Economics

# Bubbling Crude: Oil Price Speculation and Interest Rates

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## Abstract

An analysis of the current crude oil price patterns strongly suggests that they are the result of bubble. The classical indicators of a potential speculative bubble in a commodity market are all present: low US$ interest rates, high stockpiling levels despite the fast-growing demand and forward prices in contango. In the 1970s and 80s, the weight of oil on Western economies was so high that high crude prices would invariably result in inflation and therefore in the US Federal Reserve raising interest rates, which in turn would burst the bubble. Today, however, as Western economies are far less dependent on oil, US$ interest rates are also far less likely to be raised in response to an oil price spike, and therefore a bubble can take a lot longer and grow a lot larger before it reaches its bursting point. Among other considerations, this analysis suggests uncomfortable implications for emerging East Asian economies, as their dependency on oil is very high but they have little to no control on the US$ interest rates that can either fuel or cut short a commodity bubble of these characteristics.

## The Unsavory Reality of Market Bubbles

Financial bubbles may at the same time be the most spectacular and the least well understood of economic phenomena. In essence, we say the market value of an asset is riding a speculative bubble when the expectations of future price increases drive traders to demand the product today just in order to resell it at a higher price in the future; this speculative demand pushes the spot prices upwards, which, in turn, fosters even higher expectations of future price increases, which generates even more speculative demand… and so on in a self-fuelling upwards spiral. Eventually, of course, the steep price climb slows down, and then the rush of all the speculative buyers to sell out before they make a loss causes the market value to collapse –it is precisely because of the similitude between this process and the way a soap bubble inflates before it suddenly busts that the phenomenon is commonly known as a "bubble". History provides numerous examples of speculative bubbles, from the "Tulip Mania" in early 17$^{th}$ Century Holland, when otherwise sensible people seemed to believe that a single tulip bulb could really be worth more than a farm, to the "dot.com" bubble in the last years of the 20$^{th}$ Century, when earnest investors paid billions for questionable Internet ventures that under other circumstances they would have rejected outright.

Speculative bubbles have stood for decades at the centre of a heated academic debate around whether they constitute evidence of the investors' fundamentally irrational behaviour (what Charles Mackay famously called "the madness of crowds"). As it so often happens, the tendency to oversimplify the confronted theories has often reduced them to absurdity: thus, the rational expectations school has frequently defended that speculative bubbles simply cannot exist (which contradicts the empirical observations), while its detractors have presented their observable existence as incontrovertible proof that investors behave irrationally under some circumstances (which is by no means granted by the empirical evidence available either). The fact is that, under certain conditions, rational financial bubbles can indeed take place, as a number of papers have shown, starting at least from the pioneering work of Olivier Blanchard and Mark Watson in the eighties[1].

Thus, when prices climb up by far more than their fundamentals justify, one must seriously consider the possibility that they may be riding a speculative bubble. Bubbles, we should never forget, are usually triggered by one or more unexpected news whose initial price impact is perfectly consistent with their fundamentals –even if the bubble's upward spiral eventually drives the market value far away from them. Thus, in the case of crude oil, for example, numerous empirical studies indicate that prices are strongly mean-reverting, i.e. that they display a tendency to experience bubbles and crashes around a central long-term trend value[2]. Furthermore, at least since the late eighties, price falls have tended to be steeper that price increases –i.e. just as one would expect if the underlying reason for this mean-reverting pattern were indeed the impact of periodic speculative bubbles [1]. All this is consistent with the behaviour observed in other non-renewable commodities, like copper, tin or nickel. Thus, while events like the war in Iraq, the strikes in Venezuela, the hurricanes in the Gulf of Mexico or, most recently, the risk of politically-driven interruptions of Russian supply or of an Iranian oil embargo are logically bound to impact prices, it is far less clear that they should justify a price hike from about $30 in early 2004 to more than $70 a barrel by April 2006.

Against this background, what should we make of the widespread claims that the price increases we have witnessed are the result of a permanent imbalance of demand against supply, caused by the clash between rapidly growing demand from East Asia and equally rapidly exhausting reserves? A close examination suggests that, while these factors may have contributed to trigger the price inflation, they do not really justify the current levels. It is true, for example, that oil demand from the East Asian "tiger" economies, and particularly from China, has grown very strongly for the last ten or fifteen years –but the fact is that demand growth, admittedly at a high point three years ago, was already softening down early last year: for example, the year-on-year growth of China's crude-oil imports [2] dropped from over 30% in 2003 and 2004 to just 4% in the first half of 2005. It is also true that oil is a non-renewable resource whose reserves will eventually run out, and that there is robust evidence indicating that we may be close to reaching the peak of global oil production (the so-called "Hubbert peak"), although there is also solid evidence suggesting that the peak may still be decades away [3]. Yet reserve depletion is a gradual, long-winded process that simply cannot explain this sharp price spike: as a matter of fact, a recent study [4] on the American whaling industry of the 19th Century (which produced the resource that eventually petroleum came to replace, namely whale oil) strongly suggests that, as we approach the peak, "we may expect the crude oil market to become even more unstable in the future", but the price increase reflected by the trend itself (as opposed to the instabilities around it) should be expected to be gradual: thus, if the past can be of any guidance in this, we should not expect the Oil Era to end with a bang but with a whimper. Furthermore, resource exhaustion could never explain why most other non-renewable commodity markets (copper, nickel, tin, etc.) started their current price hike more or less at the same time as crude oil –we just cannot be running out of all of them at the same time!

## How to Spot A Bubble

These considerations, of course, still beg the question: how does one distinguish a speculative bubble from a longer-term price change? We have

1 Blanchard & Watson (1982); among more recent contributions it is possibly worth mentioning here my own, Gracia (2005).

2 For example, when Jaffe, Levy-Carciente & Sabelli (2004) calculated the Hurst index (a measure of serial correlation that can normally take a value between 0 and 1, with 0.5 representing a random walk) for the daily Brent crude oil prices between June 1988 and September 2002, they found a (statistically significant) value of 0.33, which indeed indicates a strongly mean-reverting pattern.

defined a bubble as a situation where expectations of future price increases drive traders to demand the product just in order to store it and sell it later at a profit. As a result, inventories grow, while future prices reflect the traders' expectations of price increase. Conversely, when prices increase because of fast-climbing, unanticipated demand, or because of a sudden fall in supply, the impact tends to go in the opposite direction: inventories are sold out, and future prices display a downward slope to reflect the expectation that, eventually, supply will at least partially manage to catch up again with demand. Therefore, the most immediate way to check whether a commodity market is under the effects of a bubble is to see whether it is indeed offering higher prices for long-term future contracts than for short-term ones, and then if market dealers are stockpiling the product.

The answer today for the crude oil market is yes on both accounts. In a commodity market, the "normal" relationship between spot and future prices is what traders usually refer to as "backwardation", i.e. a situation where future prices are lower than spot ones. This is because upstream producers, whose production schedule is usually predictable well in advance, try to reduce their risk by selling their crude at a set price beforehand, and are willing to pay for this by offering a discount. When, in spite of this, long-term future contracts are still more expensive than shorter-term ones (a situation commonly referred to as "contango"), this constitutes a clear indication that the market expects future price increases to be significant enough to outweigh the discount upstream producers would normally offer for their future production. If, in addition, this difference is so large that it makes economically profitable, after accounting for storage and financial costs, to stockpile in order to sell later at a higher price, we can say we have found evidence of a speculative bubble.

This is exactly where, according to the evidence available, we are today. Already in May 2005, before the supply chain disruptions caused by the Rita and Katrina hurricanes were even foreseeable, the US Energy Intelligence Administration [5] announced that crude inventory levels in the United States had reached their highest levels since March 2002. At the same time, the International Association of Independent Tank Owners (INTERTANKO) warned that both Brent and West Texas Intermediate (WTI) prices remained in contango, and that stockpiling in both Europe and the US had reached such levels that it was limiting capacity for operational storage. The market outlook has actually changed very little since: save for the temporary impact of unexpected supply interruptions, inventory levels have continued to expand their physical limits (in April 2006 US inventories were at their highest level in eight years [6]) and forward curves have remained in contango almost continuously to this date.

Yet inventory volumes do not necessarily convey a complete image of the impact of speculative demand on prices. For, in a market like that of crude oil, where demand is very insensitive to price (in economic jargon, very "inelastic"), consumers are essentially price takers[3], and therefore sharp price increases, whether caused by the OPEC's political decisions or by the traders' expectations, are not dampened by parallel reductions in demand volumes. Furthermore, beyond the limits of existing spare capacity, it takes heavy investments over periods of several years to expand supply, and therefore the supply side of the market is also very inelastic in the short-to-medium run. In the past, OPEC's spare capacity (particularly Saudi Arabia's), which allowed to increase supply relatively quickly whenever prices went above a certain level, had effectively introduced an additional degree of elasticity in the short-term supply curve. Yet for the last couple of years Saudi Arabia's spare capacity has proven to be insufficient to impose this type of price discipline –which means that large speculative price increases cannot be cut short by flooding the market with additional supply. In a situation like this, a price bubble can continue growing without resulting in further inventory accumulation, simply because traders can keep selling the same inventories to each other at ever-higher prices. In other words, when physical storage capacity puts a limit to the speculators' ability to accumulate further inventories, the result is that the bubble dynamics become more like those of an ordinary stock market, where, as shares are never "consumed", as long as no new equity titles are issued, supply is a constant inventory that keeps changing hands at ever-increasing prices as the expectations bubble grows.

[3] For instance, in an analysis of crude oil demand in 23 countries, Cooper (2003) found average short-term demand elasticity to be only 6%. Interestingly, there is also evidence that oil demand elasticity has reduced over time, as the lower dependency of developed economies on oil has also reduced the income effect of oil prices (Hwang & Yang, 2001).

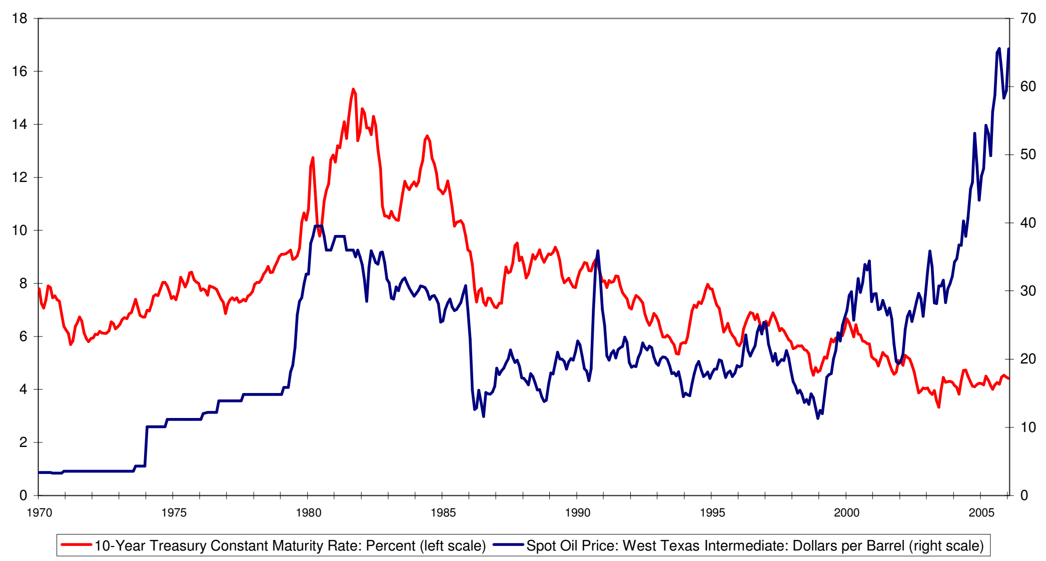
## The Impact of Interest Rates

If there is one key difference between oil and other mining products, it is the former's massive potential for general macroeconomic impact. There is simply no other non-renewable product whose prices have the relevance that crude oil has for the world's overall economic performance. Thus, historically, every time oil price went up significantly (e.g., when the OPEC raised it from $4.31 to $10.11 on 1 January 1974, or when a rapid series of uplifts brought it from about $15 to $40 between 1979 and 1980), it triggered a recession. The increased cost of so critical an input pushed then the general price levels up, while expanding unemployment forced the governments of industrialised countries to widen their deficits, thus leaving contractive monetary policy as the only macroeconomic tool available to fight inflation.

For decades, this effect proved to be much stronger than the fact that lower interest rates reduced the financial costs of speculative stockpiling and therefore increased the probability of a speculative bubble. As Carl Steidtmann [7] points out, the result was that, unlike many otherwise similar mining products, oil prices displayed a clear positive correlation with US dollar interest rates until the mid-to-late 1990s (Figure 1)[4]:

Then, in the nineties, the oil market went through another one of its changes of regime. The technology revolution made the economies of developed countries less dependent on oil, and loosened the iron grip that linked oil prices to inflation. This, to be sure, is not true for the whole world –East Asian economies in particular are still heavily dependent on oil– but, as international crude oil markets are quoted in US dollars, from the viewpoint of its speculative potential it is the US interest rate, and therefore the inflation impact on the USA, that counts. The change has been quite dramatic: the serial correlation of US$ interest rates with crude oil prices (as displayed in Figure 1) from January 1970 to December 1989 was over 90%, whereas the same metric from January 1992 to January 2006 was *minus* 57%.

**Figure 1**
**US$ Interest Rate and Crude Oil Price**




The fact that the correlation between interest rates and oil prices was so high before 1990 gives us an

[4] I owe a special a debt of gratitude to Carl Steidtmann for providing the source data for this graph.

indication of to what extent the monetary policy of the US Federal Reserve was determined by its desire to dampen the inflationary impact of oil prices. Yet the reason why the correlation has become so strongly negative since 1992 does obviously not reflect a new policy aimed at amplifying these shocks: it only reveals that the causality arrow has changed sign, and now it is US$ interest rates that, by altering the financial costs of stockpiling crude, stimulate (when low) or hinder (when high) the commodity traders' speculative bets. As long as the US interest rates remain low, US dollar-denominated stock exchanges in general, and commodity markets in particular, will remain exposed to large speculative swing –and US$ rates have remained at a historical low for the last five years. In this context, expectations of increased demand from East Asia, particularly when combined with a rapid series of alarms over supply capacity, can easily trigger a bubble –and this, once started, can take a dynamic of its own. This explains why most mining commodity markets besides oil, like copper, nickel or tin, seem to have started their current price upward trend more or less at the same time as crude oil.

To be sure, although oil demand is, as we have pointed out, notoriously insensitive to price, an increase of several times the original price in such a short period of time is bound to eventually have an impact on demand volumes. This has just started to happen, although not enough so far to significantly curb prices. The American public has started to feel the pinch, and the US Government has publicly stated its intention to intervene. Yet the most direct means to burst the bubble are primarily in the hands of the US Federal Reserve –albeit, as we have seen, there are today other economic drivers that weigh more on the Fed's decision-making process that oil price. Still, the Fed seems to be committed now to an approach of very gradual interest-rate increases aimed at controlling inflation without causing a real estate crash so, as a side effect, this may end up bursting the oil bubble. This, in a way, represents a relatively optimistic scenario. For, otherwise, the next likely trigger for an oil price crash could be a recession in East Asia (perhaps caused by the high oil price itself), which would obviously cut down demand… And it is very difficult to predict what impact a recession in the East Asian countries that seem to be increasingly taking over the role of the factory of the world could have today at a global level.

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