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The Coming Oil Price Crash

By Gail Tverberg - Oct 12, 2016, 3:04 PM CDT



We have been hearing a great deal about IMF concerns recently, after the release of its October 2016 World Economic Outlook and its Annual Meeting from October 7-9. The concerns mentioned include the following:

- Too much growth in debt, with China particularly mentioned as a problem
- World economic growth seems to have slowed on a long-term basis
- Central bank intervention required to produce artificially low interest rates, to produce even this low growth
- Global international trade is no longer growing rapidly
- Economic stagnation could lead to protectionist calls

These issues are very much related to issues that I have been writing about:

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- It takes energy to make goods and services.
- It takes an increasing amount of energy consumption to create a growing amount of goods and services—in other words, growing GDP.
- This energy must be inexpensive, if it is to operate in the historical way: the economy produces

good productivity growth; this productivity growth translates to wage growth; and debt levels can stay within reasonable bounds as growth occurs.

- We can't keep producing cheap energy because **what "runs out" is cheap-to-extract energy**. We extract this cheap-to-extract energy first, forcing us to move on to expensive-to-extract energy.

- Eventually, we run into the problem of energy prices falling below the cost of production because of affordability issues. The wages of non-elite workers don't keep up with the rising cost of extraction.

- Governments can try to cover up the problem with more debt at ever-lower interest rates, but eventually this doesn't work either.

- Instead of producing higher commodity prices, the system tends to produce asset bubbles.

- Eventually, the system must collapse due to growing inefficiencies of the system. The result is likely to look much like a "Minsky Moment," with a collapse in asset prices.

- The collapse in assets prices will lead to debt defaults, bank failures, and a lack of new loans. With fewer new loans, there will be a further decrease in demand. As a result, energy and other commodity prices can be expected to fall to new lows.

Let me explain a few of these issues.

The Need For Energy to Operate the Economy

On a worldwide basis, it takes energy to make the economy grow. This is evident, regardless of what time period we look at.

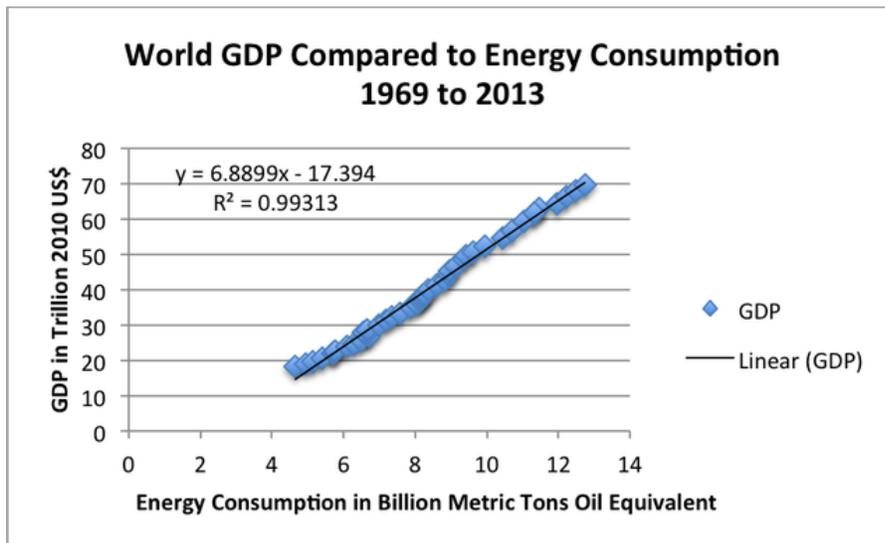


Figure 1. World GDP in 2010\$ compared (from USDA) compared to World Consumption of Energy (from BP Statistical Review of World Energy 2014).

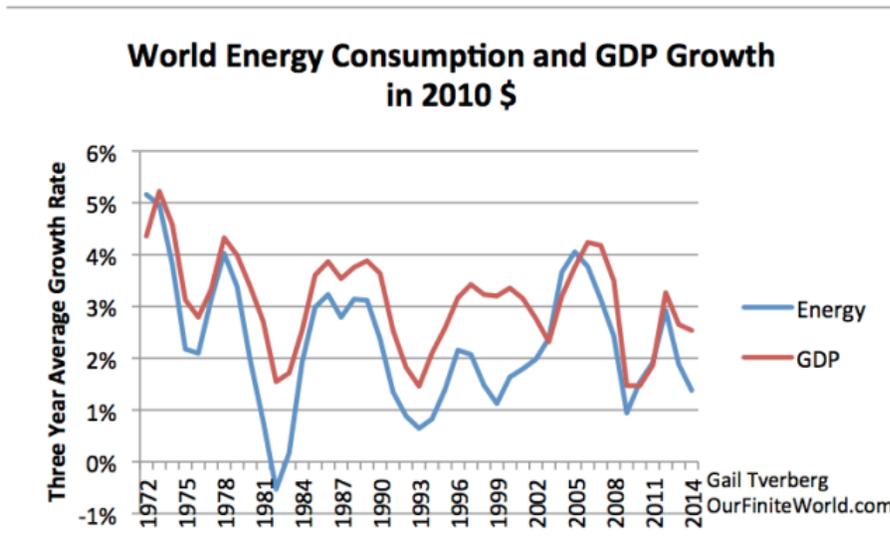


Figure 2. Three-year average growth rate in world energy consumption and in GDP. World energy consumption based on BP Review of World Energy, 2015 data; real GDP from USDA in 2010\$.

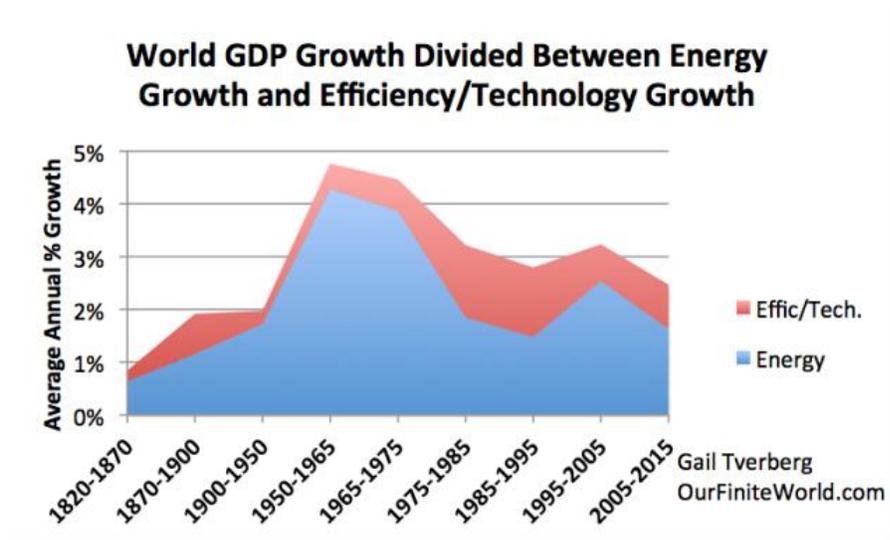


Figure 3. World GDP growth compared to world energy consumption growth for selected time periods since 1820. World real GDP trends for 1975 to present are based on USDA real GDP data in 2010\$ for 1975 and subsequent. (Estimated by author for 2015.) GDP estimates for prior to 1975 are based on Maddison project updates as of 2013. Growth in the use of energy products is based on a combination of data from Appendix A, data from Vaclav Smil’s Energy Transitions: History, Requirements and Prospects, together with BP Statistical Review of World Energy 2015 for 1965 and subsequent.

There is a small gain, over and above that added by energy growth. This gain reflects the impact of efficiency gains and technology changes. Generally, this additional gain is less than 1 percent per year.

In recent years, a large share of the world's manufacturing has been moved to developing countries. This shift gives the illusion that the developed countries can get along with less energy to produce their GDP. This is not really the case. The developed countries find themselves with a need for a large amount of imported goods. Their heavily services-oriented economies tend to grow slowly. This is because, with little energy use, it is difficult for these economies to make productivity gains. I have written about this issue in [What really causes falling productivity growth — an energy-based explanation](#).

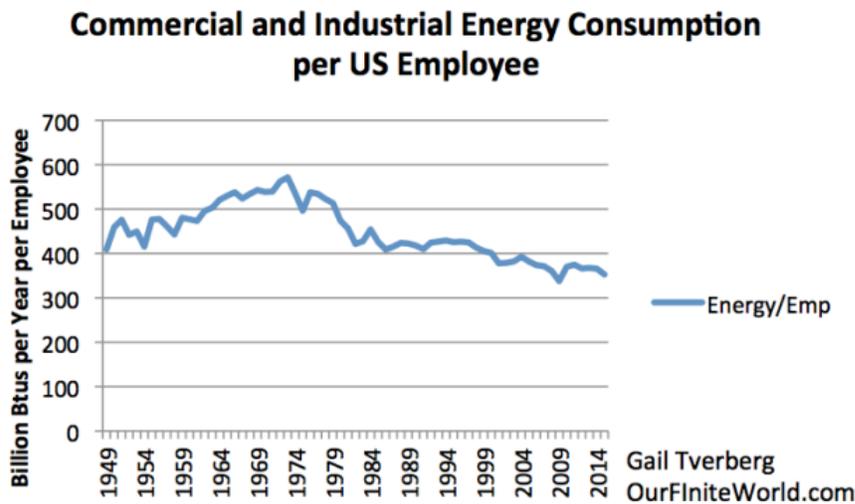


Figure 4. Total amount of energy used by Commercial and Industrial Sector (excluding transportation) based on EIA Energy Consumption by Sector, divided by Bureau of Labor Statistics Total Non-Farm Employees by Year.

We Run Out of Cheap-to-Extract Energy Products

The amount of a given energy product (whether oil, coal, natural gas, or uranium) depends to a significant extent on the price available. The wide base on the triangle in Figure 5 indicates that if the price is high enough, we can extract a very large amount of any given energy resource. For example, if oil is \$300 per barrel, we can extract the huge amounts of oil that would seem to make it possible for the economy to grow for the next 25 years.

- ▶ We extract the easiest (and cheapest) to extract energy resources first
- ▶ Much more is available, if prices would keep rising

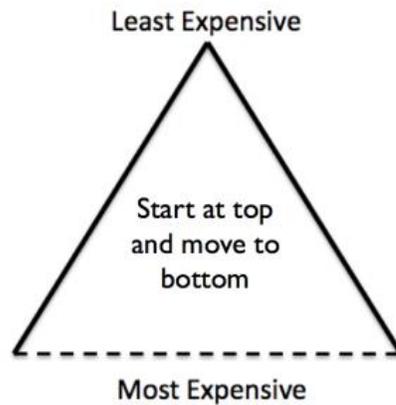
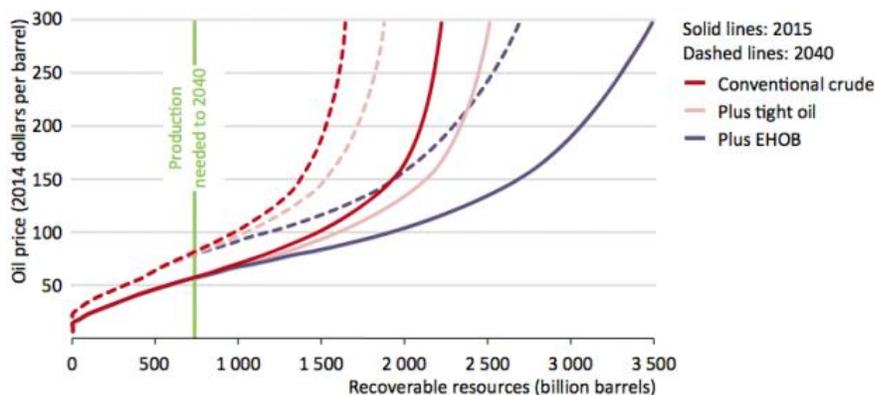


Figure 5. We extract the easiest to extract energy first.

In fact, the IEA has even made projections assuming \$300 per barrel oil.

Figure 1.4 ▶ Non-OPEC supply cost curves for 2015 and 2040 in the New Policies Scenario



Notes: EHOB = extra-heavy oil and bitumen. The vertical green line indicates the amount of production required between 2015 and 2040 in the New Policies Scenario

(Click to enlarge)

Figure 6. IEA Figure 1.4 from its World Energy Outlook 2015, showing how much oil can be produced at various price levels.

The reason why there is a problem if oil prices rise to very high levels is because wages don't rise at the same time.

Underlying problem: ***Energy is necessary to make and transport goods***

- ▶ **If price of energy is higher, price of goods tends to rise**
 - ▶ Oil and natural gas used in producing food
 - ▶ Oil used for transporting nearly all goods
 - ▶ Energy prices affect the cost of houses, cars, and factories

- ▶ **Higher prices don't come back to workers as higher wages**
 - ▶ Higher energy costs indicate extraction process is "less efficient"
 - ▶ More workers, more fuel, to extract same quantity of energy products
 - ▶ Energy workers are "**less productive**"
 - ▶ This is a major reason for lower productivity growth in recent years
 - ▶ Economy tends to produce fewer goods in total
 - ▶ Reason why the economy shrinks

Figure 7. Reason why wages don't grow.

This situation of lower and lower efficiency at extracting energy, as described above, is sometimes referred to as diminishing returns.

We can look at the problem from the point of view of the worker. He must make choices regarding which things to cut back on if energy prices rise, but his wages don't rise. The result tends to be recession.

Problem: Higher energy prices lead to recession

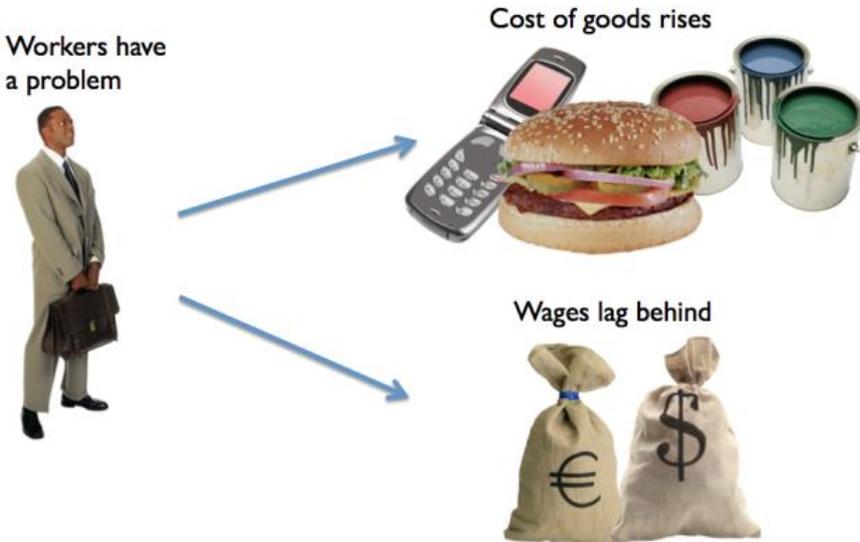


Figure 8. A worker must make choices, if prices of goods made using energy products rise, but his wages don't. These choices lead to recession.

"It behaves like billions of tiny solar cells, all connected in parallel."

– Lawrence Berkeley National Laboratory

THE DEATH OF SILICON SOLAR CELLS

[Company Behind this Breakthrough To See a 4,836% Increase in Revenue](#)



Higher prices for goods and stagnant wages together lead to recession

▶ Workers buy fewer discretionary goods



▶ Discretionary sector workers get laid off

- ▶ Layoffs lead to even more cutbacks in purchases

▶ Recession occurs

- ▶ Prices of commodities, including oil, coal, and gas, drop

Note: Photos from Wikipedia

Figure 9. Examples of discretionary goods include vacations using airline travel, new homes, and new cars. Other examples might include restaurant meals and charitable contributions.

Central Banks Can Fix the Problem Temporarily

If wages are too low to buy “big-ticket” items, lower interest rates and more debt can “sort of” solve the problem. The combination makes expensive goods more affordable on a monthly payment basis.

Central banks lower interest rates using QE – Make goods more affordable

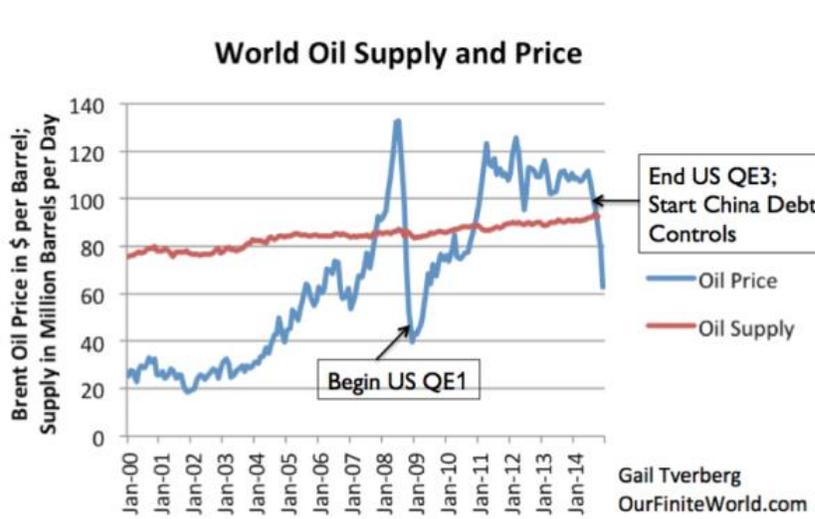


Figure 10. Comparison of world oil supply and price, as changes are made to interest rates using QE and other changes.

Quantitative Easing (QE) allows interest rates to be very much lower than normal. The United States first started using QE in 2008 when commodity prices dropped very low. The combination of the U.S.'s use of QE, and significantly greater borrowing by China to stimulate its economy, helped bring Brent oil prices back over \$120 per barrel by 2011 (Figure 10).

Figure 10 shows that, over time, QE has become less and less able to hold up oil prices. The price suddenly started to fall in 2014 when the U.S. discontinued its QE program and China cut back on its growth in debt. Oil is priced in U.S. dollars; the U.S. dollar rose relative to other currencies when the U.S. eliminated its QE program, making oil relatively more expensive for these countries. As a result, citizens of these countries were forced to cut back on discretionary purchases. This is what led to falling commodity prices of many kinds (not just oil) in mid-2014.

Since 2014, other countries besides the U.S. have maintained their QE programs. In fact, Japan and the EU have expanded their programs. Even with very low interest rates, commodity prices remain far too low for most commodity producers to be profitable. This situation could lead to catastrophe because metals, agriculture, and energy are all essential to the economy.

IMF Commodity Price Indices (2005 = 100)

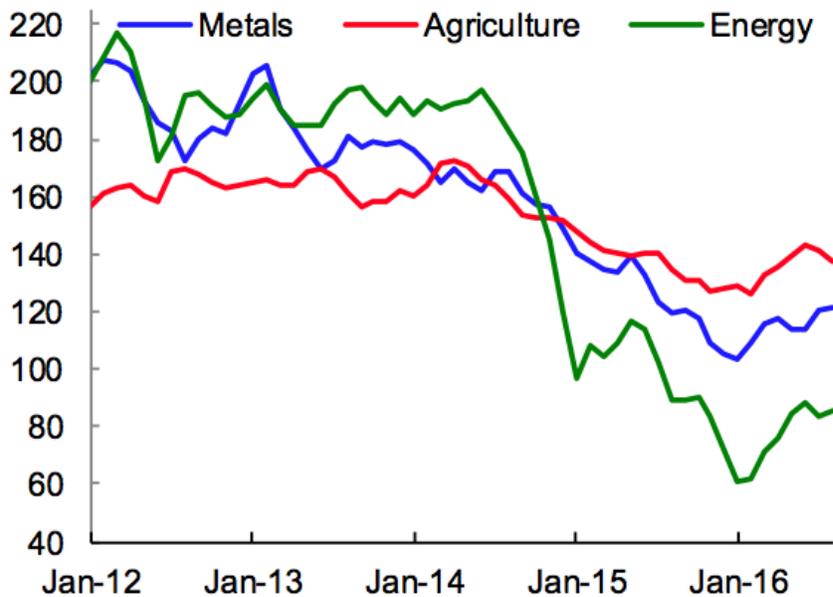


Figure 11. IMF Commodity Price Indices, from September Commodity Market Monthly.

Throughout the ages, there has been a problem with diminishing returns in producing food and other energy products. The standard workaround seems to be greater “complexity.” When complexity is used, specialization and more concentrations of energy are used to try to work around problems. For example, one solution is to make more tools and other capital goods that can be used to leverage the labor of workers. Another approach is to use larger companies with more hierarchical organizations to bring together more resources. For example, if the problem is inadequate food production, perhaps an organized group can build a dam, so that irrigation can be used to produce a greater amount of food on the same quantity of arable land. A third approach is more specialized training for some of the workers.

An unfortunate impact of greater complexity is an increasingly hierarchical society. While some workers benefit, a large number of non-elite workers accrue little benefit. Instead, lagging wages increasingly make the new, better products made possible by a complex economy less affordable.

What Goes Wrong?

There are several things that go wrong:

1. Non-elite workers find it increasingly difficult to buy the output of the economy. Their wages lag behind as more of the wages go to the workers with more advanced training and management responsibility. Because there are so many of these non-elite workers, their “demand” is needed if the prices of commodities are to stay high enough to ensure greater production of these commodities. With only low pay, non-elite workers find it difficult to afford houses, cars, and vacations. All of these use commodities, both when capital goods such as houses, cars, and airplanes are made, and later when these capital goods are operated. Low interest rates may not help these non-elite workers very much, because they lack money for down payments. Without as much demand, prices for commodities tend to fall.

2. Central banks lower interest rates, but not much of the benefit of these lower interest rates actually gets back to the buying power of non-elite workers. Instead, low interest rates tend to lead to higher prices of assets, such as land, existing houses, and shares of stock in companies. Unfortunately, these higher prices of assets do nothing for commodity prices. In order to raise demand for commodities, the buying power of non-elite workers needs to rise, so that they can buy the expensive goods that are no longer affordable.

3. The rate of return on investments tends to fall too low, because diminishing returns lead to ever more energy use (including human labor use) to produce energy products. Since capital goods are made and operated using energy products, the cost of their creation and operation is also raised. Each unit of debt required to finance new capital goods and new energy extraction tends to get lower returns over time. This results in the economy becoming increasingly less efficient, and productivity growth tending to fall.

4. Debt levels tend to rise for multiple reasons. One reason debt levels rise relates to diminishing returns with respect to energy extraction. What is needed when it comes to producing the kind of changes that underlie economic growth (for example, extraction of ores, heating of ores, and transportation of finished products to their destinations) is a particular quantity of energy, as measured in some unit of energy, such as British Thermal Units. If the cost of energy extraction is now five times as high as it was fifteen years ago, the quantity of debt needed to extract that energy may need to be five times as high. If the development process takes 10 years instead of 5, that may further increase the amount of debt required.

It is not only energy products that are affected by the need for a greater amount of debt. Products made using energy products, such as cars and homes, tend to become more expensive as well. If the prices of these products rise, more debt is needed to buy them, as well.

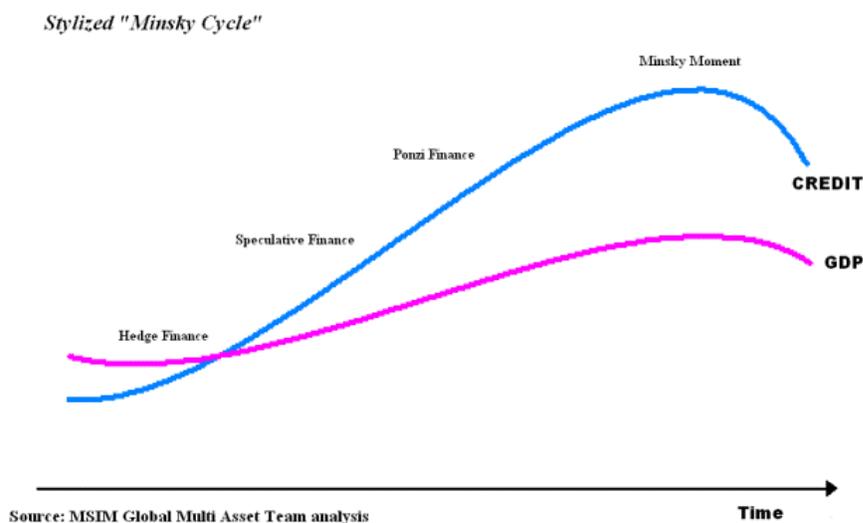
5. Another reason debt levels tend to rise relates to falling interest rates, and the impact that these lower interest rates have on asset prices. With lower interest rates, the purchase of existing buildings becomes more affordable, as does the purchase of shares of stock, so prices tend to rise. Customers buy these items, in the hope that capital gains will give them greater returns than the measly returns available from fixed income investments, and likewise, from new investment in new “productive” assets such as oil wells and factories. Most of this asset-based debt is not

productive debt; it is simply obtained in the hope of obtaining capital gains on existing assets as a result of ever-lower interest rates.

6. Relativities among currencies become more important. If the U.S. dollar rises, either because the United States is charging higher interest rates, or because it is not using QE while other countries are, then goods become relatively more expensive outside the U.S. In this situation, investment tends to fall in countries with perceived lower future prospects—in other words, in countries outside of the U.S. It becomes harder to keep debt levels up, and thus the buying power of the world economy. Downward pressure on the price of commodities becomes greater because of the loss of debt-fueled buying power.

7. Growth in energy supplies can be expected to slow and eventually begin to shrink, as low energy prices lead to lower new investments. Needless to say, these lower energy supplies adversely impact GDP growth, because of the connection between energy consumption and GDP growth. The countries likely to be affected first by low oil prices are oil exporters such as Venezuela and Nigeria. Many people will not make this connection, because they consider only the apparently beneficial impact of low fuel prices for oil importing countries.

Essentially, the problem being encountered is a physics problem. The economy is a dissipative structure. As it grows, it needs an increasing amount of energy to operate. If the energy is not available, it becomes increasingly subject to collapse. See my post, *The Physics of Energy and the Economy*. At some point, we can expect to reach a Minsky Moment. Such a moment involves a major drop in asset prices. We have already reached the corresponding drop in commodity prices that comes with diminishing returns, because fewer non-elite workers are able to buy goods made with commodities, and because of the higher U.S. dollar.



(Click to enlarge)

Figure 12. Stylized Minsky Cycle from Wikipedia.

We are waiting now for asset prices to fall to a level corresponding to what these assets can really produce. When this happens, the big drop in commodity prices will transfer back to the corresponding asset prices. For example, the price of land used to extract oil and gas should at some point drop to reflect the lower prices available for these commodities in the marketplace. The price of agricultural land should drop to reflect the lower prices of commodities that can be grown on them, such as wheat, cattle, and hogs. The price of land used to extract metals should drop to reflect the low value of metals. This drop in asset prices doesn't happen immediately, because everyone assumes that prices are going to bounce back up, and that the system will perform as it always has.

When prices of commodity-related assets drop to a level that reflects their true economic value, we can expect a huge number of debt defaults. This, of course, happens because these assets have been used as the basis for a large amount of debt. It will be difficult to save the financial system, because there will be huge defaults both on bank loans and on outstanding bonds. Banks, insurance companies, and pension plans will all be affected.

Can the Price of Oil Rise above \$50 per Barrel?

I am doubtful that the price of oil can rise very high, for very long. Our oil price problem is part of a much larger problem—a slowing economy with low prices for a large number of commodities, including oil. The price of oil can perhaps briefly rise as high as \$75 per barrel, but such a high price cannot hold for very long. Rising oil prices tend to lead to recession for oil importing countries, and recessions tend to bring commodity prices back down. The world clearly could not support a price of \$100 per barrel before the crash in prices in mid-2014. Once we understand the reason for our low-price problem—diminishing returns and the economy's tie to the use of energy—it is clear that there is no way out of the problem over the longer term.

In the not-too-distant future, our low commodity price problem is likely to become a low asset price problem. Once this happens, we will have a huge debt default problem. It will also become harder to obtain new loans, because defaults on existing loans will have an adverse impact on the ability of banks to make new loans. Interest rates required by bond markets are likely to spike as well. The lack of new loans will tend to depress demand further, because without new loans it is difficult to buy high-priced goods such as cars, homes, and factories. As a result, in the long run, we can expect lower commodity prices, not higher commodity prices. Oil prices may ultimately fall below \$20 per barrel.

By Gail Tverberg via Ourfiniteworld.com