



Financial Intelligence: How Arbitrage Forensics Provide Insight into Saudi Knowledge

Posted by [Nate Hagens](#) on March 29, 2007 - 10:24am

Topic: [Economics/Finance](#)

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The following is from guest contributor [Jeff Vail](#). Jeff is an intelligence analyst focusing on energy and infrastructure-related issues. He is a graduate of the US Air Force Academy and a former USAF Intelligence Officer. Jeff previously wrote on the The Oil Drum about the increasing [violence in Nigeria](#).

He discusses an interesting phenomenon with respect to energy futures prices, that long dated futures are limited in how much they can go up (but not down) based on arbitrage principles. Because the price of distant oil futures quickly rise alongside spot market prices when spot markets are moved by short-term events, we can infer that major producers such as Saudi Arabia think that the future price of oil will be much higher than the price at which distant futures are currently trading. This provides further support to the theory that they don't believe their own statements on their future production or on the future price band for crude oil. Jeff's post is under the fold.

[NYMEX Futures Strip for Light Sweet Crude 3/29/07 \(Click to Enlarge\)](#)

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There has been quite a bit written recently about what is “really” happening to Saudi oil production, as opposed to what the Saudis are telling us. Comparison of rig-count to oil production levels, or analysis of published seismic readings of water encroachment on a reservoir provide good insight, as Stuart Staniford has shown in [several, recent, articles](#). This article is to suggest that additional, complementary information about Saudi oil production can be gleaned through forensic analysis of the related financial markets. Just as reservoir analysis is quite complex, this financial analysis will be fairly challenging—please bear with me, I will do my best to explain the financial principles at work in this analysis (and please don't be offended if you already understand arbitrage!).

EXECUTIVE SUMMARY: Because the price of distant oil futures quickly rise alongside spot market prices when spot markets are moved by short-term events, we can infer that major producers such as Saudi Arabia think that the future price of oil will be much

higher than the price at which distant futures are currently trading. This provides further support to the theory that they don't believe their own statements on their future production or on the future price band for crude oil.

One of the basics principles of finance is the "[Law of One Price](#)." This states that, for any fungible and definable good (such as oil), all future prices flow from the spot price. Say, for example, that the spot price of NYMEX Sweet Light Crude is \$60/barrel. The Law of One Price says that the future price of that same barrel of oil in one year is not an independent price, but rather is dependent on the spot price: it is \$60/barrel + "risk-free" cost of money over 1 year + cost of carry (storage) for one year. If the future contract is trading at higher than this predetermined cap, then [arbitrageurs](#) can make risk-free profit—they sell the future contract, buy the spot oil, and store it until the future contract matures, collecting the excess as profit. This represents an upper limit, an "arbitrage cap"—the price of oil for delivery one year from today cannot exceed a set amount above the spot price, or arbitrageurs will act to correct this price distortion. It should be noted that arbitrage price cap can actually be lower than the spot price—this happens when the cost of money is negative over the time period (either due to general deflation or specific yield-curve environments).

In contrast, there is no limit to how much lower the future price of a good can be from the present price because arbitrage cannot act to correct such a disparity. If oil is trading at \$60/barrel today, there is no reason why a future contract for delivery in one year can't be trading at \$30/barrel. A trillion barrel oil field could be discovered in upstate New York—not very likely, but we just don't know. The point is, it is theoretically possible for traders to find some good reason to price oil much lower one year from now than today's spot price. Arbitrage has no mechanism to correct this disparity—you can't buy a future contract to cover a sale of oil today.

Returning to the upper limitation on future pricing: what happens when future prices push up against this arbitrage cap? Arbitrage acts to bring the prices in line with each other. But in doing so, does the future price come down, or does the spot price go up? Let's look at the mechanics. An arbitrageur looking to exploit a future price that is too high relative to the spot price must buy oil on the spot market and sell oil on the future market—this increases current demand (relative to current supply) and increases future supply (relative to future demand). As a result, both the future price comes down, and the spot price goes up. However, the volume on the future market is invariably much lower than the volume on the spot market, so the arbitrage trades bring the future price down much more than the spot price goes up.

As we've discussed, the spot price of oil cannot "push up" the future price via arbitrage. The spot price does set the psychological expectations of traders (as humans tend to extrapolate the present when predicting the future), but there is no arbitrage mechanism that forces short-term, supply-based price increases (such as the shut-in production following Hurricane Katrina) to push up prices in the distant future. Why, then, do actual price changes seem to contradict these accepted principles? Now things get interesting...

When there are short-term, supply-driven increases in the spot price of oil—such as the recent increase that can be partially attributed to the [capture of British sailors](#) by Iran (see chart below)—this price increase should not also increase the price of a future nearly four years out. And yet it did...the price of the December 2012 contract increased right alongside the spot price over the past few days. Why???

Because of the limits imposed through arbitrage, the price of oil (based on the future contract

price) in 2010 can't greatly exceed today's spot price of oil. The future price of oil can, however, be significantly lower than the spot price—and when short term events push up the spot price significantly, this might be normal occurrence. After all, an incident in the Persian Gulf, or a hurricane in the Gulf of Mexico have little bearing on the supply/demand picture for crude oil five years from now. But in the past few years, as soon as short-term spot price movements create space under the arbitrage imposed future price cap, the future price seizes the opportunity to move upwards. The explanation for this is that the future supply/demand equilibrium is at a price significantly higher than the future is actually trading, because that future price is constrained by the arbitrage cap. Whenever space is made available under the arbitrage cap, such as by current events, the future price will quickly rise to fill that space.

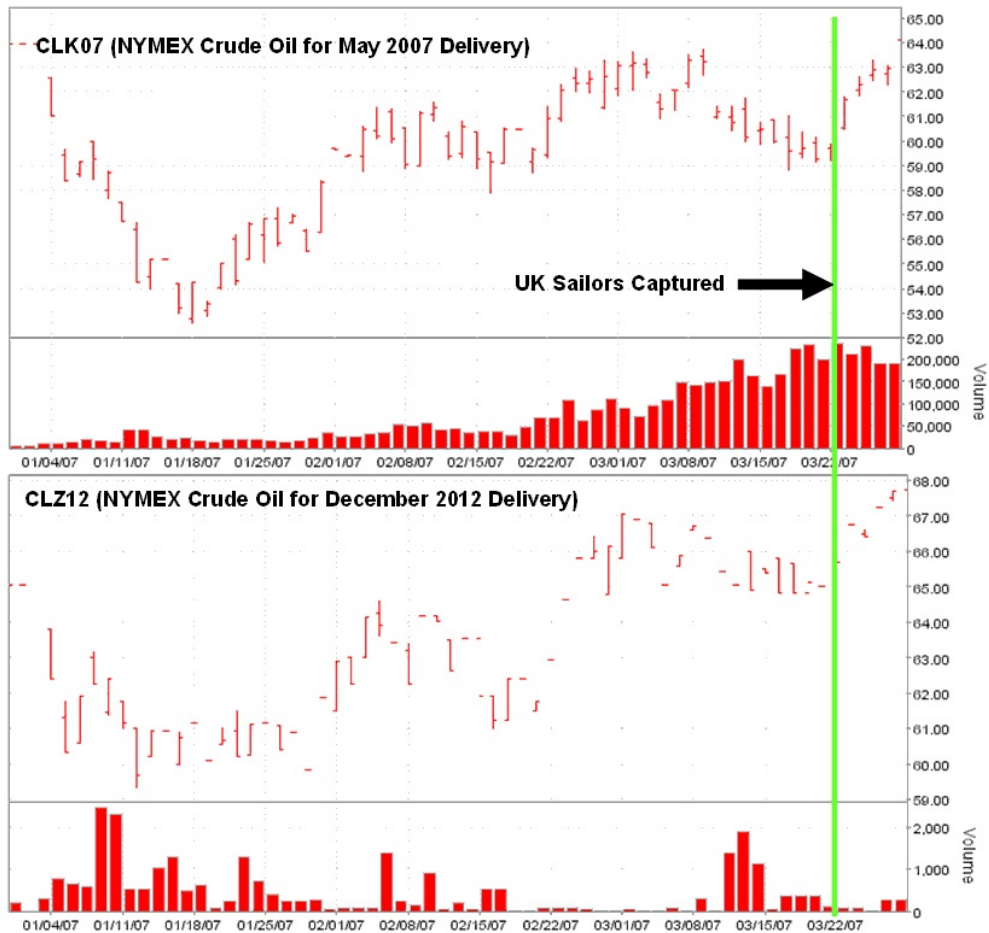


Figure 1: Illustration of distant future market closely following short-term spot market price movement to fill available space under the arbitrage cap.(click to enlarge)

If the future price of oil were significantly below the arbitrage price cap, then this would be highly significant to the Peak Oil debate—it would represent the market intentions of major producers who, with full access to their internal data, believed that the future price would not be significantly higher than the present price. Conversely, because there appears to be zero space available under the arbitrage cap—even when events temporarily increase the spot price—we can discern that these major producers believe that the future price will be significantly higher. In reality, this calculus applies primarily to only one producer—as Saudi Arabia is the worlds largest exporter, and as most future hopes for oil supply increase seem predicated on their claims, then they are the only market player whose future production has a high likelihood of setting future prices.

If Saudi ARAMCO actually believed that it would be producing 12+ million barrels of oil a day in

2012, and that prices would still be trading in a band of roughly \$60/barrel, then it would have significant motivation to sell oil futures for delivery in 2012. Why? If it can get \$68 today for oil to be delivered in 2012, and it honestly expects oil to be trading in the \$60s in 2010, it would be crazy not to sell the future today and invest the money in a bond or other financial instrument. Even at a 3% rate of return above inflation, selling a Dec. 2012 contract today for \$68/barrel is the same as selling that same oil in Dec. 2010 for \$81/barrel (in 2007 dollars). If Saudi ARAMCO did believe what it publicly states it believes, then it would be happy to sell oil for delivery in 2012 at \$68/barrel (today's future price). Or at \$67/barrel. Or at \$66/barrel—this motivation to sell even at prices below where the future is currently trading would bring the future price down—it wouldn't jump to fill space created under that arbitrage cap by short-term influences. Because this is not what is happening—in fact, because the opposite is happening and future prices rise immediately to fill any available room under the arbitrage cap—we gain a very valuable insight into the inner thinking of the Saudis. What insight? Because the future price jumps to fill space created under the arbitrage cap, we can infer with high confidence that the Saudis don't believe their own rhetoric. They don't believe that they'll actually be producing 12+ million barrels of oil per day in 2010, they don't believe that the price of oil will be less than \$80 in 2010. If they believed anything close to this, they would happily sell 2012 futures now for \$60/barrel or less—far less than the current price—and this would bring down market prices. This is, in my opinion, highly significant because their access to their own data puts them in the best position to make assessments of the future of global oil markets. If actions speak louder than words, then this is the real Saudi press release: “We've peaked...”



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