

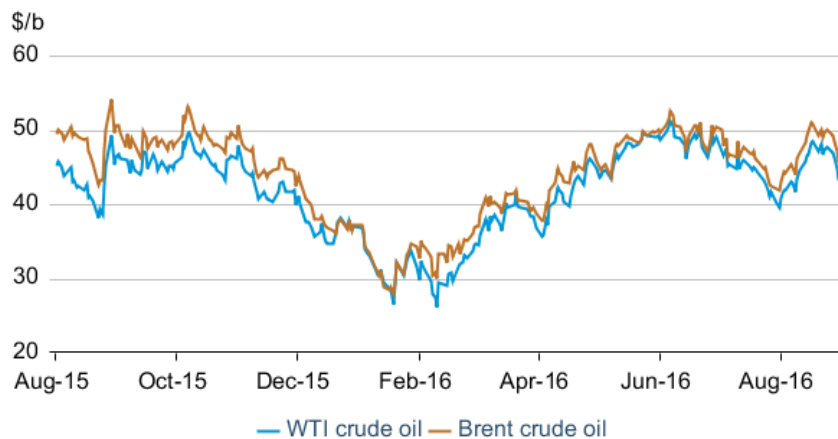


Short-Term Energy Outlook Market Prices and Uncertainty Report

Crude Oil

Prices: After reaching a four-month low in the beginning of August, crude oil prices rebounded close to the highest levels of the year. The front-month Brent crude oil price increased \$3.31 per barrel (b) since August 1, settling at \$45.45/b on September 1 (**Figure 1**). The West Texas Intermediate (WTI) front-month crude oil price settled at \$43.16/b, an increase of \$3.10/b over the same period.

Figure 1. Historical crude oil front-month futures prices



Price volatility in global equity markets declined in the past two months, potentially indicating more stability in the outlooks for the global economy and demand for petroleum products. As a result, EIA's forecast for global demand was relatively unchanged and suggests that supply side factors were the main drivers of prices. OPEC members are planning to revive discussions to freeze crude oil output at an informal meeting in September. Iran, who previously did not take part in similar talks in April, announced that they may be willing to discuss a production freeze. Uncertainty surrounding the outcome of the meeting may already be prompting market participants to focus more on estimates of continued inventory builds, putting downward pressure on oil prices.

This is a regular monthly companion to the EIA *Short-Term Energy Outlook*

(<http://www.eia.gov/forecasts/steo/>)

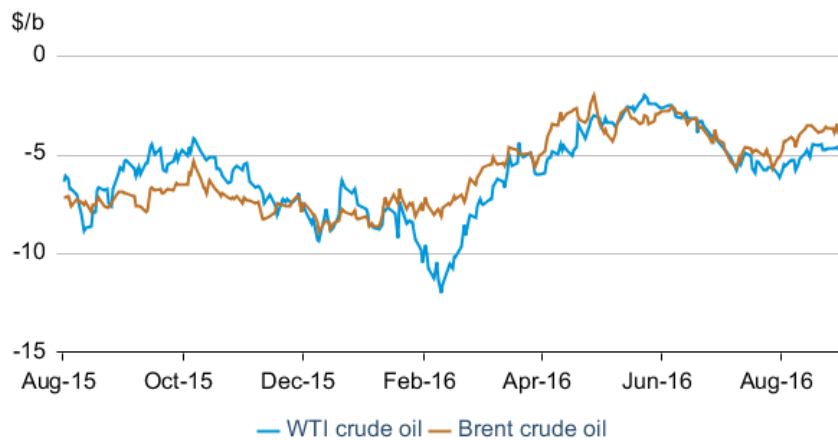
Contact: James Preciado (james.preciado@eia.gov)

Contributing authors: Rebecca George and Jeff Barron

Longer-dated crude oil prices did not rise as much as front-month crude oil prices did, resulting in less contango (when near-term prices are lower compared with further-dated ones) in the WTI futures curve. The WTI 1st-13th spread increased \$1.19/b from August 1, settling at -\$4.80/b on September 1 (**Figure 2**). The Brent 1st-13th spread increased slightly less over the same period, up \$1.18/b to settle at -\$3.97/b.

The elevated contango in the WTI market compared with Brent reflects rising inventory levels in the United States. [Total U.S. crude stocks](#) rose 3.3 million barrels from July to August, compared with an average decline of 3.5 million barrels over the same period in the past five years. The Brent market may be tighter in comparison to the WTI market because of [production outages in Nigeria](#), which are a result of attacks on the country’s oil infrastructure. However, towards the end of August, there were reports of a ceasefire between the Nigerian government and the Niger Delta Avengers militant group. If Nigerian crude production begins to increase, front month Brent prices may decline and could increase contango in the Brent futures market.

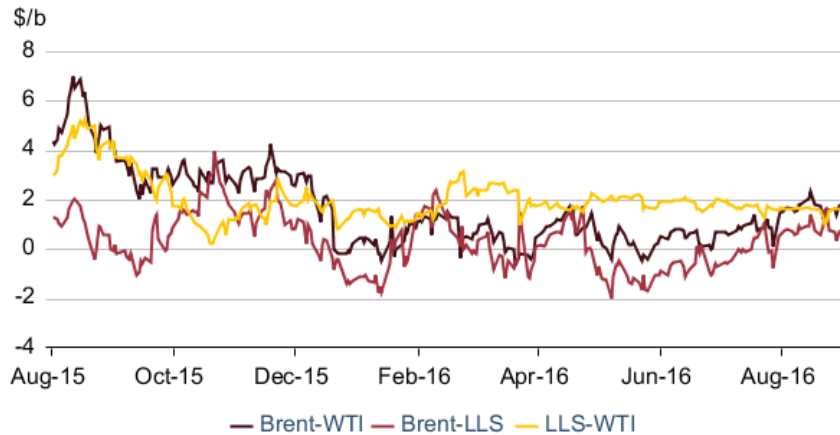
Figure 2. Crude oil front-month - 13th month futures price spread



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Through much of August, the discount between of U.S. domestic crudes to Brent crude oil grew because of increasing U.S. crude oil inventories and rising [crude oil imports](#), which reached a four-year high in August. Brent’s price premium, however, may have incentivized more U.S. crude oil to be exported. [Preliminary crude oil weekly exports](#) show that as of August 26, nearly 0.7 million barrels per day (b/d) of crude were exported, a record high. More crude exports helped to narrow the spread between Brent and Light Louisiana Sweet (LLS) towards the end of August, which settled at 64 cents/b on September 1 (**Figure 3**). The premium Brent has over LLS in the coming weeks will depend on the level of refinery maintenance on the U.S. Gulf Coast during autumn turnaround as well as the amount of U.S. crude that continues to be exported.

Figure 3. Historical crude oil differentials

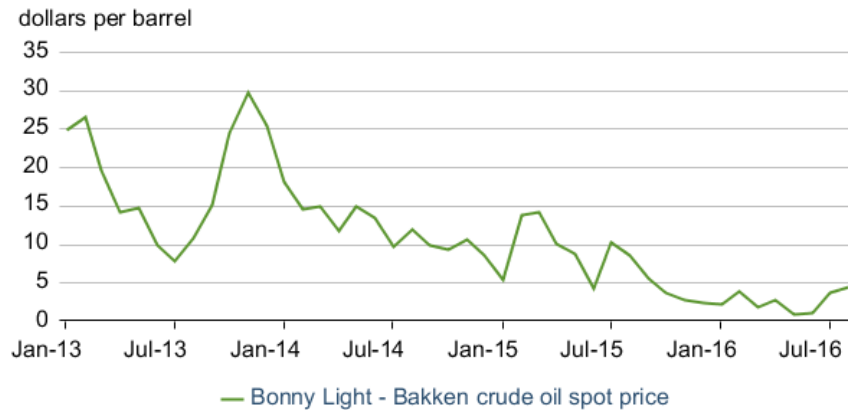


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West African crude oil imports: Nigerian and Angolan [crude oil imports](#) into the United States averaged 0.22 million b/d and 0.16 million b/d, respectively, in the first half of 2016, the most since 2013 for that comparable period. [Preliminary weekly estimates of crude oil imports](#) from Nigeria and Angola show that high import levels were also sustained on average through July and August. Most Nigerian and Angolan crude oil imports into the United States go to the U.S. East Coast. As a result, the rise in crude oil imports from West Africa is likely due to the favorable [arbitrage opportunity](#) to import waterborne West African crude oil instead of transporting domestic crude oil by rail to the Petroleum Administration for Defense District (PADD) 1.

The spread between the Nigerian crude oil Bonny Light and the domestic Bakken crude oil declined to the lowest level on record in May and June at \$1/b (**Figure 4**). With a small price differential and low crude oil shipping rates this year, refineries in PADD 1 chose to import crude oil from West Africa over having to pay the higher cost of transporting Bakken crude oil. In the coming weeks and months, imports of West African crude oil may not be as high as it has been so far this year because the Bonny Light-Bakken differential began to increase in July and August from its record low.

Figure 4. Bonny Light - Bakken crude oil spot price monthly average spread

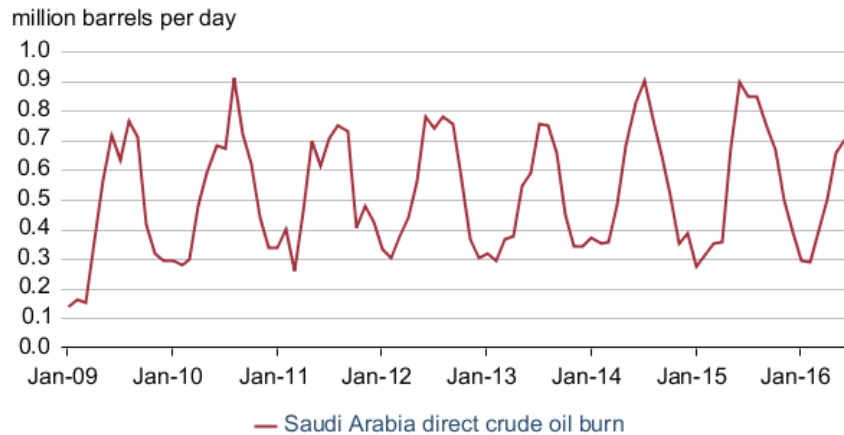


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Saudi Arabia direct crude oil burn: Saudi Arabia is one of a few countries that [burn crude oil directly for power generation](#). Typically between the summer months of June and August, Saudi Arabia increases crude oil production in order to satisfy higher electricity consumption as domestic demand for air conditioning rises. As a result, market participants usually expect both higher crude oil production and higher domestic crude burn in Saudi Arabia in the summer. This summer, however, even as estimates for crude oil production from Saudi Arabia increased, not all of the additional production volumes may have been used for electricity generation. According to the [Joint Organizations Data Initiative](#), Saudi Arabia direct crude burn in June was 0.7 million b/d, nearly 0.2 million b/d lower than last June (**Figure 5**).

Despite heat waves in the Middle East in July and August, direct crude burn in Saudi Arabia is not expected to rise to or surpass last year's levels. With the commissioning of the [Wasit gas plant](#) this year, which can process up to 2.5 billion cubic feet (bcf) per day of natural gas, along with increased domestic consumption of fuel oil, Saudi Arabia may be less reliant on crude oil for power generation. Since Saudi Arabia still increased crude oil production this summer, it is possible that the extra crude oil was either exported onto the market or refined domestically to produce exportable products.

Figure 5. Saudi Arabia direct crude oil burn

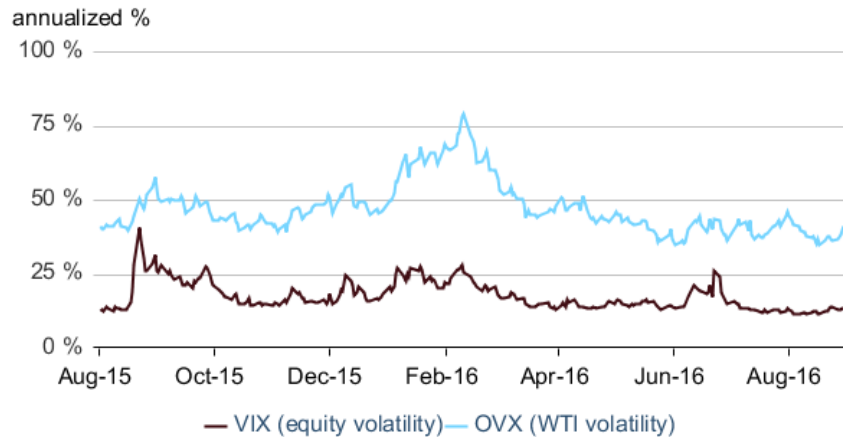


eia Joint Organizations Data Initiative

Crude and equity market volatilities: Since June, the average implied volatility of the Standard & Poor's (S&P) 500 equity index (VIX) declined five percentage points to a two-year low in August (**Figure 6**). Price volatility began to decline after the passage of the United Kingdom's referendum to leave the European Union, as fears related to the short-term economic impacts of the referendum on the global economy abated and equity markets began to rise. In addition, strong employment gains and improved wage growth in the United States has helped to lower economic uncertainty and volatility in the S&P 500.

In contrast, the OVX, which measures the implied volatility of the WTI near-term futures, was nearly unchanged on average from June. Instead of declining to reflect a more stable global macroeconomic outlook, the OVX continues to reflect uncertainties that remain on the supply-side of the oil market, including higher crude production in certain countries and the potential for an OPEC agreement to freeze production.

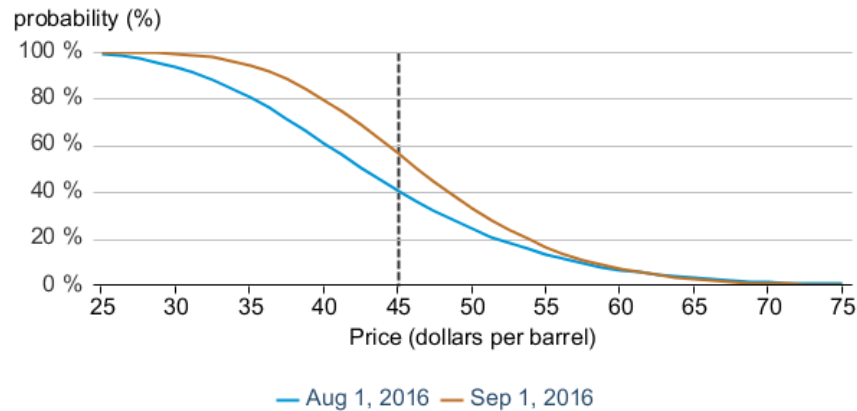
Figure 6. Equity and crude oil volatility indices



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Market-Derived Probabilities: The December 2016 WTI futures contract averaged \$47.03/b for the five trading days ending September 1 and has a 56% probability of exceeding \$45/b at expiration. The same contract for the five trading days ending August 1 had a 41% probability of exceeding \$45/b (**Figure 7**).

Figure 7. Probability of the December 2016 WTI contract expiring above price levels



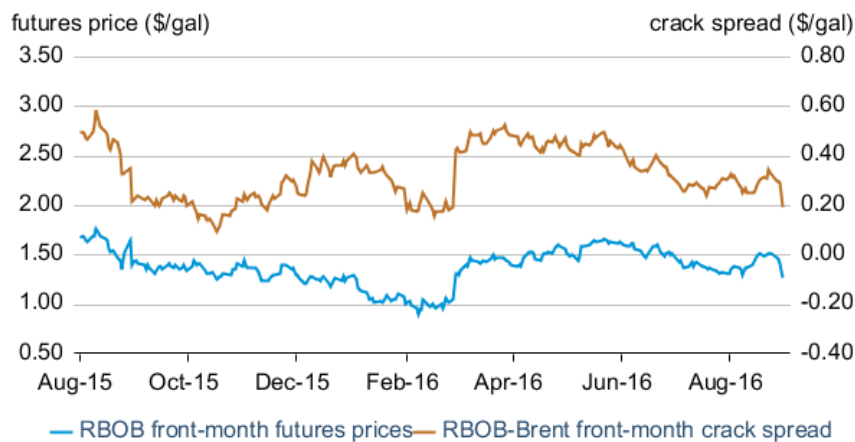
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Petroleum Products

Gasoline Prices: The front-month futures price of reformulated blendstock for oxygenate blending (RBOB, the petroleum component of gasoline used in many parts of the country) decreased 3 cents per gallon (gal) since August 1, settling at \$1.27/gal on September 1 (**Figure 8**). The RBOB-Brent crack spread declined 11 cents/gal since August 1, settling at 19 cents/gal.

Gasoline imports remain slightly higher than the same time last year and [U.S. refinery production is up 116,000 b/d](#), two factors likely pressuring crack spreads lower. However, robust demand for gasoline is providing some support for gasoline prices. U.S. gasoline consumption plus exports set another new high in August of 10.2 million b/d, a slight increase from July and contributing to a larger than average inventory withdrawal of 6.2 million barrels over the month. Although the end of the summer driving season will reduce U.S. gasoline demand in the following months, gasoline consumption is expected to average 1% above 2015 levels for the remainder of the year.

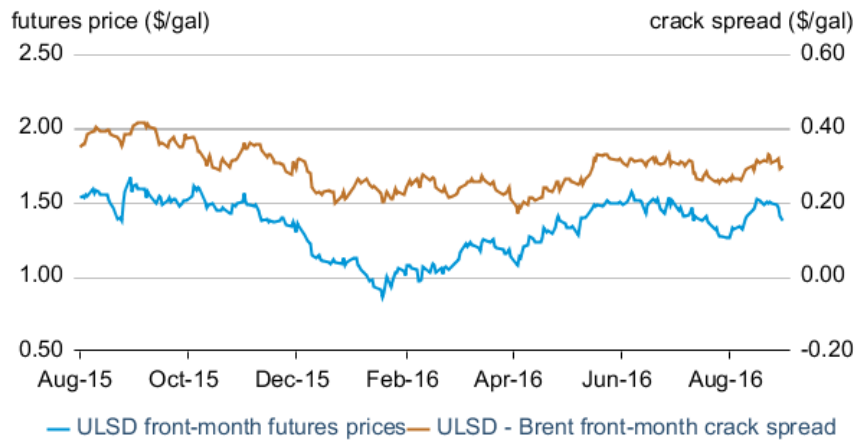
Figure 8. Historical RBOB futures prices and crack spread



Ultra-low Sulfur Diesel Prices: The front-month futures price for the New York Harbor Ultra-low Sulfur Diesel (ULSD) contract increased 12 cents/gal from August 1 to settle at \$1.38/gal on September 1 (**Figure 9**). The ULSD-Brent crack spread increased 5 cents/gal over the same period to settle at 30 cents/gal.

The U.S. distillate market is increasingly closer to balancing supply and demand this summer compared with the [supply overhang](#) in the first half of 2016, likely providing some upside support to crack spreads. Distillate inventories increased at a slower pace than is typical for the summer, building only 1.6 million barrels compared with a five-year average build of 3.5 million barrels. Lower inventory builds were driven by steady demand combined with an annual [decline in refinery production of 233,000 barrels per day](#), pushing distillate inventories back within the five-year range for the first time since February. Distillate markets could begin to tighten as the United States heads into the autumn and later winter heating season, a time of year when inventories typically decline.

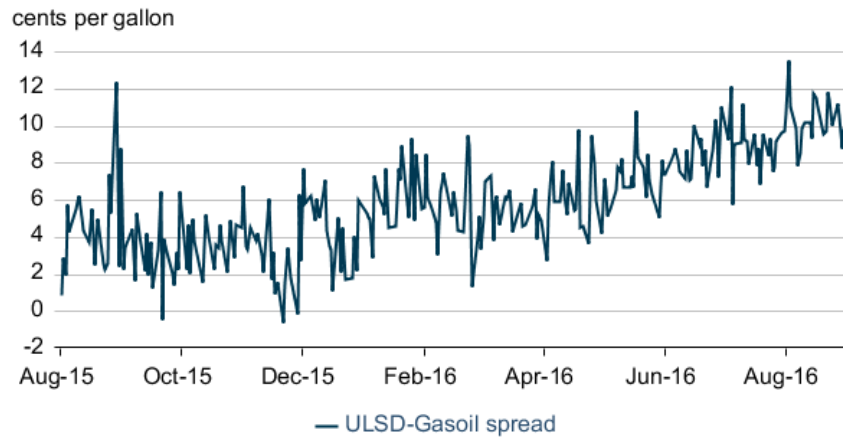
Figure 9. Historical ULSD futures price and crack spread



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European distillate prices: Distillate prices in the United States increased compared with those in Europe for most of this year. The New York Harbor ULSD spread with European gasoil settled at 10 cents/gal on September 1 and averaged 10 cents/gal in August, the highest for any month since February 2015 (**Figure 10**). While a wider spread is not unusual in the winter months if heating oil demand is higher in the Northeast and more imports are needed from Europe, the unseasonably high price spread during the summer is likely indicative of some divergence between distillate inventories in the U.S. market and Europe. The latest estimates for European distillate stocks show inventories 20% above their five-year average, compared with only 13% for the United States. [Working shell storage capacity](#) utilization for distillate in PADD 1 is currently 75%, suggesting storage space is available in the United States, and trade press reports some ships are being directed across the Atlantic to take advantage of the difference in prices. Wide price spreads and low available storage in Europe could increase U.S. distillate imports in the coming weeks.

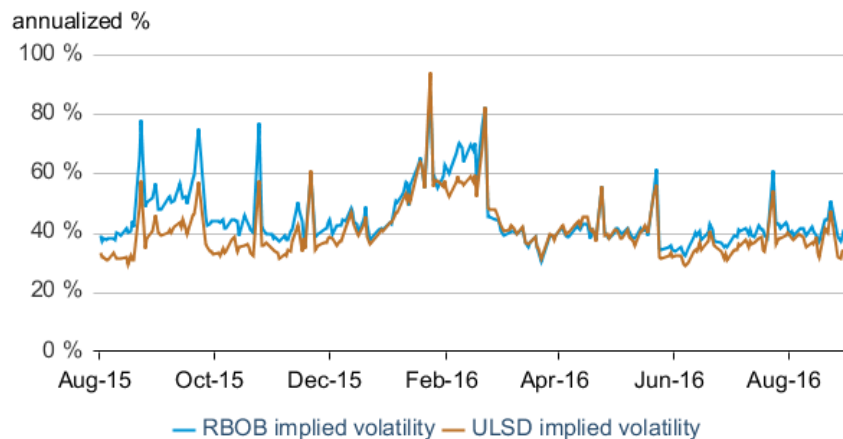
Figure 10. NY Harbor ULSD European Gasoil Spread



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Volatility: Implied volatility decreased 2.5 and 4.9 percentage points for RBOB and ULSD, respectively, since August 1 to settle at 41% and 34%, respectively, on September 1 (**Figure 11**). In recent years, the spread between RBOB implied volatility and ULSD implied volatility widened heading into autumn, which may reflect the seasonal change in gasoline specifications from summer grade to winter grade. This year, the spread widened from near zero in March-May to over 3.5 percentage points in June-August. The higher RBOB volatility may be the result of the associated inventory and production shifts.

Figure 11. RBOB and ULSD implied volatility

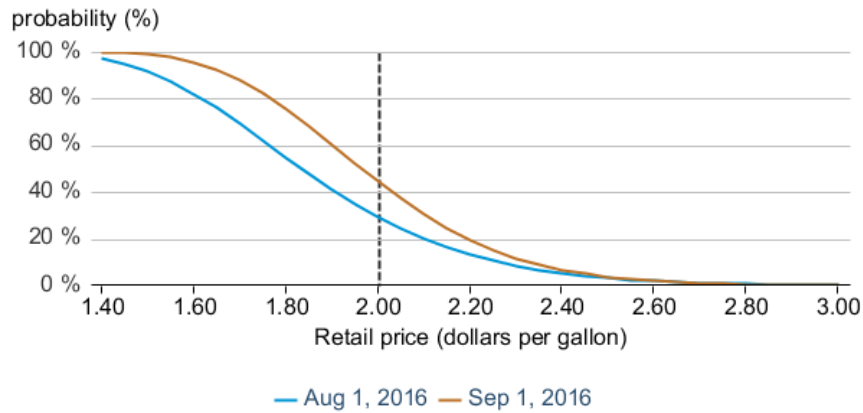


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Market-Derived Probabilities: The December 2016 RBOB futures contract averaged \$1.34/gal for the five trading days ending September 1 and has a 45% probability of exceeding \$1.35/gal (typically leading to a retail price of \$2.00/gal) at expiration. The

same contract for the five trading days ending August 1 had a 29% probability of exceeding \$1.35/gal (**Figure 12**).

Figure 12. Probability of December 2016 retail gasoline exceeding different price levels at expiration

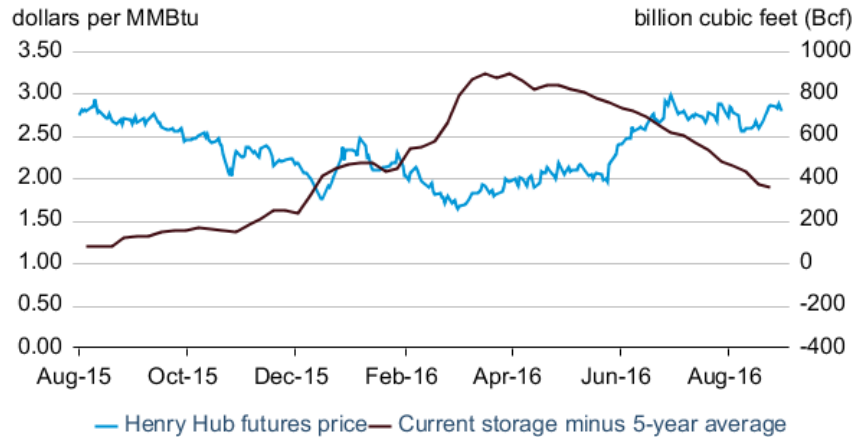


 U.S. Energy Information Administration, CME Group

Natural Gas

Prices: Natural gas prices remained near the highest levels of the year in August, with the front-month natural gas futures contract for delivery at Henry Hub settling at \$2.79 per million British thermal units (MMBtu) on September 1 (**Figure 13**). A source of price support for the natural gas market over the past few months has been the continued convergence of U.S. working natural gas inventories towards the five-year average. For the week ending August 26, total U.S. working natural gas inventories were 356 bcf above the five-year average, the smallest differential so far this year. The current STEO forecast assumes the same inventory trends continue through October and projects natural gas prices will remain under \$3/MMBtu in those months, with the potential to exceed that mark during the winter months.

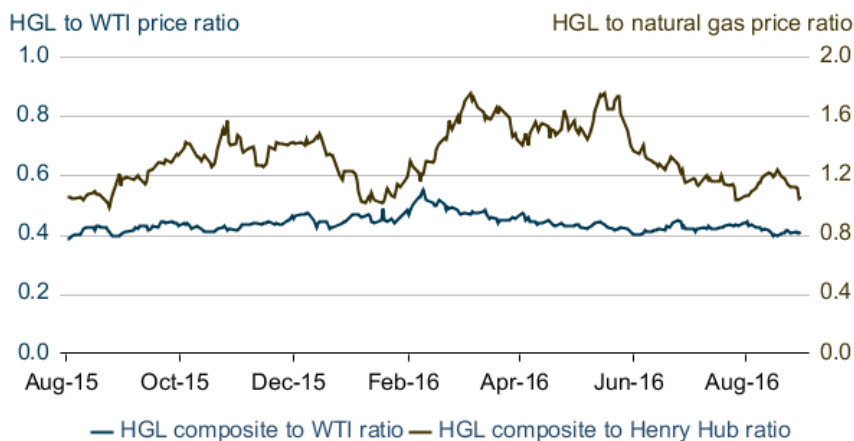
Figure 13. U.S. natural gas prices and storage



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Hydrocarbon gas liquids, natural gas, and crude oil prices: As both oil and natural gas prices increased over the past few months to near the highest prices of the year, a review of the hydrocarbon gas liquids (HGL) market shows prices for these products did not experience the same increases. The ratio of the HGL composite index (an average price of propane, butane, isobutane, ethane, and pentanes plus, weighted by production) to both WTI crude oil and natural gas at Henry Hub settled at 0.41 and 1.05, respectively, on September 1, which was lower compared with most of the second and third quarters (**Figure 14**). Average prices for all five products in the HGL composite index are lower since the late spring, while WTI prices are near prior levels and natural gas prices moved higher over that period. A combination of some delays in construction of HGL export infrastructure, higher production from processing plants, and elevated inventory levels are likely putting downward pressure on HGL prices.

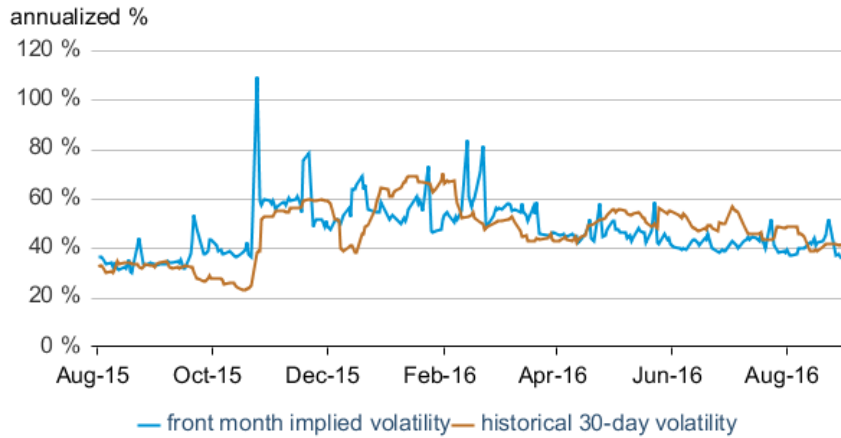
Figure 14. HGL price ratios



eia U.S. EIA, Bloomberg

Volatility: Implied volatility settled at 36% and historical 30-day volatility settled at 42% on September 1 (**Figure 15**). At different points in August, both implied and historical volatility for the natural gas front-month futures contract fell below 40%. Early autumn is typically the seasonal low point for natural gas volatility as unexpected demand shocks related to hotter temperatures become less frequent.

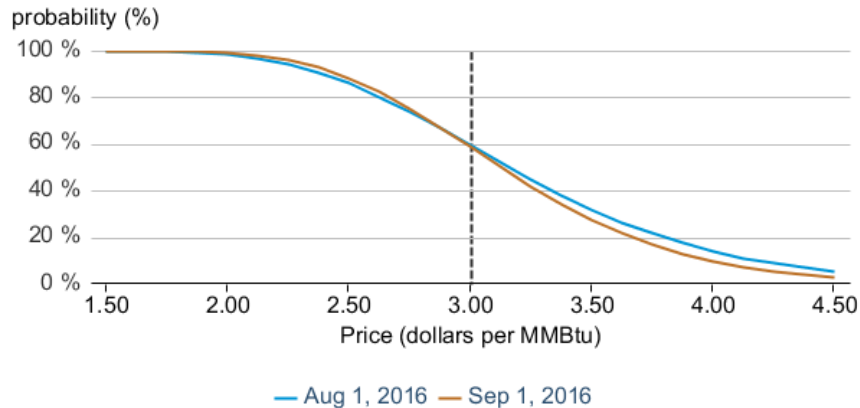
Figure 15. Natural gas historical and implied volatility



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Market-Derived Probabilities: The December 2016 Henry Hub futures contract averaged \$3.18/MMBtu for the five trading days ending September 1 and has a 59% probability of exceeding \$3.00/MMBtu at expiration. The same contract for the five trading days ending August 1 also had a 59% probability of exceeding \$3.00/MMBtu (**Figure 16**).

Figure 16. Probability of the December 2016 Henry Hub contract expiring above price levels



eia U.S. Energy Information Administration, CME Group