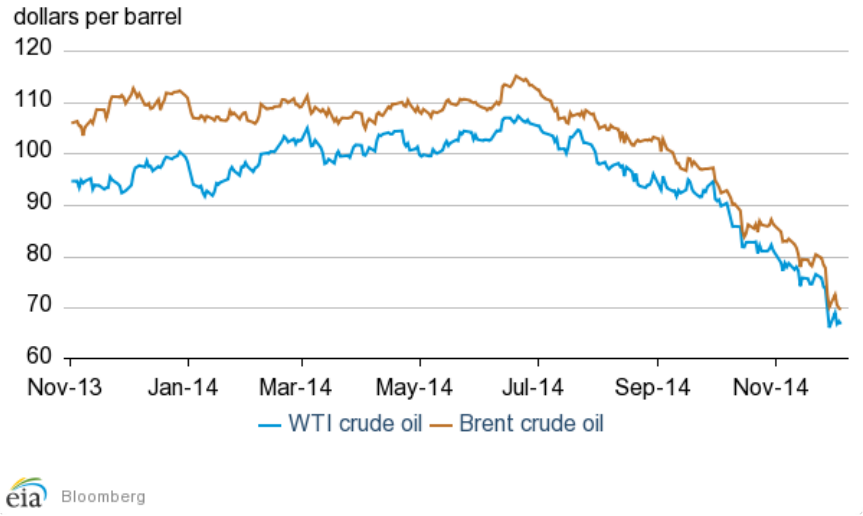
Short-Term Energy Outlook
Market Prices and Uncertainty Report

Crude Oil

Prices: Crude oil prices continued to move lower in November and recorded their fifth consecutive month of declines. The North Sea Brent front month futures price settled at $69.64/bbl on December 4, a decline of $15.14/bbl from November 3 **(Figure 1)**. The front month West Texas Intermediate (WTI) contract price settled at $66.81/bbl on December 4, decreasing by $11.97/bbl since the start of November. The settle price for Brent was below $70/bbl for the first time since early 2010.

Figure 1. Historical crude oil front month futures prices



Most of the price declines occurred immediately following the conclusion of the Organization of the Petroleum Exporting Countries (OPEC) November meeting and subsequent announcement to maintain current production levels. Expectations for global economic growth and future demand for petroleum products continued to be revised lower on weak manufacturing data from China and Europe in November, leaving global oil markets oversupplied and inventories building. With OPEC maintaining current production levels, lower prices put pressure on non-OPEC producers to reduce production in order to balance the market going forward.

This is a regular monthly companion to the EIA *Short-Term Energy Outlook* (http://www.eia.gov/forecasts/steo/)
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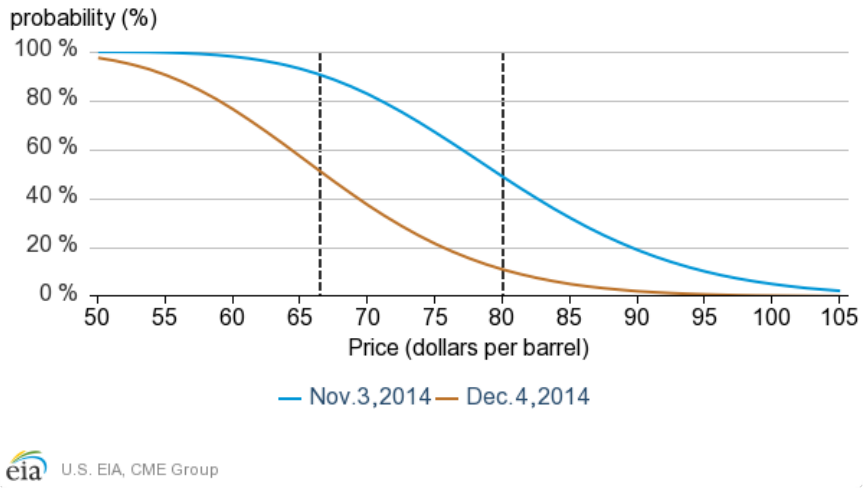
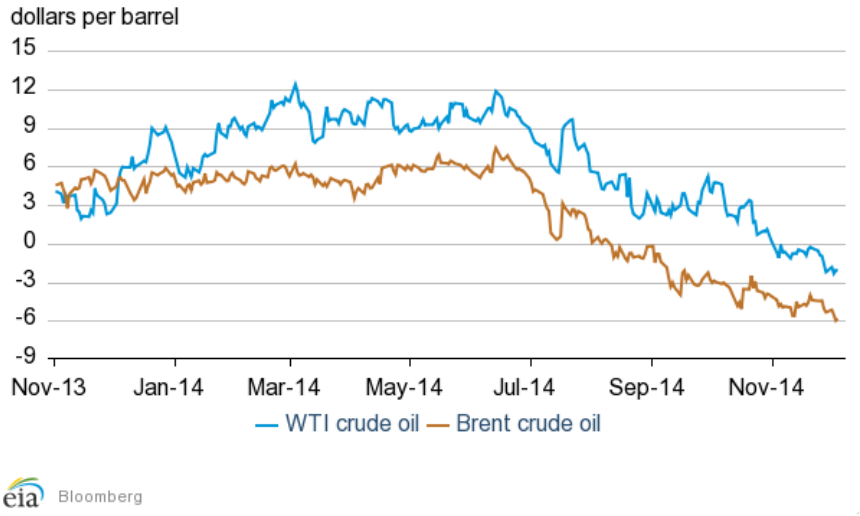
Market-Derived Probabilities: The March 2015 WTI futures contract averaged $67.47/bbl for the five trading days ending December 4 and has a market-derived probability of exceeding $80/bbl at expiration of only 11%, down from about 50% from a month ago (**Figure 2**). With recent price declines and increases in implied volatility, $66.50/bbl is the new price level that the market now assigns a 50% chance of exceeding at expiry.

Figure 2. Probability of the March 2015 WTI contract expiring above price levels



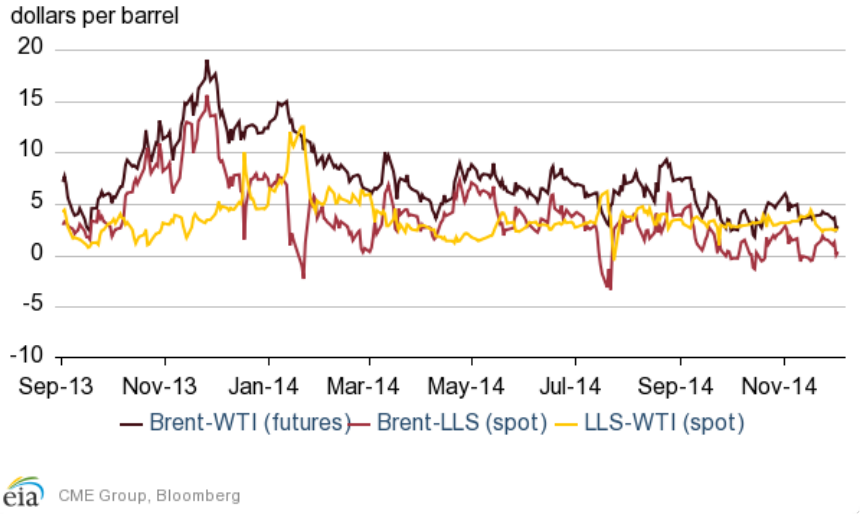
Price spreads: Both the Brent and WTI futures curves moved further into contango (when near-term prices are less than longer-dated ones) over the past month, signaling a further loosening of current oil market conditions. The 1st-13th spread for Brent and WTI settled at -$5.87/bbl and -$2.13/bbl, respectively, on December 4, a decline of $1.49/bbl and $1.43/bbl, respectively, since November 3 **(Figure 3)**. U.S. commercial crude oil inventories built again in November and global production and consumption estimates show increases in international inventories as well. Although contango in these markets increased, longer-dated futures contracts also experienced price declines. The December 2015 Brent futures contract settled at $75.15/bbl on December 4, making it more difficult and expensive for producers to hedge production at higher prices.

Figure 3. Crude oil front month - 13th month futures price spread



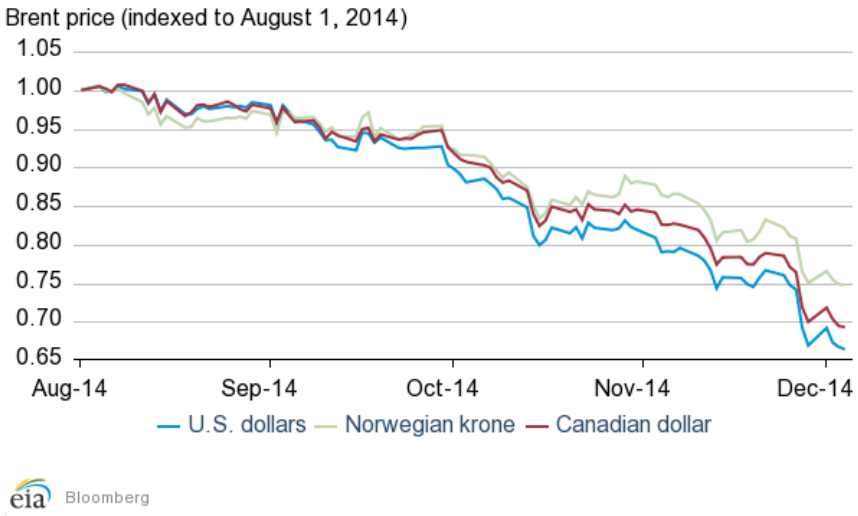
Despite the recent volatility in absolute prices, international and U.S. domestic crude oil price spreads were relatively stable. The Brent-WTI spread settled at $2.83/bbl on December 4, within the recent trading range since the start of September **(Figure 4)**. Additionally, the Brent-Louisiana Light Sweet (LLS) spread was relatively unchanged in the past month, settling at $0.33/bbl on December 4. Unlike last year, there was no divergence between international and U.S. domestic crude oil prices as U.S. refineries were able to better absorb increases in domestic production during planned maintenance. U.S. refinery inputs were about 360,000 bbl/d higher in November compared to this time last year and additional infrastructure is planned or under construction to help absorb further U.S. production increases projected in 2015.

Figure 4. Historical crude oil differentials



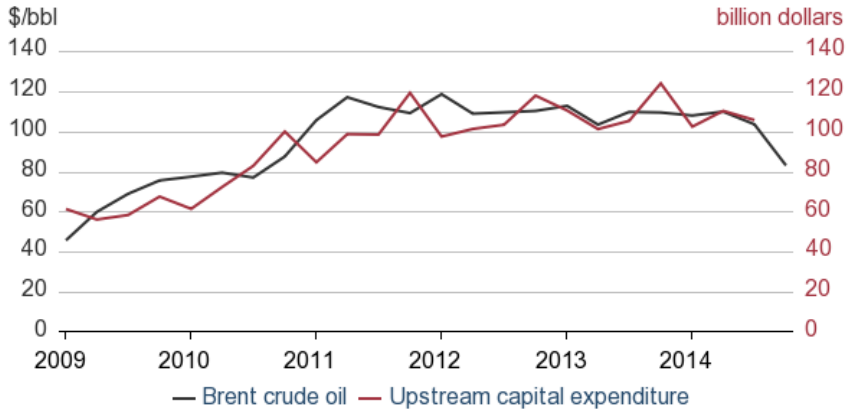
Brent in exporting countries' currencies: The value of the dollar against currencies of some oil exporting countries rose since the start of August, moderating the decline in oil prices in those currencies. From August 1 to December 4, the price of Brent in U.S. dollars fell by 34%, while the price of Brent in Norwegian kroner and Canadian dollars fell by 25% and 31%, respectively **(Figure 5)**. Lower oil prices tends to lead to lower economic growth expectations in countries that are net exporters of crude oil, thus reducing demand for their currencies. Local oil producers in those countries see some benefits from these exchange rate movements when they convert their revenue into local currency. A more favorable exchange rate lessens production and transportation costs that are not denominated in U.S. dollars relative to revenues.

Figure 5. Brent crude oil price in exporting countries' currency



Oil company capital expenditure: Upstream capital expenditures represent investments by companies in acquiring, exploring, and developing properties with oil and gas production potential. Upstream investment tends to follow crude oil prices as fields with reserves or production potential become more economically attractive as prices rise and less so when they fall. Investment projects take some time to develop, so expenditures follow crude oil price changes with a lag. Through December 4, fourth-quarter front month Brent crude oil averaged $82.99/bbl, the lowest quarterly average since fourth-quarter 2010. Upstream capital expenditure averaged $107 billion from 2012 through third-quarter 2014, based on Evaluate Energy data of 123 publicly traded oil and gas companies **(Figure 6)**. Capital expenditures in the fourth quarter and in 2015 could be significantly less given the large decline in crude oil prices thus far, with some companies already announcing plans to reduce planned 2015 capital expenditure.

Figure 6. Brent price and upstream capital expenditure of 123 publicly traded companies



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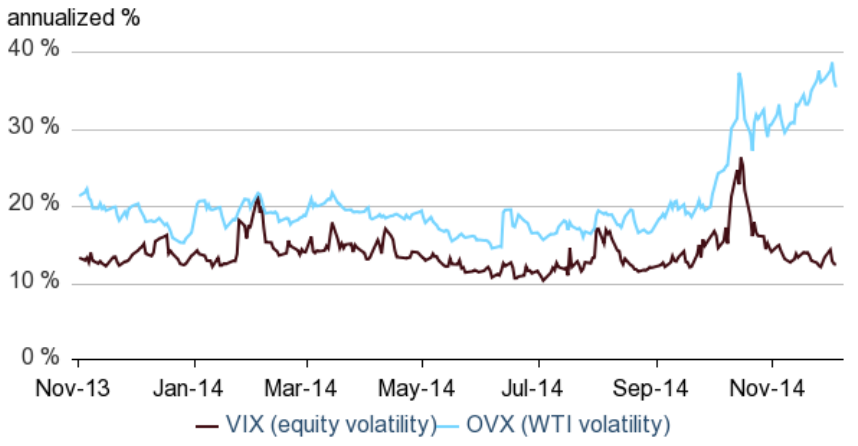
Oil and equity volatility: The OVX (an index that measures WTI implied volatility) increased in November and remains near its highest level since 2012. The OVX settled at 35.4% on December 4, an increase of 3.6 percentage points since November 3 **(Figure 7)**. An elevated OVX value reflects higher prices for call and put options traded on WTI futures contracts and implies that market participants expect further large price moves in the near-term. Additionally, the OVX diverged from the VIX (an index that measures implied volatility on the S&P 500) and the spread between the two indexes is at its highest point since March 2011. The elevated expectations for future price movements in oil markets compared to other asset classes implies that uncertainty relating to future oil supply remains pronounced in the market.

Figure 7. Equity and Crude oil volatility indices



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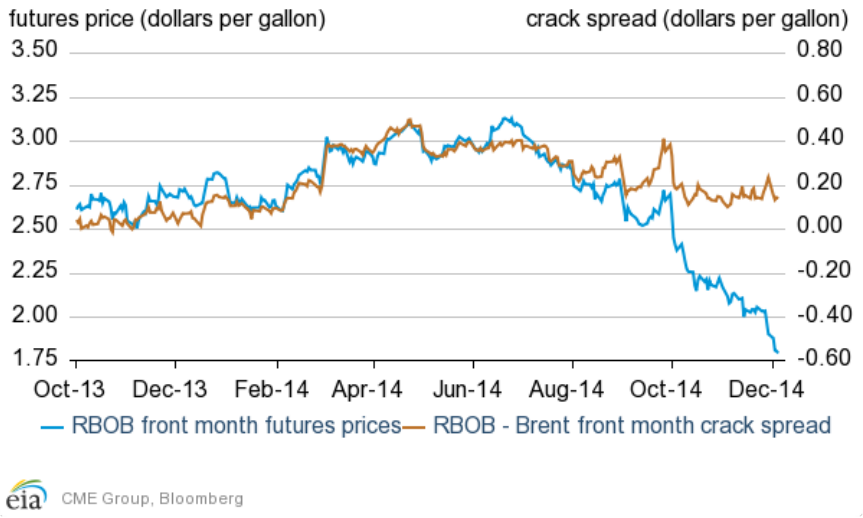
Petroleum Products

Gasoline prices: The reformulated blendstock for oxygenate blending (RBOB, the petroleum component of gasoline) front month futures price declined 32 cents per gallon (gal) from November 3 to settle at $1.79/gal on December 4 **(Figure 8)**. The RBOB-Brent crack spread rose 4 cents/gal from November 3 to settle at 14 cents/gal on December 4.

Gasoline prices continue to follow the downward trend of crude oil prices, though at a slower pace, which widened the crack spread. The November 2014 monthly average RBOB-Brent crack spread is 9 cents/gal higher than last year, when Brent crude oil prices remained in a relatively narrow range. Another source of strength for gasoline crack spreads this year was an increase in U.S. gasoline consumption plus exports, which rose to 9.6 million bbl/d for the four weeks ending November 28 and is now above the five-year range. While global economic growth remains weak, expectations for economic growth in the United States remain robust. This divergence in growth may be supporting gasoline prices as the United States consumes proportionally higher gasoline than the rest of the world.

Figure 8. Historical RBOB futures prices and crack spread

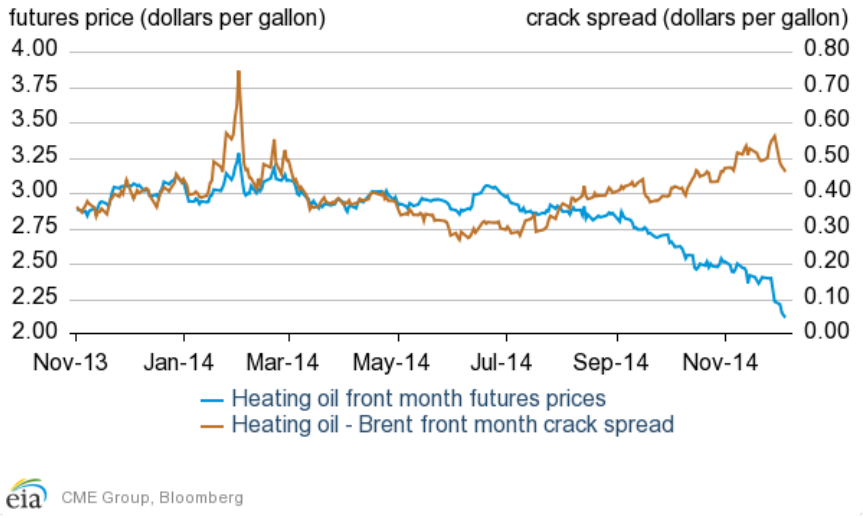


Heating oil prices: The front month futures price for heating oil decreased 37 cents/gal from November 3, settling at $2.12/gal on December 4 **(Figure 9)**. The heating oil-Brent crack spread decreased 1 cent/gal from November 3 to settle at 46 cents/gal on December 4.

The average heating oil-Brent crack spread in November was 51 cents/gal. The last time the heating oil crack spread was as high for the month of November was in 2008, when the crack spread was 55 cents/gal. During both instances, crude oil prices were declining sharply, helping to bolster crack spreads. In the next few weeks as refineries

increase production after completing fall maintenance, heating oil crack spreads could decline as more distillate is supplied to the market.

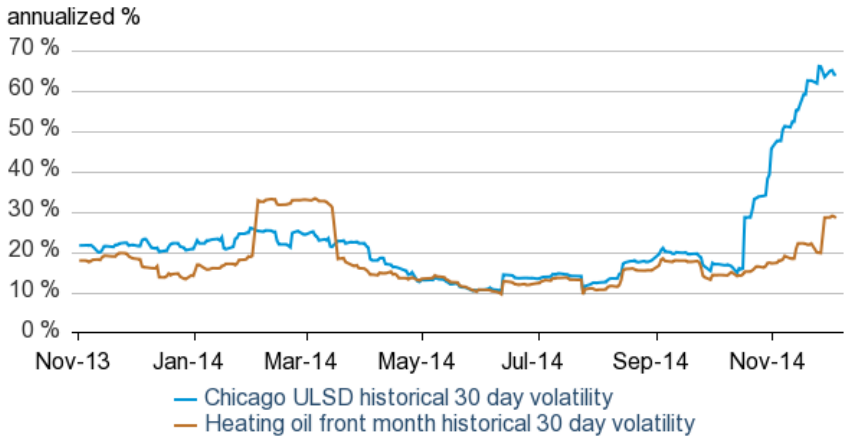
Figure 9. Historical heating oil futures price and crack spread



Heating oil spot market: The 30-day historical volatility for Chicago ultra-low sulfur diesel (ULSD) spot prices rose 48 percentage points since the middle of October to settle at 64% on December 4 **(Figure 10)**. Over the same period, the 30-day historical volatility for the front month heating oil futures contract rose just 14 percentage points. During the last half of October and the beginning of November, Chicago ULSD spot prices increased sharply as distillate supply tightened in PADD 2. Fall refinery maintenance lowered gross inputs to refineries in PADD 2 from 3.6 million bbl/d in September to a four-week average of 3.2 million bbl/d on November 7. At the same time, a record corn harvest was underway and many states experienced colder-than-expected weather, which helped push PADD 2 distillate inventories in October to the lowest of any month in more than two decades.

As November progressed, supply constraints were alleviated as the crop harvest came to an end and as refineries finished maintenance, increasing Midwest distillate production. PADD 2 distillate inventories showed its first weekly increase for the week ending November 28 since the beginning of October. Chicago ULSD spot prices declined quickly and began to follow similar downward price paths seen in other ULSD spot markets in the United States and in the heating oil front month futures contract.

Figure 10. Distillate historical volatility



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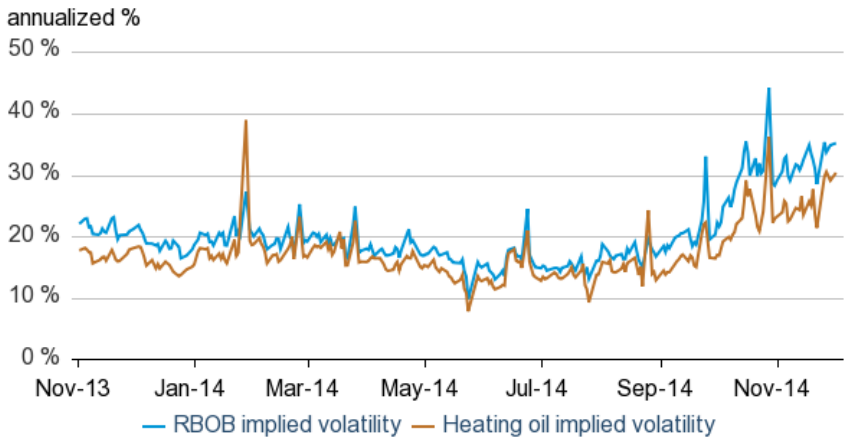
Volatility: As the RBOB and heating oil front month contracts continue to decline to several-year lows, increased uncertainty about future price movements have pushed implied volatility of both RBOB and heating oil to their highest sustained levels in over two years. Implied volatility for the front month RBOB contract and front month heating oil contract rose 3.5 percentage points and 3.8 percentage points, respectively, from November 3 to settle at 34.1% and 27.7%, respectively, on December 4 **(Figure 11)**. These increases were similar to the rise in crude oil implied volatility.

Figure 11. RBOB and Heating oil Implied Volatility



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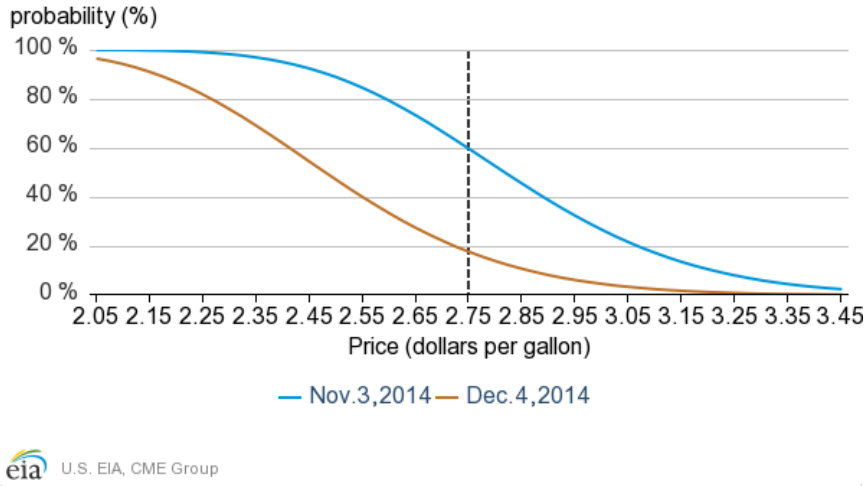
Market-Derived Probabilities: The March 2015 RBOB futures contract averaged $1.85/gal for the five trading days ending December 4 and has a 18% probability of exceeding $2.10/gal (typically leading to a retail price of $2.75/gal) at expiration. The same contract for the five trading days ending November 3 had a 60% probability of exceeding $2.15/gal **(Figure 12)**.

Figure 12. Probability of March 2015 retail gasoline exceeding different price levels at expiration



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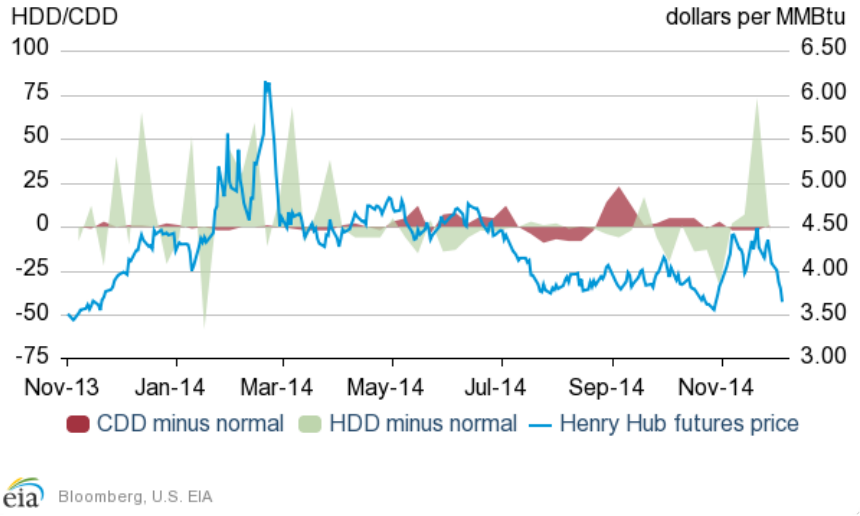
Natural Gas

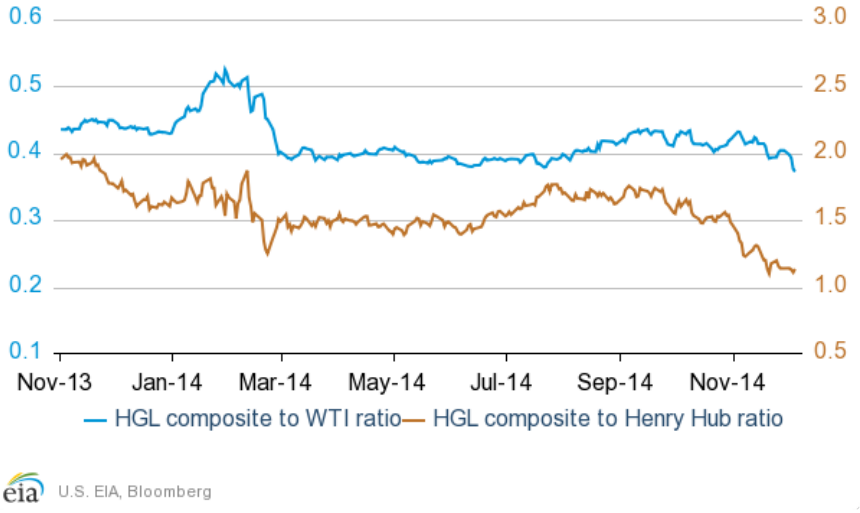
Prices: Henry Hub futures prices fluctuated in November as colder-than-average weather hit the United States in the beginning of the month but then returned to average temperatures by the end of November. Heating degree days (HDDs) were 73 HDDs higher than the 30-year normal for the week ending November 20. This contributed to a large increase in demand and some losses in production in the Rockies and Northeast, causing a record high withdrawal from storage for any week in November at 162 billion cubic feet. Normal temperatures in the following week, however, led to a withdrawal of 22 billion cubic feet for the week ending November 28, which was below expectations. This contributed to declining prices, settling at $3.65/MMBtu on December 4, $0.40/MMBtu lower than the close on November 3 **(Figure 13)**.

Figure 13. HDD minus normal and CDD minus normal



Similar to last month, most hydrocarbon gas liquid (HGL) prices declined along with crude oil prices. These declines kept the ratio of the HGL composite, a production-weighted average of U.S. HGL prices in cents/gallon, to WTI crude oil fairly stable, at approximately 40% **(Figure 14)**. With the declines in liquid prices and seasonal increases in natural gas prices, the ratio for liquids to gas is now close to parity, nearly half of what the ratio was at this time last year and the lowest since May of 2009. A low ratio could reduce the profitability of fractionating liquids from natural gas production and impact natural gas producers in "wet" plays (ones that contain higher proportions of HGLs to dry natural gas).

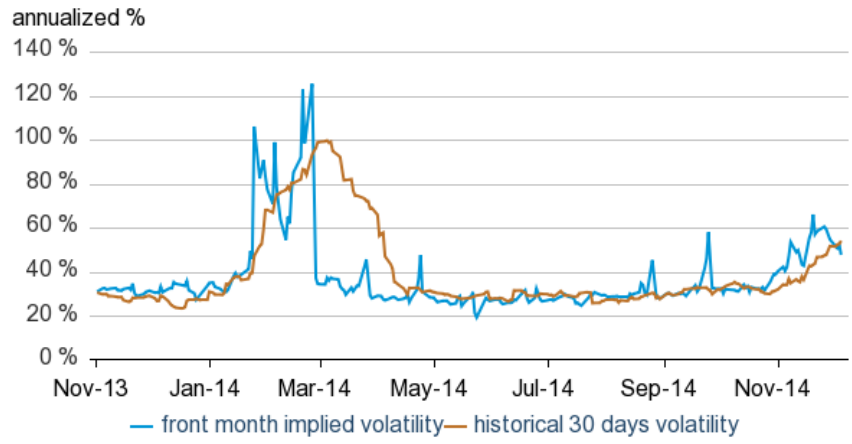
Figure 14. HGL price ratios



Volatility: Implied and historical volatility settled at 47.7% and 54.2%, respectively, on December 4, 5.4 and 19.8 percentage points higher than November 3 (**Figure 15**). Both measures rose throughout the month, with implied volatility averaging 52% in

November, the highest for that month since 2009. Market participants may be increasing option purchases to hedge against large price changes this winter.

Figure 15. Natural gas historical and implied volatility



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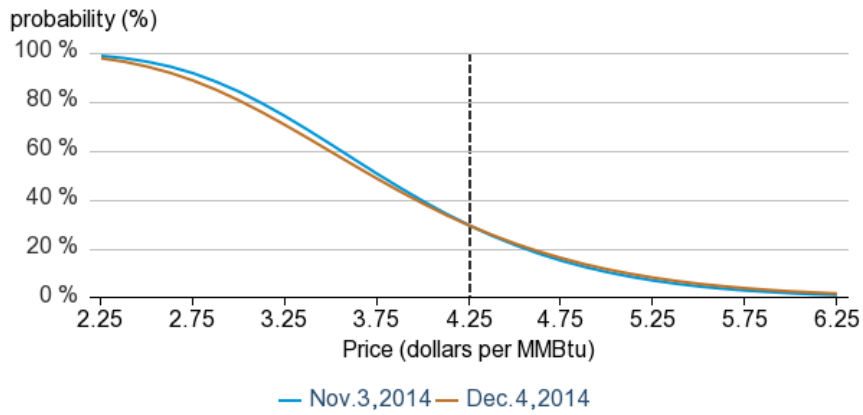
Market-Derived Probabilities: The March 2015 Henry Hub futures contract averaged $3.84/MMBtu for the five trading days ending December 4 and has a 30% probability of exceeding $4.25/MMBtu at expiration. The same contract for the five trading days ending November 3 had the same probability of exceeding $4.25/MMBtu **(Figure 16)**.

Figure 16. Probability of the March 2015 Henry Hub contract expiring above price levels



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