

Energy Storage Operators And Forward Curves

While it is a safe bet no one ever built a statue in the town square to a speculator, it is an ever safer bet no one ever built on to a warehouse operator, either. This might seem to be something of a shame as some of the greatest rewards of supply chain management and cost reduction have come from improvements in inventory management, but as we shall see below, it is perfectly understandable given storage operators' lack of leverage.

A little history is in order. Prior to the adoption of better inventory management in the 1990s, most business cycles were combinations of excess inventories leading to production slowdowns and higher short-term interest rates engineered by the Federal Reserve and made effective by Regulation Q interest rate ceilings on time deposits.

The newer era of interest rate, mortgage and credit derivatives and global supply chain management appeared to be well on its way to eliminating business cycles until the housing and credit busts of 2007-2009 proved otherwise. These sorts of things tend to happen whenever someone confuses the *Novus Ordo Seclorum* (new order of the ages) on the Great Seal of the United States for reality.

Forward Curves And Inventories

Futures traders can spend their whole lives trading calendar spreads with scarcely a thought about their role in inventory management. However, these spreads are absolutely critical for sending price signals on the economics of storage. A market where storage costs can be shifted to the producer, a common situation in extractive resources such as copper or crude oil, tends to trade in backwardation. Here the buyers keep a minimal amount of inventory on hand and are willing to assume the risk prices will rise into delivery. The willingness of producers to sell forward into discounted back-month futures is equivalent to an insurance cost.

Conversely, markets with pronounced seasonality such as natural gas often trade in contango as buyers are willing to assume the costs of storage if they can receive a discount in the spot market. The accumulation of inventories has an insurance component as well; here buyers are acquiring protection against future shortages.

Futures markets allow both producers and consumers to insure themselves against inventory risks directly. Third-party storage operators can participate in these markets as well. These warehouse/tank/terminal operators were outsourcing this vital function long before anyone knew what outsourcing was. Let's examine both the relationship between forward curves and inventories and the relative performance of storage operators in the crude oil and natural gas businesses as a function of forward curves.

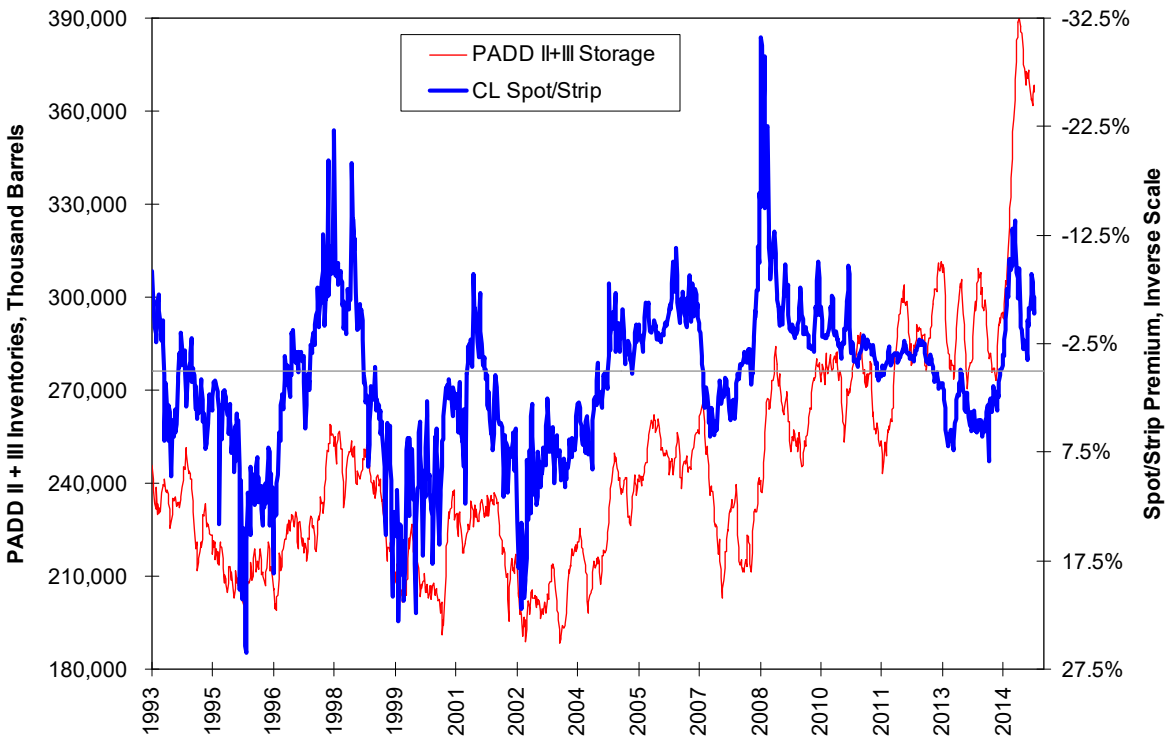
Forward Curves And Crude Oil Inventories

Let's look at crude oil inventory levels in PADD-II and PADD-III. PADD-II is the mid-continent region and PADD-III is the U.S. Gulf Coast. For those of you curious, PADD stands for Petroleum Administration for Defense Districts; these were created in 1942 to administer petroleum flows during World War II. Government programs never die.

Prior to the reversal of pipelines flowing north from production regions and import terminals on the Gulf Coast in the 2012-2013 timeframe and the construction of additional pipeline capacity flowing southward from Cushing, the two PADDs could be treated as separate. They now are treated best as a single storage and pipeline complex for purposes of examining the interplay between inventories and forward curves.

As front-month futures prices fall relative to the price of a twelve-month strip of futures, producers have a choice. They can reduce production and keep it in the ground or they can offer buyers a discount to put that crude oil into storage. Once this discount expands to a level sufficient to cover the costs of storage, inventories expand. While the inventory cycle has been operating since the advent of crude oil futures in 1983, it really accelerated with the price collapse beginning in November 2014. This is when OPEC signaled it would not reduce production but would keep offering crude oil at a discount and effectively finance the expansion of crude oil inventories. This expansion initially redounded to the benefit of crude oil storage operators, but that effect dissipated after crude oil prices turned lower after November 2014, as we shall see below.

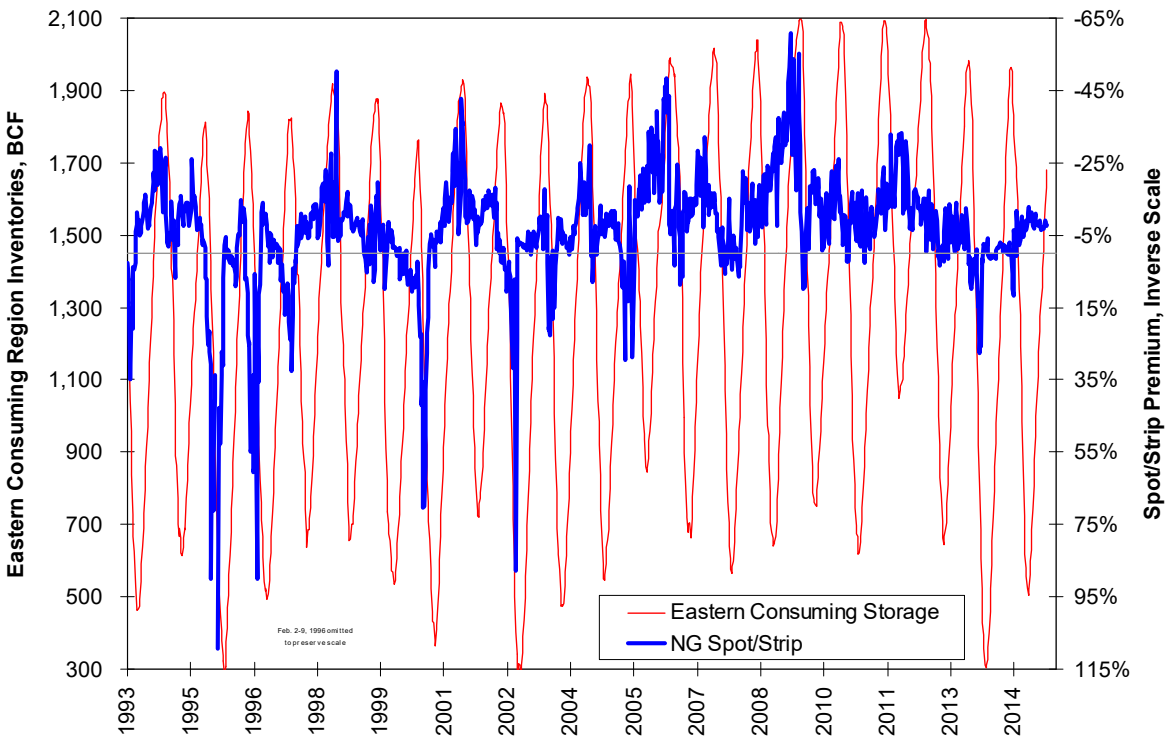
PADD II + III Inventories Rose As Contango Deepened In Bear Market



Natural Gas Inventories

The forward curve of natural gas and its inventory cycle have a much more pronounced seasonality than do their crude oil counterparts. The regular pattern should be a shift from a carry structure in the summer months toward backwardation by the late winter, and this seasonal cycle should precede inventory builds during the summer and drawdowns during the winter. The Department of Energy has been thoughtful enough to split U.S. natural gas inventory classifications into the regions of Producing and both Eastern and Western Consuming. The inventories displayed below are for the Eastern Consuming region.

Eastern Consuming Region Inventories Separating From Forward Curve



However, natural gas production and consumption have undergone structural changes as well. Production from the Marcellus Shale bed has vaulted Pennsylvania into the ranks of top natural gas-producing states and natural gas has been displacing both coal and nuclear as a source of electricity generation. These developments started to reduce the seasonality of the natural gas market by 2009 as well and weakened the formerly strong link between inventories and the forward curve.

Relative Performance

If backwardation renders cash-and-carry arbitrage, the basis for inventory accumulation, unprofitable, then the relative performance of the S&P oil & gas storage index should not only decline but decline in advance of rising backwardation. The opposite should hold true, too; relative performance should rise in anticipation of higher inventories and a shift of the forward curves of crude oil and natural gas futures into deeper carries. The oil & gas storage index includes ONEOK, Williams, Spectra Energy, Kinder Morgan and Columbia Pipeline.

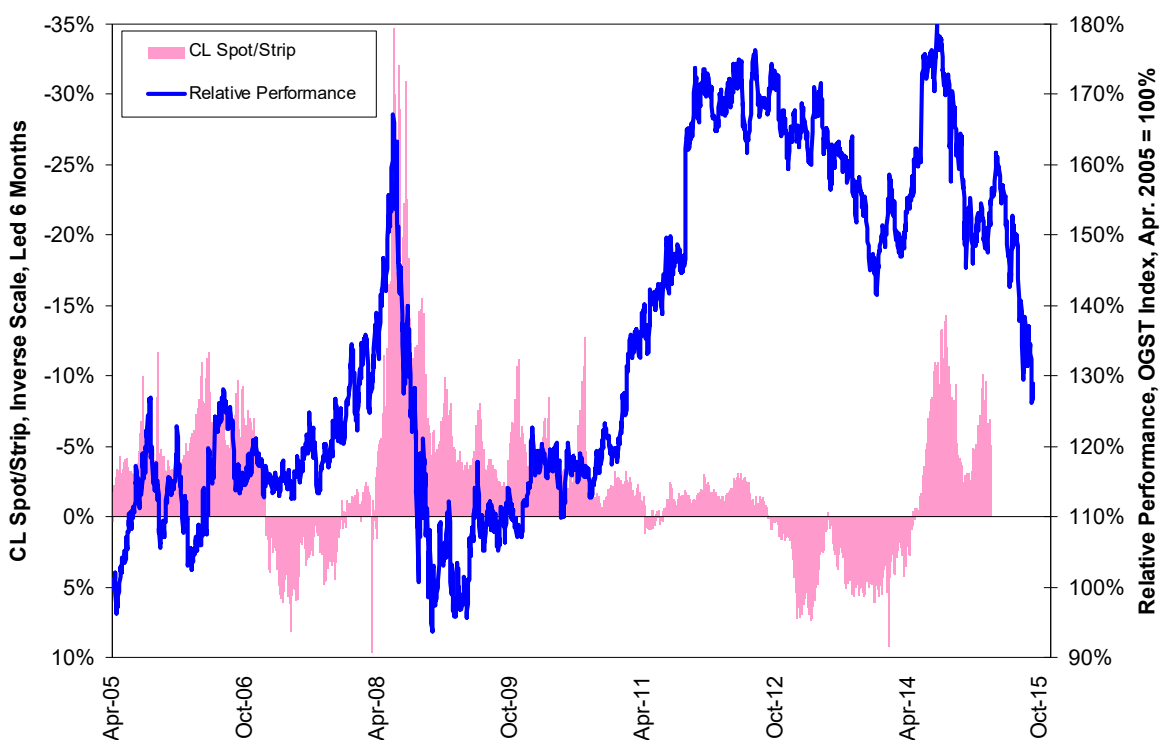
Let's map relative total returns for this storage index against the premium/discount of spot prices for both crude oil and natural gas relative to their respective one-year strip prices. In the case of natural gas, the lead-time is approximately five months. The downturn in storage stocks' relative performance between August 2012 and December 2013 both led the narrowing of natural gas' spot-price discount to its strip price and its eventual shift to a backwardation premium. This is a modest confirmation of stocks' ability to discount the future every now and then.

Storage Operators And Natural Gas Term Structure



The downturn in storage stocks' relative performance after August 2014 was dominated by developments in the crude oil market. Here the directional effect with a six-month lead time is similar but not as neat as the case for natural gas.

Storage Operators And Crude Oil Term Structure



What is clear in both cases is how the strong burst of storage operators' relative performance between April 2009 and August 2012 has reversed into a downtrend as storage capacity additions have overwhelmed the effects of rising inventories and pushed returns lower. This says the outsourcing of inventory management by consumers of both crude oil and natural gas was a short-lived phenomenon.

Cash-strapped crude oil producers, both U.S. and OPEC, needed to keep producing to cover their fixed costs of operation including debt service. This meant taking crude oil out of the ground, monetizing it at a lower price and shifting the cost of storage to buyers. While the contango storage trade can be a profitable one, no one should expect it or any other arbitrage opportunity to last indefinitely. The markets expect the current supply imbalance to be addressed at some point and for the forward curves of both crude oil and natural gas to shift away from contango to more normal levels. This will reduce storage operators' volumes and leave them with idle capacity.

While the common supposition is OPEC in general and Saudi Arabia in particular got too clever by half in flooding the market and driving forward curves into contango, in reality they played a pretty good trick on storage operators through the futures markets. Maybe winding up on the receiving end of this fancy footwork is why the storage operators will have to wait a while for their statue.