Economic SYNOPSES
short essays and reports on the economic issues of the day

2005 ■ Number 17

Future Oil

Michael R. Pakko

Crude oil prices have risen from around $25 per barrel in early 2002 to over $50 per barrel in recent weeks. This rapid run-up in prices has generated uncertainty about the outlook for oil prices: Will recent high prices persist, or will world oil prices moderate as supply and demand adjust?

Some analysts look to the market for oil futures as a source of information on prospective prices. Futures markets provide a direct reading on the price of a contract to deliver oil at a specified future date. Although we might expect that prices on these contracts would provide information about future spot prices, historically futures prices have not provided very accurate predictions. The spot price of oil incorporates information about current supply and demand conditions, as well as information about the future. Reflecting similar information sets, spot prices and futures prices move together closely.

As shown in the chart, futures prices (dashed lines) were persistently lower than spot prices (solid line) throughout the run-up in oil prices during 2004. Were futures markets erroneously predicting a reversal of price increases? Actually, there is a marked tendency for futures prices to lie below spot prices on average. In the jargon of commodity futures markets, this is known as "backwardation."[1]

Backwardation in the oil futures market is related to a consideration known as "convenience yield," the marginal benefit of holding a commodity in reserve. For oil, the convenience yield lies in the option-value of allowing oil to remain in the ground. By not pumping oil in the first place, the owner of an oil field retains the option of increasing production at a later date. An unanticipated need for oil in the future is often more conveniently and less expensively met by pumping additional oil rather than buying it on spot markets. The presence of a convenience yield acts to push futures prices below spot prices.

Storage costs and interest costs provide an opposing effect on the relationship between spot and futures prices. Unless one has direct access to an oil production facility, a promise to deliver oil in the future requires the purchase of oil on the spot market, the interest cost of borrowing to finance that purchase, plus storage costs. Hence, interest costs and storage costs comprise the total carrying cost of oil, placing an upper bound on the futures price relative to the spot price. To summarize, we have (Futures Price – Spot Price) = (Carrying Costs – Convenience Yield).

If futures prices were to rise high enough, a buy-and-hold strategy would become profitable—driving spot prices up and futures prices down. In the absence of a convenience yield, the existence of carrying costs implies that futures prices would generally lie above spot prices.

Backwardation characterizes the oil futures market more than two-thirds of the time, implying significant convenience yields. Recently, however, futures prices have risen above spot prices—a situation known as a "contango" market. One possible explanation for the emergence of this pattern is that futures prices are signaling an expectation of rising spot prices. On the other hand, the current high price of oil for immediate delivery might be suppressing convenience yields—a development that would be consistent with lower oil prices over time as producers increase their output. In the end we are left with the conclusion that prices of futures contracts convey little exploitable information about future spot prices. ■

[1] For more information on this phenomenon, see Joseph G. Haubrich, Patrick Higgins, and Janet Miller, "Oil Prices: Backward to the Future?" Federal Reserve Bank of Cleveland *Economic Commentary*, December 2004.

West Texas Intermediate Spot Price with Futures