

Crude Oil And Natural Gas Are Not The Same Thing

No one should be surprised at the association in investors' and traders' minds between crude oil and natural gas. After all, both are hydrocarbon-based fossil fuels, and most of the early production of natural gas was "associated gas" produced as the result of drilling for the more valuable crude oil. Most natural gas discoveries in recent years have been non-associated natural gas produced from sources such as deep natural gas deposits in reservoirs too hot for crude oil, tight sands and shale. The largest known source of methane on the planet, seabed hydrates, has no association with crude oil at all.

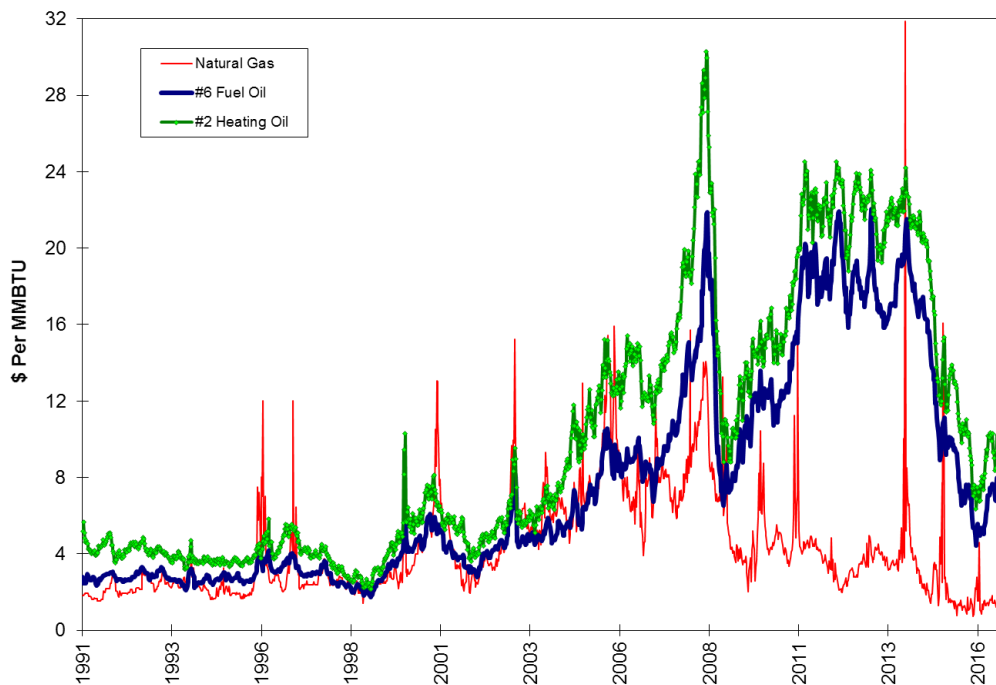
Burner Tip Parity

The association has been reinforced by what seemed to be solid economic theory. Much of this goes back to the aftermath of 1970s price controls on various aspects of both the petroleum and natural gas markets and the natural gas deregulation debate. The Natural Gas Policy Act of 1978 did not provide for full deregulation of natural gas wellhead prices until 1985.

The assumption was natural gas prices would rise to converge with the price of competing fuels at the final user site on a BTU-equivalent basis. Please note this does not mean comparing the futures price of crude oil, a feedstock not consumed directly, at Cushing, Oklahoma, to the futures price of natural gas at the Henry Hub in Louisiana. The prices paid in final markets for both refined petroleum products and for natural gas differ widely on the bases of geography, refining costs and in the case of natural gas, pipeline transportation costs.

This concept of price convergence in final markets was dubbed "burner tip parity." It has never really existed in practice for reasons discussed below. Let's illustrate this with wholesale fuel prices in the New York City market, all converted to the dollars per million BTU convention for natural gas.

Wholesale Fuel Prices In New York



Source: Bloomberg

Natural gas competes with No. 2 heating oil for space heating purposes and with No. 6 residual fuel oil for industrial and utility boiler fuel purposes. No. 2 heating oil in New York Harbor had been the basis for the NYMEX heating oil futures contract between November 1978 and April 2013; it was replaced starting in May 2013 by a contract for ultra-low sulfur diesel fuel.

Federal Energy Regulatory Commission Order 636 establishing a deregulated market for natural gas was not promulgated until April 1992. For much of the period between 1991 and 2007, natural gas and fuel oil traded closely to one another. This was due in large part to fuel oil often being priced off a formula referring to natural gas. Heating oil generally traded well over the price of natural gas prior to 2003, and then increasingly over natural gas into 2008 as petroleum prices surged to their all-time highs. After prices for all energy-related commodities broke during the 2008-2009 financial crisis, fuel oil prices recovered while natural gas prices remained under pressure except for a few wintertime price spikes. The secular decline in U.S. natural gas prices has been attributable to fracking and its impact on production. According to the Department of Energy, dry natural gas production rose from 1.383 trillion cubic feet in February 2006 to 2.304 trillion cubic feet in July 2015. As an aside, the Natural Gas Policy Act and the related Powerplant and Utility Regulatory Policy Act of 1978 were premised on natural gas being a scarce resource with a dim future. Well played, Uncle Sam.

Embedded Options

Let's return to those price spikes for natural gas. Moving beyond the obvious causes such as the active hurricane seasons in 2004-2005 or the brutal winter of 2013-2014, those spikes a physical reality for the natural gas market. Unlike readily storable petroleum products, natural gas is difficult to store on-site and withdraw quickly from storage. The same problem vexes electricity even more.

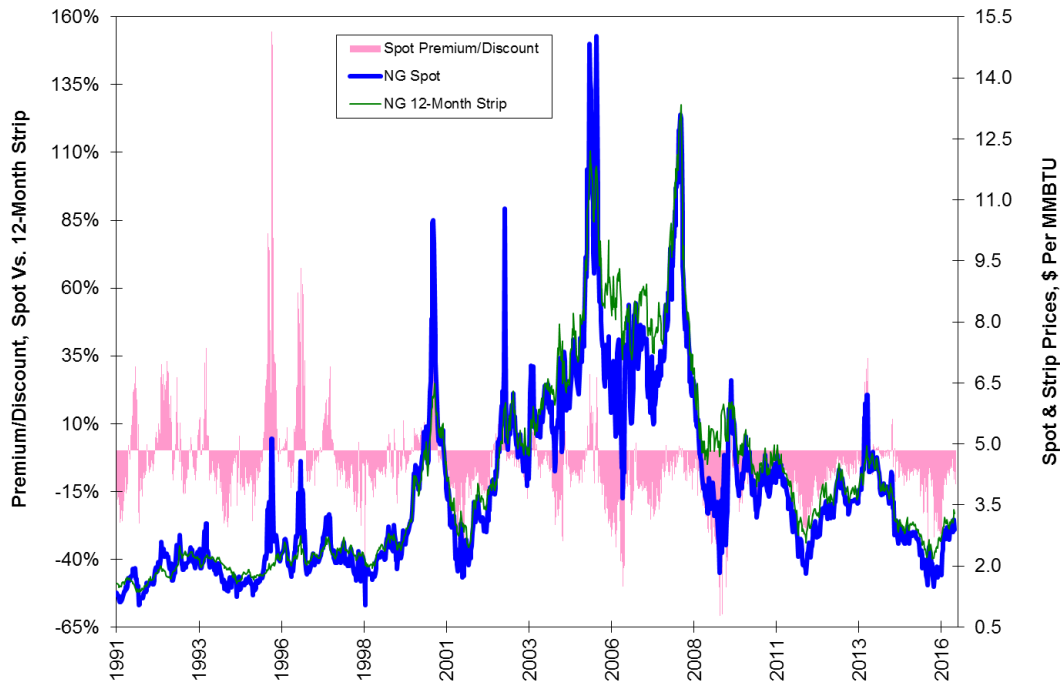
Fuel user understand the most expensive BTU is the one they needed and could not get. As many industrial customers of natural gas have "interruptibility" clauses in their contracts allowing the utility to interrupt their service and divert gas to residential users, those industrial customers are short a call option on natural gas. As a result, natural gas is a less valuable fuel and thus finds itself priced lower in the final market.

One of the better ways to counteract an embedded short call option is to buy or build it in some form. Many local distribution utilities and large natural gas buyers have constructed their own storage facilities to insulate themselves from price spikes. These facilities are known as real options. Residential customers are not in a position to construct their own storage facilities, at least safely, and therefore remain at the mercy of their suppliers unless they buy a pricing cap from their utility, as one author has done.

Forward Curves

Most casual financial traders in natural gas focus on the front month. This is a serious misalignment to how commercial traders must think about natural gas. A large buyer of natural gas such as a fertilizer or chemical manufacturer needs to protect costs over a longer period of time and therefore must focus on the strip price. Distribution utilities focus on wintertime and, increasingly as natural gas takes on a larger share of the electric utility market, on summertime strip prices. Let's compare the spot price for natural gas to a 12-month strip price.

Natural Gas Spot To Strip Relationship



Source: Bloomberg

It is easy to see how spot natural gas prices have tended to trade below strip prices since mid-2001 with only a few exceptions such as the aforementioned winter of 2013-2014. The main reason behind this is strong hedging demand by large fuel buyers. A series of price spikes in the late 1990 made buyers realize that not hedging their forward requirements was an extremely risky position. As a result, they buy capping swaps and long-dated futures strips in the less-traded back months where producer selling is less common. Once these months roll down into delivery, the spot price declines for the simple reason large buyers capped their prices a long time ago.

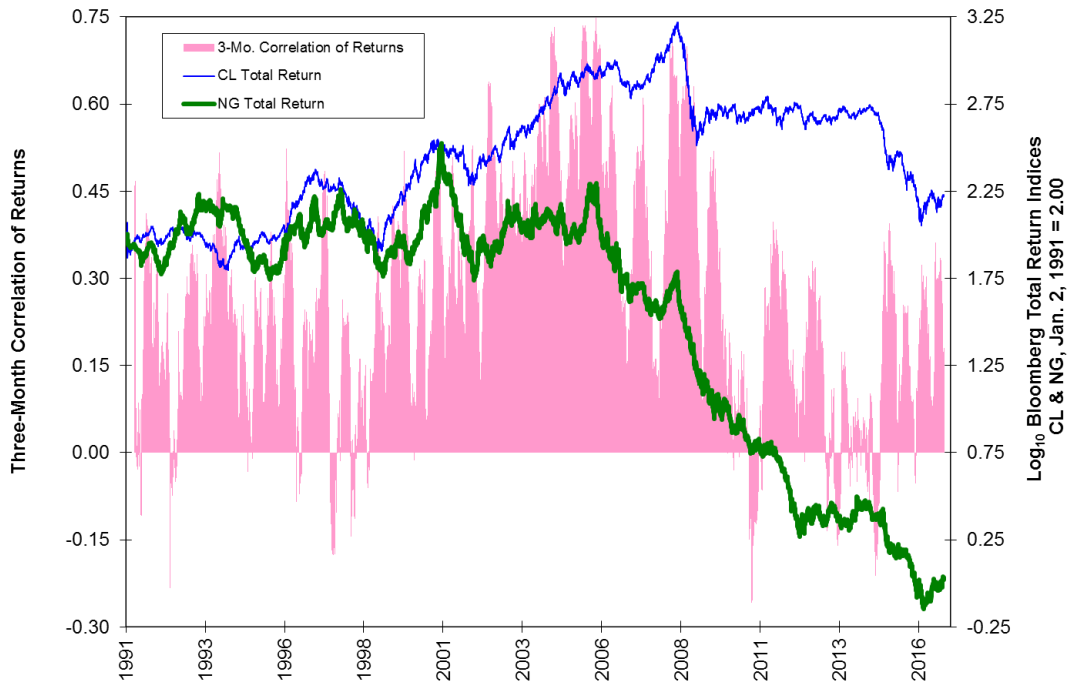
While crude oil can be stored at refiner sites reasonably cheaply and while crude oil imports can fall whenever supply rises, these price governors operate less frequently for natural gas. As a result, the discount between front-month natural gas futures and front-month crude oil futures has moved into a situation where natural gas always looks “cheap” relative to crude oil.

Total Return Indexes

The greater seasonality of natural gas and this tendency noted above for its front-month future to slip has made natural gas an unbelievably bad investment for the long-only commodity indexers and for ETFs such as the United States Natural Gas Fund (UNG).

If we map the total returns for the Bloomberg crude oil and natural gas indexes going back to their January 1991 inceptions on a common logarithmic scale, we can see just how much natural gas has underperformed. Through the late October 2016 time of this writing, the average annual return for crude oil has been 2.87 percent. The average annual return for natural gas has been -25.62 percent. How many other investments could turn \$100 in January 1991 into \$1.045 in October 2016 without making a trip into bankruptcy court?

Crude Oil And Natural Gas Comparative Return Path



Source: Bloomberg

A rolling three-month correlation of returns is instructive as well. It never exceeded 0.75 and has been less than 0.40 since mid-2010 with many periods of negative correlation. The r-squared or percentage of variance explained between the two markets over the entire post-January 1991 period has been a near-random 0.073. If you did not have the mental association between crude oil and natural gas, you would not conclude these two series are related at all.