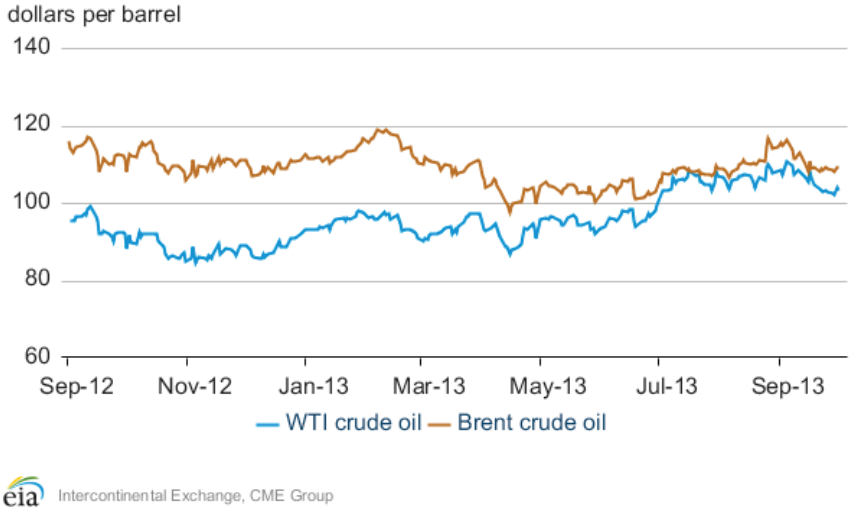
Short-Term Energy Outlook
Market Prices and Uncertainty Report

Crude Oil

Prices: Front month futures prices for the Brent and West Texas Intermediate (WTI) crude oil benchmarks fell in September. The Brent contract settled at $109.00 per barrel on October 3, a decline of $6.68 per barrel since September 3, and WTI settled at $103.31 per barrel on October 3, falling by $5.23 per barrel over the same period **(Figure 1)**. These changes marked the first month-over-month declines in crude oil prices since May 2013. The return of some Libyan production and declining refinery runs during September helped put downward pressure on crude oil prices.

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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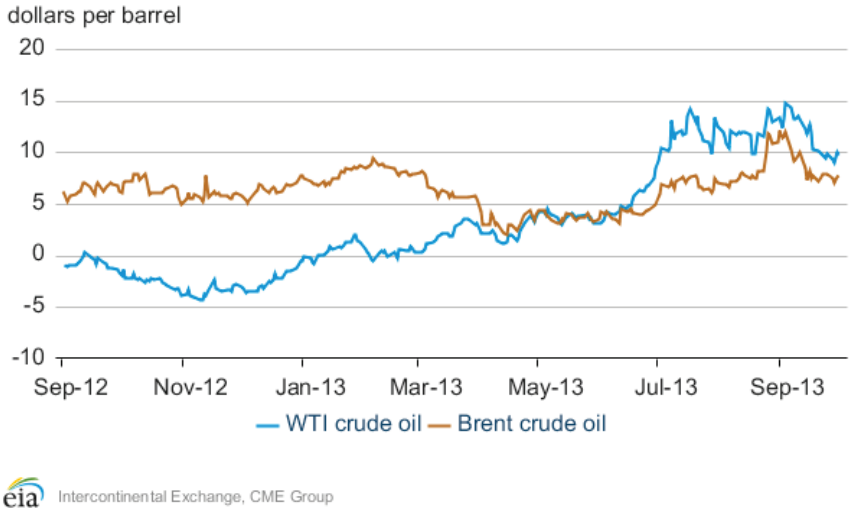
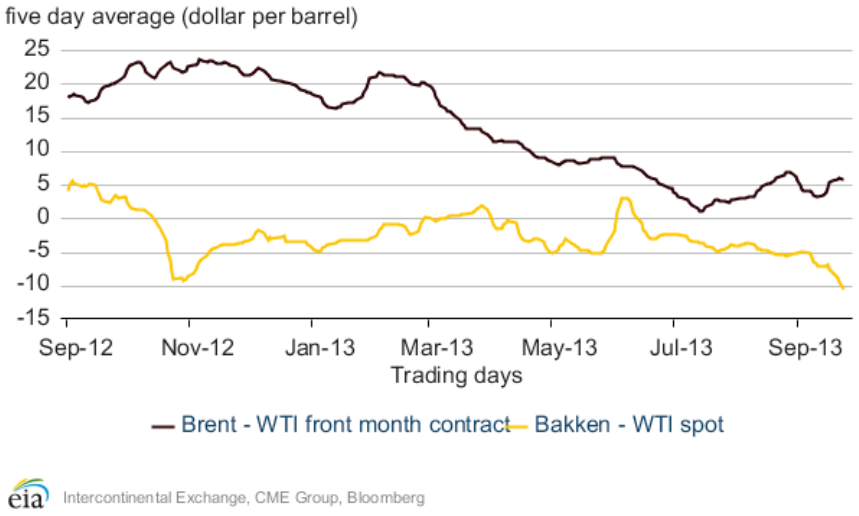
Evidence of a loosening crude oil market is seen in the decline in backwardation (when near-term prices are higher than further-dated ones) of the Brent and WTI futures curves. For the first time since April, the 1st-13th month spread declined for both contracts. The Brent and WTI time spreads settled at $7.70 and $9.66 per barrel, respectively, on October 3, declining by $4.33 and $3.73, respectively, since September 3 **(Figure 2)**. Rising crude oil supply in global markets and falling refinery runs lessened the need to draw down crude oil inventories and lowered the financial incentive to sell oil now and buy it back later.

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



The Brent-WTI front month futures spread was relatively stable over the last month, settling at an average of $5.70 per barrel for the five-day period ending October 3, a slight decrease of $0.65 per barrel since the five-day period ending September 3 **(Figure 3)**. The U.S. Midcontinent crude oil market is at an inflection point as refineries reduce runs and begin seasonal maintenance. Refinery utilization rates in PADDs 2 and 3 dropped to 89.8% and 90.3%, respectively, for the week ending September 27, the lowest utilization rates since June. The lower crude oil runs may already be affecting other crude oil prices in the Midcontinent, with the difference between spot Bakken and WTI prices increasing to $10.10 for the five-day average ending October 3. With refineries currently using less crude oil in the Midcontinent compared to the last few months, this creates downward pressure on inland crude oil prices, like Bakken, as they now have to be moved farther distances for refining or storage.

Figure 3. Historical crude oil price spreads



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Crude oil in other currencies: The recent decline in crude oil prices has been greater when viewed in emerging market currencies, rather than U.S. dollars. Since September 3, Brent crude oil denominated in U.S. dollars declined by 5.8% **(Figure 4)**. Over that same period, the decline of Brent in the Indian rupee, Brazilian real, and Thai baht was 13.3%, 12.0% and 9.0%, respectively. Even with the most recent decline, the price of Brent in many emerging market country's currencies is still higher than at the beginning of 2013, while Brent in U.S. dollars is lower.

Figure 4. Brent crude oil price in emerging market currencies

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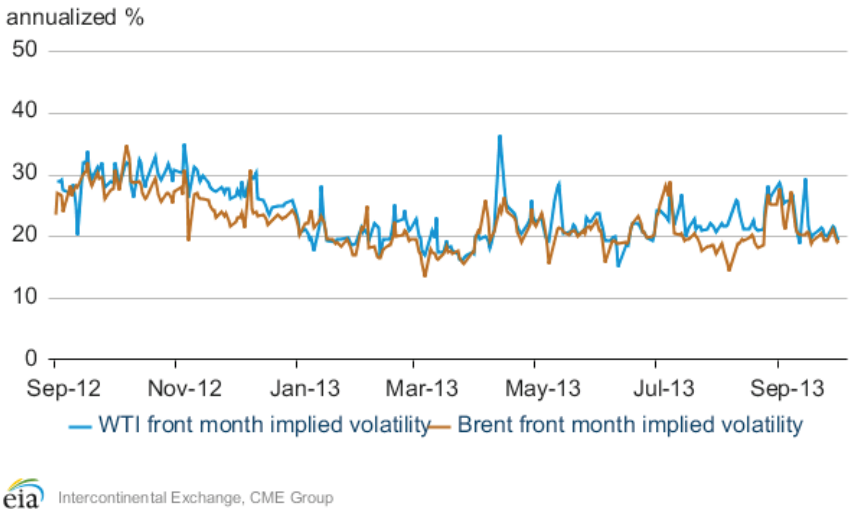
Volatility: Implied volatility for the front month WTI and Brent futures contracts settled at 19.7% and 19.3%, respectively, on September 5, a decrease of 8.9 and 8.5 percentage points, respectively, since September 3 **(Figure 5)**. The lower implied volatility for both crude oil benchmarks, combined with the simultaneous drop in price, indicates that

lower tensions in the Middle East and an easing of some previous supply disruptions were major drivers of crude oil price and volatility over the last month.

Figure 5. Crude Oil Implied Volatility



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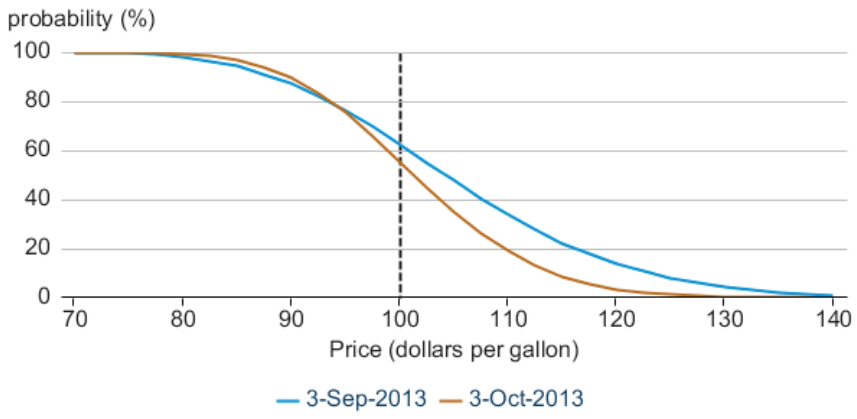
Market-Derived Probabilities: The January 2014 WTI futures contract averaged $101.73 per barrel for the five trading days ending October 3 and has a probability of exceeding $100 per barrel at expiration of approximately 55%. The same contract for the five trading days ending September 3 had a probability of exceeding $100 of 63% (**Figure 6**). Given the elevated price of Brent relative to WTI, the probability of Brent futures contracts expiring above the same dollar thresholds is higher.

Figure 6. Probability of the January 2014 WTI contract expiring above price levels



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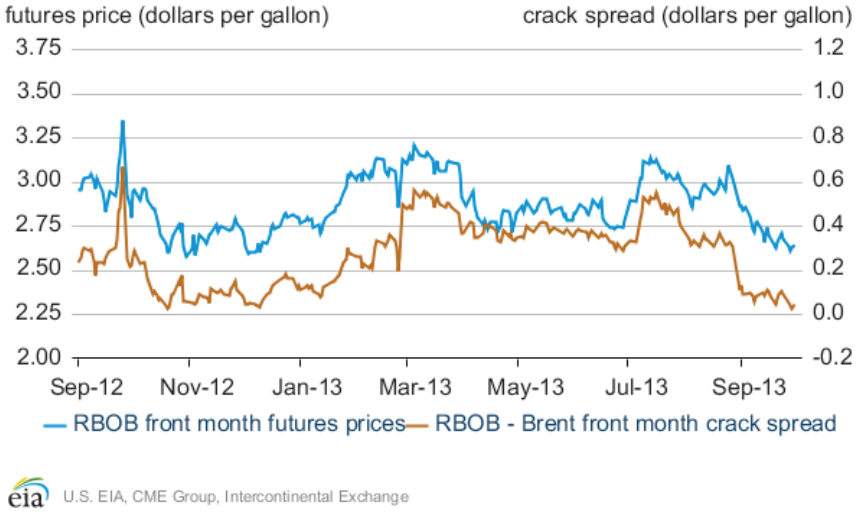
Petroleum Products

Gasoline prices: The reformulated blendstock for oxygenate blending (RBOB) front month futures contract price continued its decline in September and early October, decreasing by $0.23 from September 3 and settling at $2.64 per gallon on October 3 **(Figure 7)**. The RBOB-Brent crack spread settled at $0.04 on October 3, a decline of $0.07 since the end of August. While RBOB prices typically decline during this time of year after the change in contract specifications and the end of the U.S. driving season, the decline from the last day of August through September of this year was the largest seen for that timeframe since 2008.

Continuing the trend seen so far this year, gasoline inventories have remained at or above the five-year range. U.S. gasoline consumption and exports over the last year have not increased as much as production, resulting in sustained higher inventories compared to one year ago. Using the most recent monthly data available, finished motor gasoline and gasoline blending components inventories in July were 223 MMbl, the highest seen in more than two decades. Gasoline product supplied combined with exports rose 0.24 million barrels per day in July over last year to 9.4 million barrels per day, but it is still well within the five-year range and below the high seen in 2010 of 9.6 million barrels per day.

Figure 7. Historical RBOB futures prices and crack spread

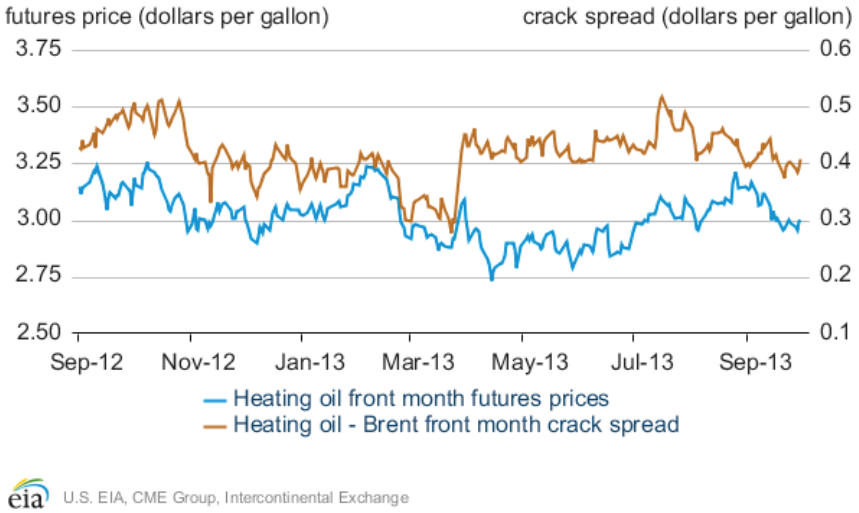


Heating Oil prices: Heating oil front month futures contract prices also decreased in September, declining $0.15 per gallon to settle at $3.00 per gallon on October 3. These declines were largely driven by lower crude oil prices as the heating oil-Brent crack spread remained relatively stable and settled at $0.41 per gallon on October 3 **(Figure 8)**.

For the week ending September 27, the four-week average for distillate product supplied plus exports was 5.1 million barrels per day, an increase of 0.4 million barrels per day from September 2012. Production of distillate also increased by 0.45 million barrels per day compared to the same time last year. Distillate inventories were slightly higher at 129 million barrels as of September 27, roughly 2 million barrels more than at the end of September 2012.

At the end of July, however, the most recent monthly data show that distillate stocks were 126 million barrels, the lowest point since 2004. Distillate exports in July were the highest ever recorded. In addition, U.S. distillate product supplied plus exports in July were the highest for the month in the last three decades, reaching 4.95 million barrels per day. Distillate production has also reached multiple record highs this year.

Figure 8. Historical heating oil futures price and crack spread



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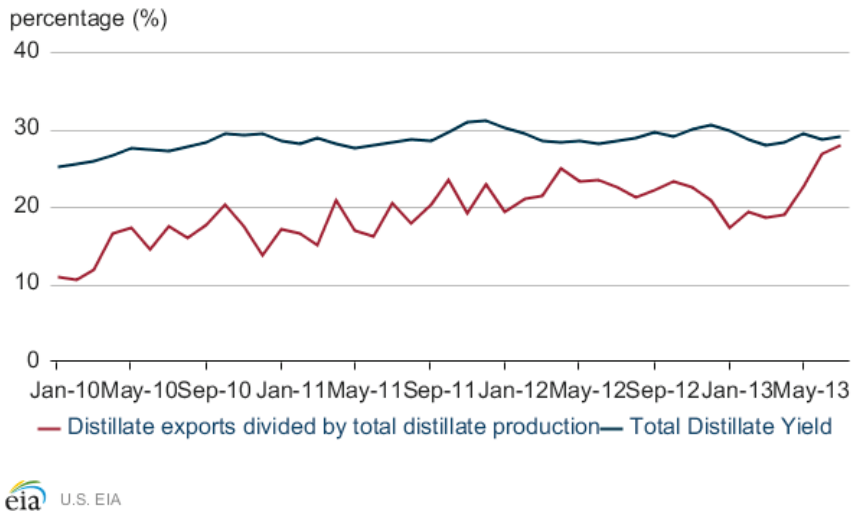
The global distillate market is showing strong demand growth, encouraging refiners to maximize distillate output. In July, 28% of the total distillate fuel oil produced in the United States was exported, the highest ever, compared to just 17% in July 2010 **(Figure 9)**. Gasoline exports remain in the single digits, reaching 4% of total production in July 2013. On average, from 2010 to 2012, distillate exports have steadily increased 3 to 4 percentage points every year. The growth in foreign demand for distillate and a strong crack spread have given refiners a year-round consumer base and the cost incentive to incrementally increase the amount of distillate produced.

The distillate yield in July was 29.2%, compared to 27.1% in July 2010. From 2010 to 2012, the share of distillate fuel oil produced increased by 0.2 to 1.4 percentage points each year. On the other hand, over the same timeframe, the gasoline yield either remained stable or decreased each year. A continuation of strong distillate demand into

the winter heating season is likely given the record highs already seen this year in total consumption and exports of distillate, providing refineries an incentive to continue high refinery runs in order to fulfill the higher demand for distillate.

Figure 9. U.S. Distillate Production and Exports



Product Crack Spreads: The crack spread for RBOB started declining in August and continued throughout the month of September **(Figure 10)**, partly due to the rollover into the October RBOB contract, which specifies winter-grade gasoline, and also due to high inventories, potentially driven by a strong incentive to produce distillate, and general weakness in gasoline demand during the fall and winter months. Even accounting for regional differences in the United States, RBOB margins have declined from this time last year. The crack spread between New York RBOB spot price and the Brent spot price averaged $0.14 per gallon in September compared to $0.52 last September. Likewise, the U.S. Gulf Coast RBOB spot price-LLS spot price crack spread showed a similar dropoff, with an average monthly spread of $0.03 per gallon this September compared to a $0.34 spread one year ago. Declines in the crack spread are normal after the contract rollover; however, the declines last year only began to occur during October and November, as the U.S. Gulf Coast RBOB-LLS crack spread entered negative territory, providing little incentive for refiners to produce gasoline. This year's crack spread declines are beginning earlier, following the pattern seen in 2011, when immediately after the summer ended, both the New York RBOB-Brent and U.S. Gulf Coast RBOB-LLS crack spreads decreased precipitously, both reaching negative crack spreads by November of that year.

Heating oil crack spreads have also been lower this September, but have stayed within the range seen in the last two years for this time of year **(Figure 11)**. Refineries still maintain a healthy margin for producing distillate, which is likely to continue as demand for heating oil increases through the fall and winter months. Typically, during

those months, the heating oil and RBOB crack spreads move inversely as U.S. consumption for heating oil begins to rise. In the coming months, if distillate demand and crack spreads remain high, refiners will maximize distillate production, but the increased refinery runs will likely result in a weaker RBOB – Brent crack spread, possibly reaching zero or even dip into negative territory, as was seen in 2011.

Figure 10. RBOB - Brent, LLS Spot Price Crack Spread

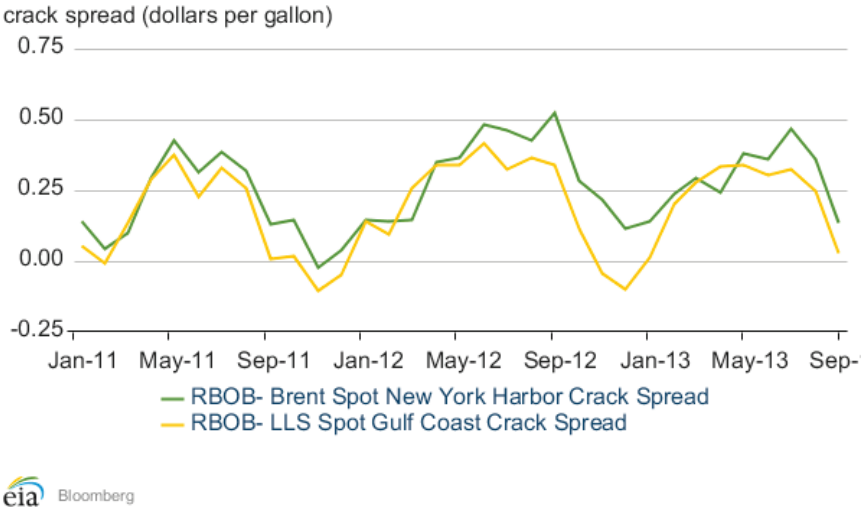


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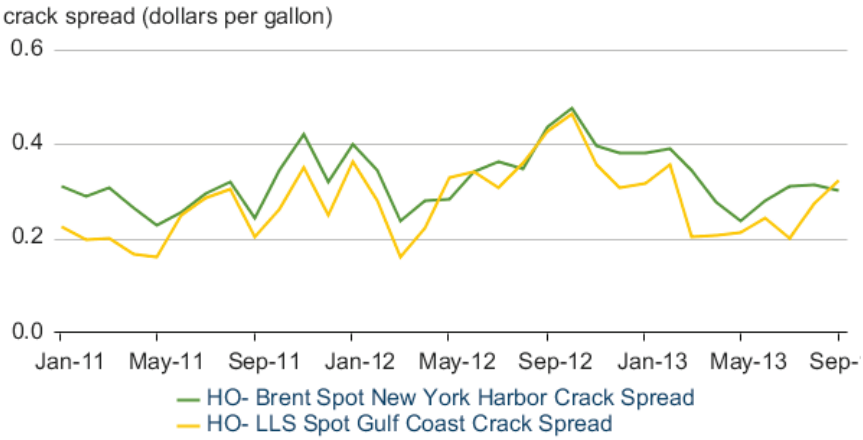
Figure 11. Heating Oil - Brent, LLS Spot Price Crack Spread



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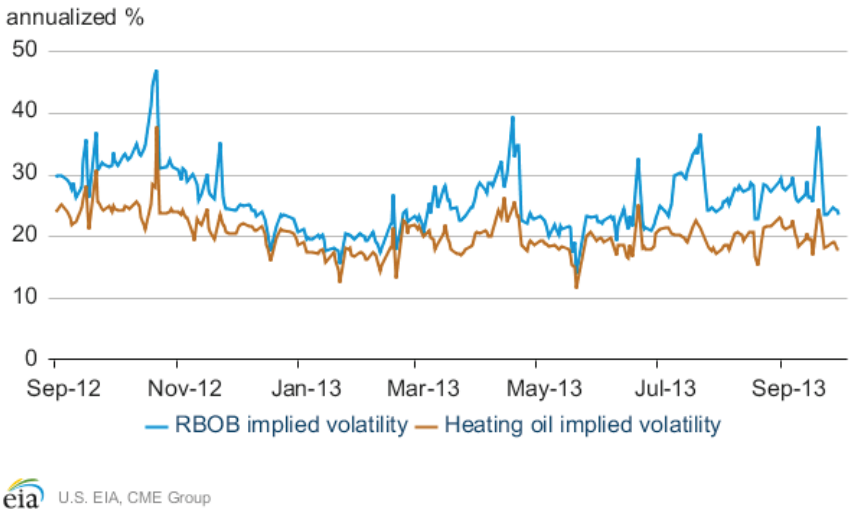
Volatility: The implied volatility for the front month RBOB contract settled at 23.6% on October 3, a decline of 5.4 percentage points since September 3 **(Figure 12)**. The RBOB implied volatility hit a high of 37.7% on September 23, the highest since April of this

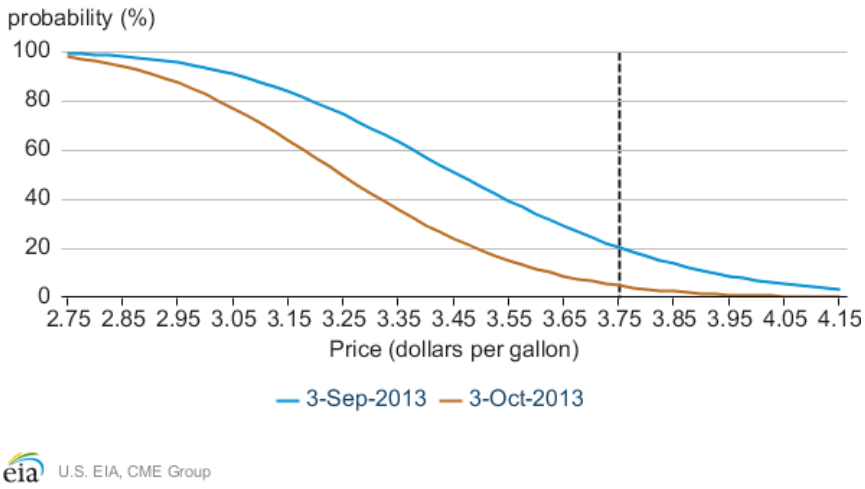
year. The implied volatility for the front month heating oil contract settled at 18%, a decrease of 5.2 percentage points since September 3.

Figure 12. RBOB and Heating Oil Implied Volatility



Market-Derived Probabilities: The January 2014 RBOB futures contract averaged $2.63 per gallon for the five trading days ending October 3 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 5%. The same contract for the five trading days ending September 3 had a probability of 20% of exceeding $3.10 per gallon **(Figure 13)**.

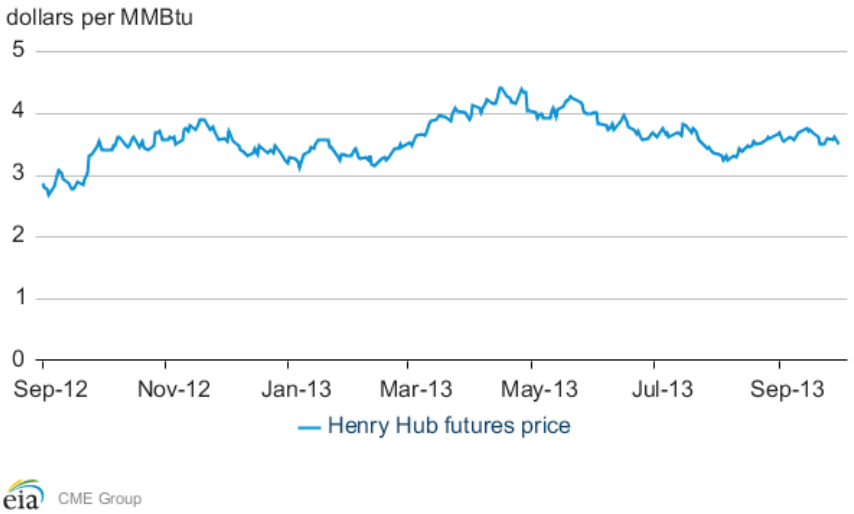
Figure 13. Probability of January 2014 retail gasoline exceeding different price levels at expiration



Natural Gas

Prices: The natural gas front month contract price increased to $3.75 per MMBtu on September 17, then declined to settle at $3.50 per MMBtu on October 3, $0.17 per MMBtu lower than at the beginning of September **(Figure 14)**.

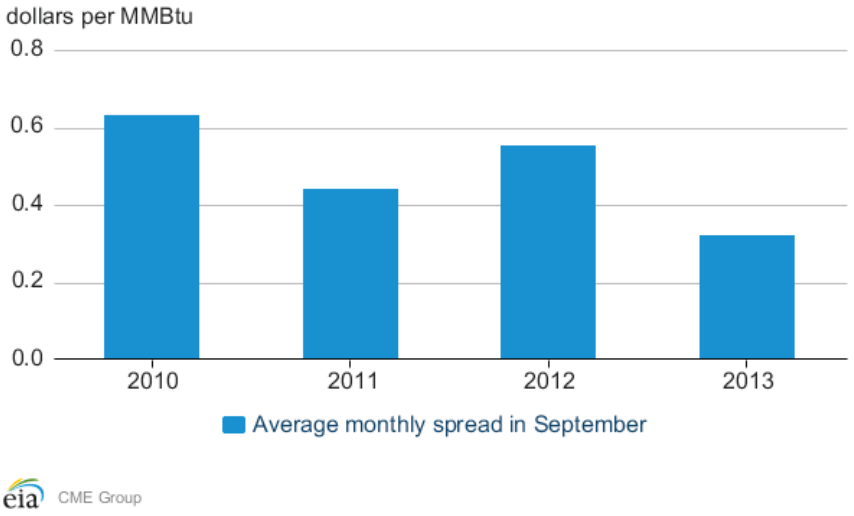
Figure 14. Historical front month U.S. natural gas prices



At the start of this year's winter season, the shape of the natural gas futures curve is flatter compared to recent years, as indicated by the average price spread between the January and October contracts during the month of September **(Figure 15)**. One short-term factor contributing to the lower spread is the National Oceanic and Atmospheric Administration (NOAA) 3-month outlook showing above normal temperatures, which reduces heating demand and puts less strain on the amount withdrawn from storage in the winter.

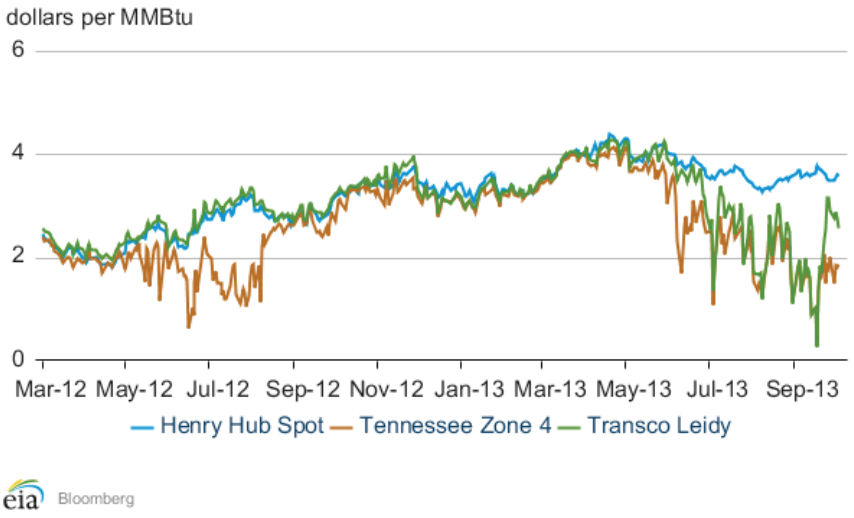
However, two longer-term structural changes in the natural gas market may also be contributing to lower seasonality in the natural gas futures curve. First, 43% of the total yearly consumption (from April 2009 to March 2010) was consumed during the winter heating months of December 2009 through March 2010. This last winter (December 2012 through March 2013) showed consumption as only 40% of total yearly consumption from April 2012 to March 2013, demonstrating that natural gas consumption is being spread out more over an entire year. Secondly, natural gas storage capacity over the last four years grew by 5.2% while natural gas consumption during winter heating months only grew by 4.9%. These two factors tend to reduce storage costs for natural gas and decrease the seasonality in the natural gas futures curve.

Figure 15. January contract minus October contract



Spot Spreads and Basis Swaps: Pipeline transport capacity plays a key role in natural gas markets. Relative to oil, natural gas has more limited economical transport options. The Marcellus shale play provides an example of how transport congestion impacts prices **(Figure 16)**. Two pipeline pricing points developed a discount to the benchmark Henry Hub since July, and reached lows of $0.27 per MMBtu in September as a result of pipeline congestion. New projects to expand pipeline capacity out of the region in coming months may alleviate these constraints.

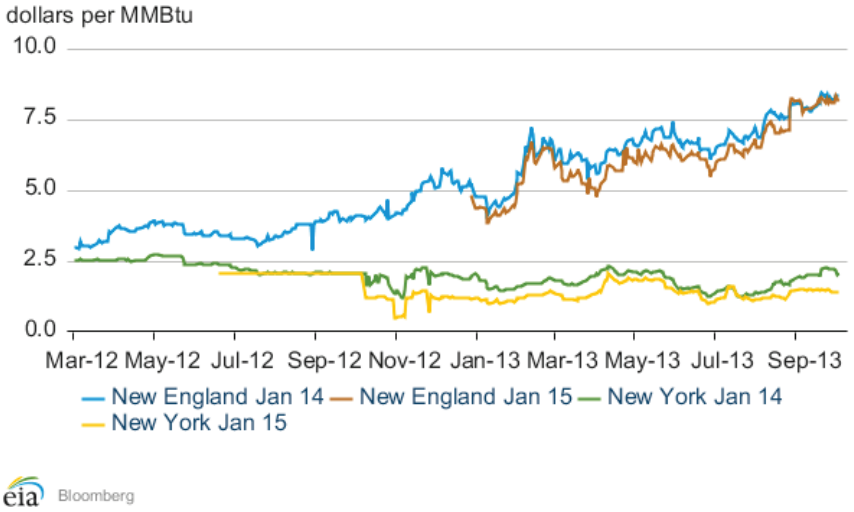
Figure 16. Marcellus area spot prices and Henry Hub



In contrast, the futures market is expecting price premiums in the winter months in New England because of pipeline constraints during peak winter demand in New England **(Figure 17)**. Figure 17 shows forward basis swap prices in New England and New York

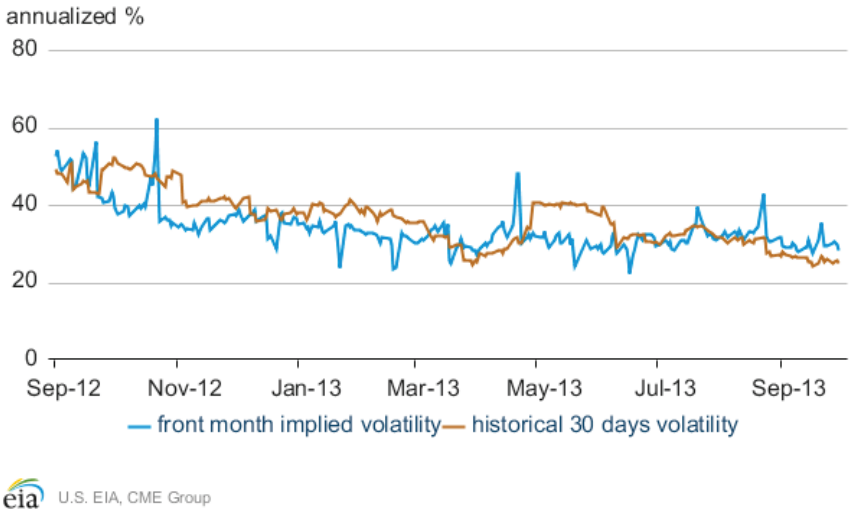
for January 2014 and January 2015 contracts. A natural gas basis swap is an instrument reflecting the market's future valuation of the difference in price between the Henry Hub futures contract and a different location for the same contract month. The two areas' basis swaps separated from each other in 2012 because of increased pipeline capacity to New York, whereas the New England market is expected to continue to have tougher challenges in meeting peak winter demand.

Figure 17. Natural gas Northeast basis swaps



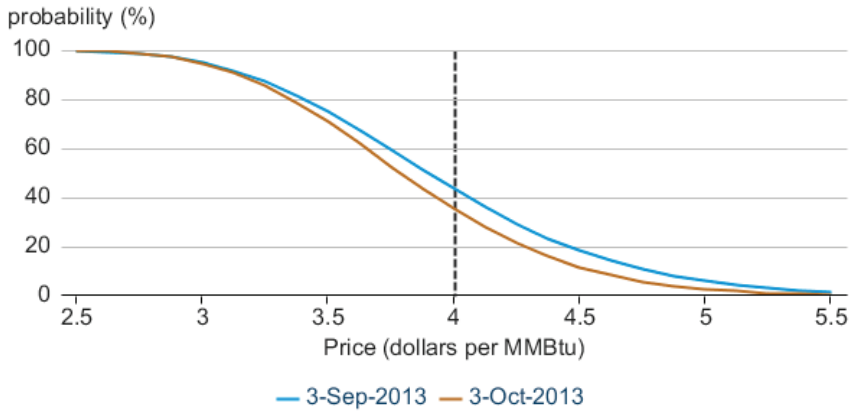
Volatility: Historical volatility has moved lower throughout September as the price movements this month have been small. Implied volatility reflects the expectations on price swings in the near future. Implied volatility settled at 28.3% on October 3, 3.2 percentage points lower than implied volatility on September 3 **(Figure 18)**.

Figure 18. Natural gas historical and implied volatility



Market-Derived Probabilities: The probability of the January 2014 Henry Hub contract expiring above $4.00 per MMBtu decreased to 35%, 8 percentage points lower from the probability at the beginning of September **(Figure 19)**. The average January 2014 contract price for the five trading days ending October 3 decreased $0.12 per MMBtu compared to the five trading days ending September 3.

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



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