



Predicting Future Oil Prices

Posted by [Dave Cohen](#) on March 6, 2006 - 1:01am

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Tags: [market prices](#), [price predictions](#), [structural adjustment](#), [supply constraints](#), [volatile prices](#) [[list all tags](#)]

After reading several debates between [Stuart](#) and [Halfin](#) on the availability of supply and demand responses on many threads (eg. [here](#)) as regards future oil prices, I finally decided to take a look at the research about what is out going out there among the analysts who study these issues because I like to investigate things that I don't really know much about. I am not an economist--nor do I want to be one! But, if I can report stuff I learned along the way and share any insights I got about oil prices, that's all for the better. *Caveat Emptor*. If you economists on TOD out there believe I've made major errors in my analysis, you might let me know in a *gentle* kind of way. But I will point out that the various sources I cite have varying opinions although as I point out below, there seems to be a general *new orthodoxy* developing about the future of oil prices. I'll try to demonstrate that conclusion in this post.

Here, we will talk about pricing and the accuracy of the signal that the oil markets (eg. NYMEX, Brent) send us. My research leads me to believe that recent price rises over the last few years (both in the short term *front end* of the pricing curve and the longer term *back end of the curve*) are an indicator of changed fundamentals reflecting a real structural adjustment in the market and are not part of a "normal" historical up & down cycle in oil prices. So, in that regard, to try to prove my point, there are three major issues regarding oil prices I'll consider here and these are

- Can we predict the either the short term price (the *front end*) or the futures price (the *back end*) with any accuracy? What is the meaning of oil futures prices on *the back end*? Does this reflect a real structural adjustment in the oil markets reflecting fundamentals or is it a matter of spread trading (speculation, thereby hedging risk) and profit taking in the market behaviour (internal trading practices)?
- What is the history of the price of oil (especially after the oil shocks of the 1970's and structural re-adjustment that ended in 1986) and what were the assumptions guiding oil prices after that period that obtained until relatively recently (about 2002)?
- Do oil futures prices trends reflect a *cyclical* or *structural* change in the prices in the future? What's the difference or does this really matter? What's the perceived cause of these trends?

I am going to refer to the following sources for my information (aside from TOD posts) and, for convenience, I'll list them with a shorthand name. To be absolutely clear, when I refer to that name below the fold, that is a shorthand for the source listed below. As usual, I recommend that everyone read all of these articles and not just take my word for it about what they're saying and my summary & conclusions. These sources are the following:

- [Oil at \\$15-30 a barrel?](#) by James Hamilton at Econbrowser (2/22/06) -- shorthand is

Hamilton

- [Do Oil Futures Prices Help Predict Future Oil Prices?](#) (pdf) from [FRBSF](#) -- shorthand is *FRBSF*
- [The Future Price Of Crude Oil](#) by Paul Stevens for the *Middle East Economic Survey* September, 2004 -- shorthand is *Stevens*
- [The End of Cheap Oil: Cyclical Or Structural Change in the Global Oil Market?](#) by Herman Franssen for the *Middle East Economic Survey* February, 2005 -- shorthand is *Franssen*
- [Paul Horsnell thinks we are moving to a sustainable long-term price level](#) from the Oxford Energy Forum, Issue #62, 1st quarter 2006 -- shorthand is *Horsnell*

This post will assume nominal conditions and not consider so-called *oil shocks* (eg. a civil war in Iraq, an Iranian embargo, escalated disruptions in Nigeria, the assassination of Hugo Chavez, Al-Qaeda blowing up Abquaq or anything else, etc). Let's see where this goes regarding the three issues brought up above. But the first issue I will discuss is whether there is any statistical method for predicting future oil prices disregarding the fundamentals of the world-wide oil trading commodity market. This post runs pretty long, so I hope you'll have some patience reading through it.

Can we predict future oil prices?

I will not bury the lead, as they say in the journalism business. Even without considering (in my view, *probable* oil shocks), our ability to predict future prices in the next year or two (on the *front end*) and price further out (on the *back end*) even considering market fundamentals and a structural adjustment in oil prices is impossible given the large number of independent variables that must be considered. To state the obvious, if there were some reliable *magic formula* that allowed traders to predict short and long term prices, the commodities markets as in oil or in other basic minerals (eg. copper) could not exist in its current form. You can't predict the future. Uncertainty is basically what gambling is all about. Following your instincts based on incomplete knowledge, what you bet on follows from those intuitions and what you currently know. I will say here that lowering the NYMEX oil LSC oil price based on robust inventories that have been built up to hedge against probable future oil shocks/shortfalls is not rational behaviour. There is always a [risk premium](#) involved when you are betting on prices. In addition, front end upward movements in the price seem to depend on external events like hurricanes, unrest in Nigeria, the Iranian nuclear situation etc. This strikes me as sensible because if you're an oil trader, your willingness to take the risk underlies the buy transactions you are making because you are aware that sudden possible disruptions may make your locked in (albeit higher) price low enough to allow profit taking later. Of course, this can be hedged through the practice of [spread trading](#). Perhaps oil traders who contribute to TOD can illuminate these practices. One particular point I'd like to see addressed is the nature of the *correlation* between the short end and the back end prices especially in the current timeframe.

Is There A Purely Statistical Model That Predicts Oil Prices?

A posteriori, we know that no such model can exist as I stated above. Beyond hedging, profit taking and the like, a perception of the market fundamentals needs to be known to some extent and data pertaining to supply & demand in the *real world* confirming these fundamentals can only be known to a limited extent. It's ironic that the world's most important, fundamental resource that fuels "economic growth"--namely crude oil--is not subject to close transparent review of the production & consumption numbers. Let's look at two sources that tell us that models based solely on the historical market behaviour itself are essentially useless for telling us anything about future prices.

Here's what [Hamilton](#) posted recently regarding the possibility of \$15 to \$30/barrel oil in the future.

One way to approach such a question [of the plausibility of a return to \$15 to \$30/barrel oil] is to use regression analysis to try to predict, say, next quarter's change in the natural logarithm of the real oil price on the basis of currently available information. But the regression coefficient relating next quarter's change in the real oil price to the current quarter's change in the real oil price is essentially zero....

Even the constant term is statistically indistinguishable from zero (p-value = 0.51), meaning one really has no basis in the historical record for anticipating a tendency for real oil prices to move in any particular direction from here.

Given this result, Hamilton concludes that a [random walk](#) might be best for predicting future oil prices. Here's his data if "we use plus or minus two standard deviations to form a 95% confidence interval and convert from logs back to levels, we arrive at the confidence ranges implied by the table [below]".

quarter	lower bound	upper bound
2006:Q1	43.57	82.63
2006:Q2	38.16	94.34
2006:Q3	34.47	104.44
2006:Q4	31.64	113.79
2007:Q1	29.34	122.72
2007:Q2	27.40	131.39
2007:Q3	25.73	139.91
2007:Q4	24.27	148.33
2008:Q1	22.97	156.70
2008:Q2	21.81	165.05
2008:Q3	20.76	173.41
2008:Q4	19.80	181.79

*95% confidence interval for real oil price
(2005 \$ per barrel) at specified horizon if the
real oil price follows a Gaussian random walk*

To see a complete table out to 2010 look at Hamilton's post. Obviously, as he himself point out,

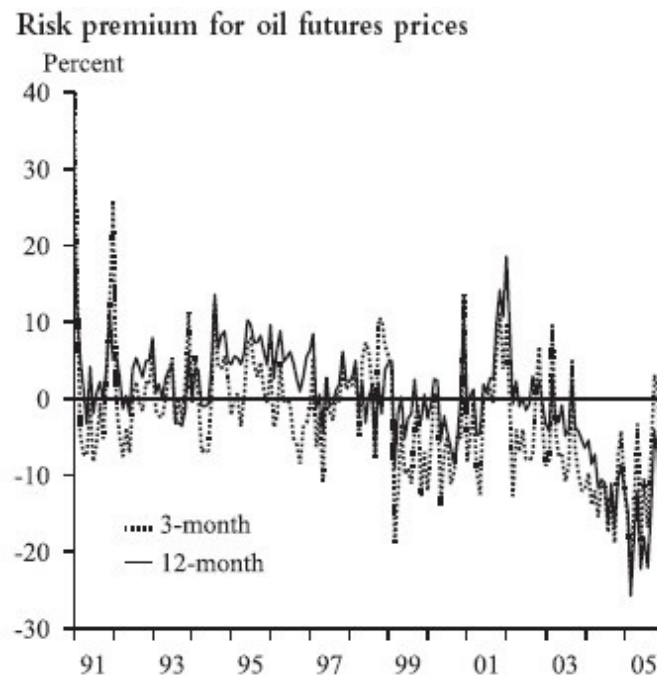
... surely professional forecasters can do better than this, one would think. Another way to judge how uncertain experts are about where oil is headed is to look at the volatility that is implicit in crude oil options prices. Using the [Black-Scholes](#) formula, one calculates an implied volatility from current values of options on NYMEX that corresponds to an annual standard deviation of 32%-- the identical number as from the historical volatility above.

Stating the obvious, these results are useless and depend solely on a random walk to try estimate market prices without considering market fundamentals. Let's consider the more sophisticated [FRBSF](#) modelling for predicting future oil prices--again without any regard for market fundamentals and the the long term structural adjustment that is happening in the markets regarding oil prices.

First the authors Tao Wu and Andrew MacCallum state their intentions.

Is the price of oil likely to rise further, or will it decline gradually, as it did in the mid-1980s? A natural place to look for an answer is in the markets, where oil traders are knowledgeable about the industry and where their profits ride on making sound investments. This Economic Letter discusses how to forecast future oil price movements based on information from both the oil futures market and the spot market. In particular, we conduct a series of forecasting exercises and compare the performance of models that use oil futures and spot prices in an attempt to find the one that performs best.

Initially, they consider the "risk premium for oil futures prices, defined as the difference between the oil futures price and the expected future spot price from the Consensus Forecast's survey. The difference is expressed as a percentage of the current spot price." See the paper for further details.



Risk Premiums for Future Oil Prices - Figure 1

As they note, although the average risk premium for future oil prices is about zero, there is a large amount of volatility over time. From this they conclude that "oil futures prices are not necessarily the best predictor of future oil prices". So instead, Wu and MacCallum consider the extent to which the current, or spot, oil price helps predict future oil price movements. Since I am only giving a brief overview here, I suggest looking at the paper itself for the methodology used. Four models are considered.

We formulate four models based on oil futures prices and the spot oil price. The first is a *random walk* model, which predicts that spot oil prices will stay at their current levels. This is the simplest statistical model and provides a benchmark to evaluate the forecasting performance of other models. Second is [Hotelling's model](#), which predicts that the future oil price will be the current spot price adjusted for the interest rate. Third is a *futures* model, which predicts an oil price level in the future identical to the current futures price level. Fourth is a *futures-spot spread* model, which uses the spread between the current futures prices and the spot price to predict movements in the future price of oil.

As it turns out, the *futures-spot spread* model performs best--a technical description of how spread trading works is provided by [Stevens](#). The *Hotelling* model does second best and slightly better for longer time ranges. However, as far as predicting future oil prices goes, great uncertainty reigns.

Based on these data, the "futures-spot spread" model projects a slight increase in oil prices, with the spot price rising to \$65 per barrel by March 2006 and \$67 per barrel by December 2006. However, the accuracy of such forecasts is quite low. For instance, we can only say that, with 90% certainty, the spot price in March 2006 will be between \$55 and \$74 per barrel.

...taking into account the relationship between current spot and futures prices instead of considering only the raw futures price can significantly improve forecasting accuracy. Prediction errors, however, are still substantial, and accurately predicting the future price of oil seems as elusive as ever.

So predicting future oil prices based solely on models of market behaviour itself is not really possible as we would expect. Whoever could do that would truly be a rich person indeed. Ironically, I will say that the Nymex price on 3/3/06 stands at \$63.67/barrel which is close to the March 6 price of \$65/barrel quoted by Wu and MacCaullum.

A Little History and the Old Orthodoxy

The papers from [Horsnell](#) and [Franssen](#) describe the history of oil prices in the period 1986 to about 2002 or so. This time sequence starts after the oil shocks of the 1970's and early 1980's and when oil prices collapsed in mid-1980's. Looking back, the collapse was largely due to 3 factors

- High prices had promoted efficiency and fuel switching which adjusted demand for oil downward.
- OPEC--especially Saudi Arabia--turned on the spigots and flooded the market.
- New non-OPEC production came online (the North Sea, Prudhoe Bay)

From Franssen:

By the early-to-mid-1980s, price induced efficiency gains and fuel substitution caused oil demand to decline, non-OPEC supply to rise and demand for OPEC oil to contract sharply resulting in a collapse in oil prices. Some oil market analysts correctly predicted at the time that the high oil prices of the early 1980s were not sustainable and were

bound to fall, but few predicted the extent of the decline in demand for OPEC oil and the subsequent oil price collapse of 1986.

The 15 years following the 1986 oil price collapse were characterized by low global oil demand growth, steady annual increases in non-OPEC oil production, large OPEC spare production capacity and ample refining/tanker spare capacity. As a result, a new consensus developed, which lasted for almost two decades – that the long-term equilibrium oil price was somewhere around \$18-20/B (average price from 1986-2000).

This "Goldman-Sachs" consensus became a dogma during this period. From Horsnell

The view was very precise, in that the long-term oil price was generally put as being between \$18 and \$21 per barrel. Indeed, the market's perception of where to place the back end of the crude oil futures curve very rarely strayed outside that \$18 to \$21 interval over the whole period from 1986 to 2002. The \$18 to \$21 range became the touchstone for views of what represented normality, and any hypothesis that suggested prices could be higher than that range was considered heretically abnormal. Governments thought in terms of that range, as did financial markets.

As Horsnell describes it, what he calls an "*ex post* rationale" developed for this orthodoxy. If prices started to exceed the \$20/barrel range, investment in non-OPEC capacity would increase the supply side and demand growth would decrease due to higher prices. Prices would fall back to the nominal range.

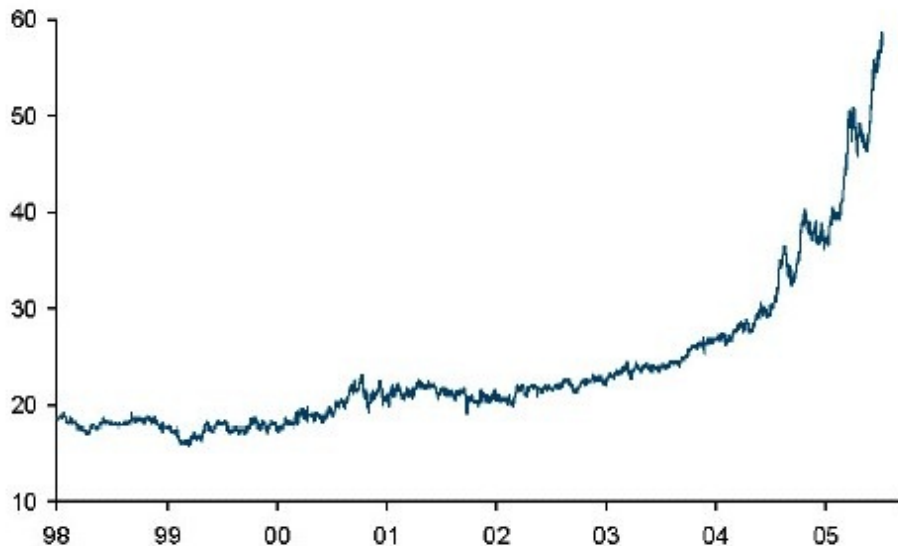
So, some analysts in the early 1980's had predicted that the oil shocks period represented a *cyclical* change in oil prices and prices would return to low levels after an adjustment period. In other words, there had been no *structural change* in which prices would reach a new much higher sustained level. These analysts were right for the period in question from 1986 on until about 2002. Thus, the view was re-established and reinforced that higher price periods were always cyclical in nature and after an adjustment period would return to normal levels. We see this idea directly in the view of CERA and Daniel Yergin today and expressed in [Stevens](#) writing in September of 2004. I will return to Stevens below since he presents the most direct arguments against so-called "depletionists". That would be most of us at TOD.

During the period of orthodoxy described above, oil futures prices on the back end stayed around the nominal \$18 to \$21/barrel range. Even during the Gulf War of 1991, when there was a spike in oil prices, the market had faith. For example, writing in [High oil prices are here to stay](#), Jeremy Baker of UBS says

During previous price spikes – for example, during the first and second Gulf wars – spot prices soared but the two-year future price remained relatively constant.

This suggested that the global oil market looked beyond the short-term crisis and focused on longer-term stability.

This graphic from Horsnell shows the trend since 1998.



Five-year Forward Price of WTI, \$/b.

Source: Barclays Capital -- Figure 2

As you can see, the forward price has turned upward dramatically since about 2004 and continues to rise to this very day as does the short term price. As this phenomenon continues a new orthodoxy is emerging to explain it. However, the issue of why current and futures prices are high is contentious but standard viewpoints converge as we shall see.

Cyclical or Structural? The Emerging New Orthodoxy

There are two basic positions about what these high futures prices indicate. If you are a structuralist like Horsnell or Franssen, then the view is that at least over the mid to longer term (5 to 10 years) out, high prices will continue albeit with great volatility. Horsnell puts it directly.

Very few would argue today that \$20 is the correct long-term price for oil. However, it should be noted how that change came about. The rejection of the orthodoxy was not the result of any debate or examination that concluded that supply and demand side responses were not as strong as had been assumed. Instead, the rejection came about simply because oil prices rose, and then kept on going....

For the marginal cost of non-OPEC oil to have followed the path of Figure 1 would be something of a stretch in our view, but that concept is still in the wild. Likewise, political discussion of the oil price still follows some very well worn grooves. Throughout the current year, various politicians have argued that higher prices are either the fault of observation, i.e. if the market had a better understanding and better data it would produce lower prices, or that the rise is temporary, or that it is simply the result of speculators or other dark forces. Even now, among many analysts and consultants there is a belief in a sharp increase in non-OPEC supply growth that will create a sustainable price collapse, i.e. they would say that old theory was perfectly correct but it is just a tad slower to operate than was first believed.

But in seeming contradiction to this position, Horsnell still presents this view, which I regard as the new orthodoxy.

Our view is the sustainable level of long-term prices is that which creates enough investment along the entire supply chain to maintain a reasonable degree of spare capacity, while also ensuring that producing countries are able to maintain some growth in employment and in per capita incomes. That would argue for a long-term price of at least \$50, with higher prices needed into the medium term to allow for some catch-up, particularly in the downstream, from the last decade of the 1990s.

This new orthodoxy rests on fundamental assumptions used by the IEA, Yergin, Stevens and others. These are as follows.

- The "call on OPEC" by OECD countries will increase production by the cartel member countries, especially Saudi Arabia and generally in the Middle East.
- Rising demand in Asia is straining the supply/demand equation but is still not a significant enough factor to keep prices rising indefinitely.
- Unconventional sources (eg. the Canadian tar sands) will easily replace harder to develop conventional oil.
- Lack of E&P and refinery investment, especially in the 1990's by the oil industry and further downstream in the supply chain accompanied by the unexpected rise in demand in the early 2000's caught everybody by surprise.
- Since there is a long lag time between discovery or reserves growth from existing resources and actual new production, there is a "catching up period" which will last at least 5 years from the present.
- There is still growth to come from non-OPEC producers, especially Russia but also from many other medium size smaller producers like Angola.

To sum up, the new orthodoxy says that there will be high prices in the medium term but they will level out to about \$50/barrel after the appropriate structural adjustments have been made. This is directly expressed by Jeremy Baker.

Supply cannot easily rise to match demand because of underinvestment in both exploration and refining capacity in the past two decades. High prices are, of course, encouraging a new wave of investment, but new oil fields and refineries take years to come on stream. A case in point is a new deep water offshore production project off the West African coast. The time horizon from appraisal to final development was around 10 years. New refineries also take a long time to construct and projects are further complicated by environmental regulations, which means many new refineries are being built and planned in emerging market regions. We're not running out of oil, it's just that the oil industry hasn't kept pace with demand.

The new orthodoxy is based on a structural adjustment but there are some who believe we are simply in a price cycle. [Hamilton](#) excellent article cites Yergin in [It's Not the End Of the Oil Age](#) from which I take this quote.

Where will this growth come from? [the usual argument that there will be an additional 16/mbpd of new capacity by 2010] It is pretty evenly divided between non-OPEC and OPEC. The largest non-OPEC growth is projected for Canada, Kazakhstan, Brazil, Azerbaijan, Angola and Russia. In the OPEC countries, significant growth is expected to occur in Saudi Arabia, Nigeria, Algeria and Libya, among others.

Perhaps he is now taking a different view considering Katrina and geopolitical events, but Yergin is on the radical side of the new orthodoxy and seems to actually assume it here according to the assumptions I list above. Prices will go down and end the current volatility. And finally, on to [Stevens](#) who takes on the Peak Oil community directly. First, he believes (or did in 9/04) that higher oil prices on both the front end and back end were due to spread trading ie. speculation. This precludes any actual structural change in market fundamentals. Second, lack of investment in the oil industry was due to pressure to maximize returns to shareholders. Stevens agrees with the "depletionists" that prices may remain high but those of us in the peak oil community may right (in the medium term) for the wrong reasons.

It would be a delicious irony if, after all this time, they [the "depletionists"] were eventually proved right but for entirely the wrong reasons. The key issue is investment by oil companies in exploration and production. Although this argument could be extended to other stages in the oil industry value chain, this short paper will focus only on the upstream....

Simple economics argue that high prices produce a supply response creating a self correcting mechanism. However, this tends to neglect the lead times involved. In upstream oil, the lead times for new capacity can be between five-to-eight years. Thus the crude shortages resulting from the current outflow of potential investment funds could be around for quite some time, together with their resultant high oil prices.

So why are we Peak Oil people wrong? I will number the three reasons within the quote (there are actually four reasons).

Their [the Peak Oil] argument, based upon the constraints of reserves, is seriously flawed for three reasons. [1] First, it assumes a fixed stock of "conventional" oil reserves. This ignores the role of investment and while I will argue below this is a key issue, it has no part in the "depletionists" battery of arguments. [2] An even more egregious error is that it ignores the potential from "unconventional" oil reserves. [3] Second, it assumes future oil demand will grow without limitation along the lines suggested by the IEA. Again, there are a great many arguments which can be deployed as to why various drivers will eventually slow such growth. These range from environmental and security of supply concerns together with consumer governments in developing and transition countries using sales taxes on oil products to raise revenue, to name but a few. Finally, [4] it ignores the feedback loops provided by markets. Growing shortage would increase prices which would in turn reduce the quantity demanded and increase the quantity supplied.

Concluding this section, the new orthodoxy contains various elements but in any case, the argument is that the current high prices both on the front end and back end (futures) is cyclical. The only disagreement is whether 1) prices will go down, perhaps radically (eg. \$30/barrel, short cycle, Yergin) or 2) prices will go down and level out at a higher price (eg. \$50/barrel, structural, Horsnell). For the Yergin price quote, see [Yergin: Oil price should settle at \\$30 price floor](#) (pdf) from Petroleum News, June 2005. Everyone agrees on higher prices in the short or medium term but future prices will stabilize at some lower level. So, that's the new orthodoxy in thinking about oil prices. I will now argue against this new orthodoxy for oil prices or, at the very least, the assumptions that underlie it.

Analyzing the New Orthodoxy

To start with, Horsnell makes the following sensible point.

The move up in prices is not a shock, it is an adjustment towards a sustainable long-term price level. It has been in progress for too long, and has been too gradual to be a shock, and indeed that has been the major reason why the macroeconomic impact has been relatively benign. Had prices gone from \$20 to \$60 very quickly there would have been a strong impact effect. As it is, a sustained move up with relatively gentle year-on-year changes has allowed demand growth to continue fairly robustly.

But let's refute this new dogma on a case by case basis considering its underlying assumptions as I laid them out in the last section. Here are my responses to Stevens' points about "depletionists" as outlined in the previous section.

1. Re: First, it assumes a fixed stock of "conventional" oil reserves. This ignores the role of investment...

Yes, the Peak Oil community does assume a fixed stock of conventional oil that Stuart estimated at **URR is 2250 ± 260 Gb** in [Extrapolating World Production](#). But the real point is that we are *very concerned* about investment--the concerns being that the major IOC's spend more money doing "drilling on Wall Street" acquiring the assets of smaller companies than for E&P and particularly that new investment is not finding much new oil. Recently, Bubba posted [2005 Exploration Round-Up](#). Prior to that, I posted [The End of Exploration?](#). The point is that money invested in E&P has less and less of a payoff because there is less and less new oil to find (unless the IOC's are increasing investment somewhat because whatever *they do manage to find* will be worth so much more in the future--a point that [Hamilton](#) seems to make). But for now, to see oil supply elasticity with respect to price as far as ExxonMobil goes, see Stuart's graph at [Speaking of bumpy plateaus](#). The assumption most notably made by the IEA that throwing trillions of dollars at the problem will fix the production side of things is incorrect according to everything we know from actually examining the data. Investing in existing fields to try increase recovery rates may raise the URR for the fields in question eg. using CO2 injection for EOR but that has a very limited applicability generally.

2. Re: An even more egregious error is that it ignores the potential from "unconventional" oil reserves.

Not at all. What we have noticed about "unconventional" oil sources is that when they are successfully produced, as with the tar sands of Alberta, the production costs are enormous and the oil is more difficult to extract and process. In other words, at best you can only get small incremental increasing production year-on-year. If these tar sands are producing 3 or 4/mbpd by 2015, so what? That would not nearly offset depletion from existing giant fields like Cantarell or the anticipated deepwater peak in about 2012.

As far as other unconventional sources go, so-called oil shales are decades away from commercial production and even if they *do* go into production, they would face the same problems that the tar sands do as just stated above. As for Venezuelan [heavy oil and bitumen](#), there are large difficulties both upstream in production and downstream on the refining side. There is no evidence this source will come to rescue. And on and on regarding GTL, CTL, etc.

3. Re: Second, it assumes future oil demand will grow without limitation along the lines suggested by the IEA.

This gets back to the assumption about rising demand in Asia and other developing countries. Actually, the overall production decline rate is the limiting factor as Stuart describes in [Hubbert Theory says Peak is Slow Squeeze](#). One point underlying this view is that Asian countries like China and India will engage in the kind of structural adjustment (efficiency, fuel switching) that the US did in the 1973 to 1986 period, thus slowing demand growth. In fact, it's the IEA (as Stevens notes) that believes in ever-rising demand, not the Peak Oil community. At the very least, demand will finally hit the supply wall (and probably already has at the current prices).

4. Re: it [the peak oil argument] ignores the feedback loops provided by markets. Growing shortage would increase prices which would in turn reduce the quantity demanded and increase the quantity supplied.

Thank you for this lesson in Economics 101. Increasing production is the problem and faith in the laws of supply & demand will not solve it. Yes, higher prices will make some additional oil economical to produce but throwing money at the problem will not induce God to put more oil in the ground.

Answering Stevens addresses most of the assumptions of the new orthodoxy about oil prices. But here are the others.

- Re: There is still growth to come from non-OPEC producers, especially Russia but also from many other medium size smaller producers like Angola.

Even ExxonMobil admits that non-OPEC production will peak about 2010. It has been [Russia](#) and increasing deepwater production from places like the Gulf of Guinea, the GOM and Brazil that has kept non-OPEC production flat for the last few years. On the other side of the equation, the North Sea is in steep decline, there are legitimate questions about Mexico's ability to maintain production levels, Canada may be able to make small incremental increases in their exports but the more general truth is that the large majority of non-OPEC suppliers have peaked.

- Re: The "call on OPEC" by OECD countries will increase production ... in the Middle East.

If Saudi Arabia's recent flat production (see [Cigar Now](#)) indicates a future trend, George Bush holding hands with Prince Abdullah won't make much difference. Of course, there is a wide range of opinions about the Aramco Black Box ranging from Simmons' "Twilight in the Desert" to theories that Saudi Arabia is increasing production incrementally to control prices. Beyond that, there are the questionable reserve increases in the 1980's and recently [Kuwait](#) appears to support theories that the reserve inflation in OPEC countries at that time was a fiction. In addition, [Nigeria](#) is a total mess. Venezuela's production has never reached production levels it had prior to the work stoppage in the 2002/2003 period. So, there are certainly legitimate concerns about OPEC's ability to increase production going forward.

And so in conclusion, I am not considering major oil shocks in this post, so I won't belabor the point that some kind of geopolitical disaster could send front end prices through the roof. However, no source I reference in this piece even *considers the possibility* that flat (or even decreasing) oil production in the medium term (5 years out or so) could cause a world-wide

recession, dampen demand considerably and therefore lower prices. To paraphrase Stevens, "It would be a delicious irony if, after all this time, they [**those holding the orthodox view**] were eventually proved right [about lower oil prices] but for entirely the wrong reasons".

On the other hand, future oil prices may eventually level out but at a price well over \$100/barrel because Economics 101 no longer works anymore for an increasingly scarce commodity like oil where the cost of new production goes up and up. In addition, the industry is running out of skilled labor who know the business. I'll end with a quote from [Hamilton](#) . Talking about the possibility of \$15 to \$30/barrel oil in the context of why the oil companies are not selling lots more oil at the current high prices now as a hedge against a collapse in the price, he says

Maybe the argument against hedging is based on the notion that these futures markets are so thin that if Exxon-Mobil starting selling in a bigger way, it would quickly move the futures price. I'm not convinced that such an argument is correct. The futures price is linked through arbitrage to all sorts of other prices in a very big world, and a thin market is no reason to believe the price should be anything other than the fundamental equilibrium value. Increasing sales need not bring about a big change in the price even if the market is currently thin. And even if the market thinness argument were correct, it still makes no sense to me as an explanation for not buying some degree of a hedge, if what you're really worried about is the possibility of a precipitous price collapse. Such concern would go beyond the joke about the economist who won't pick up a \$20 bill on the sidewalk because his theory predicts it shouldn't be there. In this case, we won't pick up a \$20 bill that we're absolutely sure is right there on the sidewalk on the grounds that, if we took it, we don't know how many more \$20 bills will float down to take its place.

Specifically, that's two \$20 bills for every barrel the oil companies choose not to sell forward. At a few million a day, that might add up.

Predicting future oil prices? Who knows? But I'll bet we'll never see \$30/barrel ever again.



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