

Varying Views on the Future of the Natural Gas Market

Secrets of Energy Price Forecasting

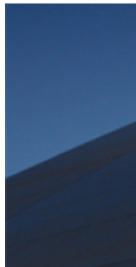
2007 EIA Energy Outlook, Modeling, and Data Conference
Washington DC March 28, 2007

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A Passion to Perform.

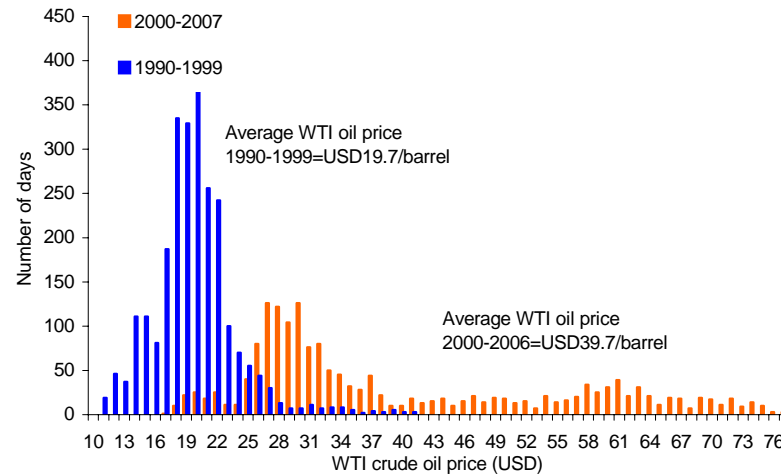
Summary of Long-Term View on Gas

- ❑ North American gas supply is declining due to eroding rig productivity
- ❑ North American gas demand growth is now driven by electric generation
- ❑ The push for new energy sources is increasing production costs for both traditional and alternative fuels
- ❑ The push for alternative fuels to reduce greenhouse gas emissions and oil imports will displace resources in agricultural markets, a politically sensitive economic sector, and increase demand for natural gas
- ❑ These fundamentals have attracted global capital to the longer-dated natural gas financial instruments
- ❑ The same geopolitical forces constraining global oil production capacity will weigh on expansion of LNG liquefaction
- ❑ Long-dated natural gas futures may be a better guide to prices than the oil futures markets

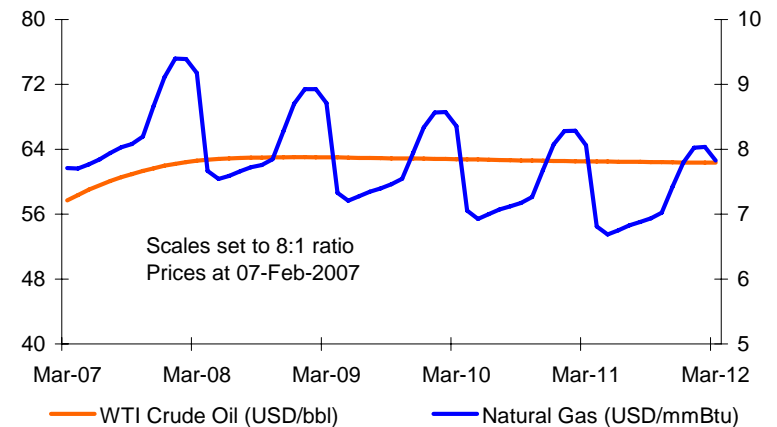
New World Order For Oil & Gas Prices

We expect oil and natural gas prices to settle lower over the next few years, but *not* back to the old USD21/bbl and USD3.50/mmBtu means

Distribution of Oil Prices Then and Now



Futures Prices for Oil and Natural Gas



Source: NOAA, DB Global Markets Research

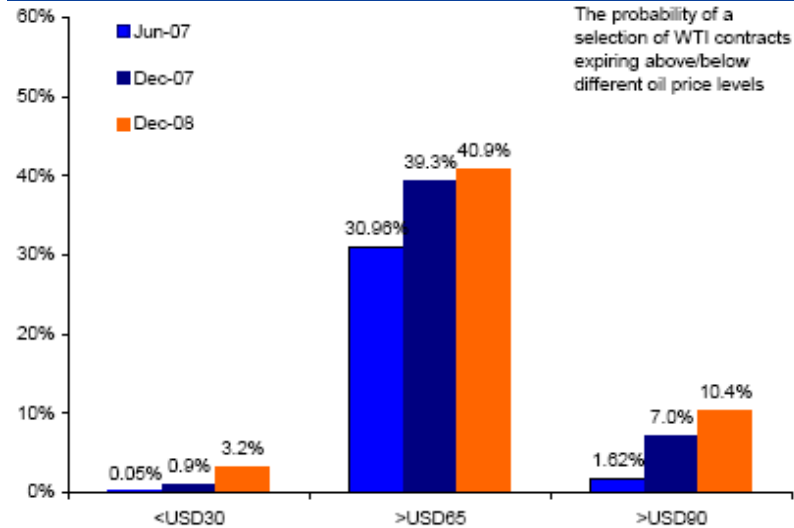
Outlook

- The WTI crude oil prices averaged just under USD20/barrel in the 1990s. So far in this decade, the oil price has averaged nearly USD40/barrel.
- We expect oil prices will average around USD50/barrel during the current decade, or more than double the average of the 1990s.
- Natural gas prices have been climbing with increased demand, limited domestic supply, tight global LNG markets and rising infrastructure costs; we see price averaging USD7.00/mmBtu over the next five years.
- Gas was selling at a discount to crude oil in the long-dated futures in 2H 2006, but now seems more in line.

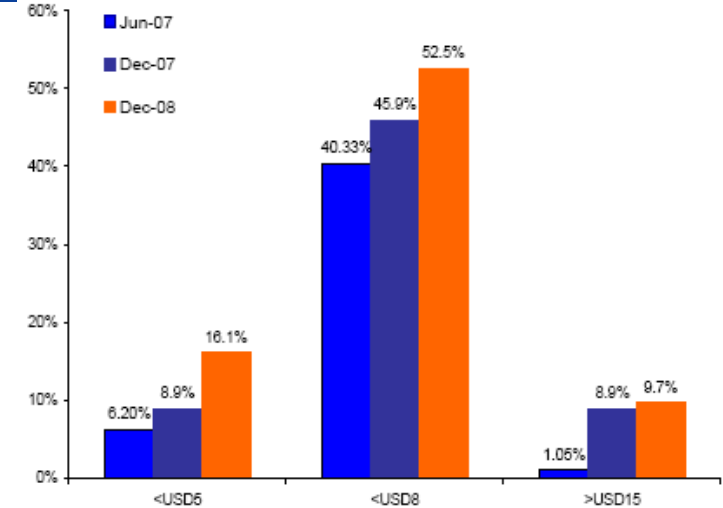
Energy Markets: Tail Events

The options market has become relaxed about the risk of an energy price spike.

The Options Market & Oil Price Spikes



The Options Market & Gas Price Spikes



Source: DB Global Markets Research

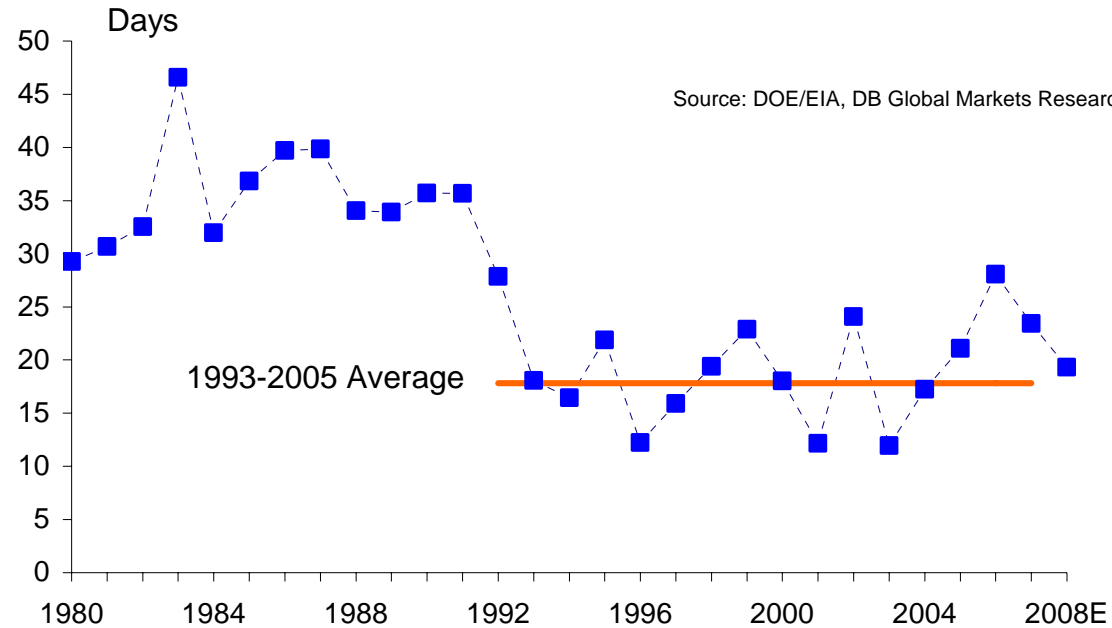
Outlook

- Lower oil demand growth, rising non-OPEC supply and an easing in geopolitical risk recently have led the WTI crude oil and US natural gas options markets to downgrade the probability of an oil and natural gas price spike over the coming year. Currently, the options market attaches a less than one-in-twelve chance of the Dec-07 WTI contract expiring above USD90/barrel.
- Throughout most of last year, crude oil vol has trended lower. We believe vol is now trading cheap and the options market has become too complacent towards geopolitical risk and the potential of world growth to snap back.

US Natural Gas: Storage Relative to Demand

We expect days forward cover of natural gas demand to fall in 2007-08 as the storage surplus is resolved and demand continues to rise.

US Natural Gas Storage Levels Days of Forward Demand Cover



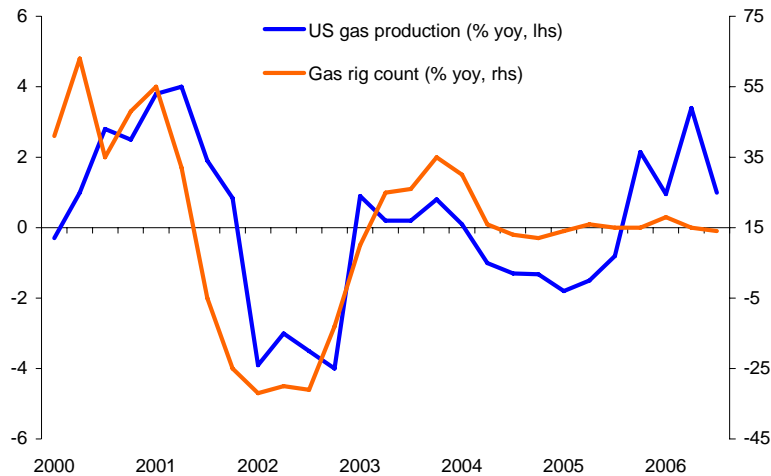
Outlook

- The absolute level of storage is often used as an indicator for natural gas pricing over the 2nd and 3rd quarter – with low storage signalling stronger prices. One shortcoming of this “single value” approach is that it ignores demand.
- This graphic illustrates the number of days that storage on March 31 can supply (cover) the average annual consumption of the year. Over the period 1993-2005, the average level of days cover at the end of the heating season has been circa 18 days.
- The jump to 28 days cover in 2006 was caused by the impact of the extremely warm January 2006 and weak industrial demand. We project that with demand rising and storage correcting lower, 2007 cover will drop to 23 days, and it should fall further in 2008.

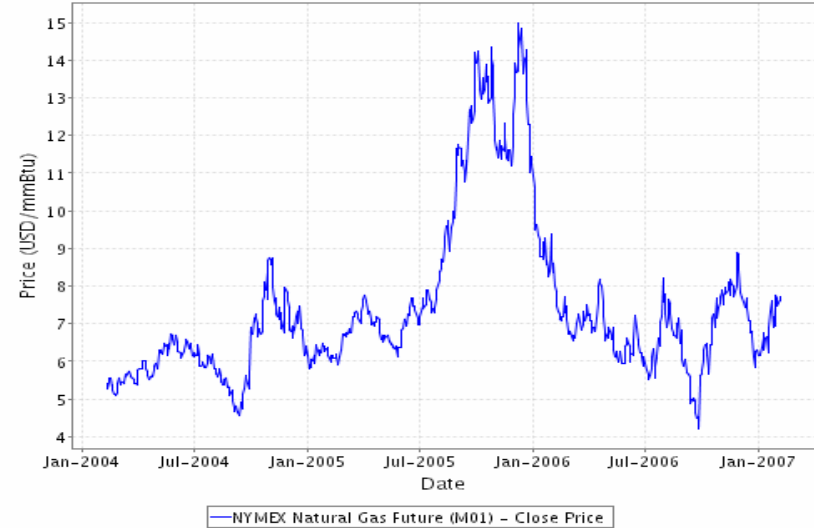
US Natural Gas Production: Rig Count

We expect US natural gas prices will surprise to the upside this year as US gas production disappoints.

US Gas Production & Rig Counts



US Natural Gas Price



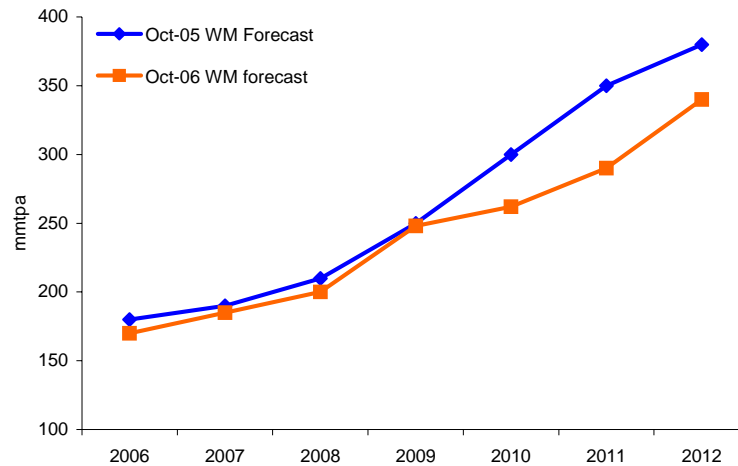
Source: Baker Hughes, EIA

Outlook

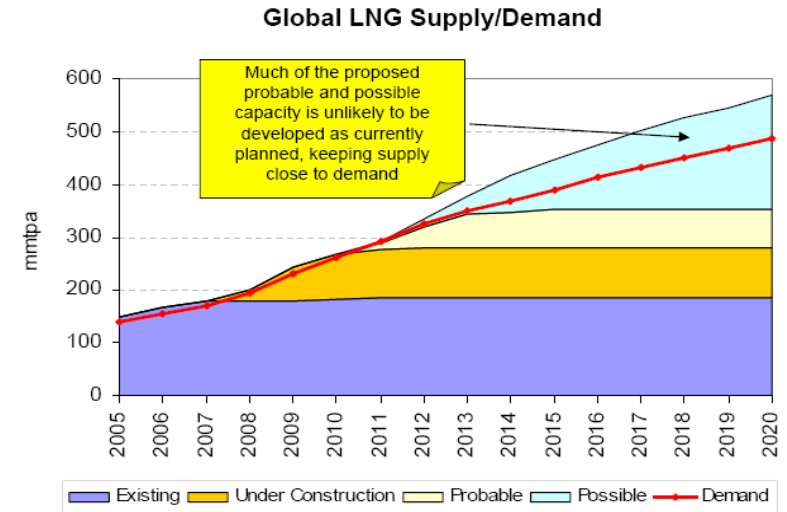
- We are cautiously bullish natural gas prices during the remainder of the year as we expect to see domestic US gas production surprise to the downside.
- We find that over the past six years it has required 13% compound annual average growth in the US gas rig count just to keep gas production levels flat. If this relationship holds in 2007, it will require an average of 1,500 to 1,600 domestic rigs just to keep gas production flat. This would represent at least a 140-rig (10%) rise from current levels.
- In addition, production of exiting wells have a very high decline rate. For example, for every Pinedale well that come on at 9MMcfe/d last summer, it will be producing roughly 2.5MMcfe/d by this summer.
- The reduction in drilling investments in Canada are also expected to limit Canadian imports into the US.

Energy: Global LNG

Global LNG Supply Disappoints



A Tight Global LNG Supply-Demand Balance



Source: Wood Mackenzie

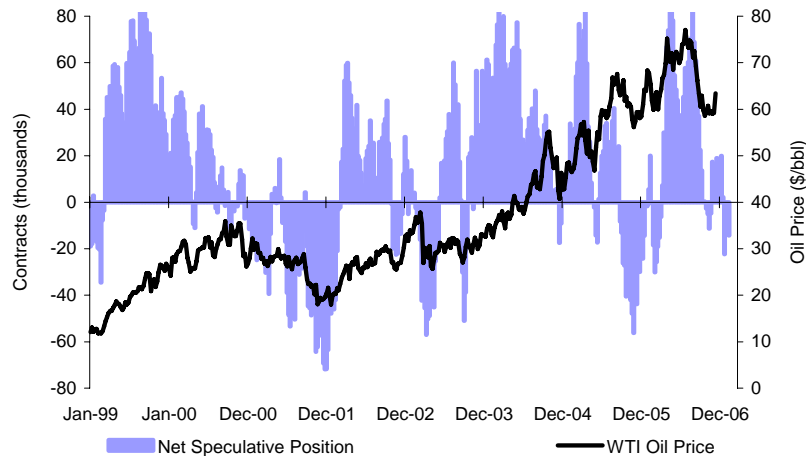
Outlook

- Wood Mackenzie forecast global LNG demand will treble by 2020. However, new capacity construction continues to be challenging due to delays most notably in Australia, Egypt, Iran and Nigeria among others. This is leading to downward revisions to global LNG supply.
- Given the problems associated with supply, Wood Mackenzie expect the supply-demand balance to be tighter.

Energy: Speculative Positioning & Prices

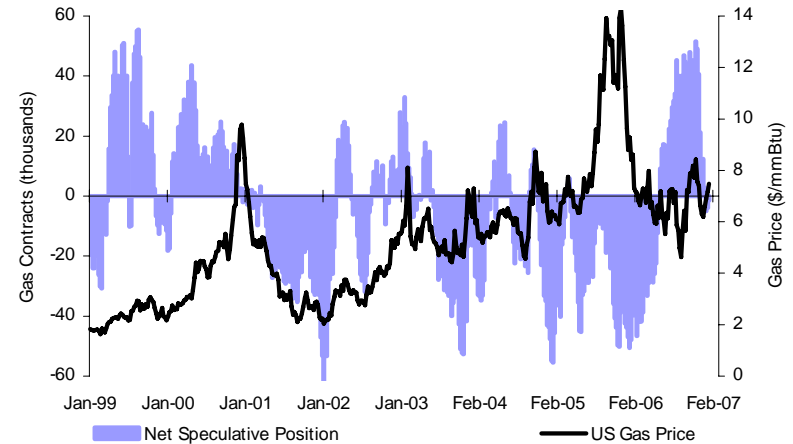
CFTC data has flaws in definition and scope, but studies show that speculators tend to follow prices rather than set them.

Crude Oil



Source: CFTC, Bloomberg, DB Global Markets Research

Natural Gas



Source: CFTC, Bloomberg, DB Global Markets Research

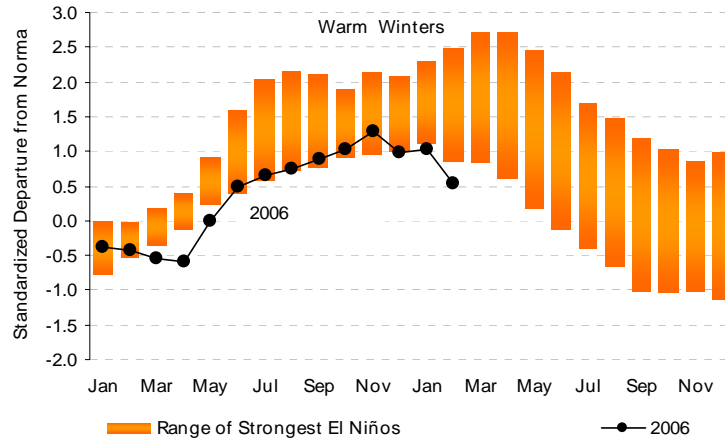
Outlook

- Some economists and analysts claim that rising speculative activity has been a major contributor to the surge in energy, metals and agricultural prices. A recent Commodities Futures Trading Commission (CFTC) study using disaggregated unpublished data collected by the CFTC suggest that among commercial traders the main groups that may potentially be involved in speculation (managed money traders, including hedge funds) act more as providers of liquidity and do not appear to significantly impact price volatility.
- Results from an International Monetary Fund (IMF) study indicate that the short-run causality generally runs from spot and futures prices to speculation, and not vice versa for five commodities examined (crude oil, copper, sugar, coffee, and cotton). The IMF found that for crude oil speculation had a small effect on futures, but this was not translated into a causal impact on spot prices.

US Natural Gas: Weather Risks

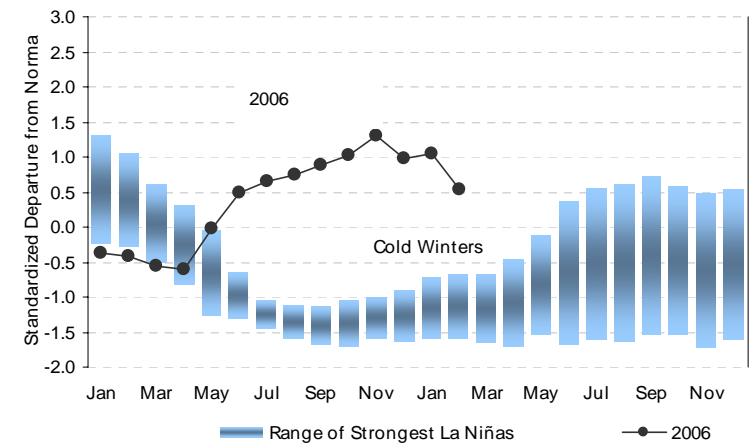
Weather outlook suggests that a moderate El Niño event was underway, but could be giving way to a weak La Niña.

Major El Niño Events vs. Current Index



Source: DOE/EIA, DB Global Markets Research

Major La Niña Events vs. Current Index



Source: NOAA, DB Global Markets Research

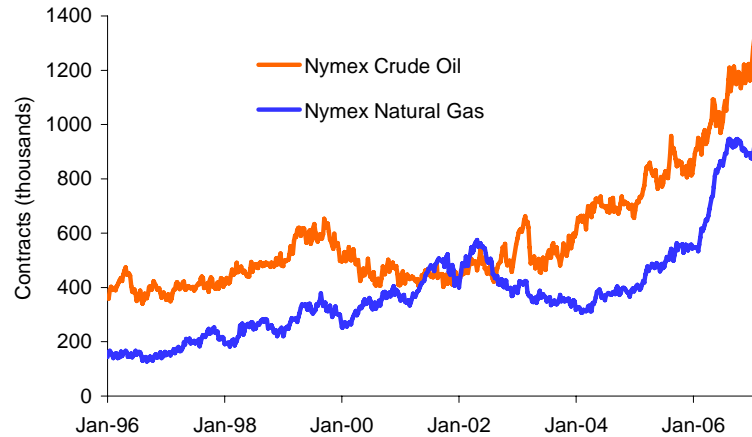
Outlook

- El Niño describes a phenomenon during which ocean surface temperatures become warmer than normal in the tropical Pacific. The Multivariate ENSO Index show above is based on six main tropical Pacific weather variables. These include: sea-level pressure, zonal and meridional components of the surface wind, sea surface temperature, surface air temperature, and a total cloudiness fraction of the sky. Values of the ENSO index are normalized to have an average of zero and a standard deviation of one.
- Current weather data suggests a moderate to weak El Niño event this winter. Strong El Niño events typically imply a milder US winter (bearish energy) and droughts extending to most of Asia (bullish grains). The relationship between El Niño and La Niña events and weather is strong but not perfect. The most recent data point suggest that the El Niño is weakening.
- Researchers continue to investigate possible interactions between hurricane frequency and El Niño. In general, El Niño events are characterized by more tropical storms and hurricanes in the eastern Pacific and a decrease in the Atlantic, Gulf of Mexico and the Caribbean Sea.

US Natural Gas: Open Interest and Trading Ranges

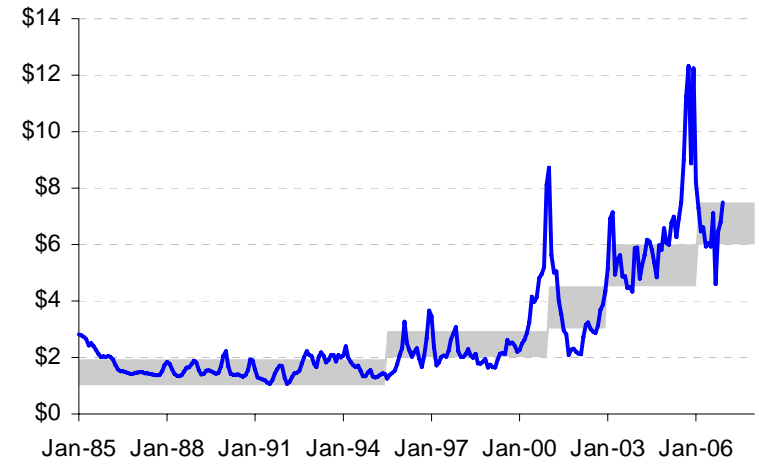
Natural gas nearly caught up again with oil in Nymex open interest.

Nymex Open Interest in Gas and Oil



Source: CFTC; DB Global Markets Research

Trading Ranges for Natural Gas



Source: Natural Gas Week, DB Global Markets Research

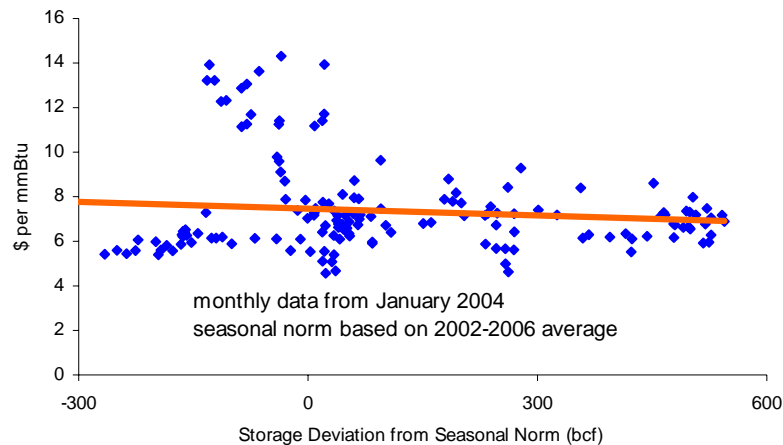
Outlook

- Open interest in natural gas has climbed significantly during 2006.
- A new trading range for monthly average prices circa USD6.00-7.50 appears to be in place. Weather events can play a strong role in taking prices above or below this range.

US Natural Gas: Storage Competitive Fuel Anchors

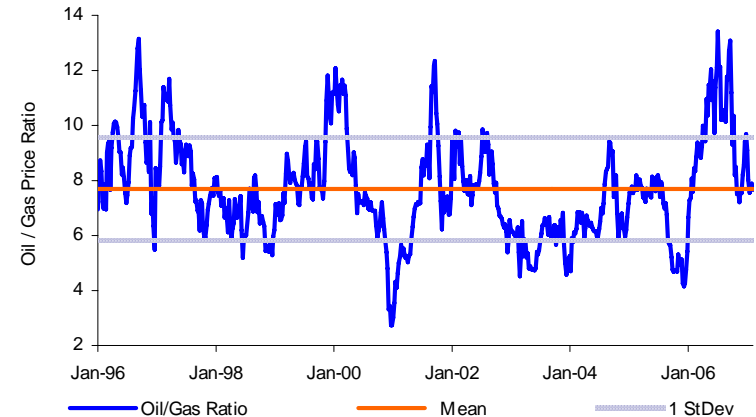
Price beginning to get more in line with storage and oil price historical relationships .

Natural Gas Prices vs. Storage Deviation



Source: Nymex, DOE/EIA, DB Global Markets Research

Oil / Gas Ratio



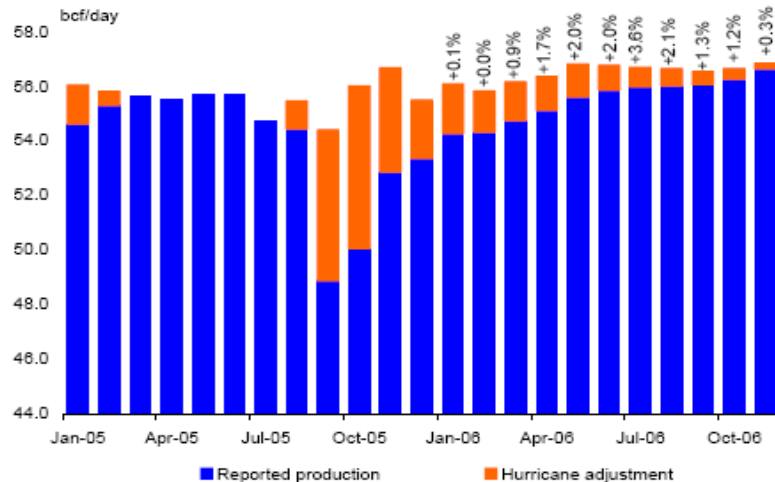
Source: Nymex, DB Global Markets Research

Outlook

- Natural gas prices tend to be related to the deviation in storage levels from historical norms. Recently, prices are starting to respond again to this concept, but at a higher price level than in the earlier this decade.
- The relationship between Nymex WTI oil prices and natural gas prices tends to revert toward 8 to 1, although volatility is high.

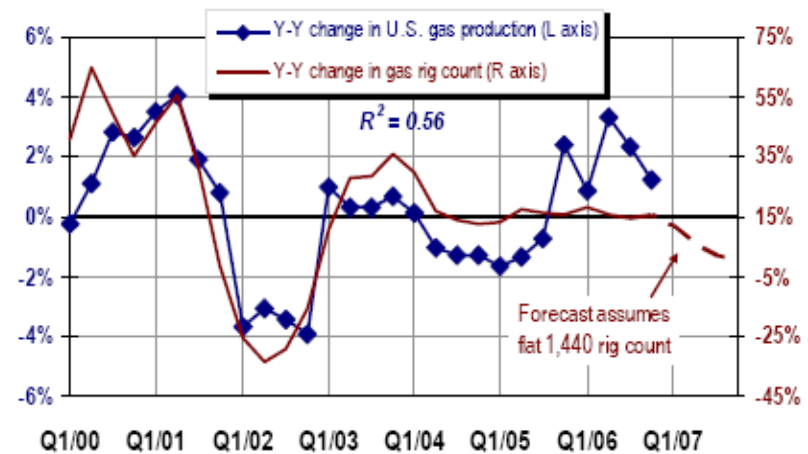
US Natural Gas: Production Could Disappoint

Natural Gas Production (Hurricane Corrected)



Source: DOE/EIA, MMS, DB Global Markets Research

Gas Rig Count Drives Production



Source: DOE/EIA, DB Global Markets Research

Outlook

- Gulf production has still not recovered 100% from 2005 events. However, higher onshore production has compensated for the loss and production rose in 2006 by 1%. Hurricane-adjusted US gas production has risen by a relatively meager 1Bcf/d over the past year. We see a strong likelihood that US gas production will disappoint this year, given a stagnating US rig count and accelerating decline rates.
- Over the past six years it has required 13% compound annual average growth in the US gas rig count to keep production levels flat. If this relationship holds, in 2007 we will need 1,500 to 1,600 domestic rigs in operation to maintain current production levels. Assuming the current 1,440 rig count holds steady for 2007, production will decline in the year ahead.

TXU's Cancellation of 8 Coal Plants Increases Gas Demand



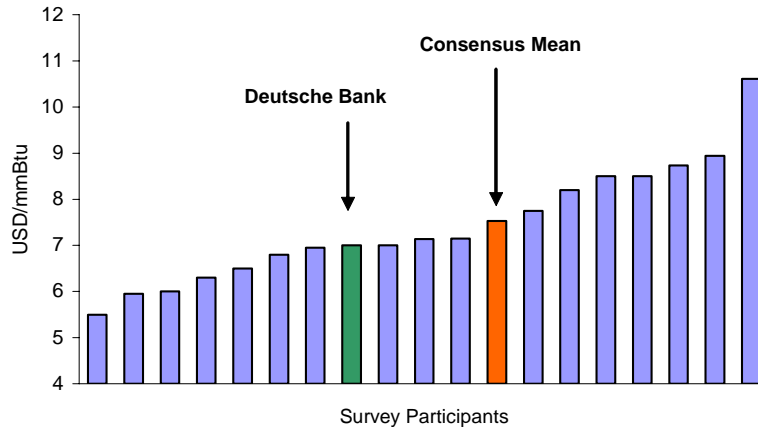
- ❑ **Assuming:**
 - ❑ **Average heat rate: 8.00**
 - ❑ **Number of cancelled plants: 8**
 - ❑ **Average cancelled coal plant size: 1,000 MW**
-
- **The cancelled coal supply will require an equivalent incremental natural gas supply of 47 bcf per month (4,700 natural gas contracts/month)**
 - **This is the equivalent of adding 1.5 bcf/day of additional US gas supply to analysts' forecasts, starting in 2009**

Source: DB Global Markets Research, Jason Oakes

Natural Gas Price Forecasts

We believe that price elasticities of demand and supply are likely to result in lower prices in 2010 than consensus forecasts were assuming in early 2007.

Natural Gas Price Forecasts for 2010



Source: Reuters, DB Global Markets Research

Average Net Demand Elasticities (%)

	10% Change in Price		10% Change in DD	
	WTI Oil	HH Gas	Winter	Summer
Petroleum				
Total	-0.37	0.08	0.76	0.16
Gasoline	-0.56	0.00	-0.01	0.00
Distillate	-0.29	0.47	1.81	0.25
Other	-0.19	-0.05	1.10	0.32
Natural Gas				
Total	0.36	-1.37	2.36	0.74
Residential	-0.11	-0.42	8.80	-0.10
Commercial	-0.15	-0.55	5.26	-0.17
Industrial	0.78	-2.69	-3.03	-5.20
Electric Power	0.55	-1.38	-0.30	2.47

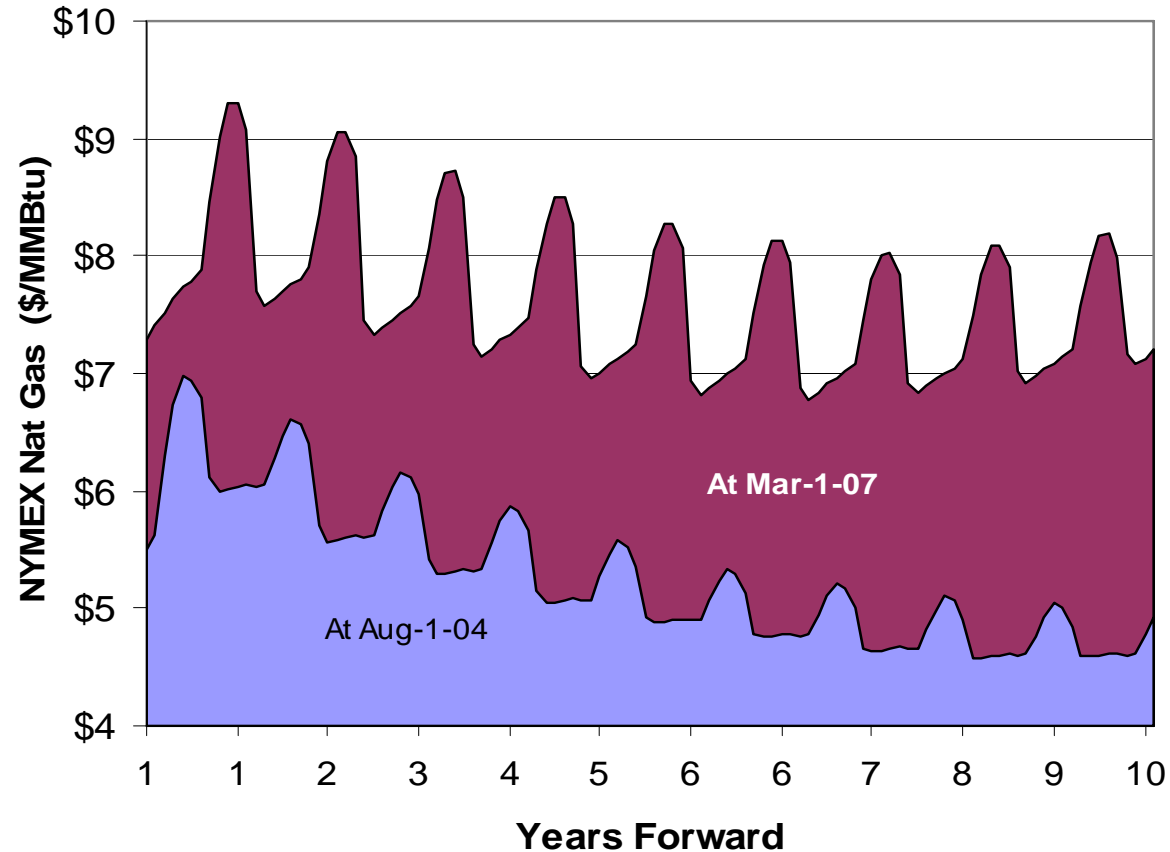
Source: DOE/EIA, DB Global Markets Research

Outlook

- In early January, a poll by Reuters showed analysts expected natural gas prices to average \$7.81/mmBtu in 2010.

Prices of Long-Term Paper Natural Gas Markets ...higher today than ever

Natural Gas Forward Curves (2007 vs. 2004)



Reported volumes from NYMEX / Globex do not include trading on ICE, which last year surpassed NYMEX in contract volume

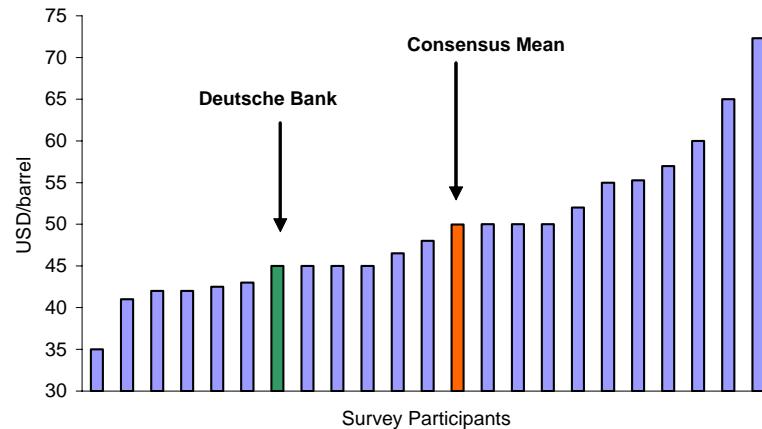
The curve shape indicates the growing investor interest in the longer dates

The Amaranth experience shows that liquidity in longer dates is less than in shorter dates

Source: DB Global Markets Research

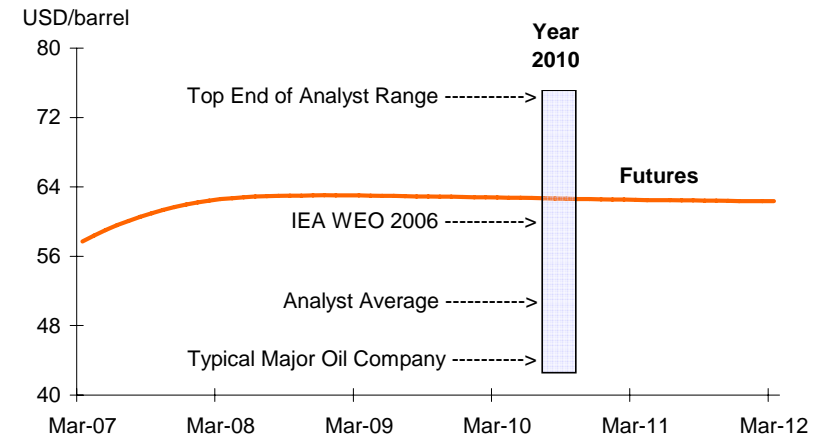
Oil Price Forecasts

Oil Price Forecasts for 2010 (Analysts)



Source: Reuters, DB Global Markets Research

Oil Price Forecasts for 2010 (Others)



Source: Reuters, IEA, DB Global Markets Research

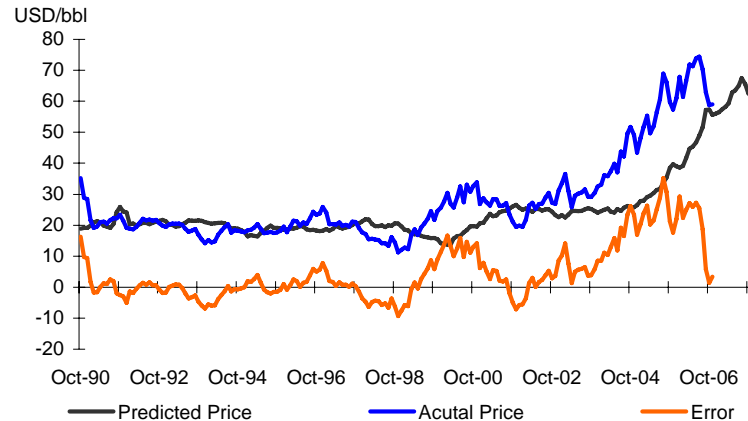
Outlook

- Many academic studies have shown that futures markets are poor predictors of future prices. Furthermore, we believe that analysts forecasts are significantly biased by current prices.
- In our view, current consensus estimates for oil and gas have likely been set too high because to the sharp increases in oil and gas prices that have occurred over the last few years.
- We believe that marginal supply costs for oil point to mid-cycle prices near USD45-50/barrel (real 2005), and equivalent prices for natural gas near USD7.00/mmBtu.

Nasty Secret of Oil Price Forecasts Revealed

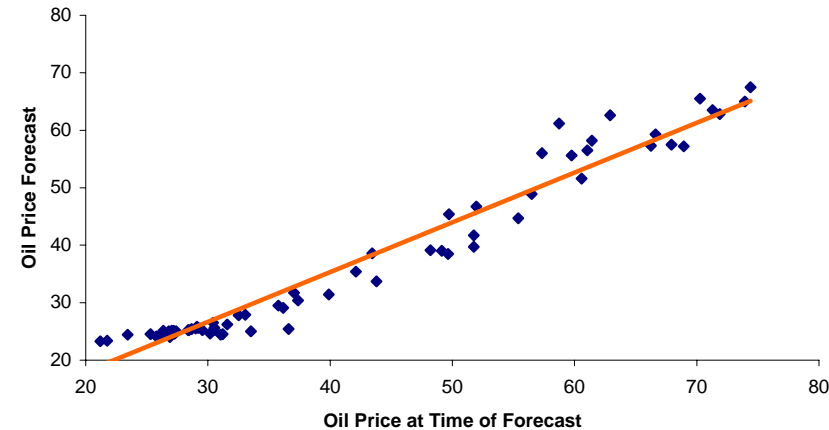
There is a 95% correlation between the consensus oil price forecast for 12 months out and the oil price at the time the survey is taken.

Consensus Oil Price Forecasts vs. Actual



Source: Consensus Economics, DB Global Markets Research

Oil Price Forecasts Bias



Source: Consensus Economics, DB Global Markets Research

Outlook

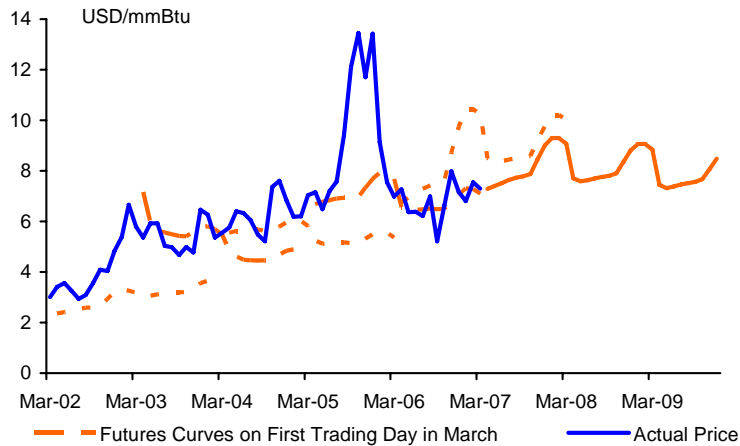
- It is very hard for analysts and economists to NOT be biased by current events.
- Oil price forecasting was an easier business when oil was mean reverting to \$21.
- The “error” in the consensus forecast has recently declined – but it took a combination of more aggressive (higher) oil price forecasts AND a decline in the actual price to make that happen.

Do Natural Gas Futures Provide Better Forecasts ...than WTI oil futures?

We are not claiming this to be an exhaustive econometric analysis, but the visual evidence since early 2002 seems compelling.

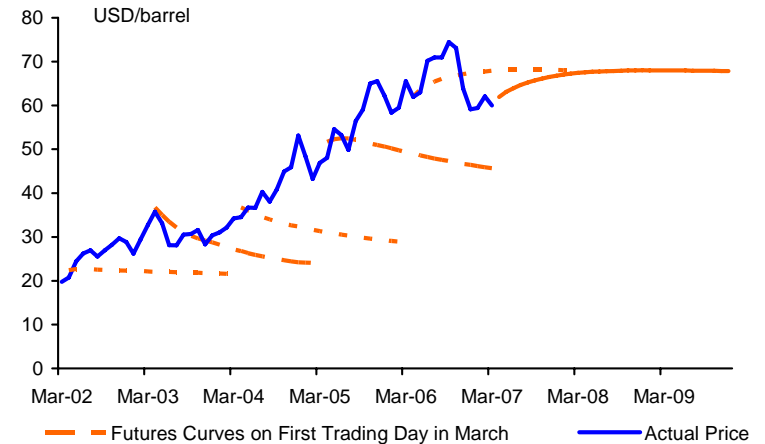
Nymex natural gas futures have been much more accurate than oil futures in signaling actual prices.

Natural gas futures as a predictor



Source: Consensus Economics, DB Global Markets Research

Oil futures as a predictor



Source: Consensus Economics, DB Global Markets Research

Outlook

- In our view, US natural gas trades on a narrower set of factors, i.e. mostly North American supply/demand fundamentals, as opposed to global economic trends, unpredictable geopolitics and host of other un-knowable supply/demand shocks that are often prevalent in the oil markets.
- The statistical data in the US and Canada are more timely and generally more accurate than global records. The huge hurricane impacts of 2005 were not predictable, and the markets may have given those prices too much weight in the 2006 “forecasts” for natural gas in 2007, but in general we would characterize the gas record as satisfactory and demonstrably better than crude oil.

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Adam Sieminski

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