The Oil Drum: Europe
DISCUSSIONS ABOUT ENERGY AND OUR FUTURE

How to Address Contrarian Arguments – part III

Posted by Luis de Sousa on February 8, 2007 - 10:43am in The Oil Drum: Europe
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On this third installment of the Contrarian Arguments series we'll address the "**Markets Will Solve It**" claims.

A regular economist will tell you a fable like this:

> If a shortage of potatoes occurs either by lack of supply or by growth on demand the market price will rise. This new higher price will signal to the farmers a need to produce more. Supply will rise, meeting demand, lowering the price and bringing the market back into balance.

Let's see what's wrong with this apparently correct logic.

Warm Up

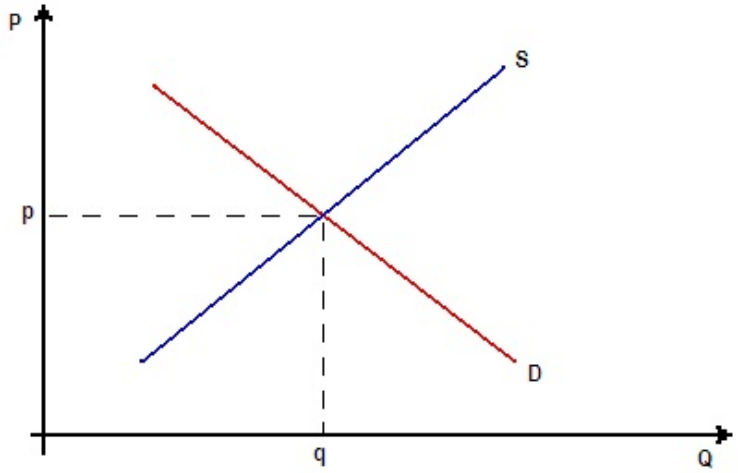
In spite of the mathematics behind it and the historical data supporting it, Peak Oil is often dismissed on the basis that (free) markets avoid such phenomena. The so called Market "Magic Hand" purportedly guarantees that the right amount of a commodity is traded at the best price. The "Magic Hand" will take care of any occurrences that momentarily disrupt this balance.

From a regular economist's point of view Oil is like any other good or commodity subject to the same rules above. As you might suspect it isn't so. In the next lines we'll see why and what is the real role of Markets and Prices in Oil Depletion.

The Basics

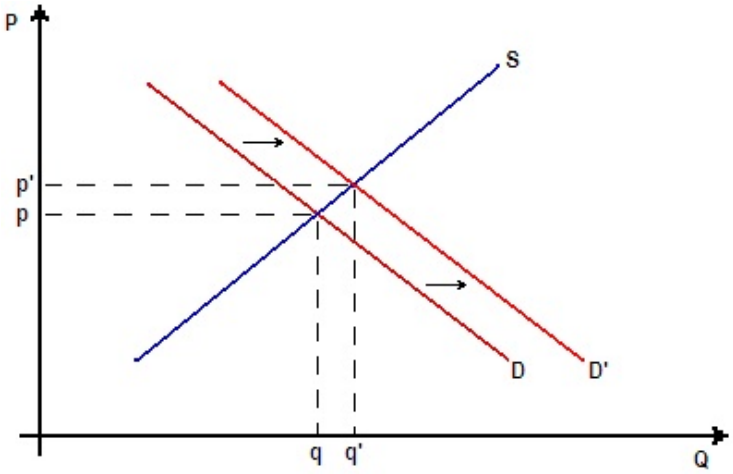
For starters we'll use that old Price vs Quantity graph (if you never heard of it I think you'll understand anyway, but you can learn more about it here or at Wikipedia). On the yy axis is represented the Price, on the xx axis is represented the Quantity traded for the good or commodity in study. To represent Demand a curve with downward slope is used - the higher the price the less consumers can by, as price lowers consumers are willing to buy more of the good. Supply is represented in an opposite fashion – the higher the price the more goods producers are willing trade, at lower prices producers will not be willing to sell as much.

In real life Demand and Supply are not linear, hence called curves, but for didactic purposes are usually represented as straight lines. These two curves meet at a specific point - the equilibrium. If the Demand and Supply curves used represent the market correctly, the equilibrium point determines the price and quantity traded of the good in question, as seen below:



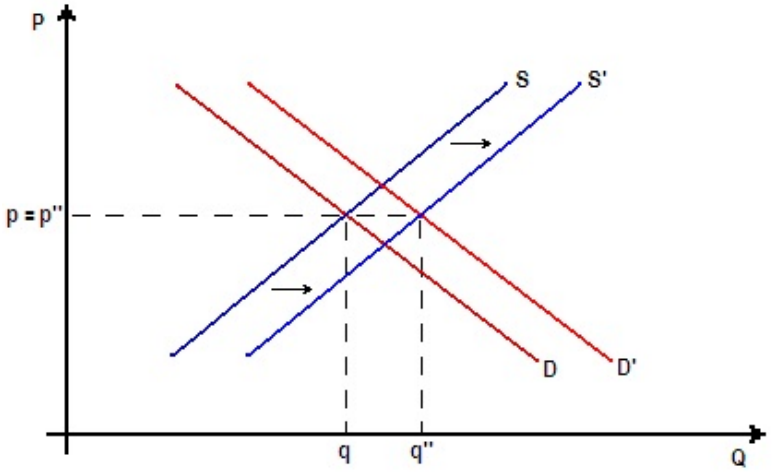
Market Equilibrium. On an unconstrained Market, price and quantity traded are set by point where Demand and Supply meet.

Now imagine that consumers really like this particular good, or become more dependent on it, in that case they'll be willing to buy more than before. This case is modeled by shifting the demand curve to the right. As seen in the next picture a new equilibrium point will unfold, where more goods will be traded, but at a higher price.



The Demand curve shifts right to reflect a new will from consumers to buy more of the same good.

More goods traded at higher prices, this means profits for producers. This new profitability will make the market attractive for new producers that will make more goods available to trade. This new movement in the market can be modeled as a right-ward shift of the Supply curve.



The higher price set by the right shift of Demand triggers in its turn a right shift in Supply.

On a free market (without price or quantity regulations) after these two moves the final price will be the same as the initial. Such is the market "Magic Hand". In a market with perfect concurrency (goods are not differentiable from producer to producer) goods are sold at the lowest price possible, and producers get virtually zero profits over base costs, benefiting consumers the most.

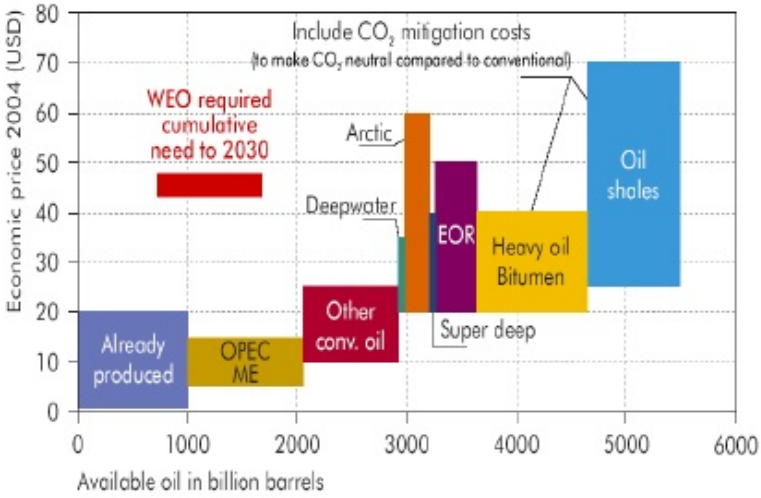
In the case of Oil this kind of movements happened constantly for about 20 years, from the mid 1980s up to 2004, where global demand for Crude plus NGL moved up from 57 Mb/d to 80 Mb/d. During that time Oil prices moved very little, apart from the 1990/1991 period with the invasion and subsequent liberation of Kuwait. Sometimes one tends to forget about this little detail, Oil demand has been a monster growing relentlessly.

So the regular economist might be right to some extent. Before moving on give it a little thought: is the present Oil market a free one?

Prices and Reserves

Among the financial and economic communities there seems to exist a hidden belief that Oil Reserves are set by prices. If prices go up by growing Demand then Reserves should follow, in order to allow Supply to match it. Even if Reserves grew with prices, it's the flow of Oil to the market that has to grow in order to meet Demand. It's really hard to understand why such belief exists or what created it, because there's no physical or logic reason to think that way.

Unfortunately some institutions not only fail to dismiss such naive beliefs but even seem to propagate them. Following is a graph produced by the IEA that leads one to believe in some sort of link between prices and recoverable reserves:



IEA's Reserves ties with Prices.

Hopefully the IEA has already made its act of contrition with the last World Energy Outlook, acknowledging energy supply problems in the next decade. But what the economics and environmental folks remember is that nonsensical graph.

The amount of oil found at a certain reservoir was formed dozens of million years ago, it's a physical reality impervious to what happens above ground in the market. Whatever the price of a barrel of oil, whatever the amounts of money oil companies hold, the amount of oil remaining in a reservoir is the same. Pretty obvious, but hard to understand for some.

One could remotely argue that it is the money that oil companies hold that make it possible for the exploration of a certain reservoir. But that money only represents the availability of surplus energy to produce more oil, what really makes a reservoir producible is the energy profit that it will yield. As we shall see in the next section, the price of oil (and in tandem the money resources that oil companies may hold) are just mechanisms to set which reservoirs are more profitable and should come on stream first.

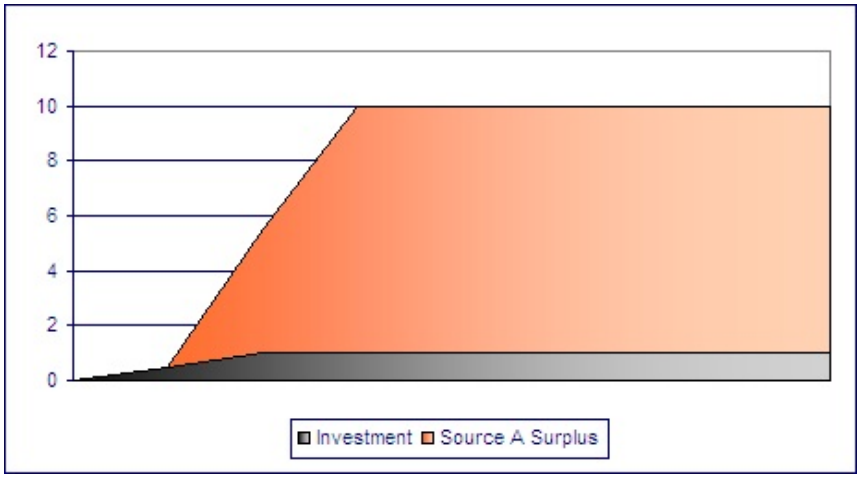
Money and Oil Flows

If it is the net energy that determines the amount of oil recoverable from a reservoir, what's the role of oil prices? Actually they have a very important role, they set at each point in time which reservoirs should be on production, pushing those with higher EROEI first and leaving those with lower EROEI for last.

To illustrate this effect let's use another parable: imagine there are two different energy sources available for exploration in an imaginary country (it could be Melnibone if you like):

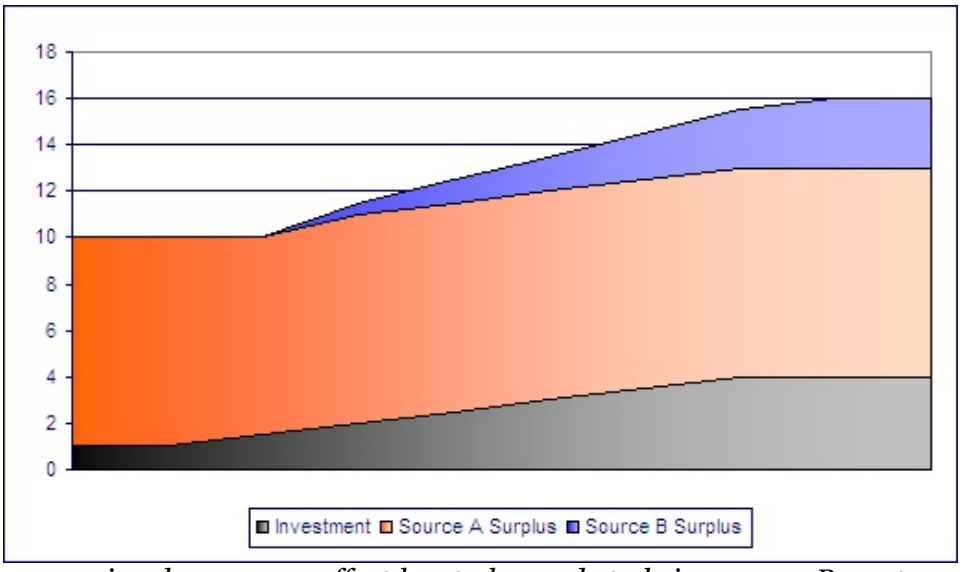
. Energy Source A producible with an EROEI of 1:10 at a maximum rate of 10 energy units per time frame;
. Energy Source B producible with an EROEI of 1:2 at a maximum rate of 20 energy units per time frame.

In the beginning there's one energy unit available got from human hard work, and energy demand of 9 energy units. Although with larger reserves, energy source B does not provide enough profit for the current energy demand given such low input, so in the market it'll have a prohibitive price. As for energy source A its market price will be lower and affordable, for it fulfills the entire energy needs of the imaginary country. If supply keeps steady we have equilibrium, were at each time frame 10 energy units are produced, 1 to produce energy in the next time frame and 9 to meet demand.



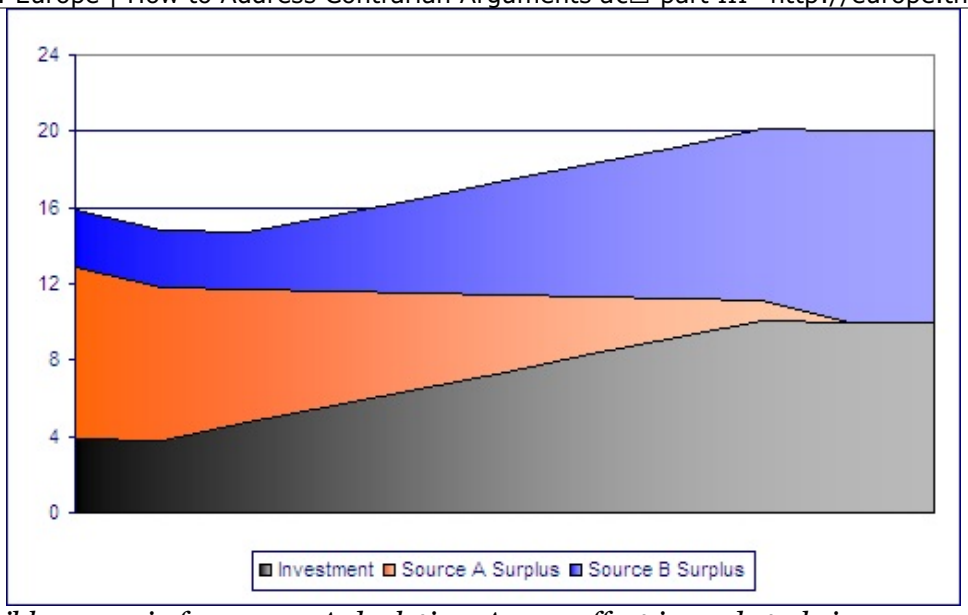
A possible scenario where energy production gets started from source A, covering a Demand of 9 units per time frame.

Now imagine that demand rises to 12 energy units per time frame. Energy source A wont suffice, energy source B has to come on stream. In this case equilibrium will be achieved by producing 10 energy units from source A and 6 from source B. In order to achieve this new equilibrium a period of turbulence will be underwent in order to raise the energy inputs needed to put source B on stream – this is where the price comes in to play. Until the new equilibrium is found the price will go up reducing demand and opening space for higher investments in the following time frame. After the new demand of 12 energy units is fully met the price will come back to its original value.



A possible scenario where a new effort has to be made to bring source B on stream. After a period where total surplus diminishes a new Demand of 12 units is finally covered.

Take now a new scenario where energy source A goes in to depletion, diminishing 10% per time frame. The price will go up again to make possible the coming on stream of the full production from energy source B. But after the depletion cycle is over only 10 energy units will be available for trade, the price will remain high to keep Demand low.



A possible scenario for source A depletion. A new effort is made to bring source B into production but in the end the original Demand of 12 units cannot be met.

Prices basically set the order by which Society uses the energy sources available, putting those with higher EROEI at front. In light of this one can draw an interesting postulate:

A new energy source will come on stream on an unconstrained market if and only if all other energy sources with higher EROEI do not entirely cover current energy demand.

By doing so prices and markets guarantee that Society uses energy in the most profitable way possible. The only problem is when the energy sources with higher EROEI are finite.

Another point worth observing is that the Market is in itself an Agent of Depletion. It is the market that makes the low hanging fruit go first, producing the declining EROEI phenomenon observed in part I of this series.

The Regular Economist

> If a shortage of potatoes occurs either by lack of supply or by growth on demand the market price will rise. This new higher price will signal to the farmers a need to produce more. Supply will rise, meeting demand, lowering the price and bringing the market back into balance.

What the regular economist doesn't tell you is that the farmer will need more oil to produce more potatoes. It's that simple. As long as enough energy is available the farmer can continue to adapt production to the signals sent by the market.

Now imagine that energy supply constraints prevent the farmer from acquiring more than some amount of fertilizers or diesel fuel, he won't be able to meet a possible surge for potatoes. The same with Oil, energy surplus has to be found to produce more of it, or else rigs will falter, access to reservoirs will not be possible, etc. This is the major difference from Oil (and energy sources in general) to other commodities: more Oil (energy) has to be invested to produce more Oil (energy).

Conclusion

Although we don't see the Market's Magic Hand has been working quite well for the last century, making sure that Supply meets a breathtaking surging Demand. Major exceptions happened in 1973 (OPEC embargo) and in 1980 (Iran-Iraq war) but even then the Market prevailed, bringing things back to normal with time.

This "Magic Hand" is itself assuring that depletion will unfold by guaranteeing that energy sources with higher EROEI are explored first. That way net energy keeps falling to the point where production can no longer tackle demand, eventually peaking and entering in decline. Once energy scarcity unfolds there's little the Market can do about it, for to generate a higher supply of energy more of it has to be invested.

Traditional Economics fails to grasp this reality for it deals with energy like any other good or commodity. The mainstream economic thinking does not acknowledge energy as a propelling factor of growth, even less as the major factor doing it. Researchers like Robert Ayres, Charlie Hall, R. Kummell *et al.* have been trying with some success to estabilish this link between energy, money and economic growth, but that's a story for another time.

Previously on the Contrarian Arguments series:

Part I : Fundamentals

Part II : Reserves

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