



April 2011



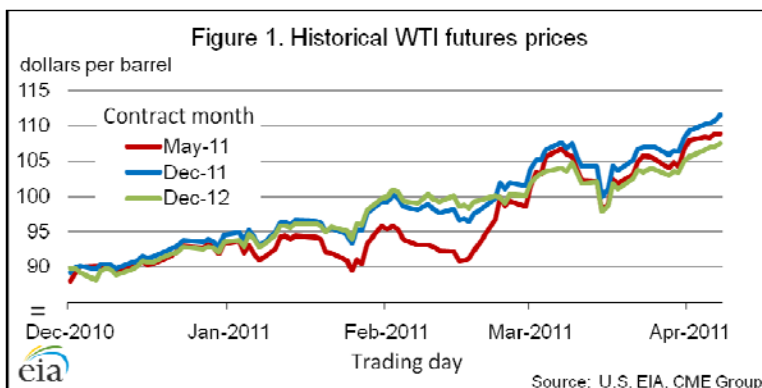
Short-Term Energy Outlook

Market Prices and Uncertainty Report¹

April 12, 2011 Release

Crude Oil Prices. West Texas Intermediate (WTI) crude oil spot prices averaged \$88.58 per barrel in February then rose to \$108 per barrel by the end of March (**Figure 1**). Projected WTI prices average \$106 in 2011 and \$114 per barrel in 2012, increases of \$5 per barrel and \$9 per barrel, respectively, from last month's *Outlook*. 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 \$2.50 per barrel below WTI in 2009 and 2010, is \$2.20 per barrel above WTI in 2011 and \$0.25 per barrel above WTI in 2012.

All energy price forecasts are highly uncertain. WTI futures for June 2011 delivery over the 5-day period ending April 7 averaged \$109 per barrel and implied volatility averaged 30 percent, establishing the lower and upper limits of a 95-percent confidence interval for the market's expectations of monthly average WTI prices in that month of \$90 per barrel and \$132 per barrel, respectively. Last year at this time, WTI for June 2010 delivery averaged \$83 per barrel with the limits of the 95-percent confidence interval at \$68 per barrel and \$101 per barrel. Based on WTI futures and options prices, the probability that the monthly average price of WTI crude oil will exceed \$120 per barrel in December 2011 is about 32 percent. Conversely, the probability that the monthly average December 2011 WTI price will fall below \$100 per barrel is about 38 percent.

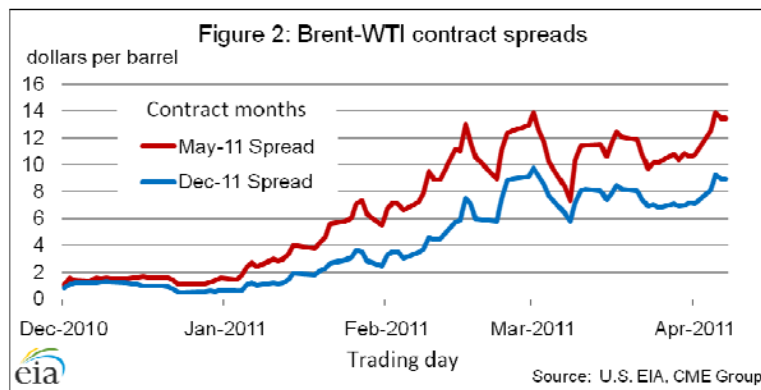


¹ This is a regular monthly supplement to the EIA *Short-Term Energy Outlook*.
(<http://www.eia.doe.gov/emeu/steo/pub/contents.html>)

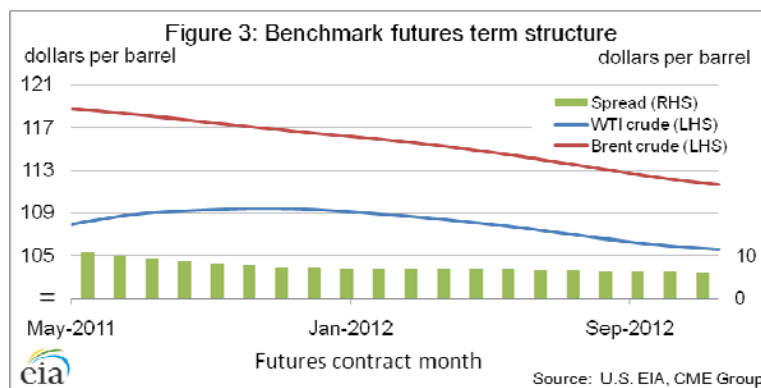
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Crude oil prices finished the month of March higher than at the start, with WTI prices for May delivery, a Midcontinent crude oil benchmark, increasing \$6.54 (6.4 percent) from March 1 to April 1. During the same time period, Brent, a similar North Sea oil grade, rose \$3.40 (2.9 percent), after even a stronger February rise (**Figure 2**). Merely considering these month-on-month increases, however, would overlook several significant movements during the month. After the tragic earthquake in Japan and subsequent nuclear concerns, market reaction appeared to revise the economic effects multiple times. Immediately after the staggering loss became apparent to a watching world, Brent prices fell over \$5 per barrel on March 15th, in anticipation of a short term demand loss.

However, as worries about the extent of damage to local nuclear facilities came to the fore, it was clear that substitute forms of electricity generation within the country would be necessary. Included in these alternatives is imported fuel oil, used previously by Japan in times of lost nuclear capacity. Estimates for increased oil demand (at least for the short term) have typically been in the 100 to 150 thousand barrels per day range. Perhaps due to these updated expectations, Brent had returned to its pre-earthquake levels by the end of the same week. All of these events, of course, came on the back of sustained unrest within the Middle East and North Africa (MENA). Continued uncertainty left crude prices steadily pushing up through the final days of March.

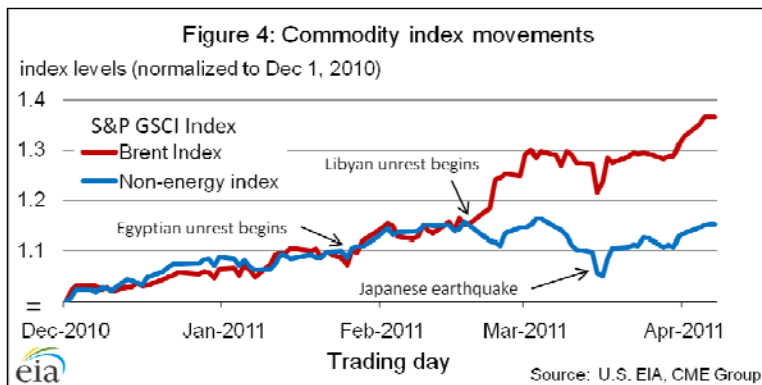


Tightness within the Brent market has continued as its futures strip remained in backwardation, with the May 2011 to December 2012 spread increasing from \$5.57 to \$7.07 per barrel (**Figure 3**) during March. The same time spread switched into backwardation for WTI for the first time in over a year on March 2nd and now is valued at over \$2 per barrel.

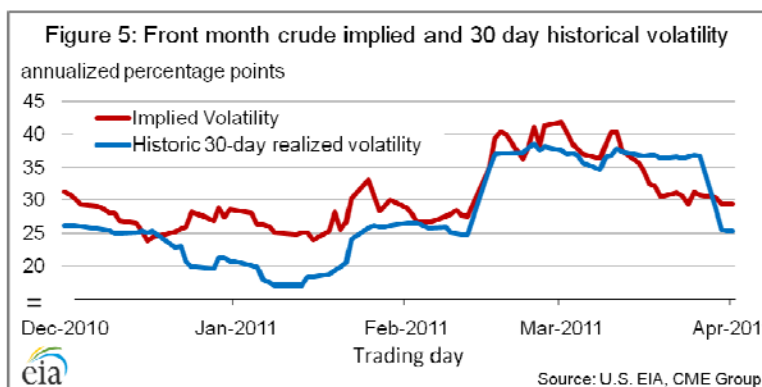


The recent divergence between crude oil and the rest of the commodities complex is also noteworthy (**Figure 4**). After escalating unrest within Libya and actual crude production loss, Brent prices rose at a

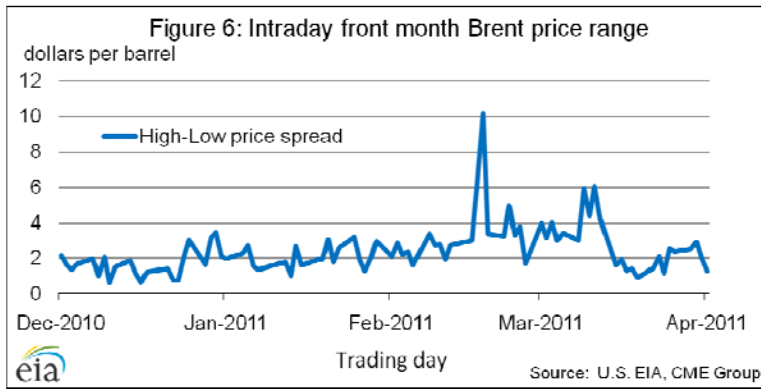
much more rapid pace than non-energy commodities, though general commodity appreciation has occurred in addition to these event driven movements. The S&P GSCI Brent Index² is now trading 37 percent higher than four months ago. This price divergence continued through March, as disruptions seemed largely concentrated in critical oil production regions, though the effects of events in Japan produced some downward movements. Coinciding with this price divergence is a widening spread between energy volatility and the rest of the asset class. Geopolitical events have not just provided upward pressure, but have strengthened anticipated shifts of oil prices in the coming months.



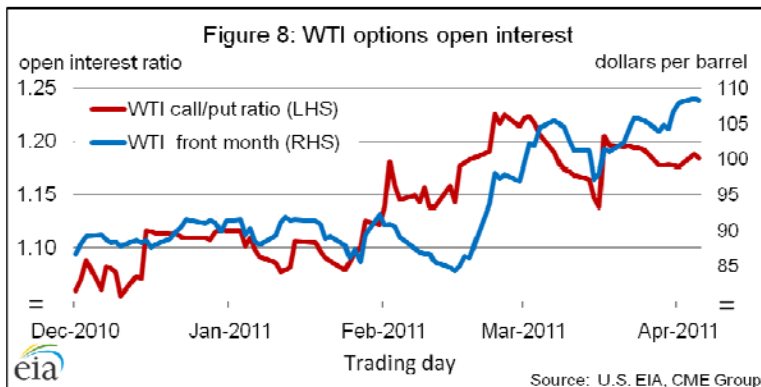
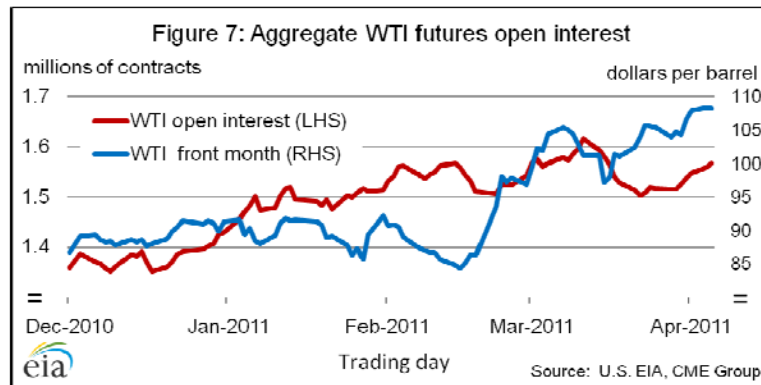
Even with price increases, implied oil volatilities eased in March, with front month implied volatility back near its January levels (Figure 5). Realized 30-day volatility on April 1 was 38 percentage points, slightly below the coincident implied volatilities, its traditional relationship. Much of this reduction in realized volatility is the recent exclusion of the trading spike beginning on the 22nd of February, a period where we saw one intraday range above \$10 (Figure 6). With expected daily movements around 2 percent, given option valuations, this fell well beyond normal variance. An increased trading range was also seen in the middle of last month just following the Japanese disaster.



² The S&P GSCI Brent Index provides rolling exposure to the Brent a near month futures contract. The index rolls from the near month contract to the second nearby during the 5th through 9th business day of each month.

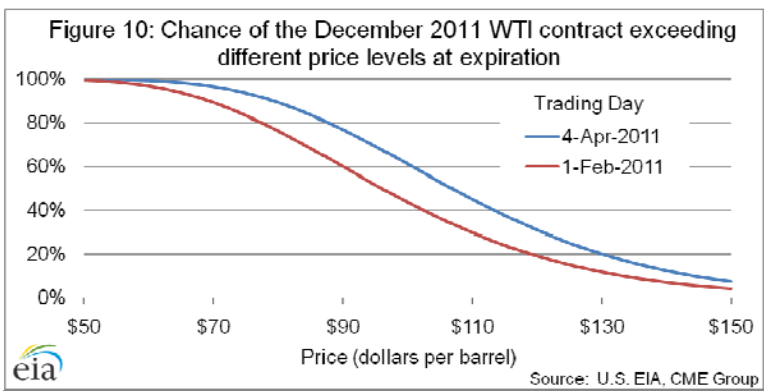
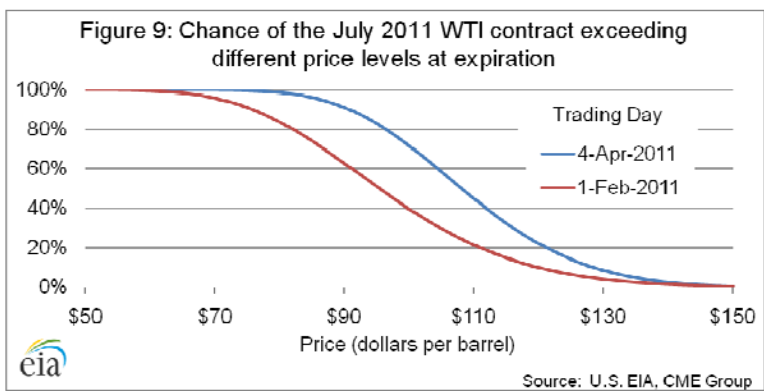


Open interest for WTI futures, the number of outstanding contracts, has increased by more than 200 thousand since December and hit record levels on three consecutive days during the week of March 11th (**Figure 7**). Trading volume also rose to a record high during the first quarter of 2011, with a 23 percent increase from the same period a year ago. Net long positions of non-commercial traders rose from just over zero in September of last year to higher than 250 thousand contracts recently, according to the weekly CFTC report. Though we note this increased participation, this trend may be a signal of a greater willingness by commercial interests to hedge more of their physical supply at these price points. Finally, relative levels of options trading have shifted market weight attention further towards upside risks (**Figure 8**). The ratio of call option open interest (an instrument which protects against price rises) to that of puts is now just under 1.2, in other words 20 percent more open upside insurance contracts.



Though WTI volatility has fallen back to levels similar to two months ago, price increases during this period have outstripped these volatility effects. Thus, EIA's probability assessments for higher prices

by the middle of the year moved up from levels two months prior (**Figures 9 and 10**). On April 4, market prices for all expirations in 2011 settled above \$108 per barrel, leaving probabilities of expiring above \$110 just under 50 percent. Higher strikes saw similar increases in likelihood, with the probability of December 2011 delivery above \$120 per barrel at 31 percent and above \$130 per barrel at 20 percent. 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.)



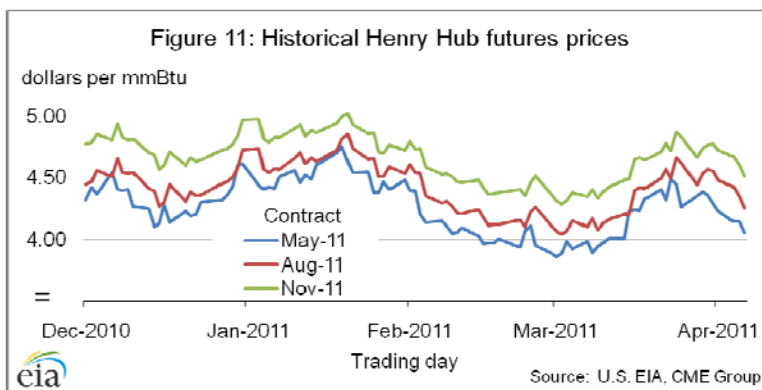
Gasoline. EIA expects regular-grade gasoline retail prices, which averaged \$2.76 per gallon last summer, will average \$3.86 per gallon during the current driving season. The projected monthly average regular retail gasoline price peaks this year at \$3.91 per gallon in early summer. Diesel fuel prices, which averaged \$2.98 per gallon last summer, are projected to average \$4.09 this summer. Weekly and daily national average prices can differ significantly from monthly and seasonal averages, and there are also significant differences across regions, with monthly average prices in some areas exceeding the national average price by 25 cents per gallon or more.

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 April 7, averaged \$3.15 per gallon. The probability the RBOB futures price will exceed \$3.30 per gallon (consistent with a U.S. average regular gasoline retail price above \$4 per gallon) in July 2011 is about 33 percent.

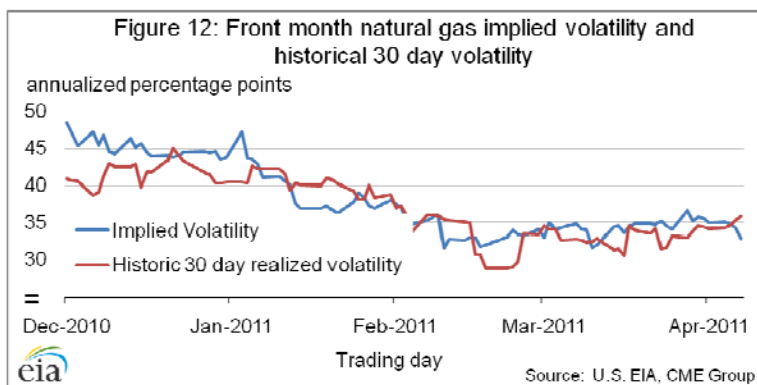
U.S. Natural Gas Prices. The Henry Hub spot price averaged \$3.97 per MMBtu in March, 12 cents lower than the average price in February and 6 cents lower than the March forecast in last month's Outlook ([Henry Hub Natural Gas Price Chart](#), **Figure 11**). EIA expects that the Henry Hub price will

average \$4.10 per MMBtu over 2011, a decline of 29 cents from 2010. However, the projected Henry Hub price rises to \$4.55 per MMBtu in 2012.

Uncertainty over future natural gas prices is slightly lower this year compared with last year at this time. Natural gas futures for June 2011 delivery (for the 5-day period ending April 7) averaged \$4.29 per MMBtu, and the average implied volatility over the same period was 34 percent. The lower and upper bounds for the 95-percent confidence interval for June 2011 contracts are \$3.37 per MMBtu and \$5.47 per MMBtu, respectively. At this time last year, the natural gas June 2010 futures contract averaged \$4.04 per MMBtu and implied volatility averaged 41 percent. The corresponding lower and upper limits of the 95-percent confidence interval were \$3.00 per MMBtu and \$5.50 per MMBtu.



Over the last month, natural gas volatility has been relatively quiescent (**Figure 12**). After a dip below 30 percentage points at the end of February, implied volatility has essentially range bound, tracking mostly within a band of 30 to 35 percentage points. Not unexpectedly, realized volatility has seen similar range-bound movement within the last few months, a sign that levels of uncertainty have not been rapidly changing in the recent past.



Combined with roughly similar volatility levels, a slight upward movement in prices and a shortened time until expiration has caused the probability of exceeding higher price points to decrease for near term contracts. The chance that natural gas prices will be greater than \$4.50 per MMBtu at expiration on the May futures contract has dropped by about half, with corresponding reduced chances for a price breakout (**Figures 13 and 14**). 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).

