

Basis plays an important role for trading in the very complex US natural gas markets: spot will differ from the benchmark Henry Hub New York Mercantile Exchange price on the same day. *Eric Fishhaut* describes how the basis works and demonstrates the relationship between the different market prices

The basics of basis

★ In the US natural gas markets, basis plays an important role for trading. The basis is the difference between the natural gas futures contract price – for delivery at the Henry Hub in Louisiana – and the cash or spot price paid in a specific location. Several price reporting organisations survey buyers and sellers of natural gas to find out what the ‘going rate’ is for each day, establishing the reported spot prices. Those prices are always likely to differ from the New York Mercantile Exchange (Nymex) price on the same day. Here we take a look at how the basis works and the relationship between the market prices.

This year’s prices have been somewhat above where the fundamentals point, with as much as 80% premium over last year in the season running up to winter, finally settling back to last year’s level in the last week of the year, shown in figure 1. This was true even though working gas in storage was as high as 3,321 billion cubic feet (bcf) on November 12, 2004, according to US Energy Information Administration (EIA) reports. Stocks were on average 7% higher than last year throughout the fourth quarter, and above or near the five-year average, as shown in figure 2. Clearly, other factors have played a strong role.

Pricing basics

The US natural gas price market is very complex, as it encompasses over 1 million miles of pipeline operated by more than 100 pipeline companies. Since deregulation, natural gas transactions in the wholesale market have gradually moved from wellheads to hubs at major interconnections of interstate and intrastate pipelines. Today most gas trading in the US takes place in large hubs and market centres. Hubs are typically operated by one or more interstate pipeline companies, which own the pipelines interconnected at the hub.

Hubs allow market participants to acquire natural gas from several independent sources and ship it to several different markets. This eliminates the need to contract natural gas and pipeline capacity all the way from the wellhead to the consumption site. Instead, shippers can combine supply routes across several hubs to diversify supply risks and minimise costs. Hub operators offer a wide variety of services – ranging from the physical transportation of natural gas, to storage, processing and trading – providing great flexibility for shippers and marketers in trading and delivering natural gas.

Natural gas prices can be measured at different stages of the supply chain. The main components of natural gas prices are the

wellhead price (the cost of the commodity itself), the pipeline cost (the long-distance transportation) and the local distribution cost. In the US, wellhead prices were the first to be deregulated.

Transportation costs are still regulated by National Energy Boards, while local regulatory boards regulate local distribution costs.

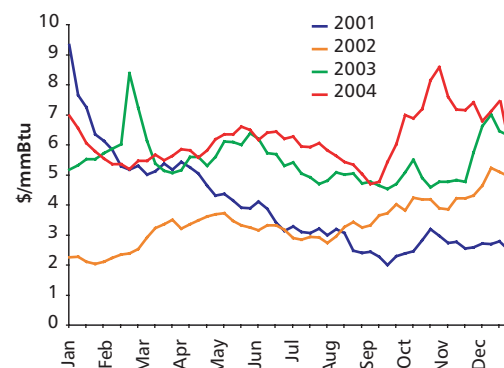
According to the EIA, wellhead prices represent about 34% and pipeline accounts for roughly 19% of the residential gas price. The balance – nearly half the price – is local distribution. Prices at the wellhead show high volatility depending on weather and different market factors. Increasing efficiencies in transport, storage and delivery have helped to reduce the impact of price volatility on consumers.

Henry Hub

Nymex uses the Henry Hub as the point of delivery for its natural gas futures contract. The gas futures contract began trading on Nymex in 1990 and is traded 72 months into the future.

The Henry Hub is the largest centralised point for natural gas spot and futures trading in the US. It is owned and operated by Sabine Pipe Line, a wholly owned subsidiary of ChevronTexaco, headquartered in Houston, Texas. The Sabine Pipe Line starts in eastern Texas near Port Arthur, runs through

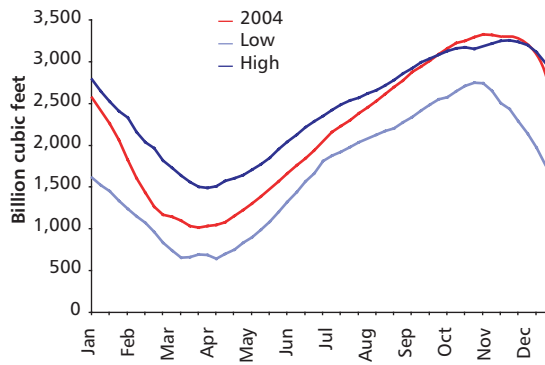
F1. Comparison: 2001 to 2004 natural gas price



The price of Nymex natural gas futures (\$/million British thermal units) this year has been substantially higher leading up to winter when compared to the previous years in this seasonal chart.

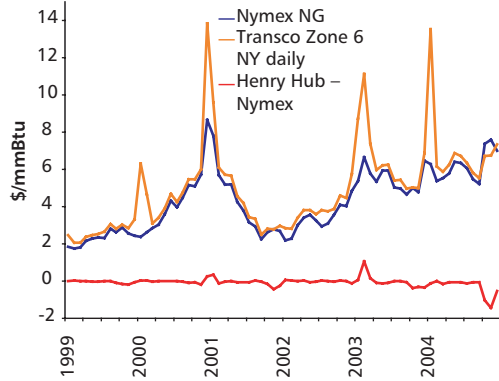
Source: Nymex via GlobalVest

F2. Working gas storage, 2004 and five-year average



The current year natural gas storage values in billions of cubic feet are provided weekly. In 2004, going into the winter season, levels were at or above the high end of the five-year average.

F3. Spot prices v. Nymex futures



The comparison of the Transco Zone 6 New York spot price against the Nymex front-month natural gas future shows difference due to supply/demand and delivery along with calculated Henry Hub spot basis difference.

south Louisiana, near the Gulf of Mexico, and ends in Vermillion Parish, Louisiana, at the Henry Hub near the town of Erath. The Henry Hub offers shippers access to pipelines that have markets in the Midwest, Northeast, Southeast and Gulf Coast regions of the US.

The Henry Hub interconnects with nine interstate and four intrastate pipelines including the following: Acadian, Columbia Gulf, Gulf South Pipeline, Bridgeline, NGPL, Sea Robin, Southern, Texas Gas, Transco, Trunkline, Jefferson Island, and Sabine's mainline. Sabine currently possesses the ability to transport 1.8 bcf per day across the Henry Hub. Relative to the total average daily gas consumption in the lower 48 US states of just over 60 bcf per day in 2000, the Henry Hub can handle up to

3% of average daily gas consumption. Approximately 49% of US wellhead production either occurs near the Henry Hub or passes close to it as it moves to downstream consumption markets.

Nymex deliveries at the Henry Hub are treated in the same way as cash-market transactions. Many natural gas marketers also use the Henry Hub as their physical contract delivery point or their price benchmark for spot trades of natural gas. In fact, the Henry Hub spot and futures prices have become the surrogate for 'real-time' wellhead natural gas prices.

Basis trades involve a counterparty buying the differential between the delivery of natural gas between two locations for natural gas delivered at some point in the future. The basis differential is usually calculated using the delta between the Nymex natural gas price at the Henry Hub in Louisiana and the buyer's preferred point of delivery. The difference in price is attributable to the cost of transport from the Henry Hub to the designated delivery point and the specific supply and demand situation at that point.

The EIA reports the US wellhead price as compiled by receiving price reports from natural gas producers for marketed gas. Early this decade, EIA calculated the relationship between wellhead gas prices with Henry Hub spot prices. These prices reflect the supply and demand conditions for two distinct facets of the natural gas market. For the period from August 1996 through December 2000, the correlation coefficient for the two natural gas price series examined – Henry Hub spot prices and US wellhead prices – was 0.97, indicating a strong linear relationship.

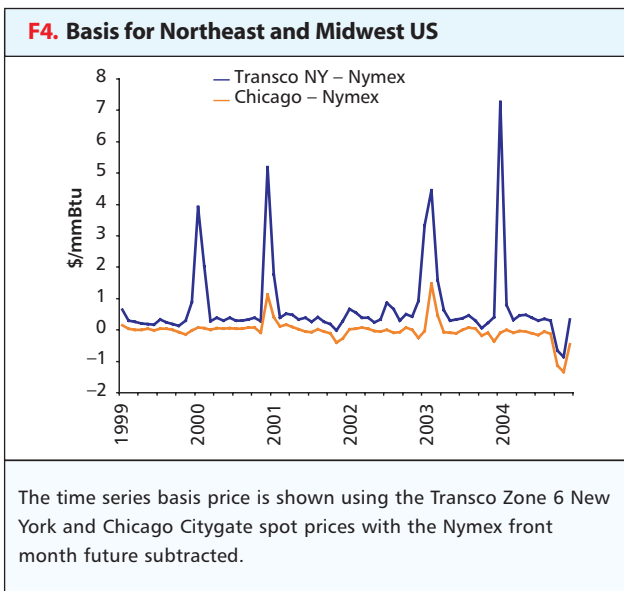
The Henry Hub spot price pertains to transactions for next-day delivery occurring at the Henry plant and is measured downstream of the wellhead, after the natural gas liquids have been removed and after a transportation cost has been incurred. In contrast, the wellhead price includes the value of natural gas liquids and pertains to all transactions occurring in the US, thereby encompassing purchase commitments of all durations.

Basis market

Given the volatility of natural gas prices and that a significant amount of physical gas sales are indexed to 'Platts Inside Ferc' – a benchmark market assessment – the need for a basis market has arisen. The basis is quoted as a differential to the Nymex natural gas contract, being the industry-wide benchmark because of its liquidity and transparency.

The cash market prices of gas at Henry Hub and the natural gas futures contract settlement prices should theoretically be the same, and the physical-delivery futures contract prices do tend to converge with cash market prices upon the termination of trading in the first nearby futures contract. But there can be divergence, and early in November 2004 it reached over \$1.40 per mmBtu, or 20%, as shown in the bottom portion of figure 3. The active over-the-counter basis market developed to protect against any inefficiencies that might develop between the two markets.

For gas, basis reflects the location difference between the Henry Hub and a delivery point as well as supply and demand for that locale. The delivery point may be a point on a pipeline or a Citygate location. Prices may vary significantly from one location



Source: NGL and Nymex via GlobalView

to another. For example, natural gas prices will almost always be higher in northeastern cities of the US than they are at Henry Hub, which is near producing gas fields. Figure 3 shows the price comparison of a Northeast delivery point – Transco New York – and the Nymex front-month future. Most prefer to see the basis tracked as the calculated difference. Figure 4 provides a view of the calculated basis for two delivery points – Chicago Citygate in the Midwest along with the Transco New York. The basis

calculation can be negative, and last fall it went to an extreme when the future price shot up while spot prices were less volatile.

To add market depth, Nymex provides a Henry Hub basis swap futures contract that gives market participants more complete risk management coverage on the basis. The final settlement is calculated as the Platts Inside Ferc *Gas Market Report* Henry Hub index price, minus the final settlement price of the Nymex Division Henry Hub natural gas futures contract for the corresponding month on the last trading day. Platts Inside Ferc calculates the Henry Hub index price from its monthly bid week survey of buyers and sellers who ship baseload gas through the hub.

As shown, the basis can reveal its own volatility based on several factors, including weather, supply and demand or market sentiment. For those delivery points with low liquidity due to fewer participants and lower volumes, the basis is a difficult computation. Up until recently, many used the basis from the nearest point with high liquidity and simply built offsets for local delivery costs. With the need for stronger valuation, this no longer seems sufficient, particularly for further forward months.

The challenge now for the industry is to improve price reporting so that basis calculations for the more illiquid points can be more discernable. While there are some that are pushing an industry collective for price gathering, momentum is still gathering slowly. There is hope for progress, and that the results will help to improve market transparency. [ER](#)

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