U.S. Energy Information Administration

Independent Statistics & Analysis

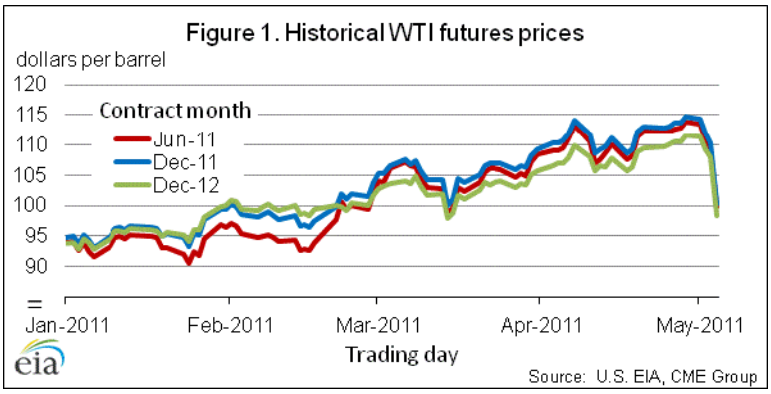
May 2011

Short-Term Energy Outlook
Market Prices and Uncertainty Report[1]

May 10, 2011 Release

Crude Oil Prices. EIA expects that West Texas Intermediate spot prices, which averaged $79 per barrel in 2010, will average $103 per barrel in 2011 and $107 per barrel in 2012, reductions averaging about $4 and $6 per barrel respectively from last month's *Outlook* (West Texas Intermediate Crude Oil Price Chart). During the first week of May WTI crude oil spot prices fell by nearly $17 per barrel to $97 per barrel, which was part of a broader commodity selloff and widespread price declines. EIA still expects oil markets to tighten as growing liquid fuels demand in the emerging economies and slowing growth in non-OPEC supply maintain upward pressure on oil prices.

Growing volumes of Canadian crude oil imported into the United States contributed to record-high storage levels at Cushing, Oklahoma, and a price discount for WTI compared with similar quality world crudes such as Brent. Consequently, the projected U.S. refiner average acquisition cost of crude oil, which was about $2.70 per barrel below WTI in 2009 and 2010, is $1.80 per barrel above WTI in 2011 and $1.10 per barrel above WTI in 2012.



[1] This is a regular monthly supplement to the EIA *Short-Term Energy Outlook*. (http://www.eia.doe.gov/emeu/steo/pub/contents.html)
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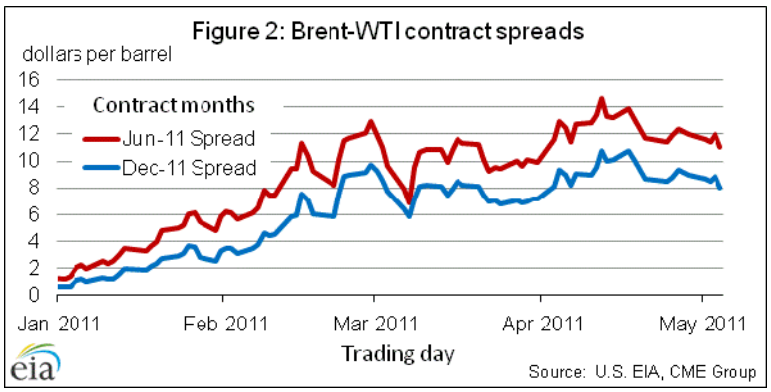
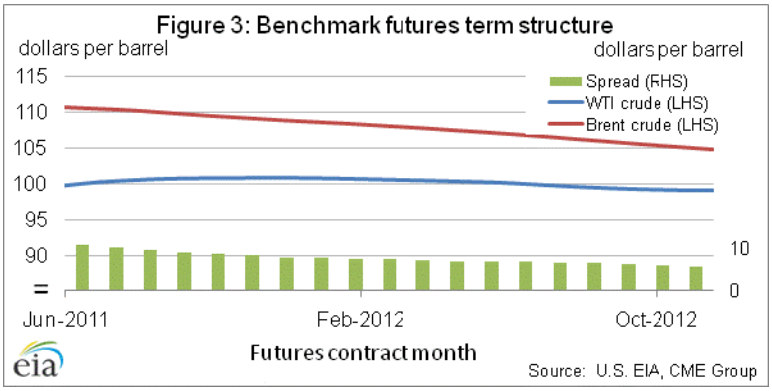
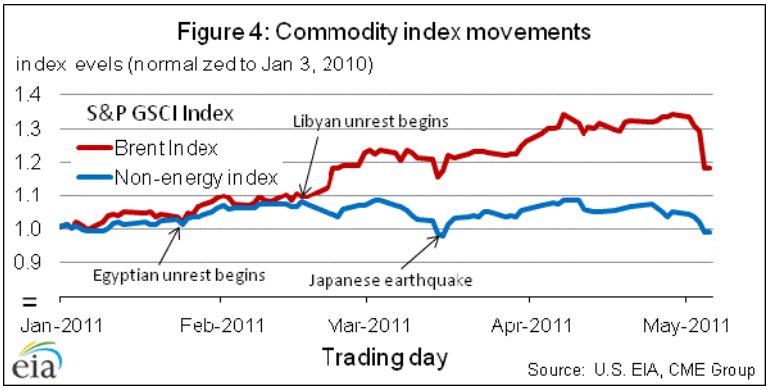


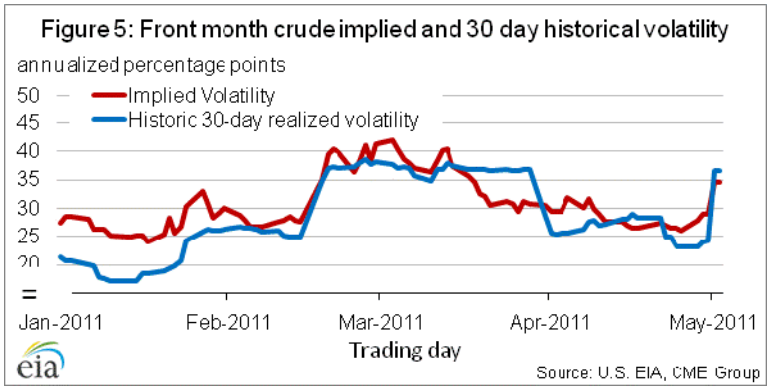
Crude prices continued to rise during the month of April, with WTI prices increasing just under $5 and Brent prices slightly over $7 (**Figure 1**). This trend began to reverse course on May 2nd and accelerated downward on May 5th when prompt month WTI dropped $9.44 (8.6 percent), to its lowest level since March 1st. Spreads between WTI and Brent have remained fairly flat (**Figure 2**), with WTI still trading at a sharp discount to other world benchmarks. This discount within futures prices diminishes over time (**Figure 3**), but even reduced levels of around $5 per barrel are noticeably higher than historic premiums.

One clear result of the recent price declines is a flattening in the futures term structure. From a high of $8.60 on the 8th of April, the June 2011/December 2012 spread for Brent futures has now fallen to $5.90. Price declines appear to have permeated through most of the commodities complex last week, with non-energy commodities, on an index basis, actually falling to levels below that of the beginning of the year (**Figure 4**). Expectations actually shifted most strongly for energy markets last week, whereas Middle East unrest pulled oil away from other raw materials from mid-February through April.

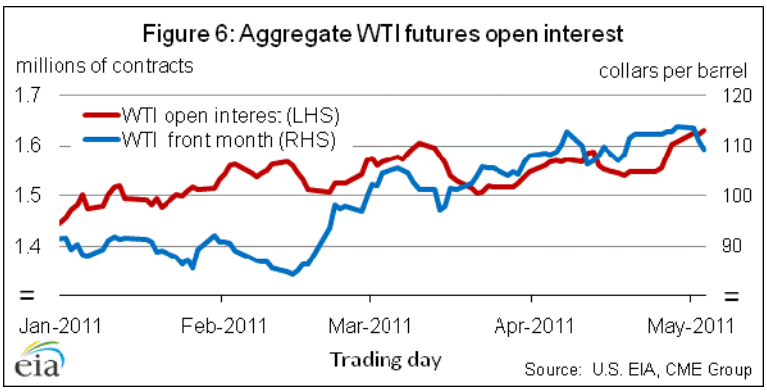


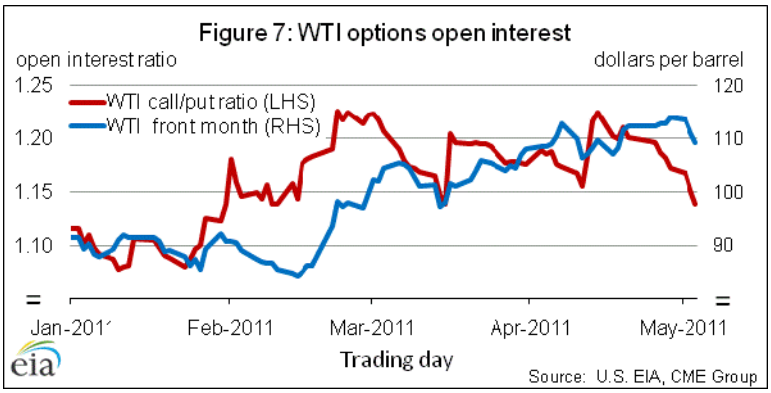


Both implied and realized volatility for WTI crude oil drifted slightly lower for much of April and came close to reaching the lows set back in January of this year **(Figure 5)**. The low for the month was set on April 29 when implied and realized volatility closed at 26.1 and 22.2 percentage points, respectively. With the broad selloff in commodities in the first week of May, volatility quickly moved higher off of those lows. As of May 5th, implied volatility had risen to 34.5 percentage points and realized volatility similarly rose to 36.4 percentage points.

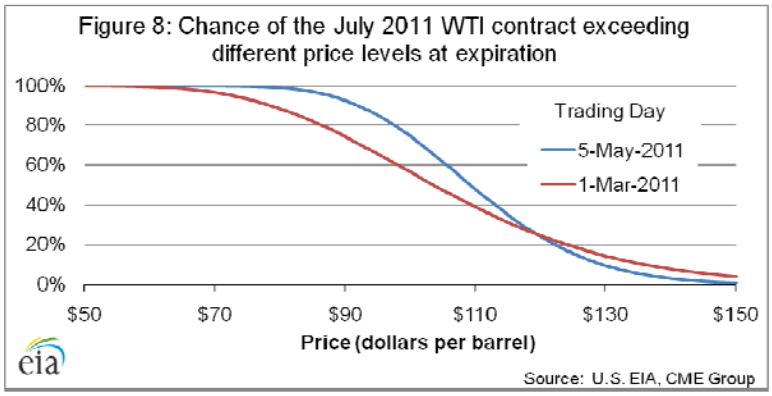


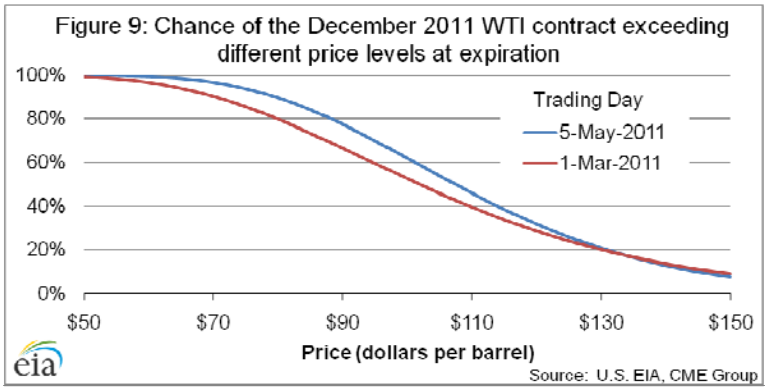
Open interest in WTI futures moved higher at the end of April and continued into the first week of May **(Figure 6)**. Another record for open interest was set on May 4 where over 1.63 million NYMEX WTI futures contracts were still being held after the market closed. In the options market, traders became more concerned with hedging their downside risk starting in the middle of April as put option open interest increased much more than call option open interest **(Figure 7)**. The call/put ratio of options on WTI futures contracts now stands at 1.14, its lowest point since early February.





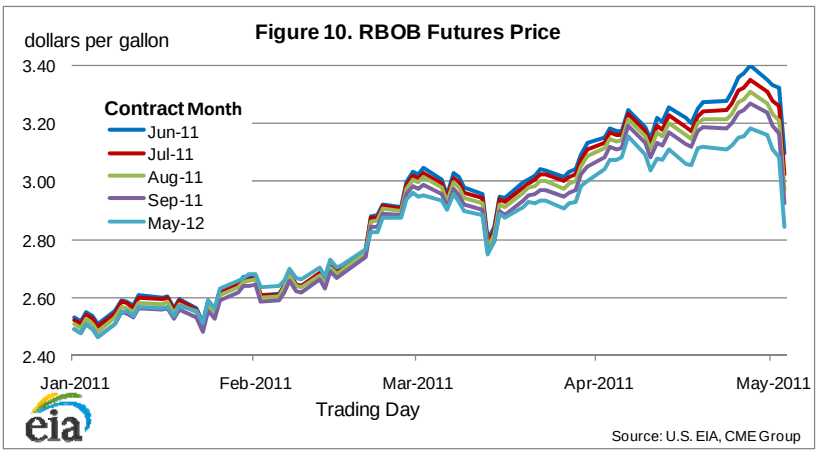
Partially due to the sharp fall in WTI futures prices that occurred during the first week of May, there was a decrease in the market's assessment of probability of exceeding high future price points compared to recent probability assessments, although an increase for lower price points (**Figures 8 and 9**). Over the 5-day period ending May 5, the probability of the July 2011 NYMEX WTI futures contract expiring above $130 per barrel was 10 percent, compared to a probability of 15 percent in the March STEO. The decrease in forward prices last Thursday was seen along the entire futures curve, but so far it has had a muted effect on probabilities further out in time. Currently, the prices of futures and options of WTI crude oil for December delivery show a probability of expiring above $130 per barrel of 21 percent, roughly similar to March 1. These probabilities are based on the cumulative normal densities derived from market expectations using futures and options prices. (See Appendices I and II of EIA's October 2009 *Energy Price Volatility and Forecast Uncertainty* article for discussion of how these probabilities are derived.)





Gasoline. EIA forecasts that the annual average regular-grade retail gasoline price will increase from $2.78 per gallon in 2010 to $3.63 per gallon 2011 and to $3.66 per gallon in 2012, reductions of 7 cents and 14 cents per gallon respectively from last month's *Outlook*. The sizable jump in retail prices this year reflects not only the higher average cost of crude oil but also an increase in U.S. refinery gasoline margins (the difference between refinery wholesale gasoline prices and the average cost of crude oil) from an average of $0.34 per gallon in 2010 to $0.50 per gallon in 2011, near the $0.53 per gallon and $0.56 per gallon highs set in 2006 and 2007, respectively. The projected refinery gasoline margin falls back to $0.44 per gallon in 2012.

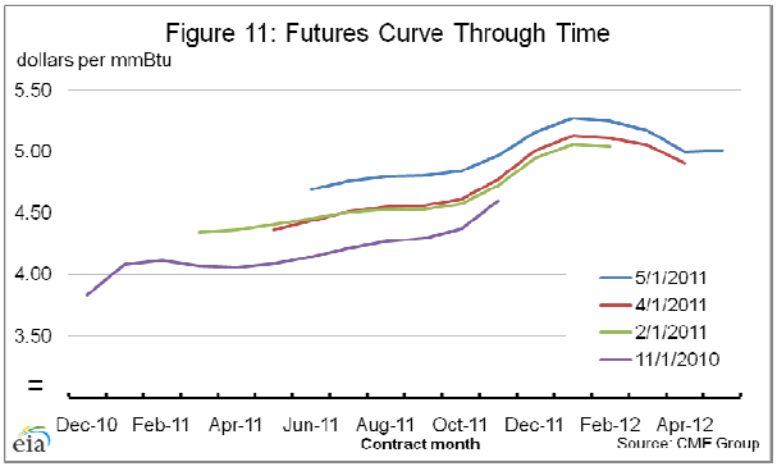
Motor gasoline prices vary widely by region. In the Gulf Coast (PADD 3), forecast retail prices average 14 cents per gallon below the national average, while prices on the West Coast (PADD 5) average more than 25 cents per gallon above the national average. The major reasons for that variation are differences in state taxes, the distance from alternative sources of supply, and differences in gasoline quality required by state and federal clean air regulations.



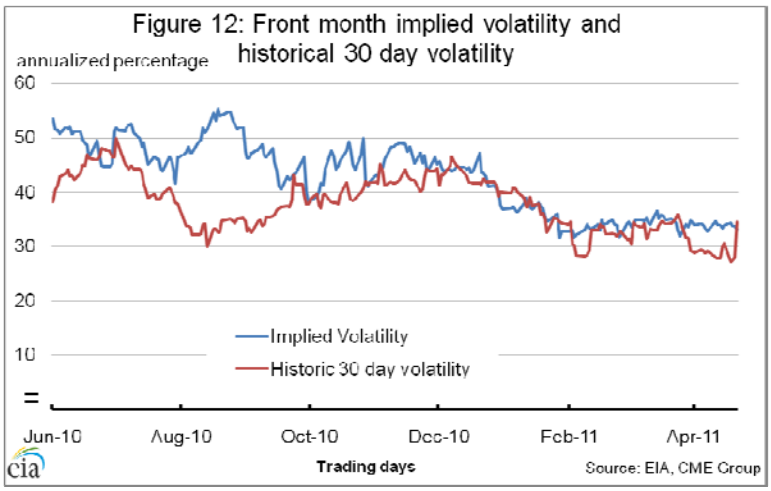
As in the case of crude oil, the market's expectation of uncertainty in monthly average gasoline prices is reflected in the pricing and implied volatility of futures options contracts. New York Harbor reformulated gasoline blendstock for oxygenate blending (RBOB) futures contracts for July 2011 delivery over the 5-day period ending May 5, averaged $3.24 per gallon (**Figure 10**). The probability the RBOB futures price will exceed $3.30 per gallon (roughly consistent with a U.S. average regular gasoline retail price above $4 per gallon) in July 2011 is approximately 41 percent. Examining prices further out on the curve, the RBOB futures contracts prices over the same 5-day period for September 2011 and May 2012 delivery were $3.16 and $3.08 per gallon, respectively, and have probabilities of exceeding $3.30 per gallon ($4 retail) at expiration of approximately 36 percent and 35 percent, respectively.

U.S. Natural Gas Prices. The Henry Hub spot price averaged $4.25 per MMBtu in April, 28 cents higher than the March average and 25 cents higher than forecast in last month's *Outlook* (Henry Hub Natural Gas Price Chart). EIA expects that the Henry Hub price will average $4.24 per MMBtu in 2011, a decline of 15 cents from the 2010 average. EIA expects that the forecast decline in production from current levels will contribute to a tightening domestic market next year with the Henry Hub price averaging $4.65 per MMBtu in 2012.

Uncertainty over future natural gas prices is lower this year compared with last year at this time. Natural gas futures for July 2011 delivery (for the 5-day period ending May 5) averaged $4.65 per MMBtu, and the average implied volatility was 34 percent. The lower and upper bounds for the 95-percent confidence interval for July 2011 contracts are $3.61 per MMBtu and $5.98 per MMBtu. At this time last year, the natural gas July 2010 futures contract averaged $4.11 per MMBtu and implied volatility averaged 46 percent. The corresponding lower and upper limits of the 95-percent confidence interval were $2.95 per MMBtu and $5.70 per MMBtu.



Over the last month, natural gas implied volatility has continued to be relatively unchanged (**Figure 12),** while we have seen a drop in realized volatility. For most of April, 30 day historical volatility remained below 30 percent. It was only in the first few days of May that it has broken above that threshold.



Given the similar implied volatility levels observed over the last few months, changes in the probabilities of exceeding certain price points have largely been dictated by recent price movements. The chance that natural gas prices will be greater than $4.50 per MMBtu at expiration of the December futures contract is 68 percent, an increase of 17 percentage points from March 1st (**Figure 13)**. These natural gas probabilities are cumulative normal densities generated using market-based inputs provided by futures and options markets, i.e., futures prices and implied volatilities. (See Appendices I and II of EIA's October 2009 *Energy Price Volatility and Forecast Uncertainty* article for additional discussion).

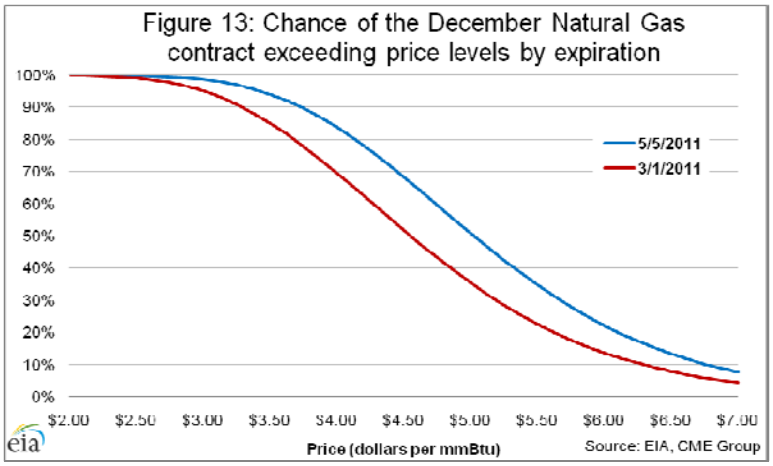


Figure 13: Chance of the December Natural Gas contract exceeding price levels by expiration
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
5/5/2011
3/1/2011
$2.00
$2.50
$3.00
$3.50
$4.00
$4.50
$5.00
$5.50
$6.00
$6.50
$7.00
Price (dollars per mmBtu)
Source: EIA, CME Group