Independent Statistics & Analysis
U.S. Energy Information Administration

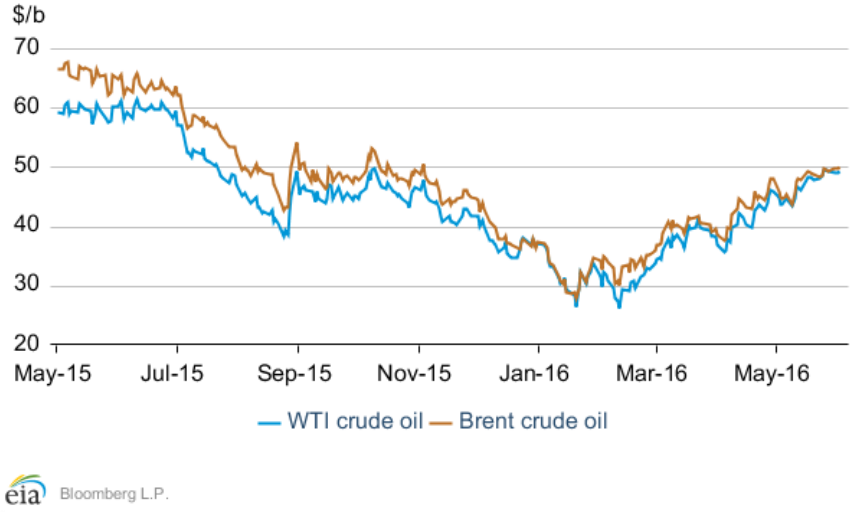
June 2016

Short-Term Energy Outlook
Market Prices and Uncertainty Report

Crude Oil

Prices: Global crude oil prices increased for the fourth consecutive month in May, closing at more than $50 per barrel (b) for the first time since November 2015. The front-month Brent crude oil price increased $4.21/b since May 2, settling at $50.04/b on June 2. The West Texas Intermediate (WTI) crude oil price increased $4.39 over the same period to settle at $49.17/b **(Figure 1)**.

Figure 1. Historical crude oil front-month futures prices



Global unplanned supply outages were estimated at 3.7 million barrels per day (b/d) in May, a month-over-month increase of almost 850,000 b/d. Wildfires in Canada and attacks on pipelines in Nigeria were the primary causes of new supply disruptions. Although the amount of barrels off the market from Venezuela is still small, social unrest there may be increasing the risk of a larger supply disruption in the future and could be supporting prices. At a time of seasonally increasing demand and higher petroleum product consumption in the United States and India, supply problems may lead to oil market balance and tighter conditions earlier than previously expected.

This is a regular monthly companion to the EIA *Short-Term Energy Outlook* (http://www.eia.gov/forecasts/steo/)
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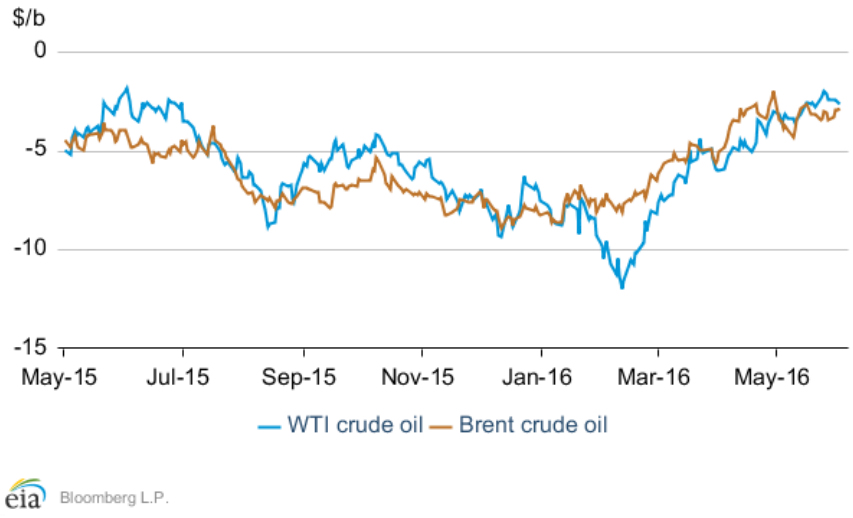
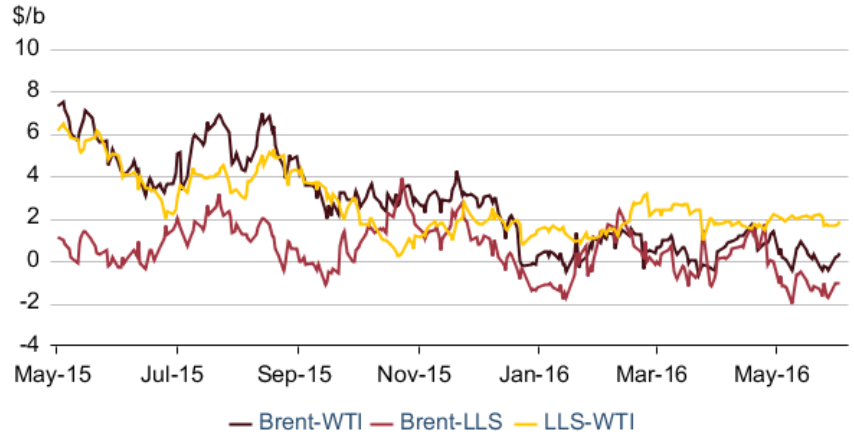
The increase in front-month prices contributed to a reduction in the contango (when near-term futures prices are less than longer-dated ones) for Brent and WTI. The 1st-13th spread narrowed by 59 cents/b and 52 cents/b for Brent and WTI, respectively, since May 2 **(Figure 2)**. The futures curve for WTI is the narrowest in nearly a year. While U.S. commercial crude inventories remain 58 million barrels above last year, Canadian production outages may be tightening the market in addition to the steadily declining U.S. production. Globally, liquids inventories are still expected to build in the third and fourth quarter of 2016, but EIA projects the builds to be more than 1 million b/d less than those that occurred in third and fourth quarter 2015.

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



The supply disruptions in Canada are also contributing to an increase in North American crude prices compared with international ones. The Brent-LLS spread began declining rapidly in the last week of April and settled at -$1.03/b on June 2 **(Figure 3)**. Brent also closed at a discount to WTI several times in the last week of May. While the Canadian wildfires have not caused permanent damage to the oil sands production facilities, the large, temporary decline in a major source of crude oil supply is raising North American crude oil prices. High refinery utilization in PADD 2, which increased 6.4 percentage points over the past month, suggests an increase in crude shipments from PADD 3 to PADD 2 and may contribute to continued price strength for North American crude oils over global crude oils.

Figure 3. Historical crude oil differentials



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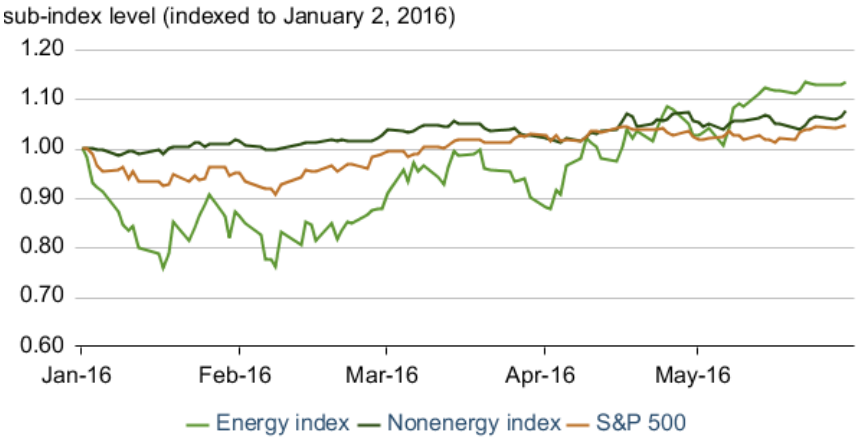
Energy, nonenergy commodities, and equities: The performance of energy commodities against other commodities and equity markets further suggests supply outages are the primary driver of crude oil prices over the past two months. From mid-February to the third week in March, energy prices increased along with nonenergy commodities and equities, reflective of less concern over a slowdown in global economic growth. Since early April and continuing in May, however, energy prices increased 29%, whereas nonenergy commodities and the S&P 500 index increased only 6% and 3%, respectively **(Figure 4)**. Price movements in one index divergent to the others typically indicates unique price drivers, such as supply-side issues. This suggests that the increase in unplanned supply outages in May was a significant driver of energy prices.

Figure 4. Energy vs Nonenergy commodities and equities



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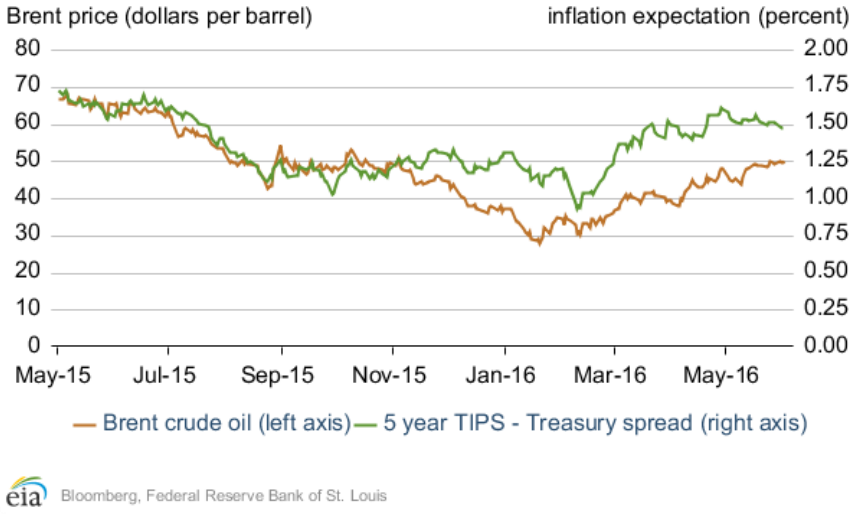
Crude oil prices and inflation expectations: Changes in crude oil prices affect market participants' expectations of future rates of inflation, as energy is a significant input into other factors of the economy. Recent increases in Brent crude oil prices have coincided with an increase in inflation expectations, as measured by the difference in yield between the 5-year Treasury rate and 5-year Treasury Inflation-Protected Securities (TIPS). The 5-year TIPS-Treasury spread increased from 0.93% on February 9 to 1.48% as of June 2, with crude oil prices increasing during the same time **(Figure 5)**. Rising inflation is an important factor in the Federal Reserve Board's decision to increase interest rates, which the Board will decide in upcoming Federal Open Market Committee meetings in June and July.

Figure 5. Crude oil and inflation expectations



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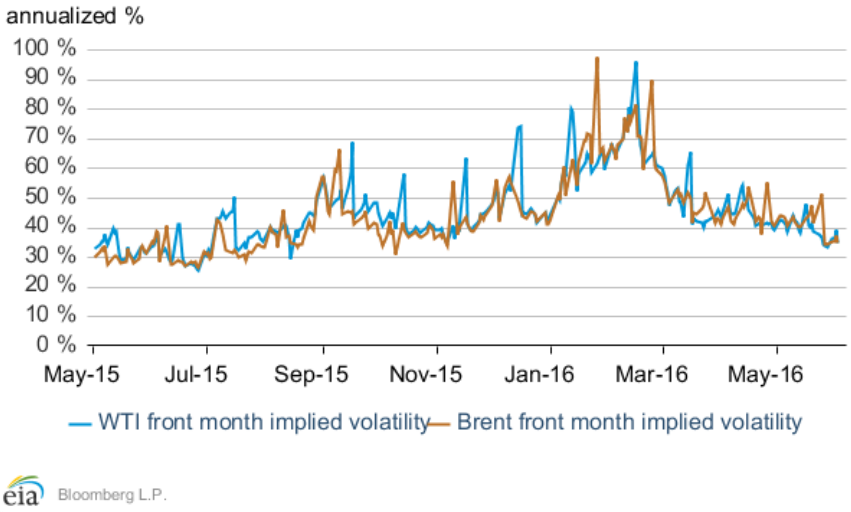
Volatility: Brent and WTI implied volatility declined over the past month. Implied volatility decreased 9.5 percentage points for Brent, settling at 34.7% on June 2, while WTI fell 8 percentage points, settling at 34.7% **(Figure 6)**. Falling implied volatility is unusual in times of large unplanned supply outages, but these declines in production are moving the current over-supply of crude oil markets closer to balance sooner than previously expected and reducing uncertainty related to how low prices need to go to reduce non-OPEC production and reach a market equilibrium.

Figure 6. Crude oil implied volatility



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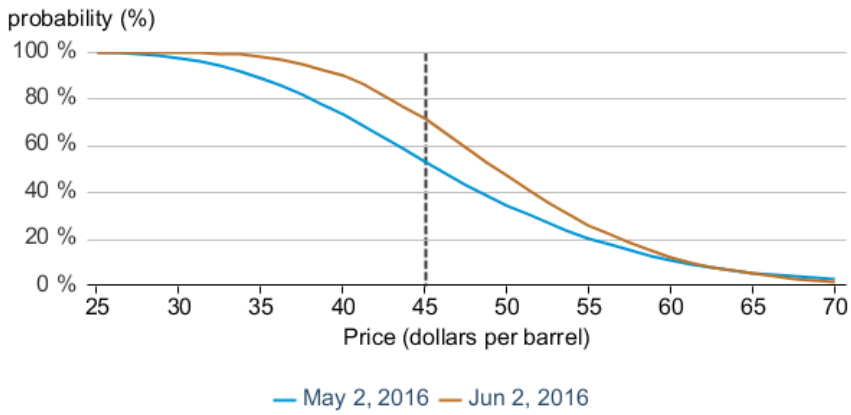
Market-Derived Probabilities: The September 2016 WTI futures contract averaged $50.06/b for the five trading days ending June 2 and has a 71% probability of exceeding $45/b at expiration. The same contract for the five trading days ending May 2 had a 53% probability of exceeding $45/b **(Figure 7)**.

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



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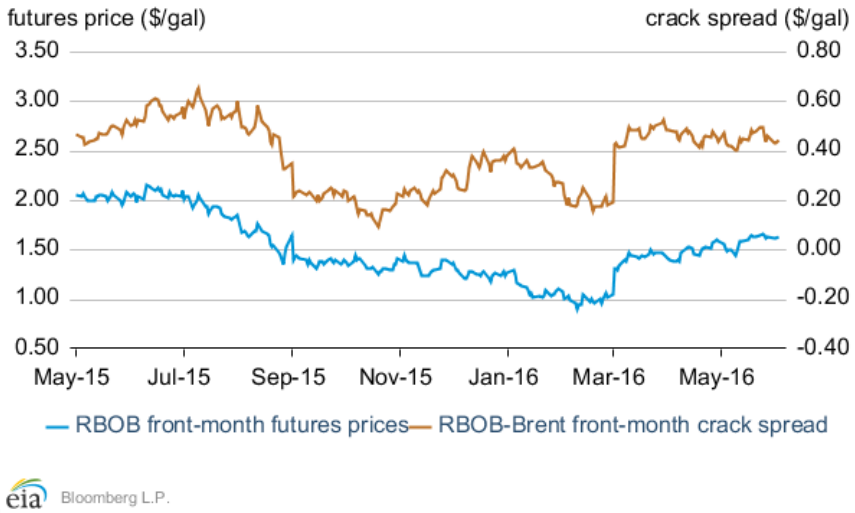
Petroleum Products

Gasoline prices: The reformulated blendstock for oxygenate blending (RBOB, the petroleum component of gasoline) front-month futures price rose 7 cents per gallon (gal) from May 2 to June 2, settling at $1.63/gal **(Figure 8)**. The RBOB-Brent crack spread fell by 3 cents/gal over the same period, settling at 44 cents/gal.

The crack spread declined despite gasoline consumption and exports surpassing 10 million b/d for the first time on record. Increased gasoline production and high gasoline inventories may be limiting the gains in gasoline prices. Gasoline production rose 0.27 million b/d from April to May, slightly more than the average gain over the past five years, and total motor gasoline inventories at the end of May remain 16 million barrels above the previous five-year high.

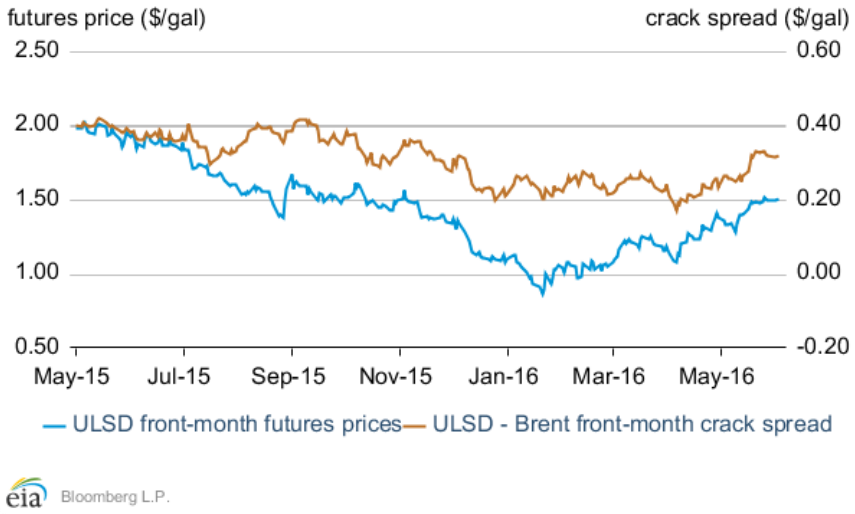
Figure 8. Historical RBOB futures prices and crack spread



Ultra-low Sulfur Diesel Prices: The front-month futures price for the New York Harbor Ultra-low Sulfur Diesel (ULSD) contract increased 15 cents/gal from May 2 to settle at $1.51/gal on June 2 **(Figure 9)**. The ULSD-Brent crack spread increased 5 cents/gal over the same period to settle at 32 cents/gal.

Total U.S. distillate inventories drew by 7.4 million barrels from April to May, the largest month-to-month decline since February 2015. PADD 2 accounted for most of the decline with a 3.2 million barrel draw. In the U.S. Midwest, a combination of a counter-seasonal decline in distillate production along with earlier-than-normal plantings of some crops as of May 29 have contributed to the decline in distillate stocks in PADD 2.

Figure 9. Historical ULSD futures price and crack spread

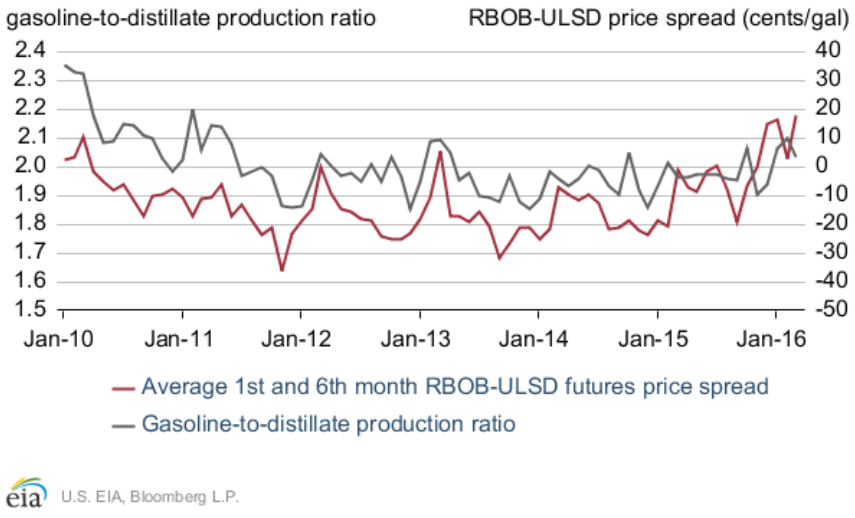


Refinery output: The U.S. gasoline-to-distillate production ratio began increasing in 2015, reversing a several-year decline in gasoline refinery yields. In February, the gasoline-to-distillate production ratio reached a high since 2013 of 2.10 before declining slightly in March **(Figure 10)**. Over time, refineries can adjust petroleum product yields in order to respond to changes in price signals from the market by adding additional equipment or modifying processes and feedstocks. From 2010 to 2013, U.S. refineries chose to increase production of distillate compared with gasoline as the average price of ULSD contracts rose compared with RBOB contracts over that period[1]. The strength in ULSD prices was in response to rising distillate demand in developing countries along with flat or declining U.S. demand for gasoline.

However, in 2015, the trend began to change, as the price of RBOB futures contracts rose compared with ULSD contracts because of lower distillate demand. Moreover, the drop in crude oil prices in 2014 was one of many factors that led to an increase in gasoline demand both domestically and abroad. As a result, current market trends have spurred refineries to increase gasoline yields and is contributing to the rise in overall U.S. gasoline production levels. In the first quarter of 2016, total U.S. refinery and blender net production rose 0.84% compared with the same period in 2015. In comparison, gasoline production alone rose 2.18%, while distillate production declined 2.52% over the same period.

[1] The RBOB-ULSD price spread in Figure 10 was calculated by first taking the monthly averages of the front-month and sixth-month futures contracts for RBOB and ULSD. Then the difference between the average RBOB and ULSD front-month and sixth-month prices was calculated and displayed in the chart.

Figure 10. Gasoline-to-distillate production ratio



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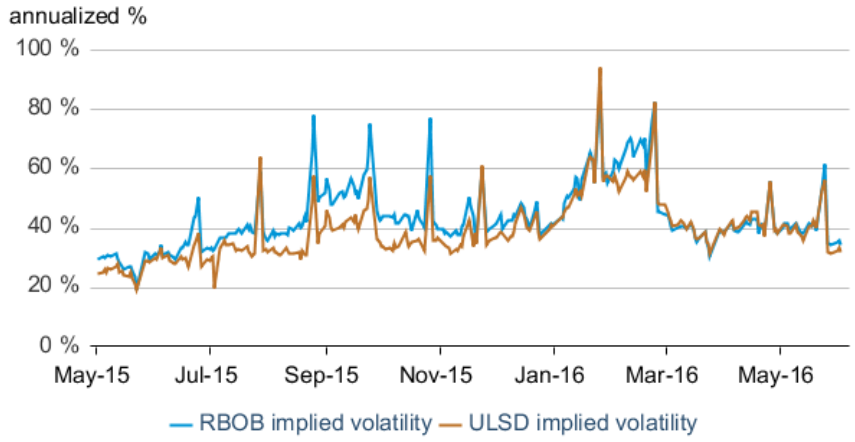
Volatility: The implied volatility for the front-month RBOB and ULSD futures contracts declined 6 and 9 percentage points to 34.5% and 31.7%, respectively, from May 2 to June 2 **(Figure 11)**. Petroleum product price volatility continues to be driven by lower crude oil price volatility.

Figure 11. RBOB and ULSD implied volatility



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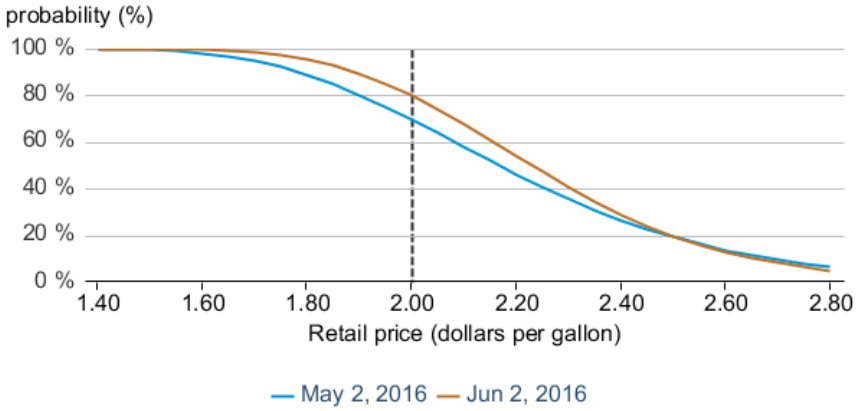
Market-Derived Probabilities: The September 2016 RBOB futures contract averaged $1.61/gal for the five trading days ending June 2 and has a 80% probability of exceeding $1.35/gal (typically leading to a retail price of $2.00/gal) at expiration. The same contract for the five trading days ending May 2 had a 70% probability of exceeding $1.35/gal **(Figure 12)**.

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



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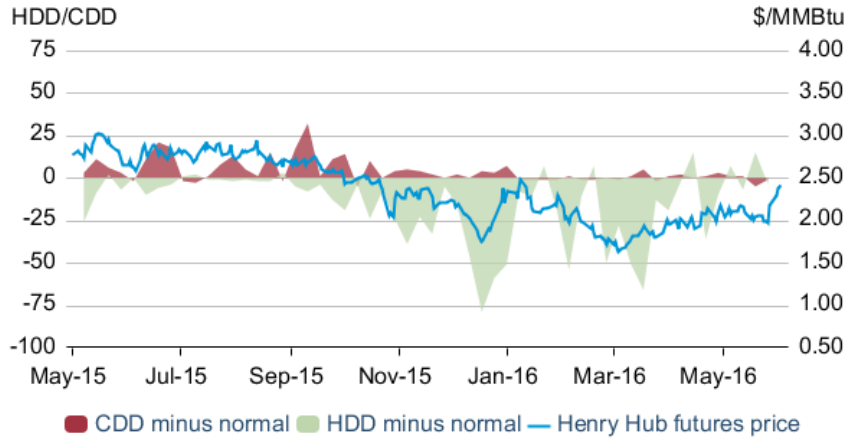
Natural Gas

Prices: Natural gas prices fell for much of May before increasing sharply when the front month contract rolled from June to July delivery. The front month (July) contract for delivery of natural gas at Henry Hub settled at $2.41 per million British thermal units (MMBtu) on June 2, an increase from the low of $1.96/MMBtu when the June contract expired on May 26 **(Figure 13)**. Below-average cooling degree days (CDD) over the past few weeks, during the time of year when demand for natural gas is typically already low, helped to push June prices lower. However, the prospect of record amounts of natural gas being used for electricity generation this summer likely provided support for July prices.

Figure 13. HDD minus normal and CDD minus normal



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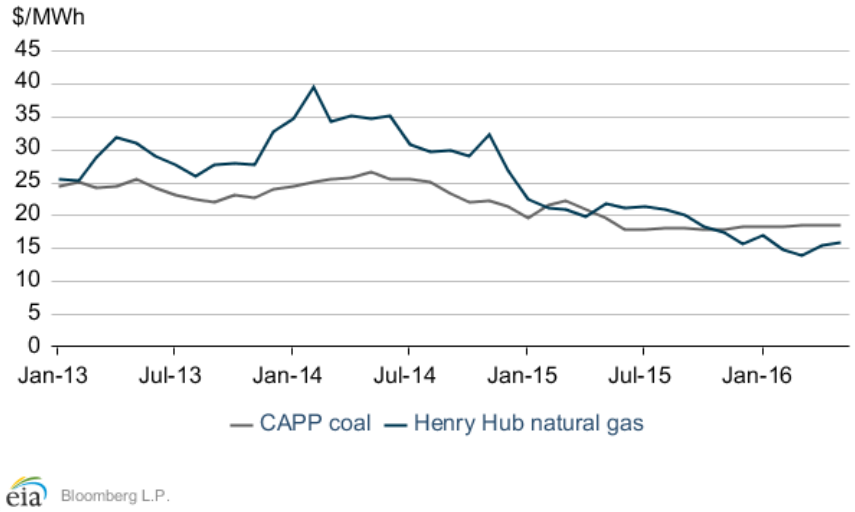
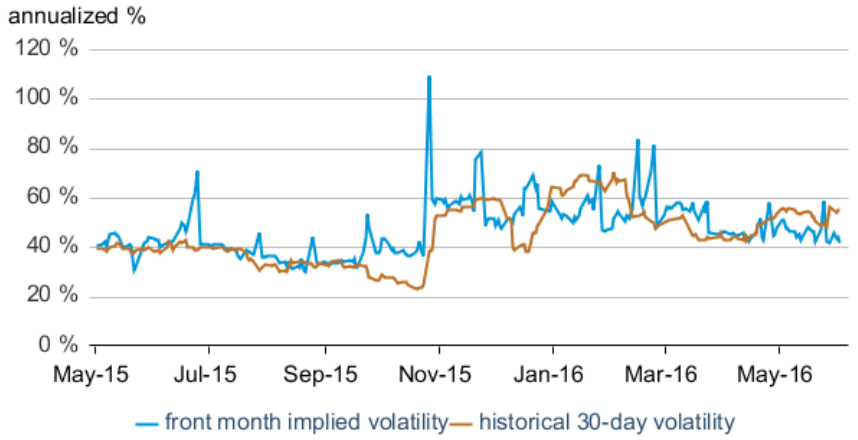
Using standard heat rates to convert natural gas and coal prices to prices for electricity generation, May marked the seventh consecutive month that natural gas prices at Henry Hub were less than Appalachian coal prices. Natural gas prices averaged $15.87 per megawatt hour (MWh) in May while coal prices remained relatively stable at $18.40/MWh **(Figure 14)**. Relatively low natural gas prices compared with coal prices are providing the economic incentive to use more natural gas in electricity generation. The June STEO forecasts that natural gas will account for a higher share of electricity production in the United States in 2016 than coal.

Figure 14. Estimated monthly average price for electricity generation



Volatility: Natural gas historical volatility remained elevated in May, avoiding the seasonal drop that typically occurs in the spring. Volatility over the previous 30 trading days settled at 55% on June 2, decreasing by 1 percentage point since May 2 **(Figure 15)**. Implied volatility also remained elevated, with the average implied volatility May 2016 5.5 percentage points above the May 2015 average. Similar to 2012, natural gas inventories are high after mild winter temperatures limited demand for natural gas in the heating sector. With more natural gas projected to be used for electric power generation this summer, weather and CDD in the United States become a larger area of uncertainty for natural gas markets this year and are likely supporting price volatility.

Figure 15. Natural gas historical and implied volatility



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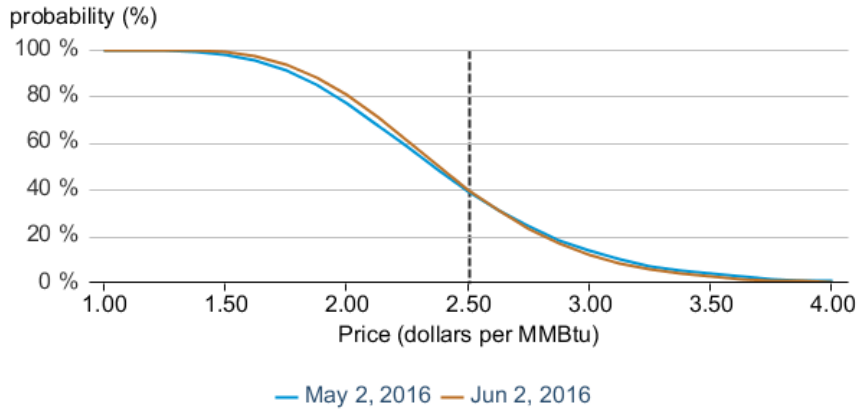
Market-Derived Probabilities: The September 2016 Henry Hub futures contract averaged $2.42/MMBtu for the five trading days ending June 2 and has a 40% probability of exceeding $2.50/MMBtu at expiration. The same contract for the five trading days ending May 2 had a 39% probability of exceeding $2.50/MMBtu **(Figure 16)**.

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



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