The Oil Drum
DISCUSSIONS ABOUT ENERGY AND OUR FUTURE

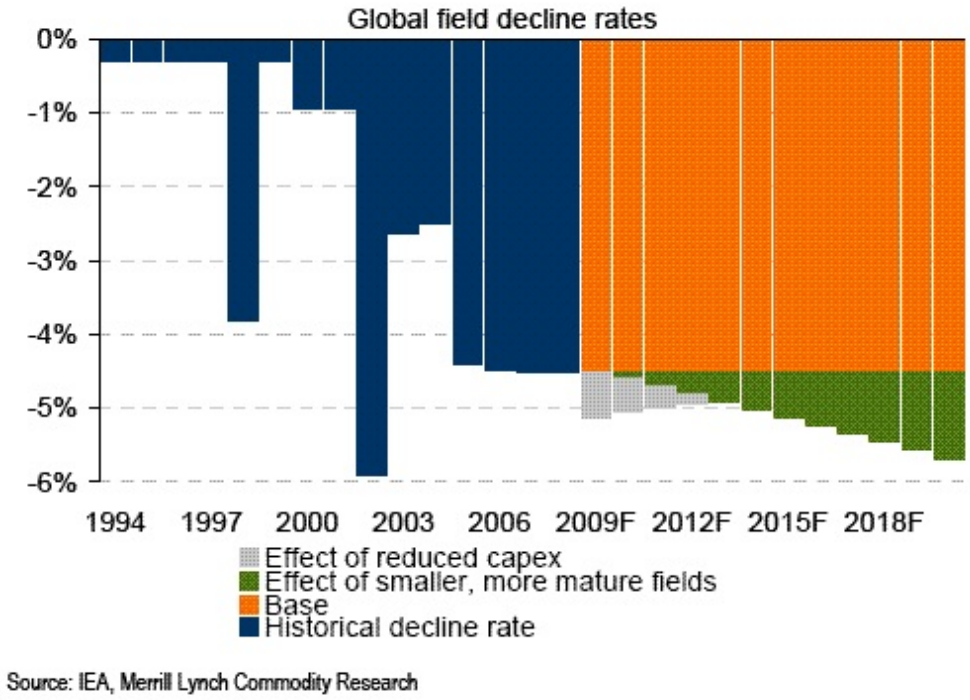
Mechanics of Future Oil Price Volatility (A Flubber Cobweb)

Posted by jeffvail on February 5, 2009 - 10:39am
Topic: Economics/Finance
Tags: global oil markets, oil demand, oil prices, oil supply, original, peak oil, price volatility [list all tags]

I previously examined the interface between peaking oil supplies and oil price volatility as a predator-prey system. With the rapid drop in oil prices, it's time to add another wrinkle to that story: widespread acceptance (psychosis?) about the stability of high oil prices acted as a damper on oil price volatility. Now that a collapse in oil prices is more than a mere theory, oil markets are poised for a long-term increase in price volatility.

The fundamental problem facing oil markets at present it this: while present supplies are sufficient to meet present weak demand, these sources of production face rapid decline. The current low oil prices are not sufficient to support the long term investment in future supplies, conservation, and consumption efficiency that will be necessary to mitigate the impact of this decline. Because of the time-lag between a sufficient price signal and oil reaching the market (or demand being reduced), and because of the impact of the recent price collapse on producer psychology, volatility will rapidly incrase as the market's price signal must make increasingly exaggerated moves to bring supply and demand into equillibrium.

Without ongoing investment to support present production levels, production decline rates will accelerate



Source: IEA, Merrill Lynch Commodity Research

Figure 1: This graph, from Merril Lynch, shows that reduced capital expenditure will have a sharp impact on field decline rates, but assumes this impact will diminish as our economy recovers and capital expenditure picks back up…

There are two key issues here:

1) The market's price signals react over much shorter time-spans than new supplies or investments in conservation or efficiency can be brought to market. Depending on the specifics, it can take anywhere from 2 to 10+ years to bring a new oil-field into full production. Therefore, even when oil was at $147/barrel, oil producers couldn't immediately realize profits from oil that would only cost $100/barrel to produce. The same is true with many efficiency and conservation measures—while the most elastic demand (e.g. Summer driving vacations) can be reduced rapidly, other conservation and efficiency efforts take much longer. Electrified rail takes years to fund and build out, and the gradual upgrade of the fuel efficiency of our vehicle fleet (or the replacement with electric vehicles) requires years of consistently high fuel prices or efficiency regulations that generally don't take effect until several years in the future.

2) Our recent market experience—a rapid crash in prices—undermines efforts at long-term investments in supplies. At $150/barrel, oil companies were willing to invest billions in new projects that, several years in the future, would bring production on line at a cost of $50, $60, or even $80/barrel. Because of the time-value of money, and because our energy futures markets are incapable of economically hedging entire oil megaprojects a decade or more into the future, oil companies needed to leave a large price cushion. $150/barrel oil did not justify a ten-year lead time to produce oil that would cost $140/barrel, even under the assumption that oil would remain at $150/barrel. This cushion shrank some during the (relatively) steady increase in oil prices from 2001 – 2008, and oil companies' willingness and ability to finance these projects increased. But now that the price of oil has crashed from $150 to $40/barrel, the prospect of a sudden drop in price is more than a mere possibility.

The result of this will be long-lasting: if oil prices again reach $150/barrel, there will be much greater reluctance to invest in long-range projects to produce oil at even $50 or $60/barrel. Similarly, the cost and availability of financing such projects has been dramatically reduced by the credit crunch. The result is that the more aggressive producers—those with the least cash and greatest incentive to take risks—are the least able to finance such projects. Those with the greatest ability to undertake such projects—select oil majors and many national oil companies—are also the most conservative and least willing to risk embarking on long-term, expensive production projects.

Continually Increasing Price Volatility

The principle results of this time-lag and shift in producer-psychology is that *price signals must become increasingly over-exaggerated to create the desired market effect*. The level of interest and willingness to invest in oil production that was spurred by 2008's $100+ oil prices will not be regained if oil again hits $100 or $150—it may be necessary for oil prices to hit $200, $250, or more to provide an adequate incentive for oil companies to invest in oil with a $50+ cost per barrel.

And, even when the price level necessary to spur sufficient investment is reached, the resulting production will not come on line immediately. Instead, it will take several more years to reach the market. During this time-lag period between sufficient price signal and new oil reaching the

market (or new demand being destroyed), prices will continue to move and push this market signal. If oil at $100/barrel is sufficient to incentivise investment in oil production to meet then-current demand, the market will continue to push the price signal past $100/barrel, especially as geological depletion continues to grind and the incentives for geopolitical disruption continue to rise.

As a result of the price rise during this time-lag, more production investment decisions will be made, and more demand will be destroyed, than was actually necessary to reach an equilibrium point. The result will be an inevitable overcorrection and price crash, restarting the price cycle. With each successive boom and crash cycle, the market psychology will become increasingly resistant to a given move in the price-signal, and *the degree to which the price signal must move to create an equivalent market effect will increase*. This will result in continually increasing price volatility as the market swings wildly to reconcile the ever moving targets with production and demand.

A Flubber Cobweb

The time-lag between market and fundamentals is exacerbated by inadequate futures markets and our own psychology. On a general level, this is a common process in economics, described by the cobweb model:

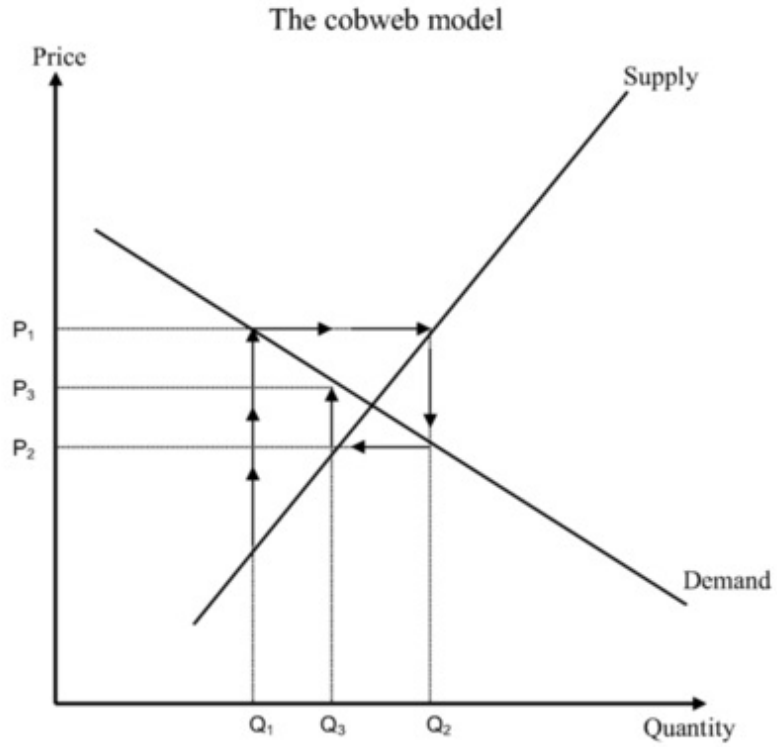


Figure 2: A classical economic "Cobweb Model" of supply and demand

This model shows a supply/demand spiral characteristic of a market searching for equilibrium in a steady-state environment—it is NOT characteristic of oil prices in a post-peak environment. Rather, once oil production has peaked, the spiral will work in the opposite direction with increasingly divergent P and Q brackets.

Under peak oil theory, Q must gerally decline, even if there is significant noise present. From a civilizational-perspective, I think there will be a great deal of information carried by what happens to P as Q approaches zero: If P1 and P3 diverge or generally trend higher as Q approaches zero, this may show a sign of fundamental economic strength in the face of peak oil —perhaps indicating that the realized EROEI of alternative energy supplies is sufficient to maintain a global-industrial economy. However, if P1 and P3 converge or generally trend lower as Q approaches zero, then I see this as the dimming of global-industrial system.

One important note: I don't think that these values carry meaning when measured simply in absolute dollar values—inflation, deflation, and other currency games introduce too much distortion. Rather, I think a measure of the dollar price of oil as a percentage of median national and global incomes (in dollars) will carry much more meaning when measuring the divergence or convergence of P1 and P3 going forward.

Add in declining supply due to geological and geopolitical peak oil and increasing global population and oil price volatility will rapidly accelerate over the next decade.

Discussion Questions:

1. How will this system interact with the global economy (itself a key driver of demand and cyclic in nature)?

2. Will oil price volatility be primarily characterized by increasing spread between price highs and lows, by a shortening of the period between highs and lows, or by some combination of the two?

3. This article suggests that oil price volatility will continually increase. At the same time, I generally criticize other theories that argue for perpetual increase (in population, GDP, resource consumption, etc.). Clearly, at some point volatility must either (1) slow or decrease, or (2) reach a functional maximum at which point market signals are reduced to meaningless "trading noise" and the market function ceases to provide utility. Which result, and why? In the spirit of Kurzweil (link) or Moore's Law (link), does this process lead inevitably to the end of markets? Half in jest, what if the causal mechanism of the Maya 2012 hypothesis (or insert your favorite apocalypse meme here) is simply global markets grinding to a halt as prices cease to carry meaning and we can't find a way to reverse the complexification that caused this?

**In light of these three concluding questions, I hope that it is clear that I am not intending to argue some fundamental "truth" with regard to ever-increasing price volatility, but rather that I'm using that argument to set up the three concluding questions (which I consider much more interesting and important in the long-run).