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Did Speculation Drive Oil Prices?
Market Fundamentals Suggest Otherwise

by Michael D. Plante and Mine K. Yücel

The tripling of oil prices from early 2007 to mid-2008 is consistent with several market fundamentals, including increased demand from emerging markets, low elasticities of demand and reduced OPEC excess capacity.

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 at evidence from the physical market for oil and conclude that fundamentals, and not speculation, were behind the dramatic rise and fall in oil prices. In our companion* Economic Letter, *we examine the futures market.*

Oil prices began their climb in 2002, reaching a record high in mid-2008, and then collapsed at the end of '08 amid the global recession. As world economic growth picked up, so did oil prices. Overall, the year-over-year change in oil prices has fairly closely tracked world gross domestic product (GDP) growth (*Chart 1*).

Energy consumption increases as GDP rises; but energy consumption in developing countries increases almost twice as fast as in developed countries. GDP expansion in emerging economies was particularly strong between 2005 and 2007, averaging 8 percent per year. Real GDP in China, for example, grew by an average 12.7 percent annually between 2005 and 2007, while the nation's oil consumption increased 5.1 percent annually during the period.

From the beginning of 2007 to mid-2008, weekly prices for West Texas Intermediate (WTI) crude oil jumped 152 percent, from $57 to $143 per barrel. It's possible that growing demand for crude oil might not be the reason for the rise. However, if the increase was due to other factors, oil consumption should have begun falling in response to the higher prices. Instead, there was almost no consumption decline during the period,

implying that oil prices were driven by growing world income and demand.

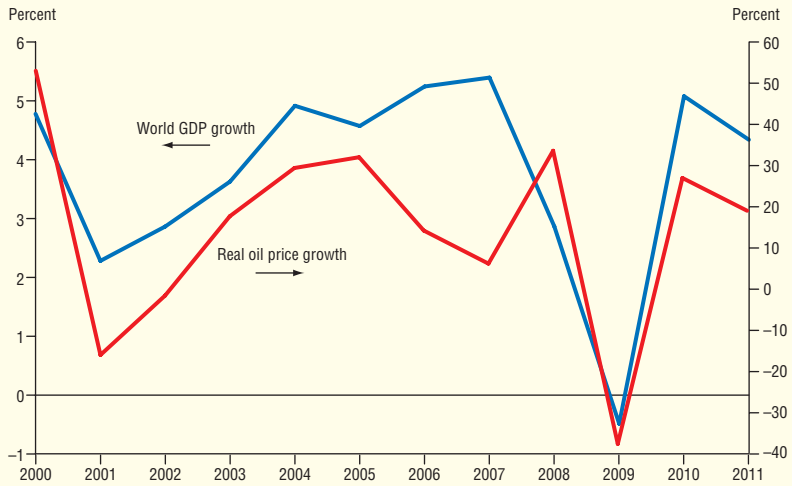
Insensitivity to Price Change

Consumers of oil and oil products are not very sensitive to price changes, especially in the short run. In economic jargon, the price elasticity of demand is very low. This is mainly because oil's use for transportation purposes accounts for two-thirds of consumption, especially in developed countries, where there are no close substitutes in the short term. When consumers are insensitive to price changes, a shock in the oil market, whether from increased demand or reduced supply, will heighten price volatility.

To see whether rising oil prices from 2007 through mid-2008 are compatible with the elasticities for oil estimated in the energy economics literature, we performed a simple calculation. Taking the developed-world and emerging market GDP growth rates from the International Monetary Fund, and making some assumptions about income elasticities of demand, we can calculate the higher oil demand implied by these growth rates. Then, by comparing actual growth in consumption and the calculated consumption numbers, we can determine the oil price elasticities they imply. We found that these elasticities would have to range from 0.01 to 0.08 for prices to surge as they did in 2007 and 2008—well within the estimated elasticity ranges in the energy economics literature.[1]

Chart 1

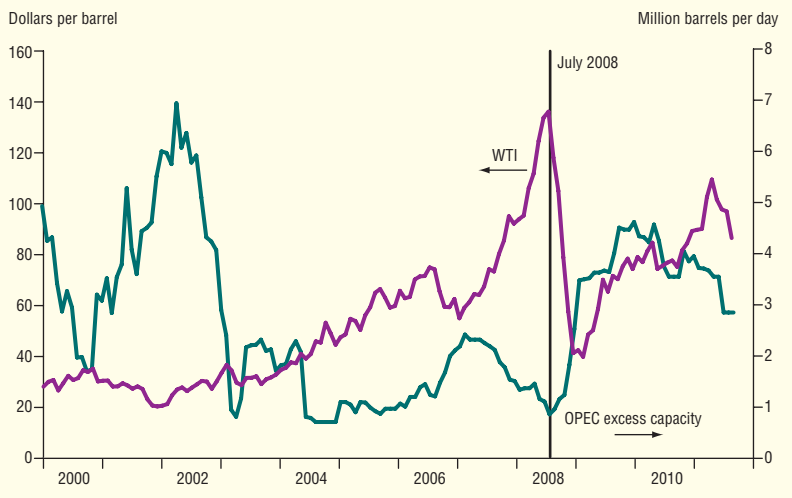
World GDP Mirrors Oil Price Growth



SOURCES: International Monetary Fund; Bureau of Labor Statistics; *Wall Street Journal.*

Chart 2

Reduced OPEC Excess Capacity Helped Tighten Market



NOTE: Oil prices are monthly averages.

SOURCES: U.S. Energy Information Administration; *Wall Street Journal.*

OPEC Market Power Firmed Prices

The oil market is not perfectly competitive. The Organization of the Petroleum Exporting Countries (OPEC), since its formation in 1970, has been an oligopolistic producer, trying to boost prices by controlling members' output (with more success at times of higher demand growth). The remaining non-OPEC producers form a price-taking, competitive fringe. OPEC's market share has dwindled from 52 percent in the early 1970s to a still hefty 42 percent today. In the 1990s, as the market grew, so did both OPEC and non-OPEC production. However, non-OPEC oil output growth flattened around 2003, while OPEC output continued expanding from 37 percent in 2003 to the current 42 percent level. Increased market power, coupled with rising demand, was a significant factor keeping oil prices high.

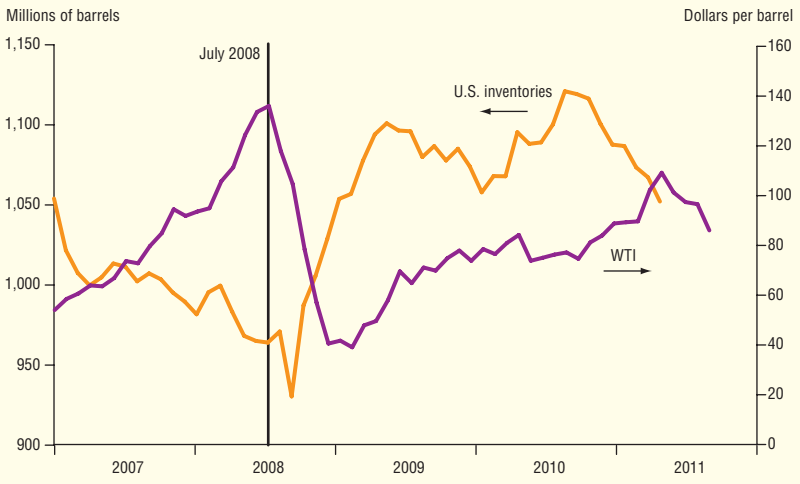
Low OPEC Excess Capacity

OPEC's crude oil production capacity has changed little since the 1970s, rising from 34 million barrels per day in 1973 to 35.5 million barrels per day in 2008. However, increased world consumption greatly diminished the cartel's excess capacity. OPEC has added capacity slowly, using its restrained output to keep prices high.

It is easier to keep cartel members disciplined and conforming to production quotas when capacity is tight. Moreover, shocks in a tight oil market can increase price volatility because OPEC lacks the ability to offset these shocks, even if it desires to. Chart 2 shows the inverse relationship of oil prices and the cartel's excess capacity. In mid-2008, when oil prices reached record highs, OPEC excess capacity was down to 1 million barrels per day.[2]

Chart 3

Oil Price Speculation? Inventories Didn't Rise



NOTE: Oil prices are monthly averages.

SOURCES: U.S. Energy Information Administration; *Wall Street Journal.*

Inventories Did Not Increase

A speculator wanting to drive up the current price of oil would have to buy in the spot market. Since the price is determined in a cash marketplace where transactions are settled with physical oil changing hands, speculative buyers would have to store their purchases, and inventories would rise. Instead, during the oil price run-up in 2007 and 2008, inventories in the U.S. were being depleted. Chart 3 shows WTI prices and U.S. oil inventories and illustrates the workings of an efficient market—as supplies diminish, prices rise and the market tightens.

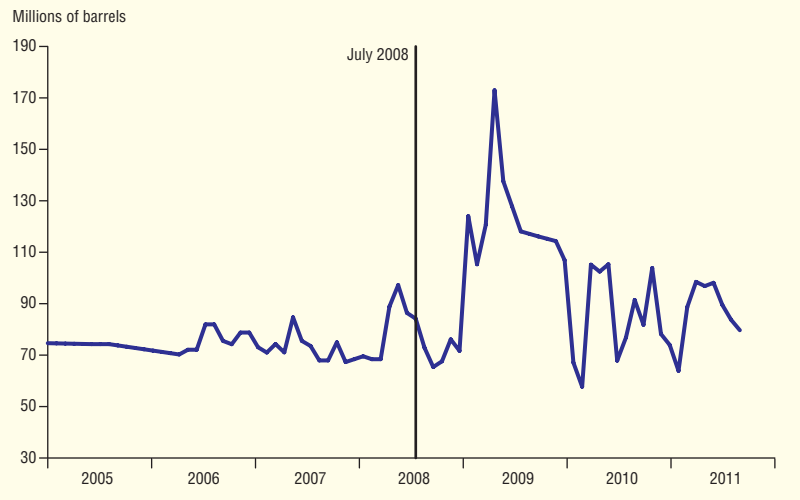
Another possibility might be speculators using floating storage, keeping oil in tankers at sea and off the market. Floating storage appears to increase in 2008, rising from 68.4 million barrels at the end of March to 97 million barrels in May (*Chart 4*). However, floating storage declined in June and continued falling throughout the summer.

We would have expected to see floating storage rise significantly during the summer if speculators were in the market; instead, the opposite occurred. Floating storage did rise much later in the year, but that was concurrent with the global recession.

There is one additional type of storage—producers maintaining the oil as reserves and not producing. However, if we look at OPEC output, it clearly rose as oil prices went up, until July 2008. OPEC increased production by 2.4 million barrels per day

Chart 4

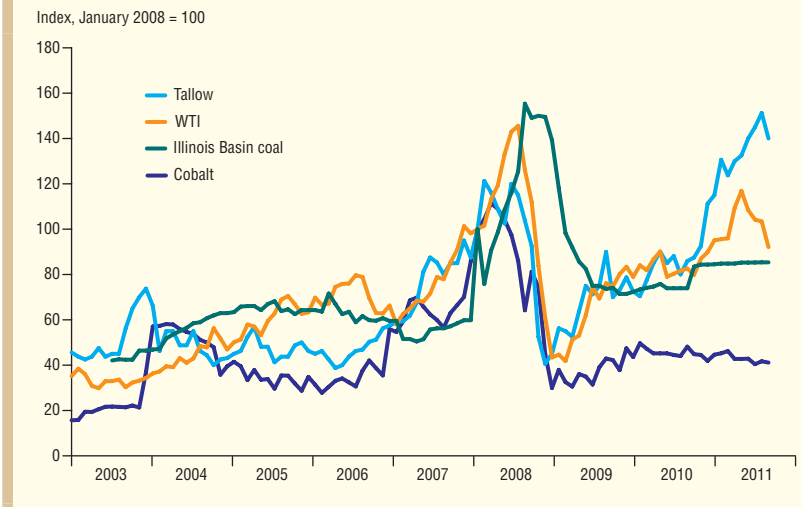
Floating Storage Suggests Changing Demand



SOURCE: Bloomberg.

Chart 5

WTI Prices Resemble Commodities Without Futures Markets



SOURCES: U.S. Energy Information Administration; *Wall Street Journal*; Bloomberg.

from the beginning of 2007 to July 2008. Non-OPEC production remained relatively constant and did not rise, though this is largely a function of non-OPEC producers' zero excess capacity rather than an attempt to restrict output.

Other Commodities Surged

Those believing speculation pushed up prices point to the coincident increase in the number of noncommercial traders in the futures market—for example, speculators—and the rise in oil prices.[3] However, Chart 5 shows that this may not necessarily be the case. It depicts the prices of WTI, Illinois Basin coal, tallow and cobalt. Of these commodities, there is a futures market only for WTI. Yet, prices for Illinois Basin coal, tallow and cobalt increased as fast as oil, if not faster, in 2008 and fell just as quickly when the economy crumbled. Such integrated movement in the prices of these commodities is consistent with a pure demand story, rather than a speculation one.

Fundamentals, Not Speculation

Activity in the futures market increased appreciably in the past decade, as did the number of noncommercial traders. This rise was coincident with the rise in oil prices, leading some to hypothesize that speculation—rather than market fundamentals—drove the price of oil.

The tripling of oil prices from early 2007 to mid-2008 is consistent with several market fundamentals, including increased demand from emerging markets, low elasticities of demand and reduced OPEC excess capacity. The behavior of inventories was also consistent with the reality of a tight market, not with a story of speculation-driven hoarding, whether we look at inventories above ground, below ground or floating at sea. Hence, evidence from the physical market for oil, similar to that from the futures market, is consistent with oil-market fundamentals leading to increasing oil prices before the global recession.

Plante is a research economist and Yücel is a senior economist and vice president at the Federal Reserve Bank of Dallas.

Notes

[1] An elasticity of 0.01 implies that for every 10 percent change in oil prices, consumption falls by 0.1 percent. Estimated short-run price elasticities for oil range from 0.0 to –0.11. See "A Literature Review of Demand Studies in World Oil Markets," by Frank J. Atkins and S.M. Tayyebi Jazayeri, University of Calgary, Department of Economics Discussion Paper 2004-07, April 2004.

[2] OPEC excess capacity has ranged from a high of 9.8 million barrels per day in 1985 to a low of 700,000 barrels per day in 2004.

[3] See "Did Speculation Drive Oil Prices? Futures Market Points to Fundamentals," by Michael D. Plante and Mine K. Yücel, Federal Reserve Bank of Dallas *Economic Letter*, vol. 6, no. 10, 2011.

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FEDERAL RESERVE BANK OF DALLAS
2200 N. PEARL ST.
DALLAS, TX 75201