil company in Brazil, OGX, recently filed for bankruptcy, because it could not profitably find and extract Brazil's off-shore oil ([Lorenzi and Blout 2013](#)).

Oil companies will increasingly find that the huge amount of debt that they must amass in the hope of producing profits sometime in the future is not really sustainable. The Houston Chronicle reports that an E&Y survey of Oil and Gas Companies indicates that the percentage of companies that expect to decrease debt to capital ratios jumped to 48% in October 2013 from 31% a year ago ([Eaton 2013](#)). If companies with huge debt loads cut back production to the amount that their cash flow will sustain, oil extraction can be expected to fall—just as it can be expected to fall if oil and gas companies go bankrupt or give back investment funds to shareholders.

The downward path in oil production is likely to be steep, if oil prices do indeed drop. The economy depends on

oil for many major functions, including most transportation, agriculture, and construction. Increasingly expensive to extract oil is a sign of **diminishing returns**. As we utilize more resources for extracting oil (oil, steel, water, human labor, capital, etc.), there will be fewer resources to invest in the rest of the economy, reducing its ability to grow. This lack of economic growth feeds back as low demand, bringing down the prices of commodities, including oil. It is because of this feedback loop that I believe that the path of oil prices is generally lower. This path is the opposite of what a naive reading of “supply and demand” curves from economics textbooks would suggest, and the opposite of what we need if the economy is to continue on its current path.

**Adverse Feedback 1: Wages stagnate as oil prices rise, tending to slow economic growth.**

Suppose we calculate average US wages over time, by dividing “Total Wages” by “Total Population,” (everyone, not just those working) and bring this amount to the current cost level using the CPI-Urban inflation adjustment. On this basis, US wages flattened as oil prices rose, both in the 1970s and in the 2000s. The average inflation-adjusted wage is 2% lower in 2012 (\$22,040) than it was in 2004 (\$22,475), even though labor productivity rose by an average of 1.7% **per year** during 2005-2012, according to the US Bureau of Labor Statistics. Between 1973 and 1982, average inflation-adjusted wages decreased from \$17,294 to \$16,265 (or 6%), even though productivity reportedly grew by an average of 1.1% per year during this period.

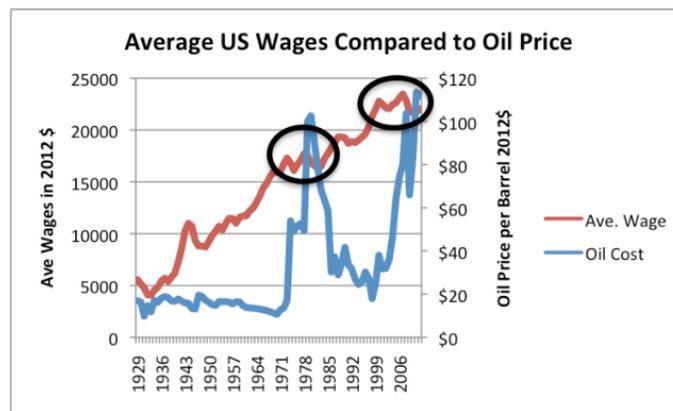


Figure 1. Average US wages compared to oil price, both in 2012\$. US Wages are from Bureau of Labor Statistics Table 2.1, adjusted to 2012 using CPI-Urban inflation. Oil prices are Brent equivalent in 2012\$, from BP's 2013 Statistical Review of World Energy.

To see one reason why wages might flatten, consider the situation of a manufacturer or other company shipping goods. The cost of goods, with shipping, would rise simply because of the cost of oil used in transport. Companies using oil more extensively in producing their products would need to raise prices even more, if their profits are to remain unchanged. If these companies simply pass the higher cost of oil on to consumers, they likely will sell fewer of their products, since some consumers will not be able to afford the products at the new higher price. To “fix” the problem of selling fewer goods, companies would likely lay off workers, to reflect the smaller quantity of goods sold—one reason for the drop in wages paid to workers shown on Figure 1. (Note that Figure 1 will reflect reduced wages, whether it results from fewer people working or lower wages of those working.)

Another approach businesses might use to deal with the problem of rising costs due to higher oil prices would be *to reduce costs other than oil*, to try to keep the total cost of the product from rising. Wages are a big piece of a business’s total costs, so finding a way to keep wages down would be helpful. One such approach would be a wage freeze, or a cut in wages. Another would be to outsource production to a lower cost country. A third way would be to use increased automation. Any of these approaches would reduce wages paid in the United States. The latter two approaches would tend to have the greatest impact on the lowest paid workers. Thus, we would expect increasing wage disparity, together with the flattening or falling wages, as companies try to hold the cost

of goods and services down, despite rising oil prices.

The revenue received by businesses and governments ultimately comes from consumers. If the wages of lower-paid consumers flattens, these lower wages can be expected to reduce economic growth, because with lower wages, these workers will have less income to buy discretionary goods and services. The higher-paid workers may have more income, but this won't necessarily feed back into the economy well—it may inflate stock market prices, but not feed back as spending on goods and services, necessary for growth.

There is even a feedback with respect to debt. The portion of the population with falling inflation-adjusted wages will find it harder to borrow, making it more difficult to buy big-ticket items such as cars and houses.

**Adverse Feedback 2: Consumers cut back on discretionary spending because of the higher cost of food and oil, leading to more layoffs and recession.**

Clearly, based on Figure 1, consumers cannot expect wage increases to match oil price increases. Even workers who work in the oil industry cannot expect wage increases equal to the increase in the price of oil, because part of the increase in cost comes from the need for more workers per barrel of oil. For example, it is more labor-intensive to extract oil from a large number of small wells, each of which require fracking, than it is to extract oil from a few larger wells, none of which require fracking.

One cost that tends to increase with the cost of oil is the cost of food (Figure 2). The cost of food and the cost of commuting are necessities for most workers. They will cut down on discretionary expenditures, if necessary, to make certain these costs are covered.

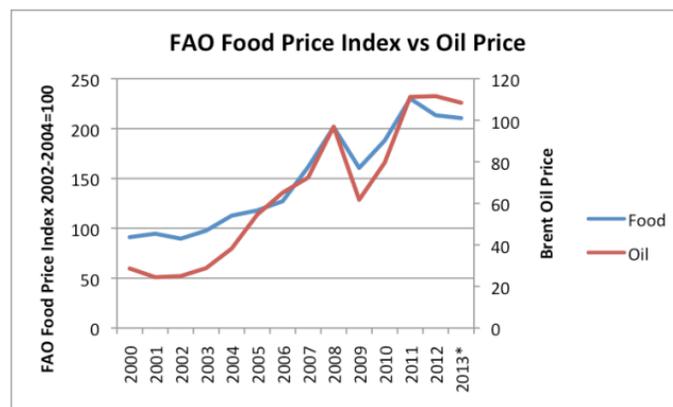


Figure 2. FAO Food Price Index versus Brent spot oil price, based on US Energy Information Agency. \*2013 is partial year.

If wages are inadequate, workers will cut back in such area as restaurant meals, vacation travel, and charitable contributions, leading to even more problems with a lack of jobs in these and other discretionary sectors.

It might be noted that even countries that export oil can encounter difficulties as oil prices rise. These countries need a way to get the extra revenue from selling high-priced oil over to the many residents who must buy higher-priced food, but do not benefit from the wages paid to oil workers. It is not a coincidence that the Arab Spring uprisings took place in several oil exporting nations in early 2011, when food prices peaked on Figure 2.

**Adverse Feedback 3: Higher oil and food prices together with stagnating wages lead to cutbacks in spending for new cars and new homes, falling prices for new homes, defaults on home and car loans, and banks in need of bailouts.**

Purchasing more-expensive homes and new cars are types of discretionary spending. If consumers find their incomes are squeezed by high oil prices, they will cut back on expenditures such as these as well, leading to

layoffs in the home construction and auto manufacturing industries. Such cutbacks can also result in bankruptcies of auto and home builders.

If people buy fewer move-up homes, the price of resale homes will tend to fall. This in turn makes defaults on mortgages more likely. Layoffs will also tend to make defaults on mortgages more likely, as well as missed payments on auto loans.

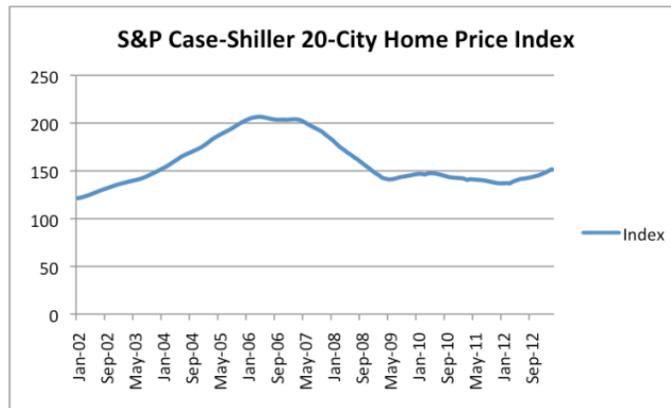


Figure 3. [S&P Case-Shiller 20-City Home Price Index](#), using seasonally adjusted three month average data. April 2006 is the peak month. Data is latest shown on website as of November 2013.

Most people do not associate the drop in US home prices with the rise in oil prices, but the latest rise in oil prices began as early as 2003 and 2004 (see Figure 2), and the drop in home prices began in 2006. Some of the earliest drops in home prices occurred in the most distant suburbs, where oil prices played the biggest role.

Banks increasingly found themselves in financial trouble, as defaults on mortgages and other loans grew. These defaults are often blamed on bad underwriting. While bad underwriting may have played a role (and may also have helped prevent the US from falling into recession even earlier, when oil prices began rising), the falling prices of homes created part of the default problem, as did job layoffs associated with higher oil prices.

All of these feedbacks led to a need for more government involvement—lower interest rates to try to hold the economy together, get spending back up, and raise home prices.

**Adverse Feedback 4: Cutbacks in consumer debt combined with flat wages appear to have led to the decline in spending that precipitated the July 2008 drop in oil prices. Consumer debt still remains depressed.**

Oil prices started falling in July 2008, and did not hit bottom until the winter of 2008 (Figure 4).

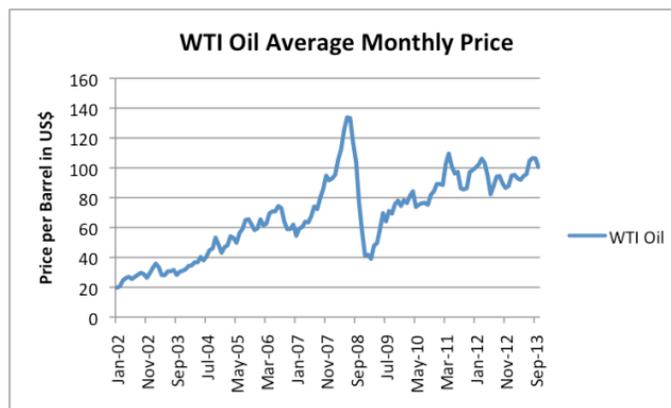


Figure 4. West Texas Intermediate Monthly Average Spot Price, based on us Energy

What could have precipitated such a fall? Many people consider the bankruptcy of Lehman Brothers on September 15, 2008 to be pivotal in the financial crisis of 2008, but the drop in oil prices started months earlier. What could have precipitated such a steep drop in oil prices?

It seems to me that the real underlying cause was a mismatch between what goods cost (such as high food and oil prices) and the amount consumers had available for spending. There are two basic sources of consumer spending—wages and increases in debt. If consumer debt suddenly starts decreasing, rather than increasing, consumer spending can be expected to fall (especially if wages are not rising).

In fact, consumer debt did start falling at precisely the time that oil prices crashed. Mortgage debt started falling in the third quarter of 2008, reflecting a combination of falling home prices and mortgage defaults. As noted previously, both of these were indirectly related to high oil prices.

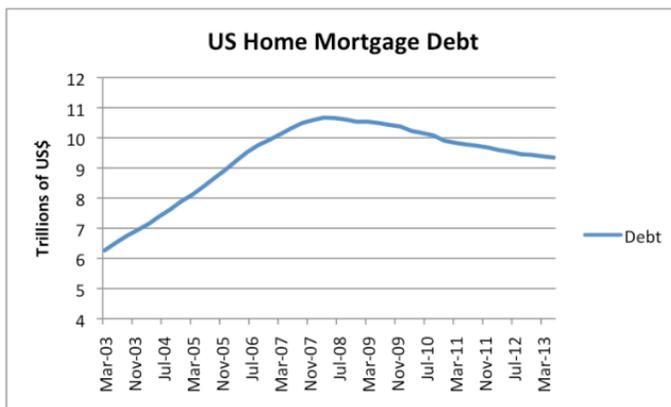


Figure 5. US Home Mortgage Debt, based on Federal Reserve Z.1 data.

Other consumer debt fell at the same time. Revolving credit (primarily credit card debt) hit a peak in July 2008, and began to fall (Figure 6).

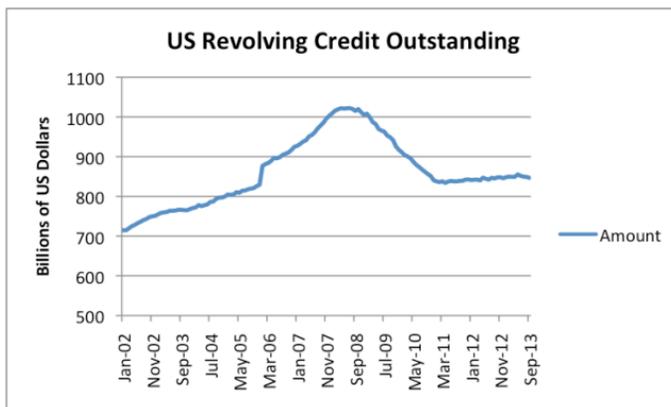


Figure 6. US Revolving Credit outstanding (primarily credit card debt), based on Federal Reserve G.19 Report.

**Adverse Feedback 5: Even after high oil prices have been in place for several years, many governments find themselves trapped by the need for deficit spending and ultra-low interest rates to cover up problems with stagnant wages and inadequate demand for homes and cars at “normal” interest rates.**

With the slack in consumer debt, US government debt soared (Figure 7). Governments in Europe and Japan found themselves in a similar bind.

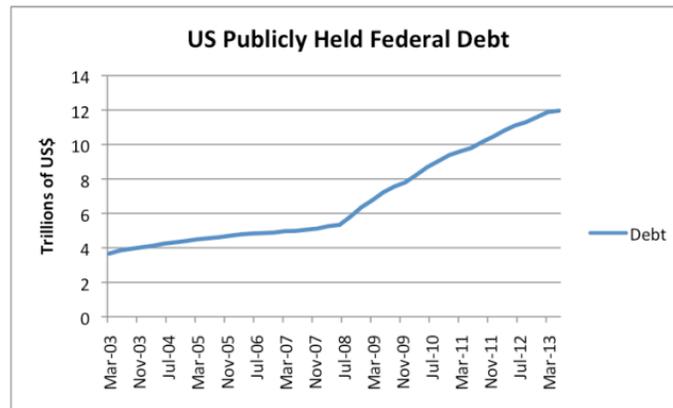


Figure 7. US government publicly held debt, based on Federal Reserve Z.1 data.

Even as US Federal Government debt soared, it was not enough to fully make up for the cutback in debt elsewhere in the economy (Figure 8).

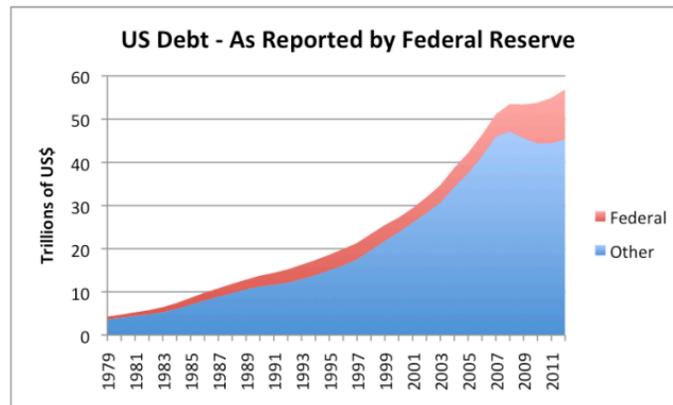


Figure 8. US Debt based on Federal Reserve Z.1 data.

How do governments get themselves caught in such a bind? Businesses can to a significant extent overcome their problems with high oil prices by laying off workers and finding lower cost methods of production. Individuals, however, find that the wage problems persist as long as oil prices remain high and businesses have the option of replacing their services with lower cost workers elsewhere. Globalization definitely makes this problem worse.

When workers have job problems, governments find themselves in the unfortunate position of trying to fix the situation by providing more unemployment benefits, food stamps, and disability benefits. Governments also find themselves with lagging tax revenue, because businesses increasingly are located in offshore tax havens, and workers' incomes are lagging.

**Adverse Feedback 6: Rising prices of oil have contributed to long term inflation. If oil prices start falling, this tends to create the opposite problem—deflation. Once oil price deflation starts, it may lead to a self-reinforcing debt default cycle.**

Not all inflation is related to higher energy prices, but some of it is. This is one reason the US government sometimes gives an inflation estimate “excluding volatile food and energy prices.” Inflation over the years appears to be one way that a small amount of diminishing returns has fed into the economy.

The concern a person has is that deflation will tend to lead to debt defaults. Clearly lower oil and gas prices mean that oil and gas businesses will become less profitable, and loans in this area will tend to default. But loans related to other types of commodities may tend to default as well. There will also tend to be layoffs in these industries, and in surrounding communities.

Also, with deflation, the low interest rate policies of governments no longer have the stimulating impact that they would have without deflation. So governments will have to concoct negative interest rate plans, and see if they can make these work, to take the place of current plans.

One question is how effective today's Quantitative Easing and ultra-low interest rate programs have been. We know that they have tended to blow bubbles in asset prices, such as stock market prices. But are ultra-low interest rates part of what allowed oil prices to re-inflate after the July 2008 drop? Certainly, they have helped hold up auto and home sales, and have supported oil drilling operations that rely heavily on debt.

To some extent, the current system appears to be held together with duct tape. It looks like it could fall apart on its own, or it could fall apart as governments try to reduce their deficits by higher taxes and lower spending (See Figure 7). Adding deflation to the combination would seem to be another way of making the current approach for covering up our problems even more vulnerable to collapse.

The frightening thing is that there is already some evidence that oil prices (and commodity prices in general) are starting to trend downward. The chart I showed in Figure 4 showed West Texas Intermediate (WTI) oil prices—a price that is often quoted in the US. On Figure 9, I show WTI oil prices alongside Brent, another oil benchmark. Brent reflects world oil prices to a greater extent than WTI price does. It seems to be showing a recent downward trend in world oil prices. To the extent that this downward trend in prices feeds back into inflation rates and makes Quantitative Easing work less well, this downward trend becomes a potential problem. Its effect would tend to offset the stimulating effect on economies that lower oil prices would normally have.

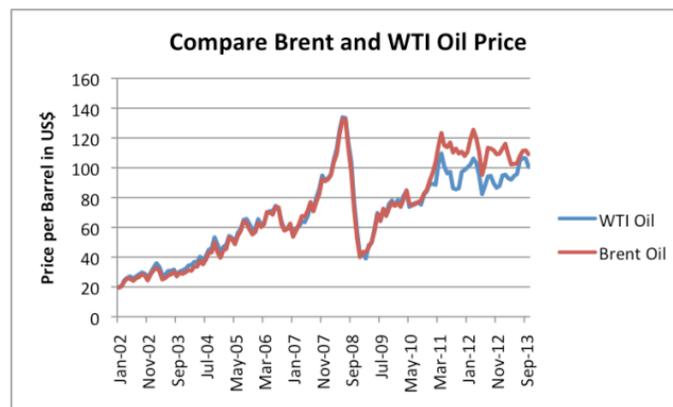


Figure 9. Brent oil price compared to West Texas Intermediate oil price, based on EIA monthly average spot prices.

## Conclusion

Oil and other fossil fuels are unusual materials. Historically, their value to society has been far higher than their cost of extraction. It is the difference between the value to society and their cost of extraction that has helped economies around the world grow. Now, as the cost of oil extraction rises, we see this difference shrinking. As this difference shrinks, the ability of economies to grow is eroding, especially for those countries that depend most heavily on oil—Japan, Europe, and the United States. It should not be surprising if the growth of these countries slows as oil prices rise. The trend toward globalization can only make this trend worse, because it gives businesses an opportunity to lower wage costs by outsourcing part of their production to lower-cost countries (that use less oil!). When costs are reduced in this manner, businesses are also able get the “benefit” of

more lax pollution laws overseas.

We saw in Figure 9 that global oil prices seem already to be trending downward, as growth in countries such as China, Brazil, and India is faltering. At the same time, oil from easy to extract locations is depleting, and oil companies have no choice but move on locations where more resources of all kinds are required, leading to diminishing returns and ever-higher cost of extraction. The way I view our predicament is shown in Figure 10.

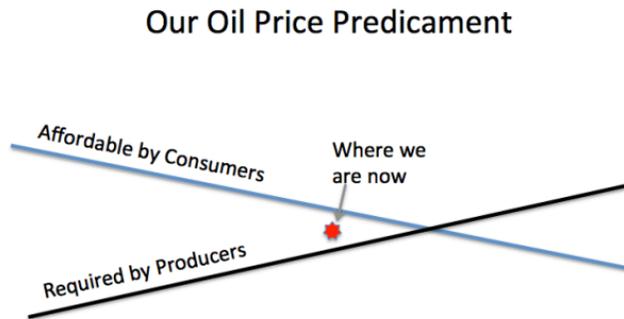


Figure 10. Our Oil Price Predicament. Over time, if we want to maintain constant oil consumption, the price consumers can afford tends to fall, while the price required by oil producers in order to earn a profit tends to rise.

Over time, in order to maintain constant oil production, the price consumers can afford tends to fall, because governments need to “take back” the huge deficit spending they are using now to prop up the system. At the same time, prices required by producers tend to rise, as the mix of oil production moves to more difficult locations.

While in theory oil prices could spike again because of rising demand of the less developed countries, it is hard to see how this price spike could be sustained. We would likely run into the same problems we had before, with more layoffs and plus credit contraction leading to a cutback in demand in the US, the European Union, and Japan. These users represent a big enough share of the total that their drop in demand would tend to bring world prices back down.

The problem this time, though, is that governments seem to be getting close to being “out of ammunition,” in trying to fight what is really diminishing returns of one of the major drivers of our economy. I don’t know exactly how things might play out, but experience with prior civilizations suggests that “collapse” might be a reasonable description of the outcome.

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#### About Gail Tverberg

My name is Gail Tverberg. I am an actuary interested in finite world issues - oil depletion, natural gas depletion, water shortages, and climate change. Oil limits look very different from what most expect, with high prices leading to recession, and low prices leading to inadequate supply.

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