The Oil Drum
DISCUSSIONS ABOUT ENERGY AND OUR FUTURE

An Overlooked Detail - Finite Resources Explain the Financial Crisis

Posted by Gail the Actuary on November 21, 2008 - 9:43am
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Tags: benjamin warr, financial crisis, monetary system, original, peak oil, robert ayres [list all tags]

Recently, two major actuarial organizations asked members to submit essays on the financial crisis. The only limitation was that the papers had to be very short--they should fit on two typewritten sheets of paper.

Since I have written in the past on the financial crisis, I took the opportunity to respond. This was my summary of the current financial situation, its connection to our limited resources, and what we need to do to solve the crisis. I never actually use the words "peak oil" and, in fact, the precise timing of peak oil is irrelevant. The issue is really the financial squeeze that occurs when resources starts to become expensive to deliver, and that doesn't really require peak oil.

Our World Is Finite

We all know the world isn't flat. Any of us would be laughed out of the room if we built a model with a flat earth as one of its major assumptions.

We also know that the world isn't infinite. There are a finite number of atoms in the earth and its atmosphere. The ability of our atmosphere to absorb pollutants is limited. The ability of our soil to withstand repeated mistreatment is limited. The amount of our non-renewable resources is limited.

Fossil fuels, especially oil, are a particular problem. Even though the amount of resources seems huge, the cost of extraction (in terms of fossil fuel resources, man-hours, and fresh water) increases greatly after we have extracted the easy-to-extract oil, natural gas, and even coal. Substitutes (such as ethanol and solar voltaic) are expensive in terms of fossil fuel use, man-hours, and fresh water. It is also difficult to ramp up quantities to the level needed to substitute for fossil fuels.

Finite Resources but Unending Growth

In spite of the clear issue of a finite world, the financial community has taken as one of its central beliefs that *Economic Growth is Good*, and is in fact to be expected. A close corollary is that *Leverage is Good*. Our monetary system is very closely tied to debt, and would come to a screeching halt if lending stopped. Our banks and insurance companies depend on lending, with banks using lending as their primary source of revenue, and insurance companies using bonds for

much of the asset side of their balance sheets.

How did we come to believe that never ending growth was possible? One way was a simple look backward. Growth has continued since the industrial revolution. There was a tie-in with energy resources all along. The industrial revolution brought coal to make creation of goods easier. We later added oil, natural gas, and uranium as additional energy sources. The world's use of energy has ramped up over a long period, practically without interruption.

Another way we justified the idea of unending growth was through economic models that ignored the contribution of energy and, of course, ignored the fact that we are living in a finite world. Economic models of this type include the Solow-Swan Growth Model that considers the contributions of labor and capital, and the Cobb-Douglas production function that considers labor, capital, and productivity. Neither of these models has built in limits, either.

The Tie Between Energy Resources and Economic Growth

Robert Ayres and Benjamin Warr showed a close tie between energy resources and economic growth in 2004. They found that when they used an economic model that considers both growth in energy use and growth in energy efficiency, it explains the vast majority of US economic growth between 1900 and 2000, except for a residual of about 12% after 1975.

Common sense also tells us that energy resources are required for growth, and even to keep our current economy functioning. There is very little economic activity that we can perform without diesel or gasoline or electricity. Common sense would tell us that models such as the Solow-Swan Growth Model and the Cobb-Douglas production function are incomplete.

We Are Reaching Limits

No matter what kind of resources we are working with, they don't simply "run out", as we use more and more of them. Instead, they become more and more difficult to extract. In the case of minerals, the ore concentrations become lower and lower. Mines need to be built deeper and deeper. Fossil fuels become of lower quality and more difficult to extract quickly.

For many years, depletion was not really an issue. Resources were so vast, and the leverage provided by energy from fossil fuels was so great, that we could extract as much of almost anything we wanted (oil, natural gas, coal, uranium, copper, phosphorous, gold, platinum, indium, gallium, fresh water, and many other things) very cheaply, in the quantities needed for whatever use was desired.

What has happened in the last few years is that we have started reaching the point where extraction of many of these resources is becoming much more difficult. In April, 2007, the CEOs of Royal Dutch Shell and of French oil company Total SA were quoted as saying that the days of "easy oil" are gone. Just this past week, the International Energy Agency released a report whose executive summary begins, "The world's energy system is at a crossroads. Current global trends in energy supply and consumption are patently unsustainable environmentally, economically, socially."

Our Current Economic Crisis

Now that we are reaching a point where the extraction of fossil fuels and minerals of all types are starting to reach limits, we find that if the economy starts to heat up, the price of many

commodities starts to skyrocket. Part of this is competition for limited resources. Part of this is the high cost of extraction of these resources, now that we are increasingly reaching limits. Food prices are affected as well, partly because oil (for machinery) and natural gas (for nitrogen fertilizer) are used in food production, and partly because competition with corn production for ethanol drives land prices up.

Once food and fuel prices rise, people find it difficult to repay debt, and debt defaults rise. Now debt defaults are rippling through the economy. The poor financial condition of banks makes them unwilling to lend. This lack of credit is making it difficult for many direct and indirect buyers of commodities to buy products of many types (oil, natural gas, uranium, and copper, for example). Prices are plummeting for a wide range of products because prices are relatively inelastic.

These lower prices have a feedback effect on new production of commodities. In a paper to be published in Journal of Energy Security shortly, I show that the credit crisis and the resulting lower commodity prices are leading to cut backs in planned production of energy products of all types (fossil fuels, renewables, and uranium). As a result, if the economy does start to heat back up again, we will have another round of commodity price increases. This, of course, will be followed by another round of debt defaults.

What Is the Solution?

In a finite world, we will soon find ourselves in a level or declining economy, simply because there are not enough easily-extractible resources to support growth without causing huge price spikes, followed by debt defaults, and another round of credit contraction and commodity price crashes. The only solution I can see is to develop a new monetary system that is not debt based, and is not expected to grow. Ideally, it would decline as there are fewer resources, and as the economy naturally declines.

With a flat or declining economy, long-term debt no longer makes sense. The likelihood that borrowers will be able to repay loans with interest becomes quite low, because the economic system as a whole is not growing and producing a surplus that can be used toward interest payments. It is much easier for a borrower to repay a 20-year mortgage with interest when he is getting promotions and salary increases than when his employer is downsizing and cutting hours.

Somehow, a monetary system needs to be devised which operates without debt, except for very short-term debt to facilitate commercial transactions. In addition, we need to extract ourselves from the debt morass we have created. There is now far more debt and far more promises like Social Security and Medicare than can possibly be honored with existing resources.

The only way I can imagine transitioning to a new form of monetary system is by having an overlap period in which both monetary systems are in place. The new money might initially be limited in supply and only be good for food and energy products (somewhat like a rationing system). People would receive some pay in each monetary system. Eventually, the new monetary system would replace our current seriously problematic system.

(Not part of original two page article)

Links to other financial posts written by me, Gail E. Tverberg, on The Oil Drum

Jeff Rubin: Oil Prices Caused the Current Recession Nov. 5, 2008

Oil Prices: A Little More of the Story Nov. 27, 2008

Why are Oil (and Gasoline) Prices so Low? Oct. 22, 2008

Revisiting an April 2007 Forecast Regarding the Connection Between Peak Oil and the Collapse of the Monetary System Oct. 13, 2008

The Impact of the Credit Crunch on the Energy Markets Oct. 4, 2008

The Connection Between Financial Markets and Energy - Open Thread September 15, 2008

Peak Oil and the Financial Markets - July 31 Update July 31, 2008

The Expected Economic Impact of an Energy Downturn March 26, 2008

Peak Oil and the Financial Markets - A Forecast for 2008 Jan. 9, 2008

Economic Impact of Peak Oil - Part 3 - What's Ahead? Oct. 1, 2007

Economic Impact of Peak Oil - Part 2 - Our Current Situation Sept. 25, 2007

Economic Impact of Peak Oil - Part 1 - A Flashback Sept. 24, 2007

Our World Is Finite: Is this a Problem? Apr. 30, 2007

Other financial articles / presentations by me, Gail E. Tverberg, available elsewhere on the internet

Peak Oil and the Economy Presentation at Association for the Study of Peak Oil-USA Meeting, Sept. 21, 2008

Expected Economic Impact of an Energy Downturn (Video) Talk for *Converging Environmental Crises Teach-In* at Ohio State University School of Public Health. April 10, 2008

Our World Is Finite: Implications for Actuaries, *Actuary of the Future*, Society of Actuaries, November 2007.

Our Finite World: Implications for Actuaries, *Contingencies*, American Academy of Actuaries, May 2007.

Oil Shortages: The Next Katrina?*Emphasis*, Towers Perrin (Tillinghast), 2006/2.

A few other financial articles of interest on The Oil Drum

The Failure of Networked Systems: The Repercussions of Systematic Risk By David Clarke, October 25, 2008.

Herman Daly on the Credit Crisis, Financial Assets and Real Wealth Herman Daly (with Nate Hagens), Oct. 13, 2008.

Resurgence of Risk - A Primer on the Develop(ed) Credit Crunch Stoneleigh, Oct. 10, 2008.

Monetary Policy and Weaseling Out of Debt Shunyata, Aug. 28, 2007.