

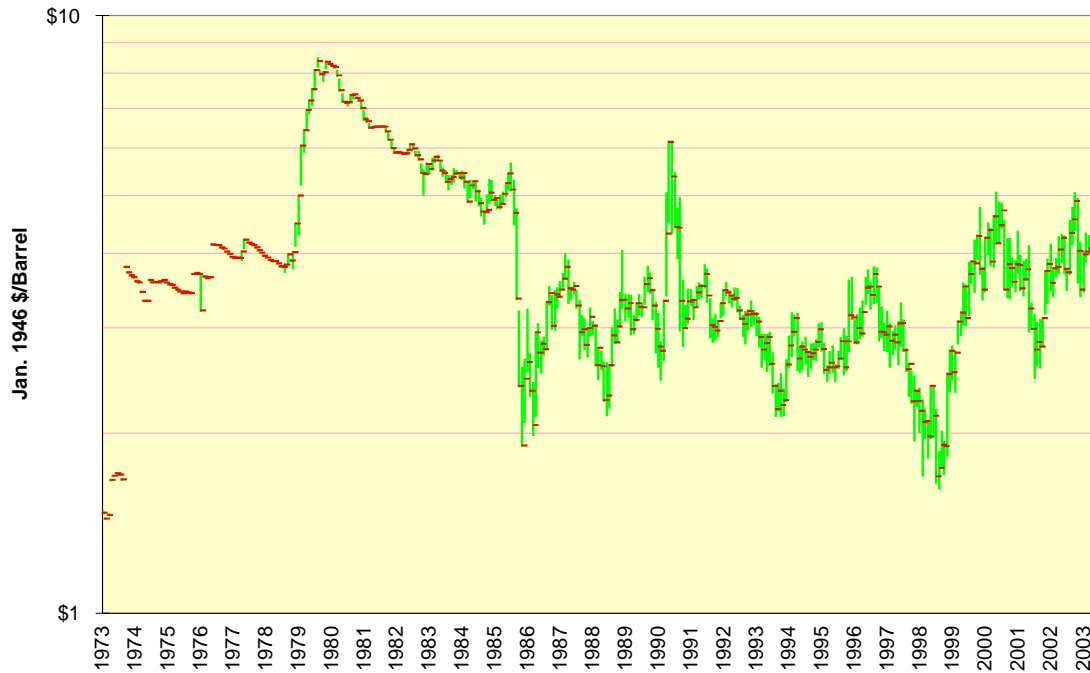
## A Six-Pack Of Oil Indicators

Rattlesnakes have the admirable quality of warning before they strike. Speaking of OPEC, should not these paragons of petroleum follow suit and provide adequate and fair warning of their intentions?

No, and none is necessary: The internal structure of the petroleum markets as manifested both in outright prices, substitution and process spreads and in readily derived relationships provides us with a great deal of information applicable to forecasting.

But if OPEC owes us no obligation, we certainly owe it to ourselves. In the three decades since the first oil shock, the global economy has suffered through three additional price shocks and various intermittent price collapses. The oil shocks of 1980-81, 1990-1991 and 2003 all occurred in the context of Saddam Hussein's adventures, his invasions of Iran and Kuwait and later his invasion by the United States and its coalition of the willing. The price collapses of 1985-1986, 1988, 1993-1994 and 1998-1999 all occurred in the context of the OPEC cartel's failure to maintain supply discipline. The price collapse of 2001-2002 occurred in the aftermath of the September 2001 terrorist attacks. Surprisingly, oil price collapses can be as economically disruptive as the upward price shocks, as they render alternative energy projects unattractive and discourage more efficient use of energy.

### Shock And Collapse: The Crude Oil Story



With this in mind, let's run down a list of indicators and discuss why they are important.

#### The Fear Factor

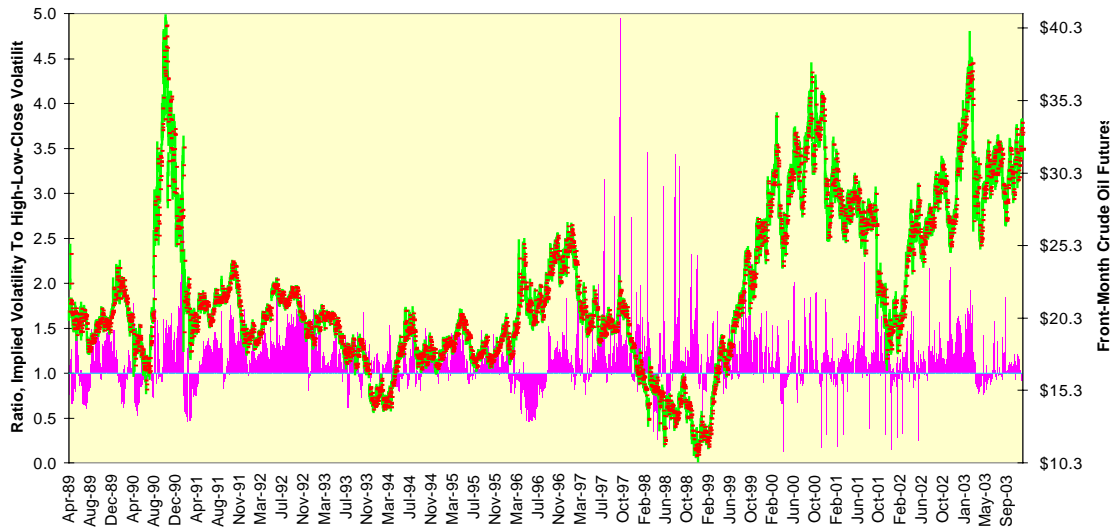
The ratio of implied volatility to high/low/close volatility in the crude oil market gives a good measure of the extent to which traders are willing to purchase insurance against adverse price moves. High/low/close volatility is calculated as:

$$HLCVol \equiv \sum_{i=1}^N \left[ \frac{.5 * \left( \ln \left( \frac{\max(H, C_{t-1})}{\min(L, C_{t-1})} \right) \right)^2 - .39 * \left( \ln \frac{C}{C_{t-1}} \right)^2}{N} * 260 \right]^5$$

Crude oil, like stock indexes, has an investor skew in its option volatility; volatility tends to jump when prices fall and tends to fall when prices move in gradual uptrend. This volatility structure is the opposite of the demand skew seen in products such as heating oil and natural gas, wherein the buyer is the more anxious party and volatility tends to rise in upward price moves.

Unlike stock indexes, however, implied volatility in crude oil frequently falls toward the high/low/close volatility level once the market accepts a downtrend. Lower stock prices have an immediate balance sheet impact as stocks are instantaneously liquid, but lower crude oil prices have only a short-term impact on the reserve holder. After all, unless the reserve holder intends to sell and exit the business, only the small portion producible for sale at current prices is affected.

### Low Fear In The Option Market

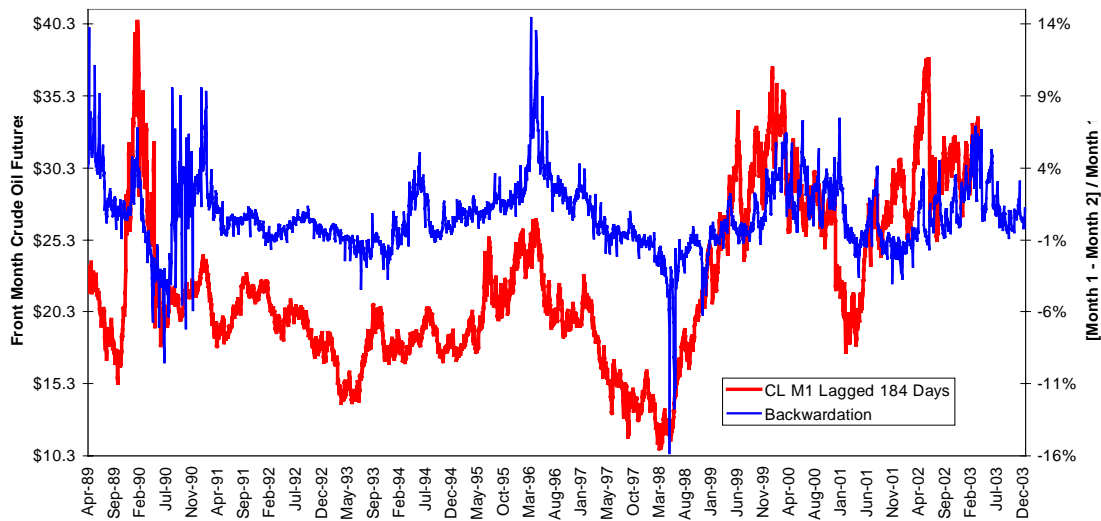


Whenever the ratio of implied to high/low/close volatility falls toward 1.00, it indicates relative comfort with the prevailing trend, whether higher or lower. Of course, crude oil is a notorious news market, which means the opposite, high implied volatility, should not necessarily be confused with rejection of a trend underway.

### Bending Over Backwards

The second indicator is the intermonth spread between the first and second months of crude oil futures. A high level of backwardation, or premium of the front month to the second month, indicates anxiety on the part of both buyers and sellers that the present price is unsustainable and is expected to fall. The opposite applies to contango, the situation that exists when the front month trades at a discount.

### Intermonth Spread Leads Price



Stable levels of backwardation or contango within a trending market for crude oil also indicate a high comfort level. This, for example, was one of the tip-offs the 1999-2000 rally was real: Backwardation did not increase substantially until well after the \$30 per barrel mark was breached.

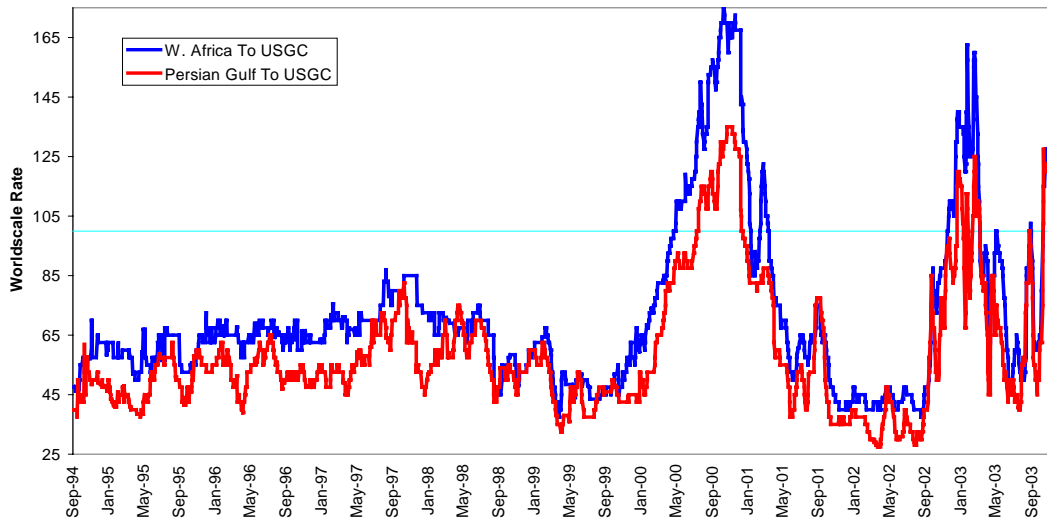
The intermonth spread in crude oil has the most useful property of being very forward-looking; its extremes lead changes in price by six to nine months. The intermonth spread's utility as a shorter-term forecasting indicator is less, despite all of the breathless phone calls originating from NYMEX floor brokers.

This is not a case of spurious correlation, as it is linked to the inventory cycle. Contango encourages the building of inventories; the stored oil bought at depressed spot market prices can be hedged with a positive return by selling distant futures at a premium. The oil placed into inventory represents an increase in demand that will support prices at some point. Backwardation does the opposite, it encourages the shedding of inventories that depress current demand and place downward pressure on future prices. The building and shedding of inventories takes time, which brings us to our next indicator.

### Floating Inventory

A crude oil tanker from the Persian Gulf to the U.S. Gulf Coast faces a two-month voyage; a tanker from West Africa to the USGC takes about fifteen days to arrive. While the cargoes are not included in U.S. inventory data, they will affect inventories once they arrive. If we follow tanker rates, we can get an idea of how much crude oil is going to be coming our way across the water. These rates are expressed as Worldscale, or percentage of the calculated normal shipping tariff.

### Today's Cargoes Are Tomorrow's Inventories

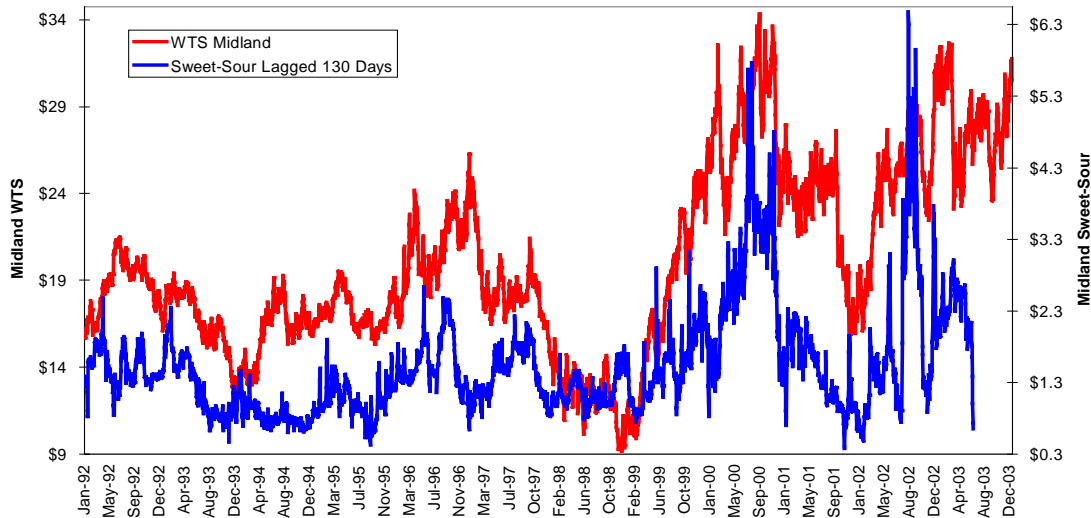


The big surges in tanker rates in 2000 and then in anticipation of the Iraq War in 2002 led to subsequent declines in crude oil prices. Conversely, the low tanker rates of 1999 exacerbated the later increases in crude oil prices in 2000.

### Oil Market Spreads

Now let's add three different oil market spreads to extend the analysis. The first of these is the spread between sweet, or low-sulfur, and sour, or high-sulfur, crude oil. Let's look at West Texas Intermediate for the sweet and West Texas Sour for the sour crude, both prices taken at Midland, Texas. Whenever crude oil demand is high, incremental refining capacity is brought on stream capable of handling only the low-sulfur crude; the sweet-sour spread moves out as a result.

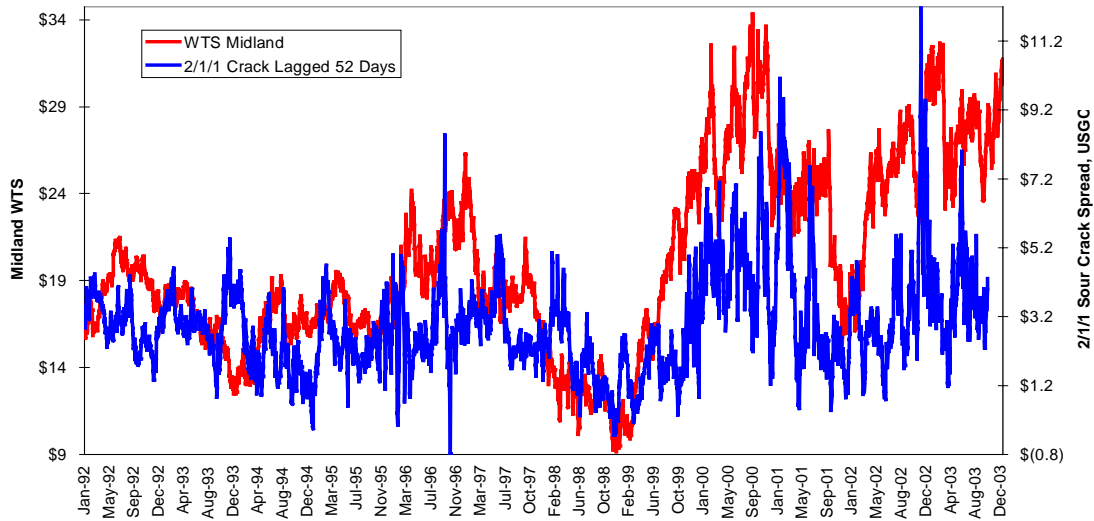
### West Texas Sour Power



Unfortunately for the purposes of U.S. futures trading, the price of sour crude leads the sweet/sour spread by about 130 trading days; this lag reflects the amount of time it takes to reconfigure refineries and to bring new units on-stream. The NYMEX launched a poorly designed - eight very different types of crude oil were deliverable against it, and the contract was traded in the same pit as sweet crude at the exchange's former space in the World Trade Center - contract on crude oil in the early 1990s. If this contract is ever modified and re-launched, keep this leading relationship of sour crude oil prices to the sweet/sour spread in mind.

Refining margins, also called crack spreads, lead sour crude oil prices by a little over 50 days, which coincides with the planning horizon for many refiners. Let's look at the so-called 2/1/1 crack for sour crude at the U.S. Gulf Coast, the conversion of two barrels of sour crude oil into oil barrel each of heating oil and gasoline. A higher spread level indicates better refining economics and greater capacity to bid the price of crude oil higher.

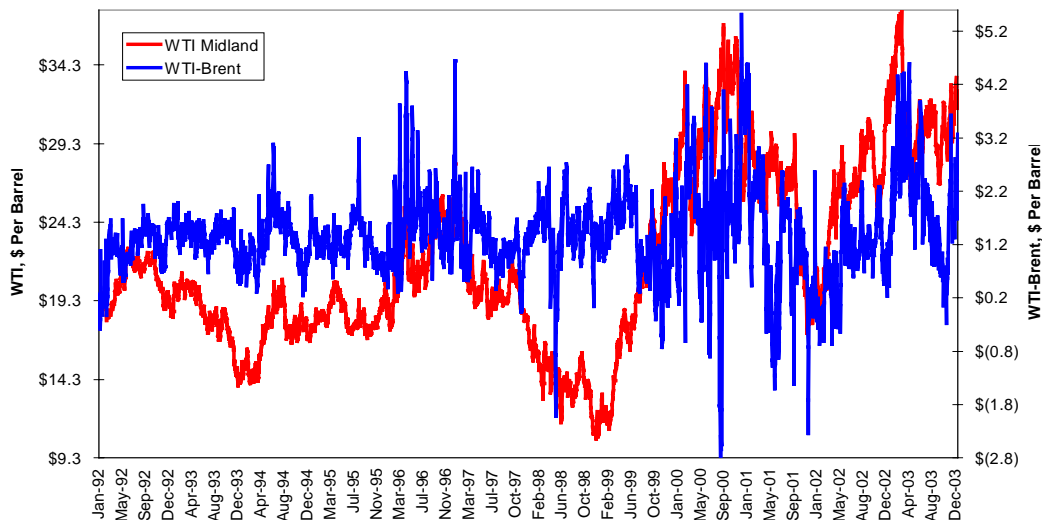
Step On A Crack



Refining margins have become more erratic in recent years as many smaller operations had to close because of compliance costs with environmental regulations, the Clear Air Act in particular. The incremental suppliers of refined products to the United States more often than not are located in the Caribbean. Any disruption to these supplies, as occurred with the Venezuelan oil workers strike during the winter of 2002-2003, plays havoc with the U.S. industry.

The final spread we will examine is between West Texas Intermediate and Brent, the marker sweet crude oil produced in the British sector of the North Sea. A high spread value, like a high level of backwardation, indicates an unstably high U.S. crude oil market.

Atlantic Basin Snapshot



Of course, even if we are armed with all of these indicators and more, trading any of the energy markets can be devilishly difficult. Thirty-plus years of experience with OPEC, terrorism, misguided domestic decisions and natural accidents should be enough to convince anyone that risk management trumps market analysis every time.