



## The Economics of Oil, Part I: Supply and Demand Curves

Posted by [Prof. Goose](#) on August 19, 2007 - 11:20am

Topic: [Economics/Finance](#)

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*This is a guest post by Robert Smithson, a portfolio manager at a London based investment fund.*

This is part one of a two part article on the economics of oil price demand. The second part looks at the economics of peak oil, and how the oil fits into an overall energy demand curve.

### Introduction

“The world is consuming more oil than it is producing.” --*The Economist*, July 14-20 print edition.

Wow, that’s a shockingly foolish statement. Each day approximately 84 million barrels of oil are extracted from the earth, and approximately the same amount is consumed. It can be no other way: inventory space is limited, and could not be extended significantly by “excess production” or indeed drawn down for long by “excess demand”.

The problem is a basic lack of understanding of economics. And *The Economist* is hardly the only culprit.

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Take the IEA’s latest Oil Market report:

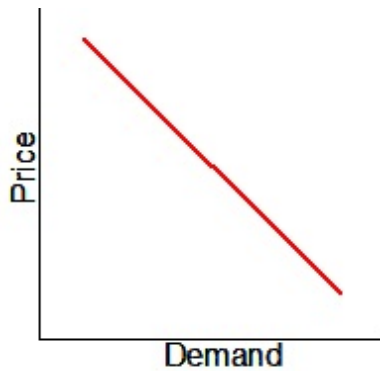
Global oil product demand is expected to rise by a robust 2.5% to 88.2 mb/d in 2008... Non-OPEC supply in 2008 is forecast to reach 51.0 mb/d.

But of course, as any economist will tell you, there is no simple supply number and demand number: there is only a demand curve and a supply curve. And the key to all of this is to understand that demand can never outstrip supply, there is never a supply “gap”, there is only the price at which the market clears.

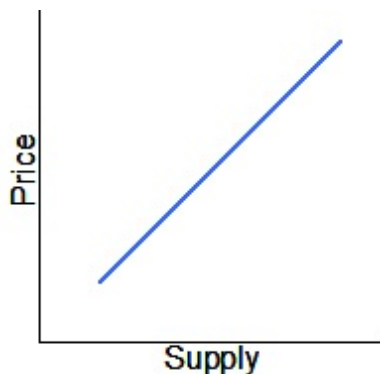
### Supply and Demand

The study of supply and demand inside a market is known as micro-economics. (This differs from macro-economics, which is the study of inflation, unemployment, and the like.) So, let us take a

simplified market; it has a demand curve that looks like this:

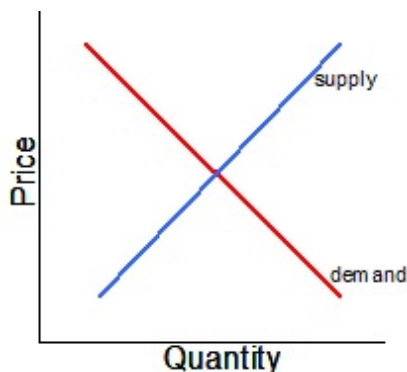


The x-axis is the price, and the y-axis is the demand. There is an inverse correlation between price, and quantity demanded. If we pretend this is the car market, then we see that at lower price levels, people who couldn't previously afford (or justify) cars can now buy them, and that some families which previously owned one car, will spend on a second. Demand varies with price. And the same is true of supply:



If the price rises, so will supply. At first, this can be difficult to appreciate; surely supply is a function of how many factories make cars? But supply is “elastic”, it does grow with price. In the short-term, higher car prices encourage factories to run with two or three shifts and to pay over-time. Longer-term, higher-prices will feed into firms' capital expenditure decisions: new machines will be bought. Higher prices mean more supply.

Economists put these two curves together, the demand and the supply to understand a market:



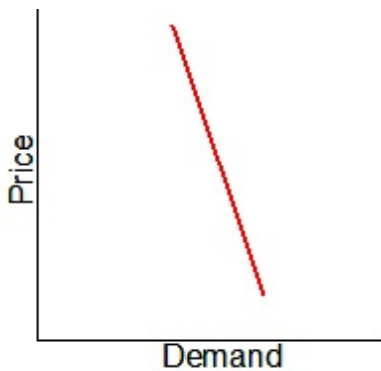
The market price is the point at which demand meets supply. That is, there is a price level where the level of demand is equal to the level of supply. This point cannot be emphasized enough: the market will clear. In any normal market, there cannot be enormous inventories of unsold

products, or millions of people willing to pay the prevailing market price... yet unable to do so. An excess of supply, or shortage thereof, is merely another way of saying that the clearing price is moving. And markets will clear.

## Oil Supply and Demand

The market for oil is unusual, because – in the short-term – both demand and supply are highly inelastic. Irrespective of what petrol costs, your car cannot easily switch to another fuel. Ships and aeroplanes cannot move from diesel oil and kerosene for their propulsion. If it's freezing cold, and you need to heat your house, the only option may be to pay more for heating oil. Likewise, if the price of petrol was to halve, you would not drive twice as far, or turn the thermostat up from 22 to 44.

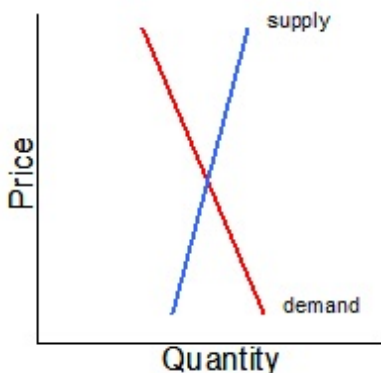
The result is that the short-term demand curve looks like this:



In other words, a large change in price only has a small impact on demand.

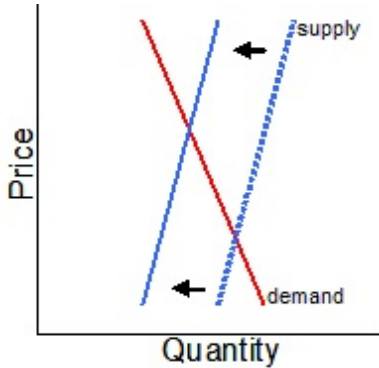
Supply of conventional oil is also relatively inelastic, although for a different reason. The actual cost of pumping a marginal barrel of oil is relatively low, once the capital expenses of prospecting and building an oil rig (and associated infrastructure) has been put in place. An oilfield will cost roughly the same to operate whether it is producing at 50% of capacity or at full capacity. Given this, once you have an oil field in place, producers will tend to pump at their maximum sustainable rate. Of course, there is always some flexibility: old wells can be “uncapped”, scheduled maintenance can be postponed, and greater concentrations of gas can be pumped into the well. But these have costs, and oilfield owners are loath to do these, unless the price of oil is high enough to justify it.

The result of this is that the oil market is one where small changes to the supply or demand curve cause large changes to the clearing price.



## The Oil Shocks of the 1970s

This model can be applied to the oil price shocks of the 1973. Following US support for Israel in the Yom Kippur war, the newly founded OPEC announced it would stop selling oil to the US, and would restrict its overall oil output. Because OPEC supplied so much of the world's oil, this had the effect of changing the shape of the supply curve. In other words, for any given price level, there would be less oil supplied:

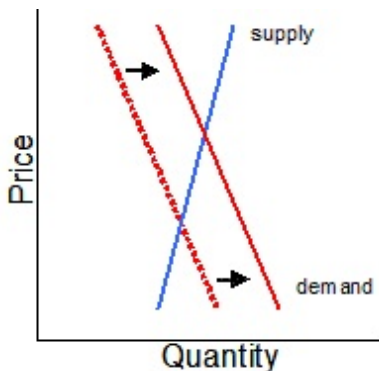


As can be seen from the chart above, this restricting of supply caused the blue supply curve to move to the left, and – as the market must clear – the price rocketed. Dropping out of theory and into practice, we see that this is exactly what did happen. The price of Saudi Light oil jumped from under \$3 a barrel in 1971 to almost \$40 by 1980.

### Other Short-Term Changes to Supply and Demand Curves

It is not only sellers' cartels that affect the oil price. When Hurricane Katrina knocked out production in the Gulf of Mexico it had a similar effect: the supply curve was shifted to the left and prices rose.

The rise of emerging markets has also changed the supply and demand dynamics. As China, India and the like industrialize, and their emergent middle classes buy cars, then the demand curve moves to the right. For any given level of price, more oil is demanded. As the chart below shows, this has exactly the same impact on the clearing price of oil as does reducing supply: the price moves, and sharply.



### Long-term Supply and Demand Dynamics

But this analysis misses one key point. Oil demand and supply may be inelastic in the short-term, but in the long-term, they are remarkably elastic. Hurricane Katrina does not cause a long-term change in consumer behaviour; but if long-term expectations for oil prices rise, then both the

demand and supply curves will shift.

Nowhere is this clearer than in the study of the results of the 1970s oil shocks. In the US the government responded by introducing a 56mph national speed limit, and mandating strict new efficiency standards. In 1975, the average American new car had 136 horsepower under its hood; by 1982, that number had fallen to under 100. Consumers shifted to more fuel efficient cars (a boon for Japanese makers, and a bane for Detroit), and the demand curve moved to the left. Similarly, electricity generators chose to build nuclear or coal-fired power stations rather than oil-fired ones. EDF, France's national generator, now supplies the vast majority of its electricity from nuclear power stations.

In the three years following the first oil shock in 1973, oil consumption continued to rise – despite soaring prices. Yet from a peak in 1976, consumption began to fall, dropping eventually 15% from its highs. And, again, consumption continued falling for three years, even after oil prices peaked in 1980 and after the world economy began recovering. Moves towards energy efficiency and towards alternative power sources are slow to ramp up, but their effect on the demand curve cannot be over-stated.

Rising prices had another effect in the 1970s, they spurred investment in exploration and production in areas that had previously not been cost efficient. Building rigs in the hostile waters of the North Sea, or in the wilds of Alaska, made little sense while Saudi crude was available for \$3 a barrel. But if the Saudi's oil was restricted, and the price had shot up north of \$30, then a lot of new oil suddenly became competitive. And because the key expenses are upfront – building the infrastructure in the first place – then once the new oil came on stream then it was unlikely to be removed, irrespective of the price of oil. The oil supply curve moved to the right.

The impact of a supply curve that moved right (more supply at any given price), and a demand curve that moved left (less demand at any given price) was a collapse in the market clearing price. By 1985, the oil price had fallen back to \$10. On an inflation-adjusted basis, oil was as cheap as it had been before the 1973 oil shock.

The lesson here is simple: there is no “over” or “under” supply, there is only the price at which the market clears. And over the long-term, high oil prices will tend to encourage consumers to either reduce energy consumption or shift to other forms of energy. Similarly, investment in either inhospitable areas or in developing technologies will result in greater quantities of oil or synthetic crude coming on to the market. Each boom in the oil price sows the seeds of its own destruction.



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