



## The Link Between Peak Oil and Peak Debt – Part 2

Posted by [Gail the Actuary](#) on July 15, 2011 - 9:45am

In Part 1 of this post, I pointed out that an economy is closely linked with the resources that underly it. Because of this, if there is really is a limit that prevents oil supply from rising endlessly, then there is also a limit that prevents debt from rising endlessly. I talked about seeing a two-way link between peak oil and peak debt:

1. Peak oil tends to cause peak debt. This is what I discussed in Part 1.
2. Once debt growth peaks (shifts from growth to decline), we can expect a feed-back loop that will tend to make post-peak oil supply decline even more rapidly than it would otherwise.

It is this second point I want to discuss today.

The basic issue is that more debt tends to cause more demand, and thus higher oil prices. At these higher oil prices, oil tends to get pumped out more quickly than it would otherwise. But once a shift occurs from increasing credit availability to reduced credit availability, as it does about the time peak oil production is reached, then prices for all types of commodities tend drop. At these lower prices, oil production drops off more quickly than it would have otherwise.

Let me elaborate a bit.

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### The Cheese-Slicer Model

We know that there is a cycle that permits oil production, that gradually changes over time. Professor Charles Hall has represented this cycle with his Cheese-Slicer Model. In 1970 he shows this view:

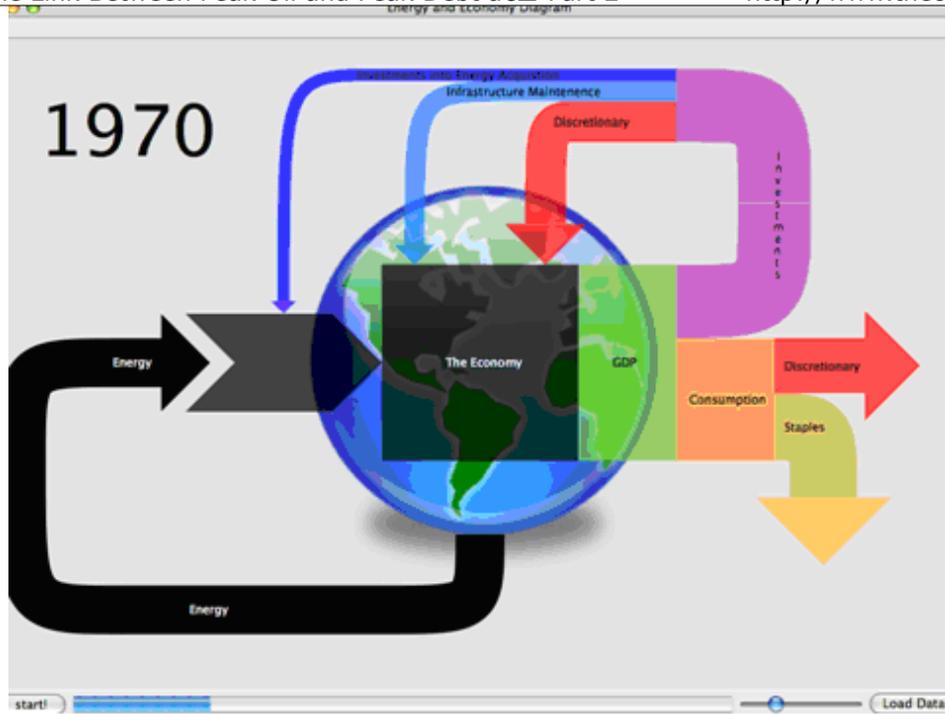


Figure 1. Professor Charles Hall's cheese slicer model of the economy, reflecting the energy needed to make energy, and other aspects of the economy at 1970

As of 2030, he shows the model:

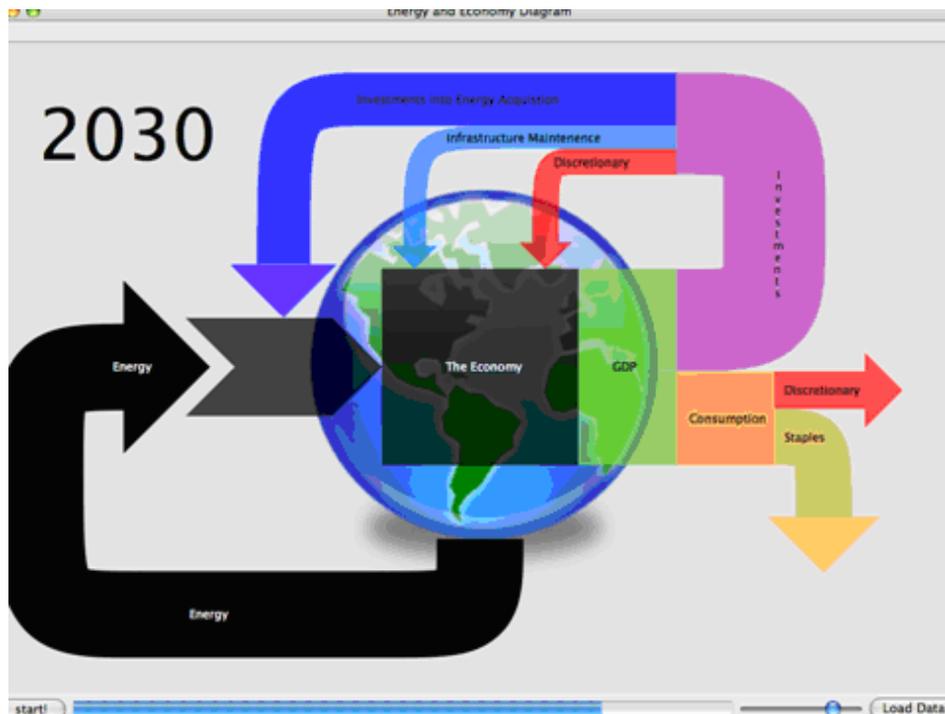


Figure 2. Professor Charles Hall's cheese slicer model of the economy, reflecting the energy needed to make energy, and other aspects of the economy at 2030.

What happens is that as we extract oil, we use some of it for investment (top big arrow with purple and blue) and some of it for consumption (arrows straight to the right).

Over time, as the “easy to extract” resources are exhausted, we have to use a larger portion of

the oil that is extracted oil (1) to obtain additional oil (top dark blue arrow) and also (2) to repair the infrastructure we have built up over the years, like highways and water supply and electric power transmission lines (medium blue arrow second from the top). Since these arrows get bigger, there is less oil available for discretionary investment in manufacturing facilities for things like cars and new iPods (top red arrow).

As the size of this investment arrow grows, the size of the square orange “consumption” box gets squeezed. The size of the green arrow pointed down, called “staples” stays relatively the same size, but the size of the red arrow, called “discretionary” (for things like new cars, and trips to restaurants, and vacation trips) gets smaller.

With this scenario, discretionary goods and services we get from oil energy goes down over time. This relationship holds on a percentage basis, relative to the oil in the system. We are likely not to notice this issue much when total oil supply is rising, because total supply available remains fairly adequate. Even if oil supply is flat, this downward drift may not be too noticeable, because a shift toward greater efficiency, or a switch of some users from oil to electricity, can help cover a small drift toward less available oil for consumption.

The biggest impact of the shift shown in Figures 1 and 2 is post-peak, when users are faced with a combination of (1) declining oil consumption and (2) greater percentages needed for non-discretionary items. Thus, it is likely to be something we experience more in the future than we have to date.

### **Impact of Rising Debt on the Model**

The model is set up based on the amount of energy coming through the system. In the real world, though, there are monetary transactions involved. These monetary transactions involved consider not only the oil that has come through the system, but also considerable lending based on the expectation of future energy resources and the goods they will produce.

In a situation with rising debt, people have more money to spend. Consumers can take out an auto loan to buy an auto; investors can take out a loan to build a new manufacturing facility, or to drill for oil and gas. It is not necessary to wait and see how much really comes though the cheese slicer, in terms of the materials that are generated by the operation of the cheese slicer; it is possible to spend in advance.

Because of the availability of loans, the demand for new cars (and many other goods using oil) is higher than it would otherwise be, and the demand for oil to operate those new cars is higher than it would be. This keeps the price of oil higher than it otherwise would be, convincing marginal producers that prices are high enough for their operations. This keeps oil production higher than it would otherwise be, enabling the use of more oil for both investment and consumption. In a sense, what the additional debt does is make the world look like it is at an earlier year in Prof. Hall’s Cheese Slicer models than is really the case.

So suppose we are in 2011, but because of rising debt, it still feels like we are in the 1991 version of the cheese slicer model. What happens when instead of rising debt, the situation suddenly changes to falling debt? Then many people can no longer get loans to buy new cars, and they cannot afford to go on the vacation trips of their dreams. It becomes more difficult for businesses to invest in new plants and equipment.

Because there is less economic activity, the price of oil drops. Suddenly, investments in oil which previously looked profitable, no longer look profitable. We find ourselves moving out on the years of the cheese slicer. As long as there is some debt, it helps keep demand up. So maybe we move rather suddenly from 1991 to 2001 in the cheese slicer models, when we really are at 2011.

As debt declines, the cheese slicer model gets more and more “gummed up.” It becomes more and more difficult to make investments, because investment funds need to come from accumulated profits, rather than be borrowed in advance. Potential consumers find it more difficult to buy cars and houses and new appliances, because they have to wait until they have accumulated funds.

These reasons are the primary ones for my statement at the beginning of the post that the switch from increasing debt to decreasing debt will tend to make the downslope steeper.

I should mention that there may be some other reasons that will also tend to reduce people’s ability to buy oil, besides the cutback in debt. As you will recall, the reason for the cutback in lending was related to higher oil prices causing businesses to raise prices on many types of goods, and requiring people to cut back on discretionary goods of all kinds—the types of changes that go with recession ([see Part 1](#)). In a finite world, oil supply shortages are likely to get worse over time. Other non-renewable resource may also be in short supply, as limits are reached on other resources, such as fresh water from aquifers that replenish very slowly. These issues are likely to make the recessionary influences worse over time. If many people are without work because of recession, they will find it impossible to accumulate funds to afford expensive new consumer goods. This lack of income will tend to produce a similar effect, namely reduced demand for oil products, and a move to lower outputs of the type expected in a later year of the cheese slicer model.

I should also note that a major cutback in debt is likely to affect all aspects of the economy—not just oil and gas. I wrote a post in late 2008 called [Impact of the Credit Crisis on the Energy Industry – Where Are We Now?](#) In it, I surveyed all of the kinds of energy, from oil to gas to coal to uranium, and all of the prices were down, because of the credit contraction at that time. In retrospect, we find that even electricity use was down. US electricity generation showed a 5% dip between 2007 and 2009, instead of the 3.5% growth that might have been expected in that two-year period, in the absence of recession.

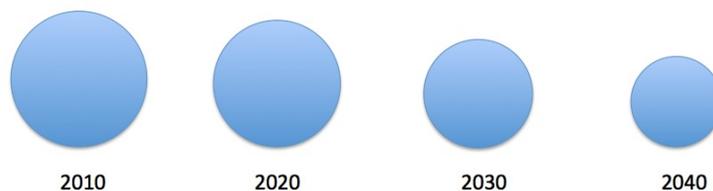
### A Partial Offset

If we are moving from an expanding to a contracting resource base, saving and spending behaviors are likely also to change.

Scenario 1: Underlying Financial System



Scenario 2: More Likely Actual Growth Pattern



*Figure 3. Two views of future growth*

One reason for a change in savings and spending behavior is obvious—if there are more resources

to buy now than later, it might be better to buy now while goods and services are available. Furthermore, if the economy is really declining, money will cease to be a store of value, in the way it is today, because less goods and services will be produced in the future than today. In this environment, it might make sense to spend money rather than save it, especially if it can be invested in something of long-term value to the person with excess funds.

There is a second reason for a change in savings patterns. There is a tie between debt and savings. The debt of one person is for the most part the savings of someone else. A bond sold by a company as financing for its debt may end up in someone's pension fund, or on the balance sheet of an insurance company. To the extent that there is less in the way of debt, there is also going to be less in the way of savings.

With peak oil, what is likely to happen is that the default rate on existing debt will rise, so many people who own bonds (or other debt instruments) will discover that they are worth less than they thought, perhaps nothing. And banks and insurance companies and pension plans will discover that quite a few of their assets aren't what they thought—they will never be repaid with interest.

In this environment, the world will change. Insurance companies are likely to stop selling annuities, because they really can't make good on long-term promises any more, if there are too many debt defaults. Pension plans will become uncommon. People will figure out that they really can't save very well for retirement—they will have to depend on their friends or relatives, or perhaps a government program funded by taxes.

In this environment, buying patterns will change. People with money may decide to take a vacation trip now, rather than waiting until later. They may make other choices as well—they may try to buy more land, for example. It may be that the price of land for farming is bid up. They may buy tools for working the land. With these new buying patterns, some of the demand for oil and other fuels may return.

The reason why this activity is not likely to completely offset the current bidding up of energy prices with debt is because quite a bit of current debt may ultimately vanish as worthless. It was created using assumptions that held at a different time—back when the economy was fueled with cheap oil—but are not valid any more. Prices of homes have dropped, so huge mortgages on them no longer make sense. Bonds from companies (and countries) in financial distress will not be paid back, especially if we stumble back into recession. We don't know yet how this will play out, but we can see distress signs around the world, suggesting that more defaults are not far away.

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