



Short-Term Energy Outlook

Energy Price Volatility and Forecast Uncertainty¹

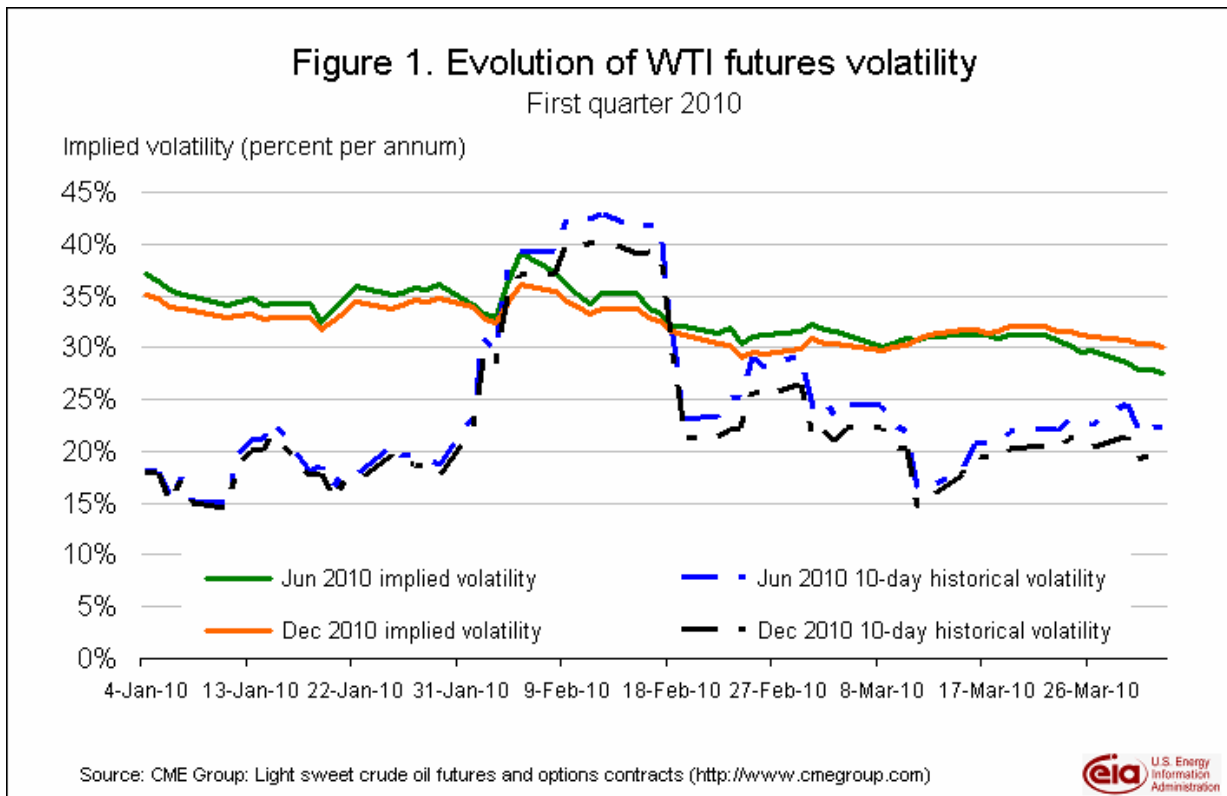
April 6, 2010 Release

Crude Oil Prices. WTI crude oil spot prices averaged \$81 per barrel in March 2010, almost \$5 per barrel above the prior month's average and \$3 per barrel higher than forecast in last month's Outlook. Oil prices rose from a low this year of \$71.15 per barrel on February 5 to \$80 per barrel by the end of February, generally on news of robust economic and energy demand growth in non-OECD Asia and the Middle East, and held near \$81 until rising to \$85 at the start of April. EIA expects WTI prices to average above \$81 per barrel this summer, slightly less than \$81 for 2010 as a whole, and \$85 per barrel by the fourth quarter 2011 ([West Texas Intermediate Crude Oil Price Chart](#)).

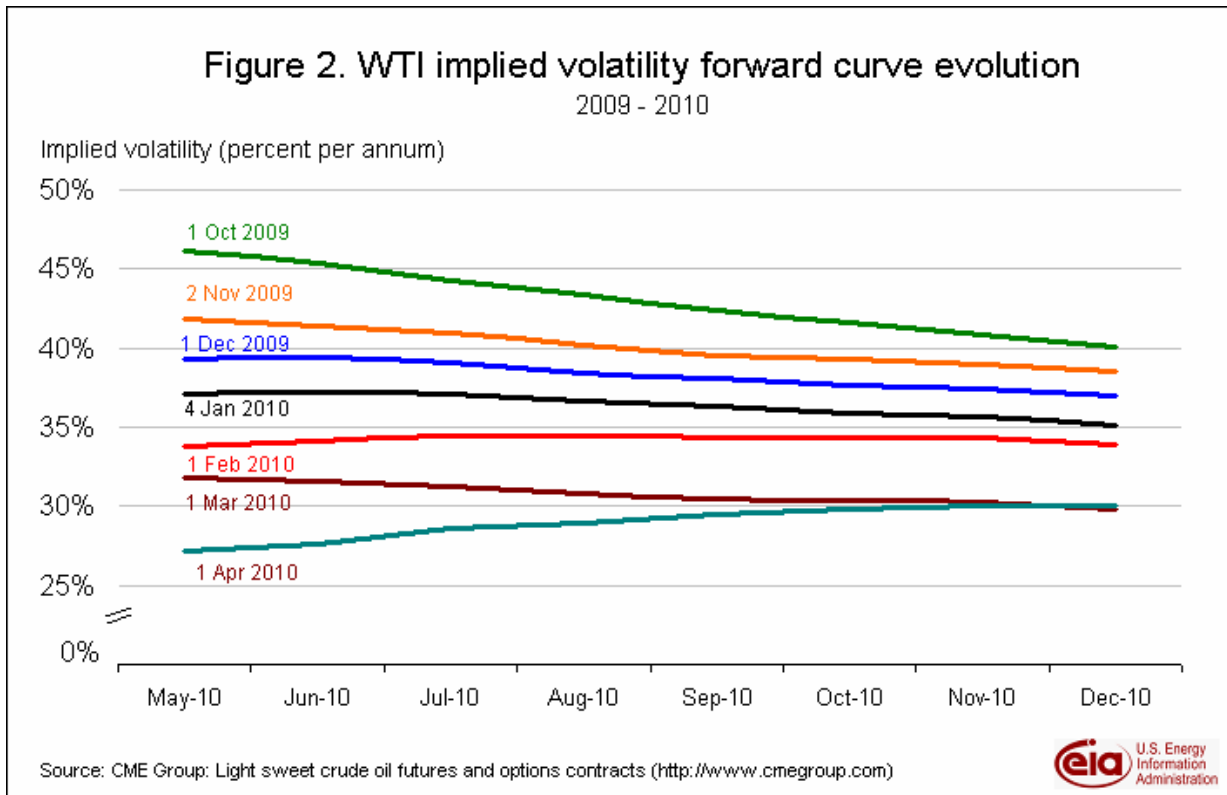
Over the 5-day period ending April 1, June 2010 WTI futures contracts averaged \$83.07 per barrel. Over the same 5-day period, the lower and upper limits for the 95-percent confidence interval for June 2010 futures were \$68 and \$101 per barrel, respectively, based on the June 2010 implied volatility of 28 percent calculated from New York Mercantile Exchange (NYMEX) near-the-money options on WTI futures (see [Energy Price Volatility and Forecast Uncertainty](#)). One year ago, futures contracts for WTI delivered into Cushing, Oklahoma, in June 2009 averaged about \$45 per barrel and implied volatility, at 74 percent, was more than twice the rate now trading in the options markets.

WTI futures implied volatility has been trending lower since peaking in late 2008. In March, the implied volatility of the June 2010 futures contract for WTI continued to move lower while the implied volatility for the December 2010 contract changed little over the month (Figure 1).

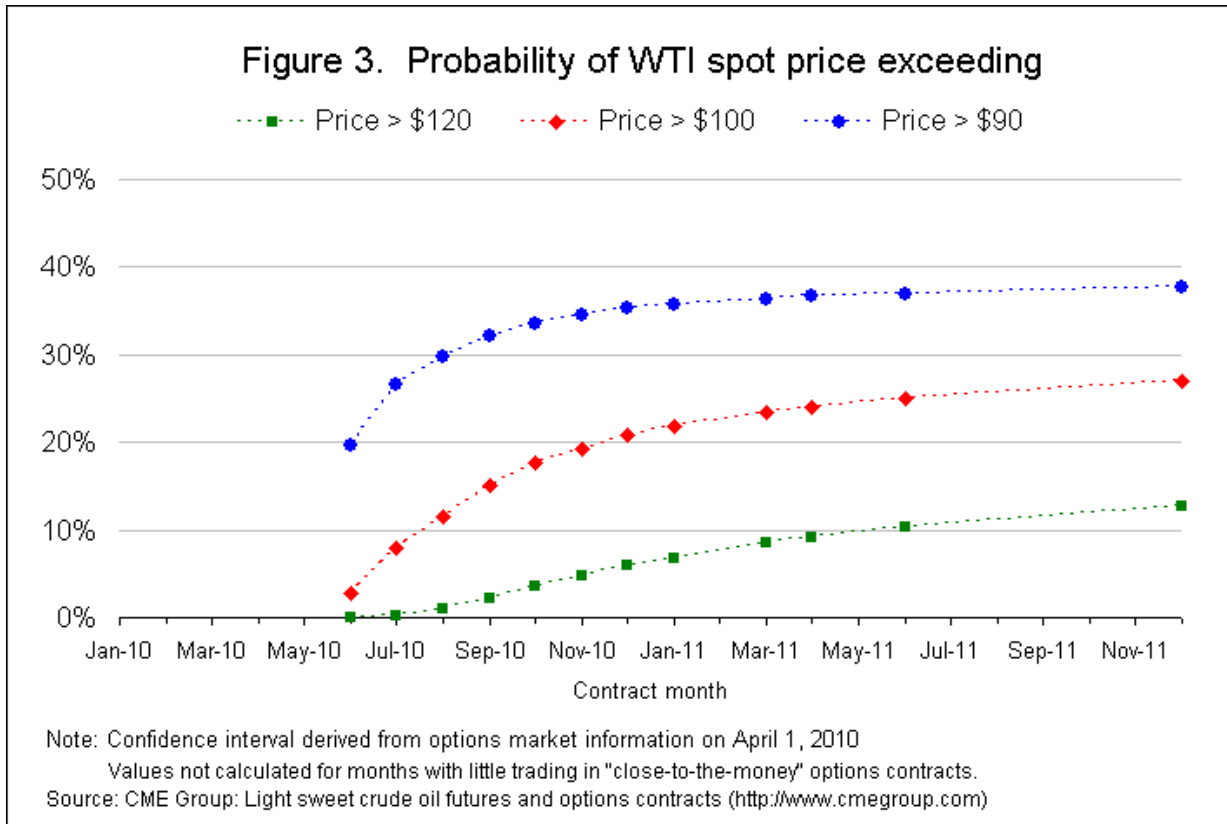
¹ This is a regular monthly supplement to the EIA *Short-Term Energy Outlook*.
(<http://www.eia.doe.gov/emeu/steo/pub/contents.html>)
Contact: Bob Ryan (Robert.Ryan@eia.doe.gov)



As implied volatilities for nearby futures contracts edged lower during March, the forward volatility curve shifted to a contango structure (i.e., nearby volatility was lower than deferred implied volatility) as seen in Figure 2. This is a change from the "normal" backwarddated term structure for WTI implied volatility. Prompt implied volatilities typically are higher than longer-dated implied volatilities in a backwarddated term structure because supply and demand are more price-inelastic in the near term.



Crude Oil Price Probabilities. The market's assessment of the probability of the realized WTI spot price exceeding \$100 per barrel during 2010 increases from 3 percent for the June 2010 contract to 21 percent for the December 2010 contract. These probabilities showed little change across the forward curve in March. The probabilities are calculated using a cumulative normal density function, derived using Fischer Black's (1976) commodity option pricing model (see Appendix II of [Energy Price Volatility and Forecast Uncertainty](#), beginning on page 22.). The probability for each month is calculated using the futures price for that contract, its implied volatility, and its time to expiration. Like the confidence intervals reported by EIA, this is a market-based probability estimate derived using traded futures and options prices (see April STEO Supplement, [Probabilities of Possible Future Prices](#)).

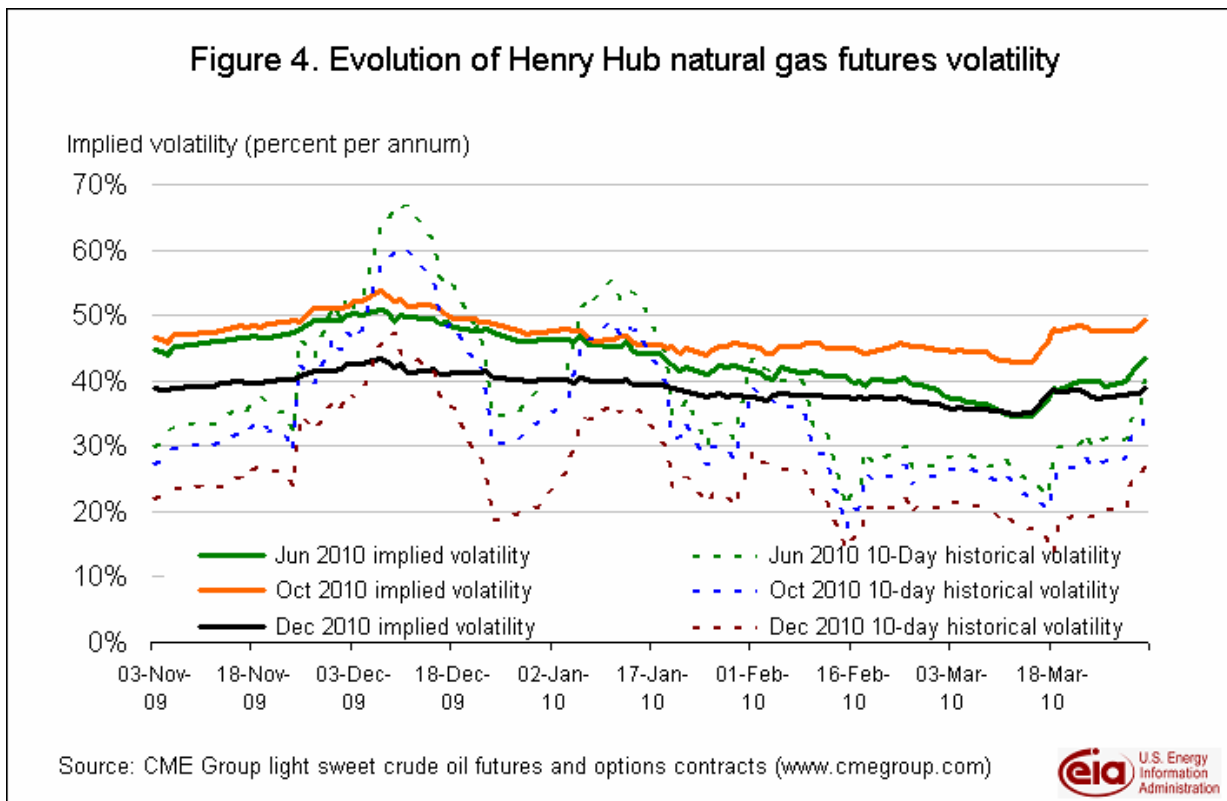


U.S. Natural Gas Prices. The Henry Hub spot price averaged \$4.29 per million Btu (MMBtu) in March, \$1.03 per MMBtu lower than the average spot price in February and \$0.64 per MMBtu lower than the forecast for March in last month's Outlook (Henry Hub Natural Gas Price Chart). In the same way that colder-than-normal weather contributed to higher prices during portions of January and February, warmer-than-normal weather contributed to lower prices in March. In particular, prices touched a 4-month low during the final days of the month as lower demand and higher production resulted in storage injections. EIA expects prices to remain low for the next several months. With strong production and the absence of meaningful space-heating demand, lower-priced natural gas will once again compete with coal for a share of the baseload electricity supply—particularly in the spring and fall. Sustained low prices should reduce drilling activity over time. As a result, EIA expects production to decline and prices to increase, albeit mildly, in 2011. The Henry Hub spot price forecast averages \$4.44 per MMBtu in 2010 and \$5.33 per MMBtu in 2011.

Volatility in the June 2010 futures and options markets trended lower during the first half of March but rose in the second half as natural gas spot prices fell to \$4 per MMBtu (Figure 4). For the 5-day period ended April 1, implied volatility for June

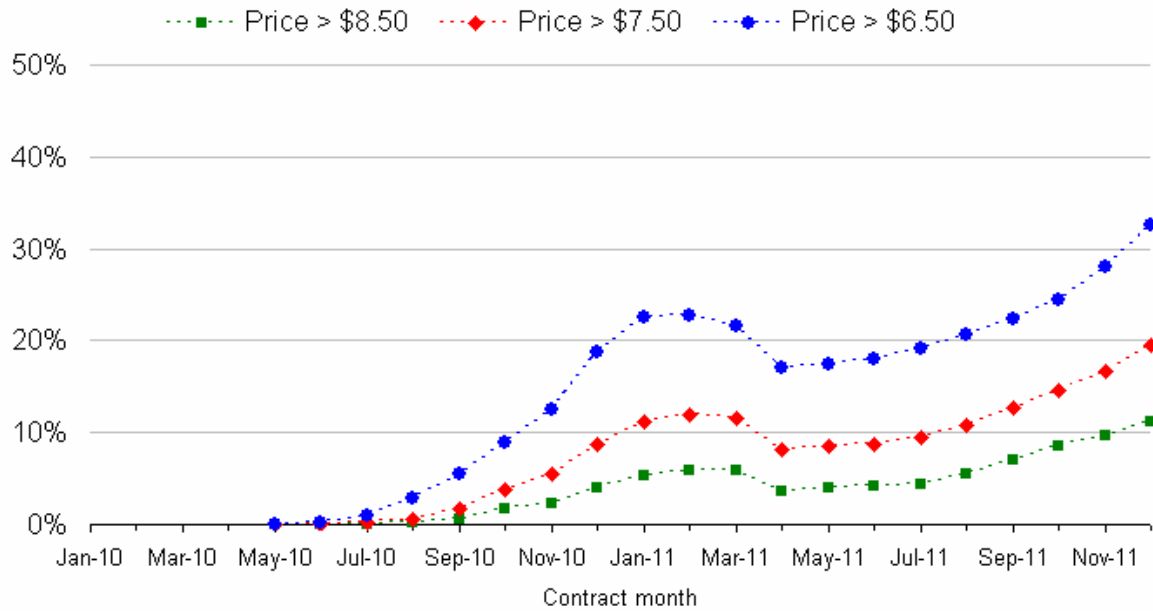
2010 natural gas options averaged 41 percent per annum, while June 2010 futures prices averaged \$4.04 per MMBtu. The lower and upper limits of the 95-percent confidence interval, therefore, were \$3.00 and \$5.50 per MMBtu, respectively.

A year earlier, natural gas delivered to the Henry Hub in June 2009 was trading at \$3.90 per MMBtu and implied volatility averaged about 63 percent. This generated a lower and upper limit for the 95-percent confidence interval of \$2.45 and \$6.20 per MMBtu, respectively.



U.S. Natural Gas Price Probabilities. Despite the increase in the implied volatilities during March, the probability of the Henry Hub realized price rising above \$6.50 million Btu in December 2010 fell from 30 percent last month to 19 percent this month.

Figure 5. Probability of Henry Hub spot price exceeding



Notes: Probability values calculated using NYMEX market data for the five trading days ending April 1, 2010.

Values not calculated for months with little trading in "close-to-the-money" options contracts..

Source: CME Group: Light sweet crude oil futures and options contracts (<http://www.cmegroup.com>)

