

Oil prices



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essay: Oil Pricesessay?, When oil prices hit record levels, many people look for a scapegoat, and hugely profitable oil companies are an easy target. Even so, the typical political “ solutions” overlook the crucial role that market prices play in resource allocation, both among competing uses in different areas of the world today and among competing uses in different time periods (i. e. today versus the future).

Contrary to popular belief, it is private sector professionals who will ensure an adequate supply of oil and other commodities for our descendants. It is the politicians” not the speculators” who are notoriously shortsighted and threaten to cripple our energy supply. To refine our thinking on this complex topic, well start with a simplistic case, and then gradually add more layers of realism.

This will help us understand the basics of oil prices and make sense of the present state of the market. In particular, well see that the best remedy is a return to market guidance, not top-down political directives. Hotellings Rule: A Known and Fixed Pool of Oil Read more about depletable Natural Resources in an article by William J. Baumol and Sue Anne Batey Blackman in the Concise Encyclopedia of Economics. The simplest case is actually probably how most people think about a finite, depletable resource such as oil. Assume that every last drop of oil in the world is conveniently located at the surface of the earth, dispersed among thousands of small pools, each of which is owned by a different individual. Each of these owners” who controls a tiny fraction of the worlds total stockpile of oil” knows exactly how big his own pool is, and the pools of oil owned by his competitors. Further suppose

that it costs each owner virtually nothing to extract a barrel of oil and sell it on the market.

Assume also that the cost of storing the oil is zero, and further that each owner can predict with perfect foresight the demand for oil at every date into the future. There is no doubt that the known oil in the various pools is the only oil that will ever be available. Finally, suppose that each owner is also quite confident that there will always be people wishing to buy some barrels of oil, for virtually any price, into the foreseeable future. Under these very unrealistic yet convenient assumptions, what can we say about the price of oil? Harold Hotelling provided the elegant answer back in 1931. ¹ On the margin, an owner of the oil must be indifferent between selling an extra barrel of oil today" and earning the spot price" versus holding it off the market and selling it in the future. Since we have assumed away storage and extraction costs, and any risk that the quantity demanded of oil will drop to zero if the price rises too far, we can conclude that the spot price of oil (the spot price is the current price at any given time) must rise over time with the interest rate. For example, if a barrel of oil sells today for \$100, and the interest rate is 5%, the spot price of oil in twelve months time must be \$105 in order to make it worthwhile for the owner to keep some oil off of the market today and carry it forward to next year.

The idea is that the amount he earns by having the oil sit in the ground must equal the amount he would earn in interest on a portfolio of bonds. For example, if the spot price of oil were \$101 while the expected price next year were only \$103, then the owner would rearrange his plans, and devote more barrels for sale today, and fewer barrels for sale next year. (This is

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because \$101 rolling over at 5% interest would be worth more than \$103 in the following year.) This shift would push down the spot price of oil today, and raise the anticipated price next year. If the spot price were finally pushed to \$100 while the expected price next year had risen to \$105, the owner would be happy with his allocation, because whether he sold one more barrel in the present and invested the revenue at 5% interest, or whether he kept the barrel in the ground, he would have \$105 at his disposal in the following year.

(A similar argument shows that if oil prices rose more than 5% per year, then the owner would devote more of his supply to future markets, ultimately bringing oil prices back into conformity with Hotellings Rule.) Of course, Hotellings Rule doesn't tell us what the actual spot price is at any time; it merely tells us how quickly it must rise. To come up with the specific numbers, we would need to know the demand for oil over time. In a general equilibrium, the spot price would rise with the interest rate (Hotellings Rule) and consumers of oil would purchase their optimal number of barrels per day (depending on the price at the time), such that the total consumption into the future would just equal the original size of the pool. The first modern economic work forecasting an imminent catastrophic future because of a depletable resource was *The Coal Question*, by William Stanley Jevons.

The 1865 book vaulted Jevons to public notice. Even at this stage, we can see that the standard question, “Will we run out of oil?!” is the wrong one to ask. Even in the “worst case” scenario outlined above” where there is no chance for new supplies to be discovered, and all of the oil is controlled by an unregulated monopolist bent purely on profit” the world wouldn't suddenly

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run out of oil, and it would never experience a jolting shock in prices. On the contrary, the price of oil would rise steadily over time in a predictable manner, with consumers at some point reducing their total annual consumption as ever higher prices made it more economical to substitute away from oil and into other fuels. ² This observation is neither optimistic nor pessimistic; depending on the initial size of the pool, and the availability of other options, this eventual weaning of oil usage could be either uneventful or catastrophic. The point, however, is that the scarce commodity would be distributed in a perfectly efficient manner among competing uses in the present and in the future. At any moment, the spot price would already reflect the fact that consuming a barrel today necessarily meant future generations would have one fewer barrel. Burn All You Want: Well Find More Obviously Hotellings model is not an accurate description of the oil market in the real world.

For one thing, oil prices have not risen steadily and exponentially over time. In real terms, that is, adjusted for inflation, they were fairly flat during much of the twentieth century, spiked during the 1970s and early 1980s, then fell sharply, only to rise again in the 21st century. Clearly there is more at work here than the simplistic scenario described above. One major difference is that in the real world, oil is not concentrated into neat little pools with zero extraction costs.

On the contrary, oil deposits offer varying degrees of difficulty of extraction. In the Middle East, for example, average total production costs per barrel were \$14. ³¹ during 2004-2006, while average total costs per barrel in offshore U. S. operations were \$69. ⁷⁵ during the same period.

3 Keep in mind that in addition to the varying costs of extraction, there is also the matter of finding the deposits in the first place, which costs scarce resources. Now given that there are vast resources of oil spread throughout the earth, some obvious and some well-hidden, and, further, where each deposit offers a harder or easier time of extraction, what would be the rational thing for people to do? Naturally, they would first concentrate on developing the deposits that have already been located and which had the lowest costs of extraction. Then, as those deposits were exhausted, resources would be spent locating new reserves, and also developing techniques to allow for better exploitation of existing sites. This quite rational approach is in fact just what the oil industry has done. At any given time, of course there is only a finite amount of known reserves of oil. It is only as that available window begins to shrink" because of rising consumption rates and continued depletion of known reserves" that it makes sense to invest in finding new reserves. This principle is no different from a household's weekly routine, where the pantry is stocked with only, say, a month's worth of food at any time.

This is why the alarmist warning of, " At present consumption rates, we have only x years of oil left!" is silly; we always have " only" x years of oil left, whatever x is. There is no a priori reason to expect that x will steadily diminish with the passage of time, just as we don't expect the typical household to starve after one month. In fact, the window of oil availability generally improved over the 20th century. At the end of 1944, " proved reserves" 4 of crude oil were 51 billion barrels worldwide.

By 2003, the number had grown to 1.27 trillion barrels of proved reserves. 5 Given the annual rates of consumption in the two years, the world went from a proven supply of under 25 years worth of oil in 1944 to a supply of about 44 years in 2003. Meeting Demand: The Customer Is Always Right Another major simplification we made in our initial thought experiment was to assume that the demand for oil (as a function of price) was known, even into the distant future. In reality, the demand for oil is unpredictable, and this fact partially explains the recent record-high oil prices. When the major oil companies were making investment decisions during the 1980s and 1990s, they underestimated the explosive economic growth in countries such as China and India in the 21st century. Because of this mistaken forecast, the necessary infrastructure was not in place to adequately service the increase in oil consumption.

Consequently, spare capacity margins have become extremely narrow, leading to price spikes. In this situation, the major oil companies have again done just what we would expect (and desire) from Adam Smith's famous "Invisible Hand": They have ploughed hundreds of billions of their profits into further investment, in order to expand production capacity in the future. Indeed, from the early 1990s through 2006, new investments have tracked (and usually exceeded) earnings (see Chart 1). Chart 1. Oil and Natural Gas New Investments Chart 1. Oil and Natural Gas New Investments ZOOM The Social Function of Speculation and Derivatives As our discussion so far has made clear, it is not the finite supply of oil but rather the uncertainty over its supply, and the demands on it, that leads to trouble. Even though the average person is hostile towards these exotic practices, it is here where

speculation and derivative markets play a crucial role. The motto of the speculator is to “ buy low, sell high.

” The only way to be a successful speculator is to make better forecasts than others. For example, if a speculator makes a bundle by stockpiling crude at \$100 today and selling it for \$110 next month, there must have been plenty of other people who were surprised by the price hike: otherwise they would have bid up the price today. Here we see the true social function of speculation. By buying when prices are relatively low, and selling when prices are relatively high, the speculator makes prices less volatile than they otherwise would be.

More important, the speculator snatches up oil during times of relative plenty, and delivers it to times of relative scarcity. Its true that the speculator earns personal profit in proportion to the superiority of his forecasts, but this is no different in principle from the fact that the best brain surgeons earn a fabulous salary on the market. Modern financial markets have sophisticated derivatives markets, such as futures contracts and forward contracts, and even options on these contracts themselves. These more exotic instruments allow market participants to more effectively allocate risk and, thus, increase total production. One of their specific benefits is to greatly enhance the effectiveness of speculation. For example, suppose an oil analyst receives an intercepted communication, and is quite sure that Hugo Chavez, in an effort to harm the U. S., will completely cut off oil exports in one month.

Obviously, the analyst stands to profit tremendously from this intelligence, because the rest of the market has no idea that oil prices will skyrocket in 30 days. Naturally the analyst should buy oil now, at its relatively cheap price, and then sell it once the news breaks. Yet this raises many practical questions. For one thing, what is the analyst supposed to do with thousands of barrels of oil? Store it in his shed? And it certainly sounds fine in theory to say, "Buy oil and then sell it in one month!" but whom do you call about buying that much oil? How can you trust them? Do you need to pay someone to inspect the barrels upon delivery? And what if your neighbors like to have bonfire parties this time of year" is that going to pose a problem? Believe it or not, an organized futures market solves all of these difficulties. Rather than buying and physically storing oil for one month, our hypothetical analyst can simply buy the desired amount of futures contracts. These contracts entitle the bearer to buy 1,000 barrels of oil on a particular date in the future for a set price (the futures price). As new information becomes available, the futures price (for a particular date) is constantly readjusted, with the gains or losses accruing to those holding the contracts. Assuming his forecast about Chavez is correct, our analyst can invest as much as he wants in futures contracts on oil, wait until the market sees the storm coming, and then unload the contracts before the delivery date.

He can thus profit from his superior foresight, without ever dealing with a drop of actual oil. Even so, his actions have still helped equilibrate the intertemporal market for oil, as his initial purchases of the futures contracts pushed up the spot price of oil. ⁷ Note, also, that the successful speculator serves as a kind of "distant early warning" system for future disruptions. In

addition to facilitating those wishing to engage in pure speculation, futures markets also help those who wish to hedge away their exposure to commodity price movements.

For example, the owner of an oil field might be uncertain whether he should invest millions to increase his pumping capacity. If the price of oil over the next five years averages above \$85, the project will be worthwhile, whereas he will lose money if oil should fall below that threshold. At the same time, an airline company might be uncertain whether to add a new city to its list of destinations. Its accountants have determined that if oil prices exceed \$90 per barrel over the next five years, the route will lose money. With only a spot market in oil, risk aversion might lead the oil producer and the airline to play it safe, thus missing out on gains from trade. Yet if the airline can enter into a forward contract with the oil producer, where it agrees to buy a certain number of barrels every year at, say, \$88 per barrel, then the oil producer can confidently invest in expanding his production, while the airline can confidently expand its services.

Conclusion: Let the Free Market Do Its Job! Thus far we've seen that as we relax the unrealistic assumptions in our initial scenario, the free market jumps to the rescue. Unfortunately, the last assumption we need to consider is that the owner of oil was allowed to charge whatever the market would bear, and to keep all of his earnings. This is clearly at odds with political realities, what with talk of "windfall" taxes or even outright price controls. As with other government interventions, here too the politicians will achieve the exact opposite of their stated intentions. By reducing the likelihood that "hoarders" will be able to profit from their speculative activities, price controls

and windfall profits taxes weaken the incentives for price smoothing.

Moreover, confiscatory taxes and price controls reduce investment in the development of further reserves, as investors seek less-dangerous projects for their money.

The end result of political interference is thus a less-efficient exploitation of our scarce supply of oil. The free market does just what we want it to, if only the politicians allow it to function. As one wag put it, the government needs to leave prices alone: they have important work to do! ;,?