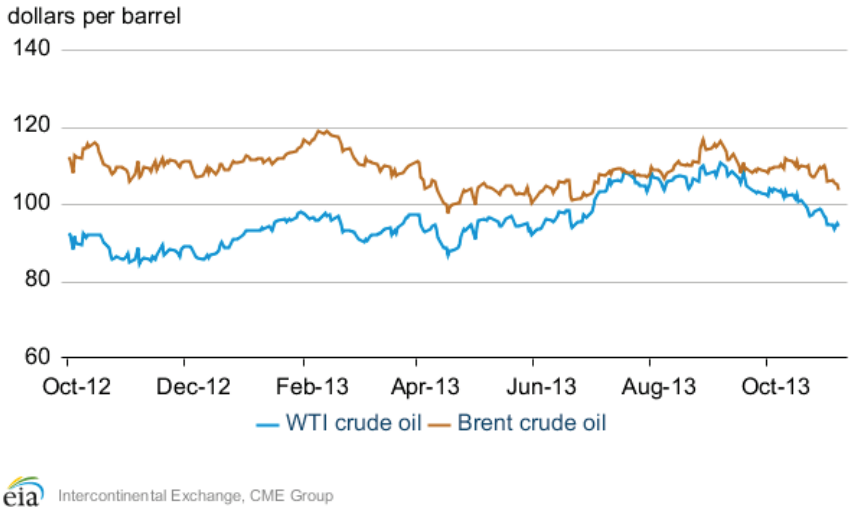
Short-Term Energy Outlook
Market Prices and Uncertainty Report

Crude Oil

Prices: North Sea Brent and West Texas Intermediate (WTI) front month futures contracts continued their recent decline in October and the first week of November as a larger-than-normal seasonal decrease in global refinery runs from August through October lessened demand for crude oil. The Brent contract settled at $103.46 per barrel on November 7, a decline of $4.48 per barrel compared to October 1 **(Figure 1)**. The decreases in WTI futures prices were greater compared to Brent, with the front month WTI contract settling at $94.20 per barrel on November 7, a fall of $7.84 per barrel over the same period.

Figure 1. Historical crude oil front month futures prices



This is a regular monthly companion to the EIA Short-Term Energy Outlook (http://www.eia.gov/forecasts/steo/)
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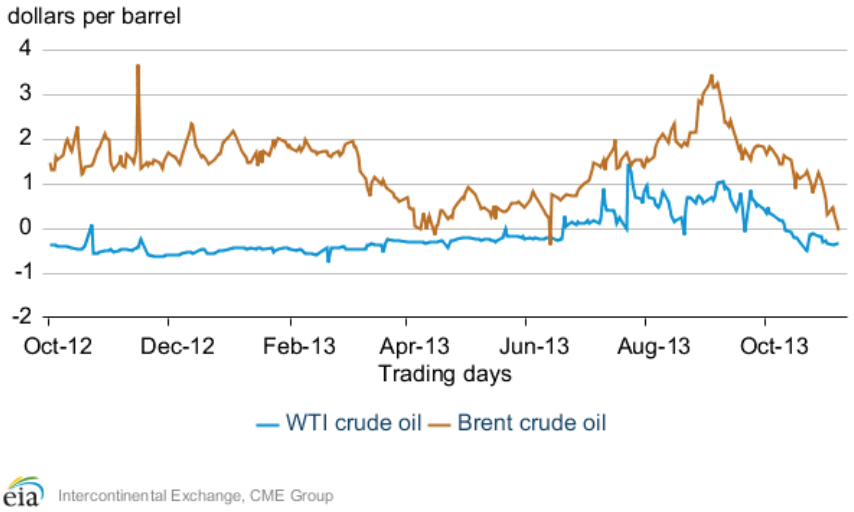
Crude oils located in the United States showed greater price declines compared to international benchmarks in October and the first week of November, widening their differentials to Brent. The Brent-WTI front month futures spread settled at $9.26 per barrel on November 7, an increase of $3.36 per barrel since October 1 **(Figure 2)**.

Unlike earlier periods since the start of 2011 when the Brent-WTI spread reached about $10 per barrel, most of the current difference between Brent and WTI prices is not due to transportation constraints from the North American Midcontinent to the U.S. Gulf Coast, but rather an increase in supply of light sweet crude oil combined with lower refinery runs compared to a few months ago. This can be observed in the behavior of the Louisiana Light Sweet (LLS)-Brent spot price spread. The spread settled at -$5.63 per barrel on November 7, only $3.63 per barrel less than the Brent-WTI spread. When the Brent-WTI spread previously reached $10 per barrel, at the beginning of April, the LLS-Brent spread was positive, indicating that the Brent-WTI differential during that time was due to costs associated with transporting crude oil to the U.S. Gulf Coast.

Figure 2. Historical crude oil differentials

Backwardation (when near-term prices are higher than further-dated ones) in the front part of the Brent and WTI futures curves decreased in October, supporting an easing of tightness in crude oil markets. The Brent 1st-3rd month futures price spread was near zero on November 7, its lowest point since June **(Figure 3)**. Extended refinery maintenance in Europe combined with strong October and November loadings for crude oil out of the North Sea pushed near-term Brent prices lower. Recent inventory builds in Cushing, Oklahoma depressed near-term WTI prices compared to prices over the next few months. The 1st-3rd month futures spread for WTI moved into contango (when near-term prices are lower than further-dated ones) in October and settled at -$0.34 per barrel on November 7.

Figure 3. Crude oil front month - 3rd month futures price spread



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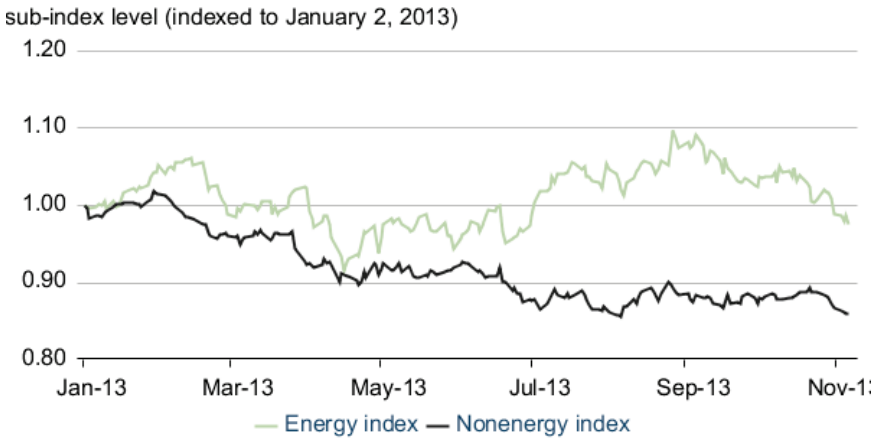
Energy vs Nonenergy commodities: The recent decline in commodity prices has also included nonenergy commodities. The S&P Goldman Sach's Commodity Index (GSCI) is divided between energy and nonenergy price components. The energy portion declined by 4.7% since October 1, to settle near its beginning-of-the-year level **(Figure 4)**. The nonenergy portion of the index also declined over the past five weeks, settling 1.6% lower on November 7 compared to October 1 and nearly matching its lowest point in 2013.

Figure 4. Energy vs Nonenergy GSCI components



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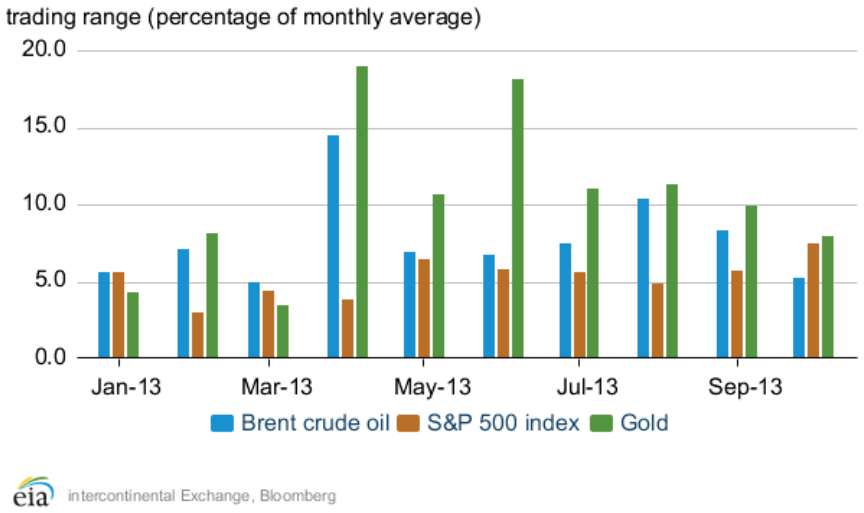
Trading ranges: Much of the variability in crude oil prices has come in the form of regional variations and volatility in price spreads because of recent cuts in refinery runs, while absolute price levels for Brent have remained relatively stable compared to other markets. The monthly trading range (calculated by subtracting the low price from the

high price and dividing by the monthly average) for Brent was 5.2% in October, the lowest since March **(Figure 5)**. October was also the first time that Brent had a smaller trading range than the S&P 500 and gold (the highest weighted nonenergy commodity in the GSCI) in the past four years, which had trading ranges of 7.5% and 8.0%, respectively, in October.

Figure 5. Monthly trading ranges for crude oil, equities and gold



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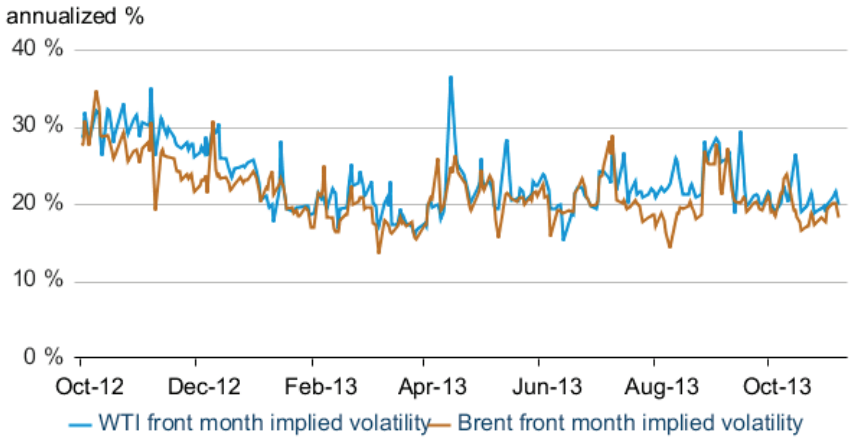
Volatility: Implied volatility for the front month Brent and WTI futures contracts settled at 18.3% and 20.0%, respectively, on November 7, both declining slightly from their October 1 settlements **(Figure 6)**. With lower refinery runs largely offsetting reductions in global crude oil supplied from unplanned outages, implied volatility for both benchmarks moved lower as the market became less tight.

Figure 6. Crude Oil Implied Volatility



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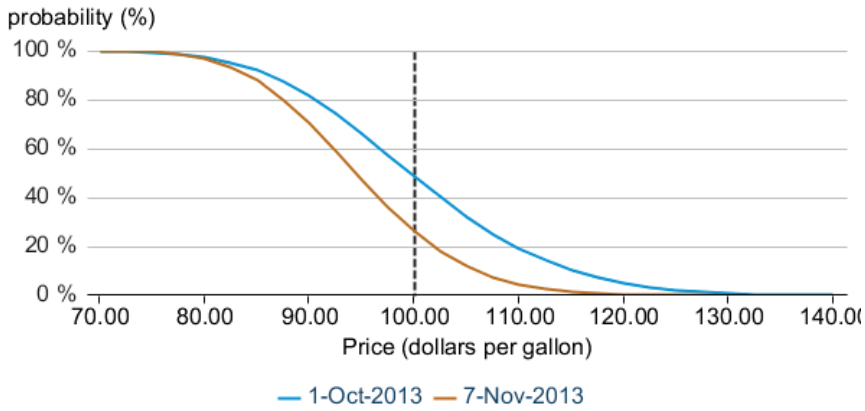
Market-Derived Probabilities: The February 2014 WTI futures contract averaged $94.80 per barrel for the five trading days ending November 7 and has a probability of exceeding $100 per barrel at expiration of approximately 26%. The same contract for the five trading days ending October 1 had a probability of exceeding $100 of 49% (**Figure 7**). Because Brent prices are higher than WTI prices, the probability of Brent futures contracts expiring above the same dollar thresholds is higher.

Figure 7. Probability of the February 2014 WTI contract expiring above price levels



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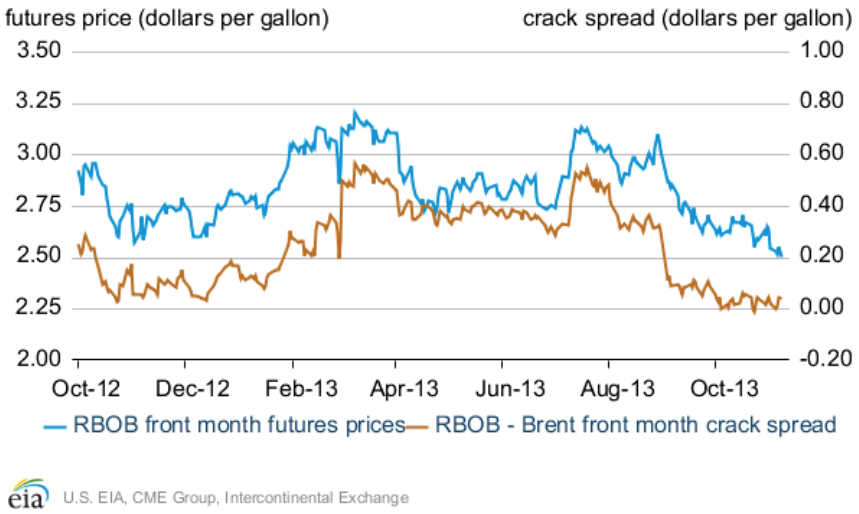
Petroleum Products

Gasoline prices: The reformulated blendstock for oxygenate blending (RBOB) front month futures contract price declined $0.10 per gallon from October 1, settling at $2.50 per gallon on November 7 **(Figure 8)**. The RBOB-Brent crack spread settled at $0.04 per gallon on November 7, relatively unchanged from the start of October. The crack spread briefly entered negative territory and reached -$0.01 on October 23, its lowest point since December 2011. In 2011, the crack spread turned negative in the first week of November, reaching a low of -$0.13 per gallon in the middle of the month. The following year, in 2012, the crack spread stayed positive during the winter months, but reached its lowest point on October 23, comparable to this year.

Gasoline production dipped slightly from September, as the four-week average ending November 1 stood at 9.1 million barrels per day, relatively unchanged from last year even though crack spreads have shown significant weakness throughout October. Refineries on the Gulf Coast, however, can take advantage of U.S. crudes that are priced at a discount to world waterborne crudes. As a result, location and crude specific crack spreads for refineries in the U.S. are likely to be higher than a generic crack spread calculated using Brent crude oil prices, giving an incentive to continue producing and exporting petroleum products.

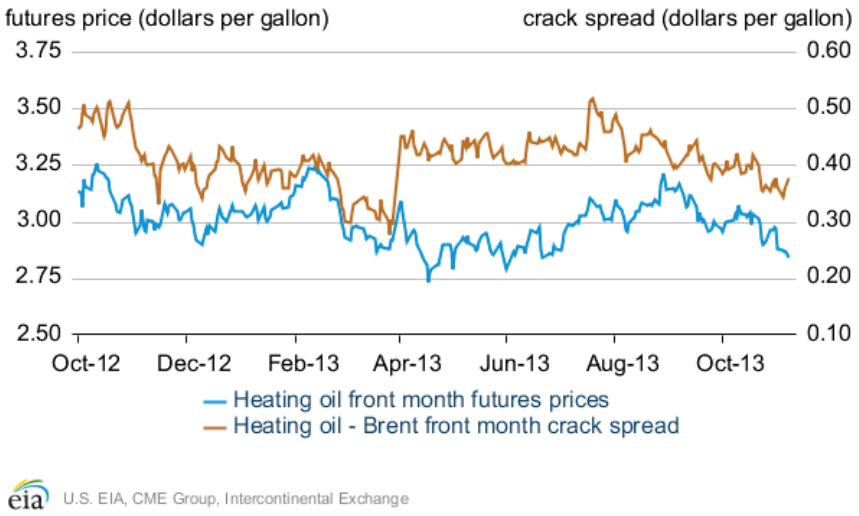
Figure 8. Historical RBOB futures prices and crack spread



Heating Oil prices: The front month futures price for heating oil decreased by $0.12 per gallon in October and the first week of November, settling at $2.84 per gallon on November 7. The heating oil-Brent crack spread also declined slightly, settling at $0.38 per gallon on November 7, a decrease of $0.01 since October 1 **(Figure 9)**.

For the week ending November 1, the four-week average distillate production rose 0.3 million barrels per day from last October, even though average heating oil prices and heating oil-Brent crack spreads for the month of October are at their lowest since 2011. As with gasoline, although the differential between waterborne crude and petroleum products is generally weak, refineries that run cheaper U.S. crude can have higher margins. Distillate, specifically, continues to show strength in overseas markets. For the week ending November 1, the four-week average of distillate consumption plus exports was 5.3 million barrels per day, up 0.4 million barrels per day from last October. Distillate stocks have been at or near the five-year low since June of this year, and for the week ending November 1, inventories stood at 118 million barrels, slightly lower than this point last year.

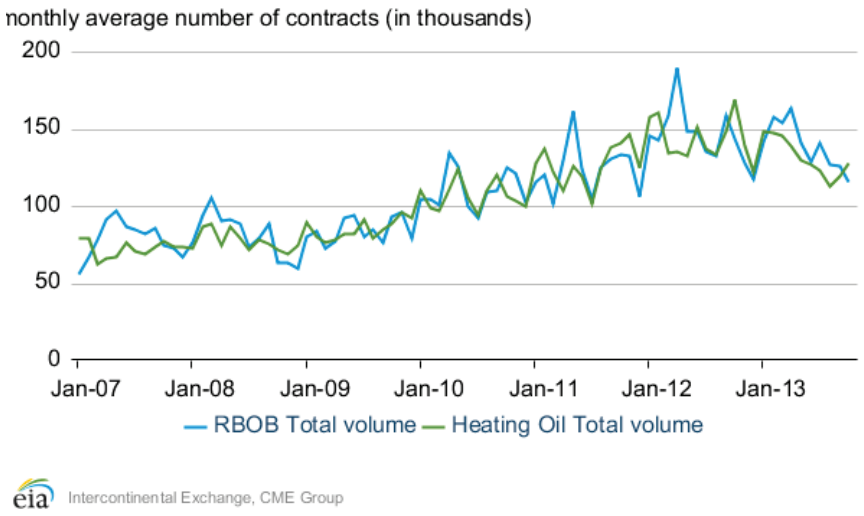
Figure 9. Historical heating oil futures price and crack spread



Volume and Open Interest: The trading volume on RBOB and heating oil futures contracts has steadily increased nearly every year since 2007, the first full-year that the RBOB futures contract began trading **(Figure 10)**. Each year from 2007 to 2012, the trading volume for RBOB gasoline futures contracts increased for all contracts and had an average year-over-year increase of 260,000 contracts. Heating oil trading volume increased each year from 2002 to 2012 for all contracts, averaging a year-over-year increase of 115,000 contracts. The trading volumes for RBOB and heating oil tracked closely since 2007, never deviating by more than 75,000 contracts for the year.

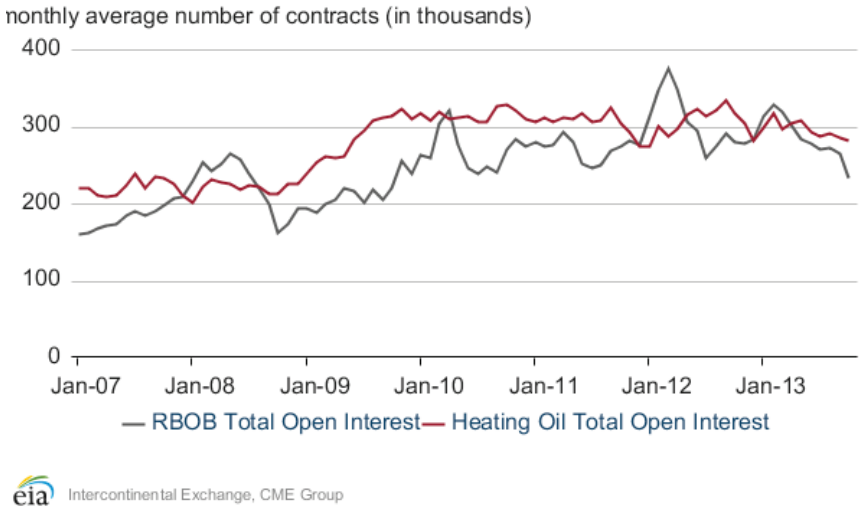
In the first 10 months of 2013, the RBOB trading volume for all contracts totaled 1.4 million contracts while the heating oil has seen 1.3 million contracts traded. Unless the average monthly trading volumes in November and December for RBOB rise above 175,000 contracts, much higher than the average seen for those two months historically, this year will be the first full year-over-year decline in trading volume since RBOB futures contracts began trading. The same can be seen with heating oil as its trading volume for the first 10 months is lagging from the same time frame in previous years and will show the first full year-over-year decline since 2001 if the average monthly trading volumes in November and December stay below 200,000 contracts.

Figure 10. RBOB and Heating Oil Total Volume for All Contracts



Total open interest of all RBOB contracts followed similar patterns seen in total volume of RBOB contracts traded. For 9 out of the 10 months of this year, open interest has declined from the respective month from last year **(Figure 11)**. The last year to have nearly as many declines in open interest was in 2009, when 8 out of the first 10 months of the year showed declines. The total open interest for heating oil has shown year-over-year declines for six months this year, all occuring after May. Trends in open interest for heating oil contracts are more muted, as most years since 2001 have had several months experience declines in open interest.

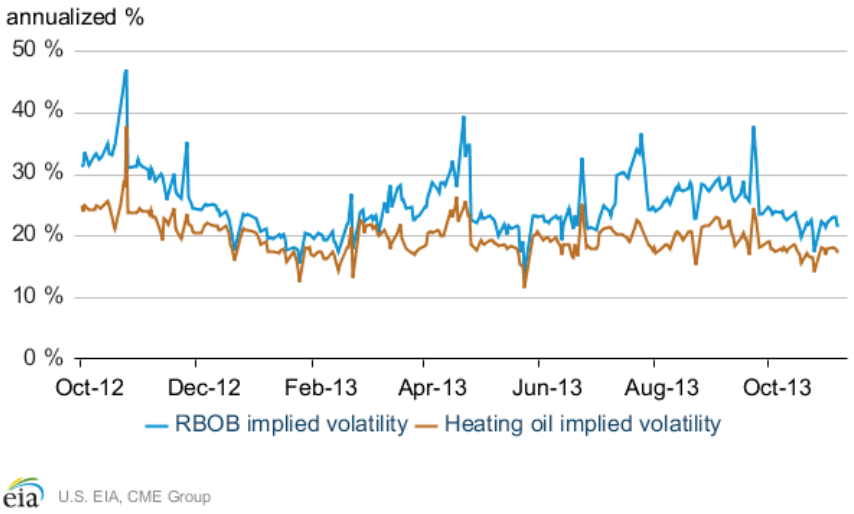
Figure 11. RBOB and Heating Oil Total Open Interest for All Contracts



Volatility: The implied volatility for the front month RBOB contract declined 2.9 percentage points since October 1, settling at 21.7% on November 7 **(Figure 12)**. The

implied volatility for the front month heating oil contract also fell, settling at 17.4% on November 7, a decrease of 1.8 percentage points since October 1.

Figure 12. RBOB and Heating Oil Implied Volatility



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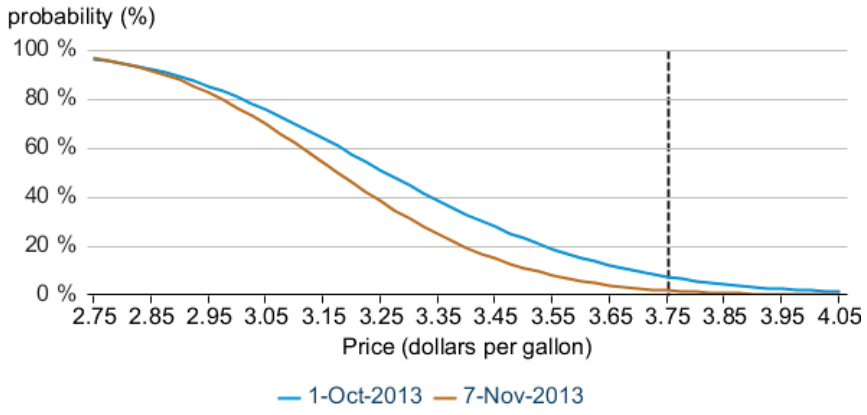
Market-Derived Probabilities: The February 2014 RBOB futures contract averaged $2.54 per gallon for the five trading days ending November 7 and has a probability of exceeding $3.10 per gallon (typically leading to a retail price of $3.75 per gallon) at expiration of approximately 2%. The same contract for the five trading days ending October 1 had a probability of 8% of exceeding $3.10 per gallon **(Figure 13)**.

Figure 13. Probability of February 2014 retail gasoline exceeding different price levels at expiration



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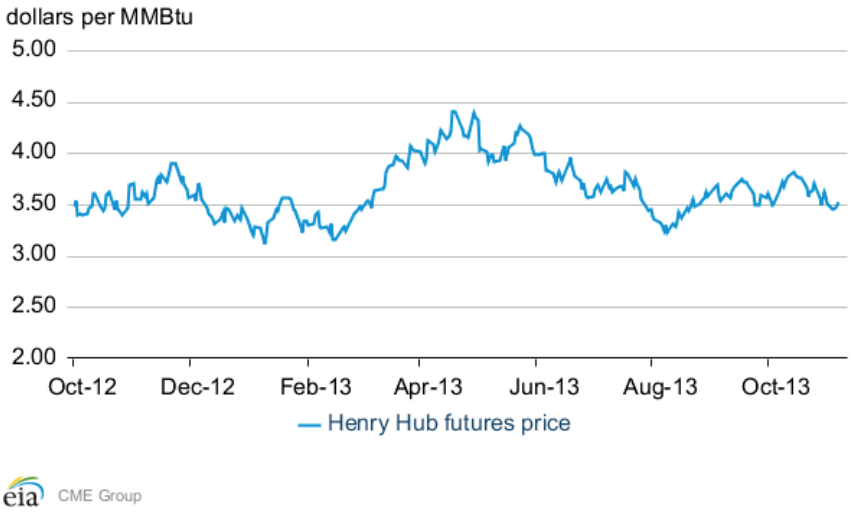
Natural Gas

Prices: November 1 traditionally marks the end of natural gas storage injection season and the start of withdrawal season, although storage injections can continue into

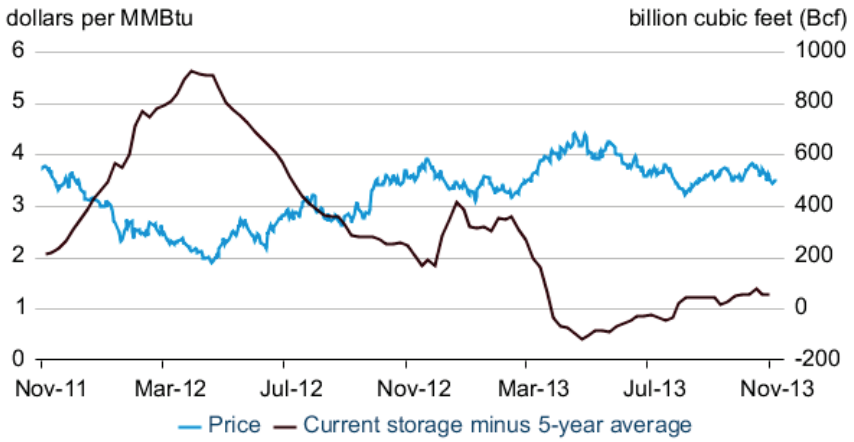
November. Over this injection season, the front month contract reached a high of $4.41 per MMBtu in April and a low of $3.23 per MMBtu in August. Front month prices throughout October ranged between $3.40 and $3.80 per MMBtu, settling at $3.52 per MMBtu on November 7, $0.09 per MMBtu lower than the price on October 1 **(Figure 14)**.

Figure 14. Historical front month U.S. natural gas prices



Dry natural gas production has held above 66 billion cubic feet per day (Bcf/d) since April, helping lift storage levels above the 5-year average since August **(Figure 15)**. Furthermore, the Federal Energy Regulatory Commission approved the start of service of two pipeline projects to provide almost 1 Bcf/d of Marcellus Shale production to the New York and New Jersey area, which will continue to help relieve pipeline constraints that were often seen during past high demand periods.

Figure 15. U. S. natural gas prices and storage



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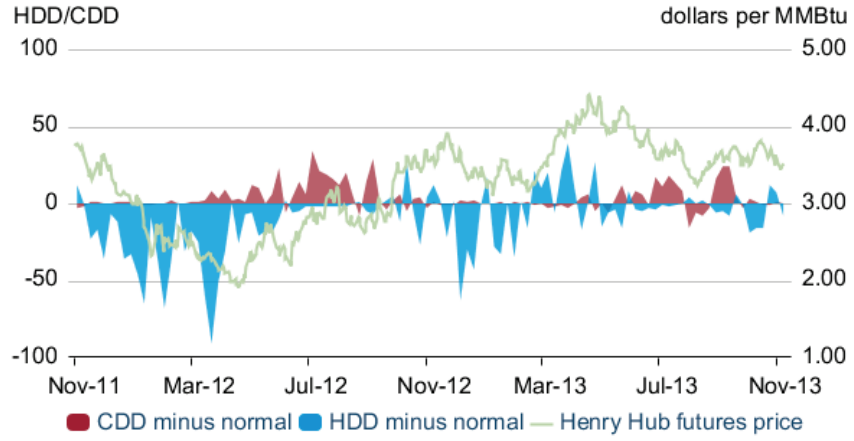
On the demand side, this year's injection season had several warmer-than-normal periods but not as many as 2012 **(Figure 16)**. This winter is expected to be colder than last year's warm temperatures, which may raise natural gas prices, although futures prices show scant evidence of that. October's warmer-than-normal temperatures contributed to recent price declines.

Figure 16. HDD minus normal and CDD minus normal



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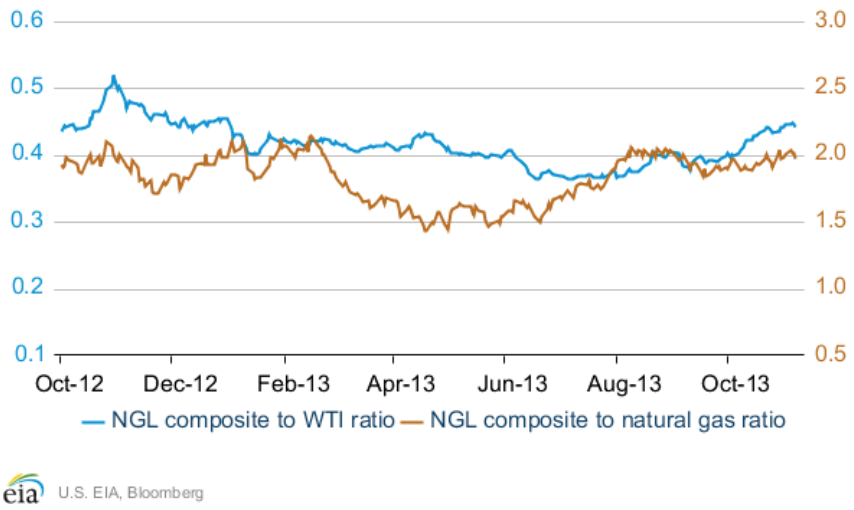
Natural Gas Liquids (NGL): EIA's new Drilling Productivity Report (DPR) develops more meaningful ways to assess oil and gas production than traditional rig counts. Since drilling produces both oil and natural gas, it is important for operators to analyze market prices in making production decisions. **Figure 17** shows price ratios for the NGL

composite, WTI crude oil, and natural gas at Henry Hub. The ratios are calculated after converting all fuels to cents per gallon, and are an indicator of relative market strength or weakness for a given fuel. The NGL-to-crude ratio is nearing the same level as this time last year, which can partly be attributed to the seasonal demand increase for butane and propane.

With the recovery of natural gas prices since 2012 combined with weak ethane and propane prices, the NGL-to-gas ratio fell to a three-year low in April. The rise in propane prices, which equal almost a third of the NGL composite and have increased 25% since then, as well as the fall in natural gas prices have brought the ratio up near last year's levels. High ratios have spurred producers to look for more liquids-rich natural gas plays.

Figure 17. NGL price ratios



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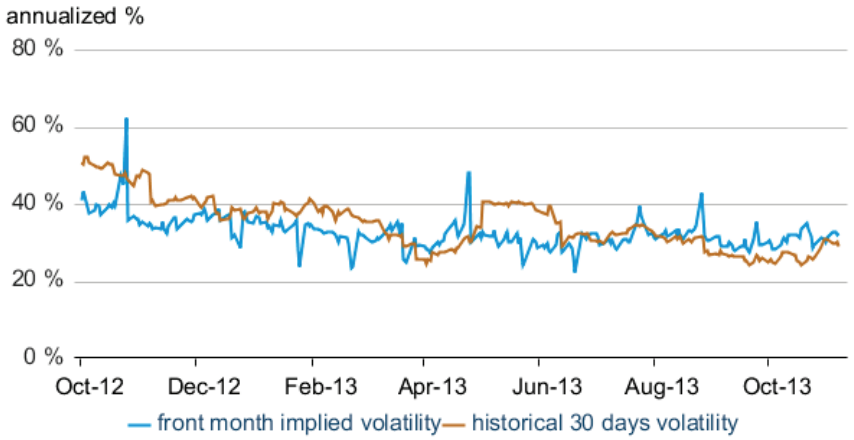
Volatility: Historical and implied volatility increased throughout October but remain below year-ago levels **(Figure 18)**. Historical volatility increased 3.9 percentage points since October 1 to settle at 29.0% on November 7 while implied volatility increased 1.9 percentage points since October 1 to settle at 32.2%. Some large downward price movements contributed to the increase in historical volatility.

Figure 18. Natural gas historical and implied volatility



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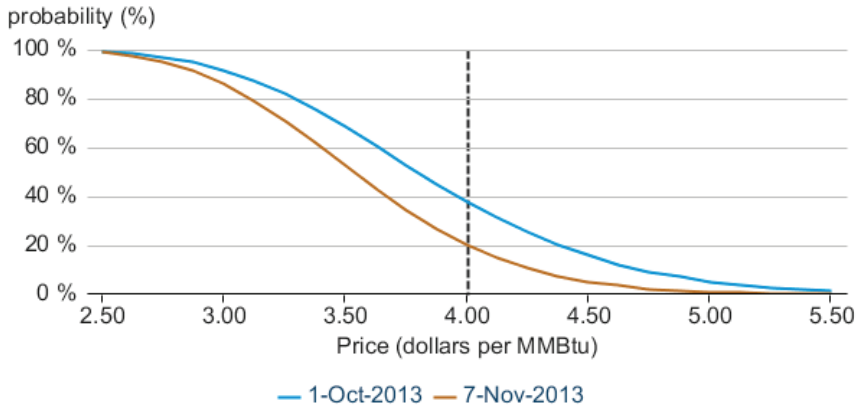
Market-Derived Probabilities: The probability of the February 2014 Henry Hub contract expiring above $4.00 per MMBtu decreased to about 20%, 18 percentage points lower from the probability at the beginning of October **(Figure 19)**.

Figure 19. Probability of the February 2014 Henry Hub contract expiring above price levels



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