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The data are consistent with how a well-functioning futures market would behave, initially when there is tightness in the market, and later when there is considerable slack due to the global recession.

Did Speculation Drive Oil Prices? Futures Market Points to Fundamentals

by Michael D. Plante and Mine K. Yücel

Oil market speculation became an especially popular topic when the price of crude tripled over 18 months to a record high \$145 per barrel in July 2008. Of particular interest to many is whether speculators drove oil prices beyond what fundamentals would have otherwise justified. We explore this issue over two Economic Letters. In this article, we look for evidence in the futures market that would signal speculation primarily drove prices. In our companion Economic Letter, we examine the physical market.

There are several methods of speculation that could unduly affect the price of a commodity such as oil. Speculators can buy oil in the spot market and hoard it. Alternatively, they could purchase significant numbers of futures contracts, which would push up futures prices and, indirectly, prompt other market participants to hoard oil. Finally, producers themselves could speculate by withholding output, hoping to jolt prices higher.

Each of these means of speculation would leave telltale signs in certain data, such as inventories. On the other hand, if fundamentals drove speculative activity and prices, the signs should be different.

We reviewed various pieces of evidence, such as the behavior of inventories, supply and demand data, and macroeconomic variables, to see whether they support one hypothesis over the other. After examining futures-market-related data, it appears that fundamentals drove speculative activity and prices—rather than speculation dictating prices. A separate analysis of the cash, or “physical,” market presented in our companion *Economic Letter* produces similar findings.

Chart 1 shows the nominal price of West Texas Intermediate (WTI) crude oil. After bouncing around \$20 per barrel throughout the 1990s,



prices trended upward after 2000. They almost doubled from \$54 to \$93 in 2007, followed by another jump to the record daily high of \$145 in July 2008. Amid the global recession, they collapsed to \$40 at the end of 2008. The near tripling of oil prices in a

year and a half and the subsequent drop sparked much discussion about speculation.

An increase in the number of non-commercial traders in the oil futures market prompted this discussion. Noncommercials now average about 40 percent of open interest (the proportion of futures contracts for which delivery hasn't been made) for New York Mercantile Exchange (NYMEX) West Texas Intermediate crude-oil futures contracts. That compares with 10 to 15 percent in 2000 (*Chart 2*).

Just who are the noncommercials and what do they do? In any futures market, some participants, such as producers or users of a commodity, want to hedge positions, and others solely seek monetary gain. The hedgers are termed “commercials,” while those solely seeking monetary gain are termed “noncommercials,” or “speculators.” Despite being lumped together, this group is made up of many different participants, including hedge funds and commodity index investors.

In a literal sense, speculators bet on where the price of the commodity

will go. If they are correct, they make a profit. In the grander scheme of things, however, speculators perform an economic function by making the market more liquid, acting as additional buyers and sellers, thus facilitating transactions and improving market efficiency.

This function is useful because there will always be a mismatch between hedgers going long (those who want to buy) and hedgers going short (those who want to sell). This can be due to a mismatch in quantity—for example, more participants who want to go short than long. It can be due to a mismatch in timing—a hedger who wants to go long is unable to find a corresponding hedger who wants to go short at a particular time. It can also reflect a mismatch of the duration of the desired contracts—long hedgers may be interested in buying a six-month contract, but short hedgers may want to sell one-month contracts. In such cases, speculators can fill the void and correct these mismatches and improve market efficiency.

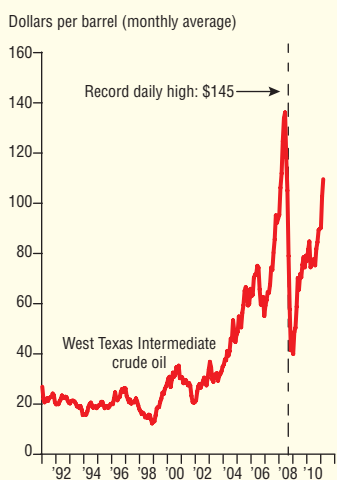
Chart 3 tracks the positions taken by noncommercials over time. Contrary to popular opinion, speculators do not, as a whole, go only short or long. There are large numbers of both long and short contracts, as well as spreading positions, which occur when a trader has an equal number of long and short positions.¹ An increase in spreading positions dominates the growth in both short and long positions. It is possible that the explosive growth in spreading positions is due to noncommercials taking different positions across the maturity structure—for example, going short in near months while going long in distant months.

Linking Futures and Spot Markets

A central question is: How could “speculative” futures market activity translate into higher spot market prices?

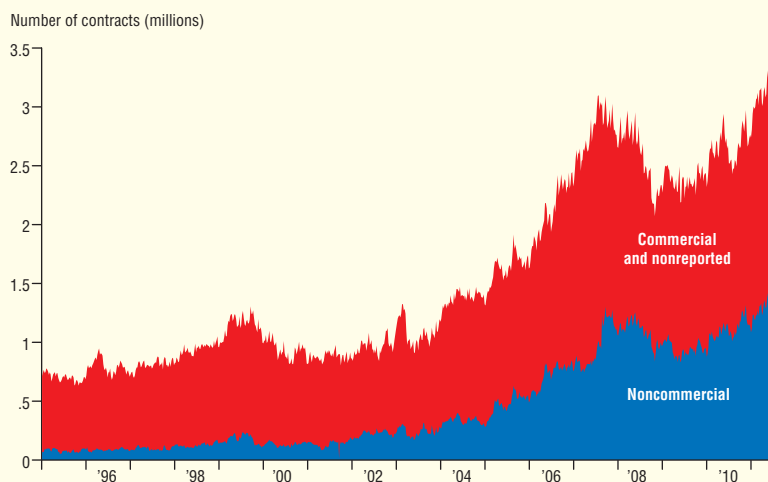
Spot prices are determined in the cash market where transactions are settled with oil physically changing

Chart 1
Oil Prices Volatile



SOURCE: *Wall Street Journal*.

Chart 2
Noncommercial Contracts Rise Dramatically



SOURCE: Commodity Futures Trading Commission.



hands. Consequently, there is no transmission mechanism tying futures prices to spot prices until transactions occur in the spot market. If futures markets work properly, arbitrage between selling today and in the future links spot and futures prices. For storable commodities, such as oil, it also connects those prices with inventories.

To see how this works, consider the following: Suppose a barrel of oil could be sold today at the spot price, S , or in the future for the futures price, F . If the owner sells now, he receives an immediate payment of S . In addition, that money could be invested and earn interest income, I . The owner also avoids the storage costs, C , that would be paid if the oil were sold in the future. At a minimum, the futures price must compensate the owner for the lost income from selling today, plus the lost interest income, and for storage costs.²

Based on this, we can link futures and spot prices:

$$F = S + I + C.$$

This equation does not hold perfectly in the real world, but it provides useful intuition about prices and inventories. For example, sometimes the futures price will be significantly higher than what this equation says it should be. When this occurs, sellers are receiving an unusually large premium to sell in the future as opposed to the present. Market participants will respond by choosing to sell more in the future and less today. Over time, this should prompt inventories to rise, spot prices to increase and futures prices to decrease. This continues until futures and spot prices are in line with the equation. When futures prices are below what this equation says they should be, market participants receive the opposite signal and respond by selling more today instead of in the future.

In short, during normal times, the futures price should be higher than the spot price—with the premium roughly equaling the cost of storage and lost

interest income—and inventories should be abundant. In certain situations, such as when demand is temporarily high or supply temporarily low, the spot price will be higher than the futures price, and inventories will be

relatively low.

Chart 4 uses actual data since 2004 for the NYMEX West Texas Intermediate futures contract to show the relationship between inventories at Cushing, Okla., (where WTI spot

Chart 3
Noncommercial Spreading Positions Rise Over Time

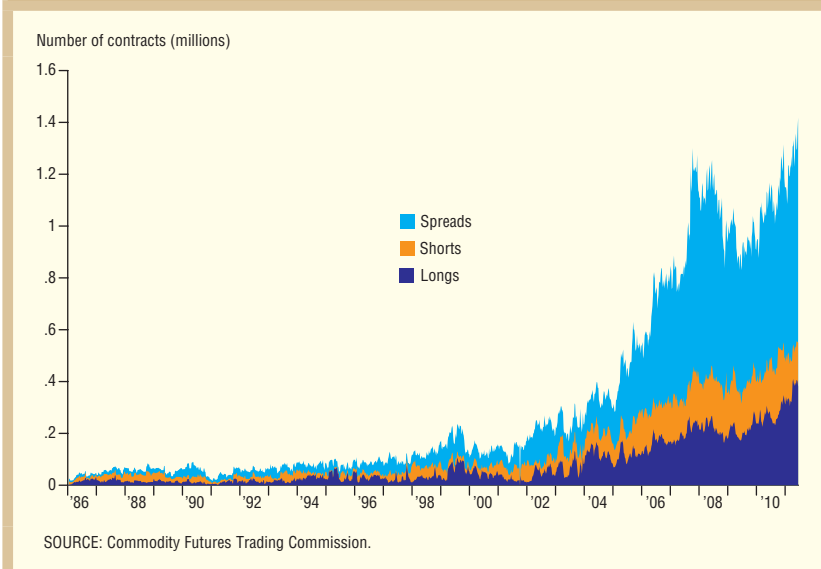


Chart 4
Oil Price Spread Varies with Inventory Levels
(Six-month future prices – spot prices)

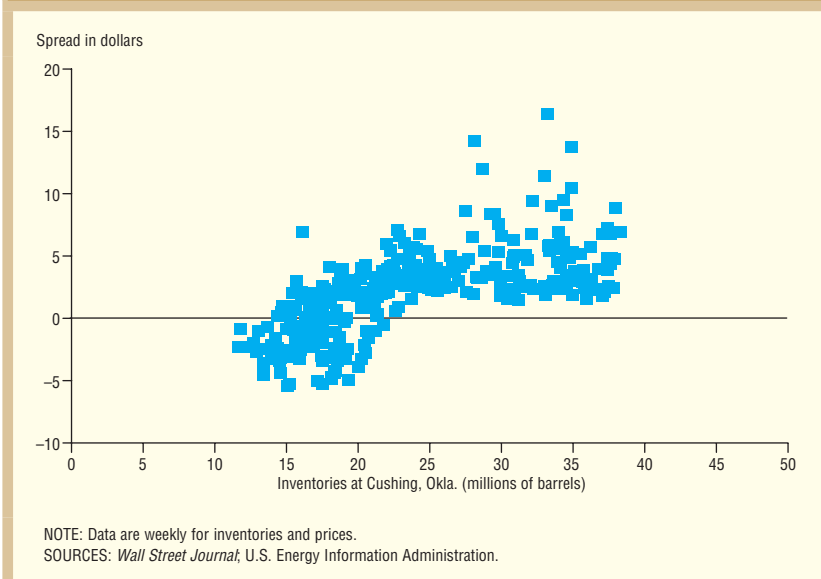
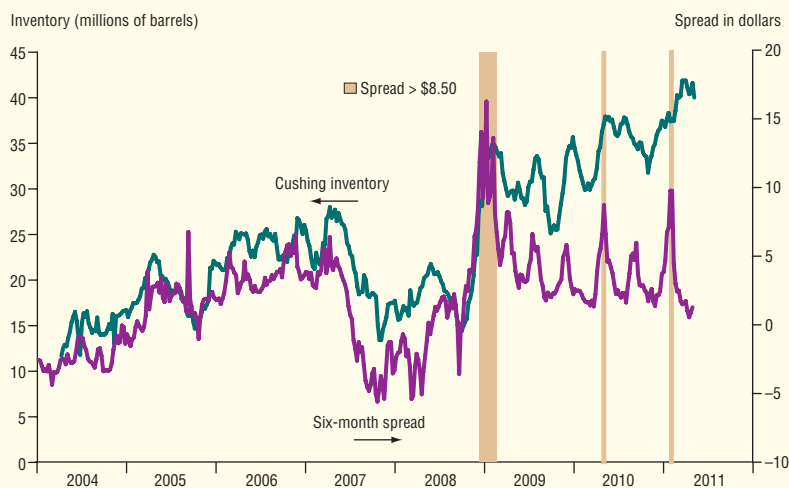


Chart 5

Cushing, Okla., Inventories and Six-Month Spread Illustrate Recession Impact



prices are determined) and the spread, or difference, between the price of the six-month futures contract and the spot price. When inventories are relatively low, the spot price tends to exceed the six-month futures price, and the spread is negative. When inventories are high, the spot price tends to be below the futures price, and the spread moves into positive territory. Specifically, once inventories exceed roughly 22 million barrels, there are no instances where the spread is negative.

Several outliers appear in the chart where the spread is relatively large. One might view this as a sign of potential excessive speculation, but looking at inventories and how the spread evolves over time, a different picture emerges (*Chart 5*). The shaded bars indicate the periods when the outliers occurred. The bulk of the outliers were in late 2008 and early 2009, when the world economy was in recession. The likely explanation for the abnormal spread is the unexpectedly low demand that occurred then, causing the spot price to plunge.

Perhaps more importantly, most of the data for 2007 and 2008 point to a persistent tightness in the crude-oil market. Inventories were relatively low and the spread negative during most of that period. If speculation in the futures market was responsible for the price hike, very large positive spreads would have been followed by significant increases in inventories. Instead, the data are in line with what the theory predicts we should see when market tightness and a reasonably well-functioning futures market exist.

Normal Market Behavior

Activity in the crude oil futures market increased appreciably in the past decade, as did the number of noncommercial traders, the so-called speculators. This coincided with rising oil prices but didn't necessarily cause them. No transmission mechanism linking futures prices to spot prices appears until transactions occur in the spot market. Looking at the 2007–09 period, the data are consistent with how a well-functioning futures market would behave, initially when there is tightness in the

market, and later when there is considerable slack due to the global recession. Futures market traders, therefore, seem to have been routine market participants.

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Notes

- ¹ In an example of such a spreading position, a speculator goes long in the three-month contract but short in the six-month one (betting prices will go up in the short term and down longer term).
- ² There may be other costs and/or benefits than those listed here that accrue from selling in the future as opposed to the past. More complicated theories attempt to explicitly model these.

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