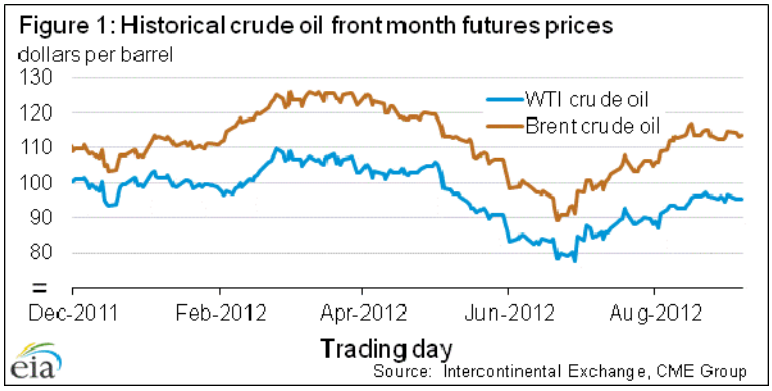
Short-Term Energy Outlook
Market Prices and Uncertainty Report[1]

Crude Oil

Prices: Crude oil prices rose during the first half of August and were relatively constant during the second half of the month, remaining at the higher levels. The Brent and WTI crude oil benchmarks settled at $113.49 and $95.53 per barrel, respectively, on September 6, with Brent increasing by $7.53 per barrel and WTI increasing by $6.62 per barrel since August 1 **(Figure 1)**. Both Brent and WTI have been in narrow trading ranges over the last few weeks, with settlement prices for Brent and WTI staying within $3 dollar per barrel ranges since August 17.



The month of August began with hopes of stimulus from governments and central banks around the world, which improved expectations for economic growth. Over the last month, the European Central Bank announced details for a new bond buying program after its most recent central bank meeting and the Chinese government formalized plans for $157 billion dollars in infrastructure improvement spending. Additionally, expectations of more quantitative easing from the U.S. Federal Reserve Bank at its September 12 – 13 Open Market Committee meeting have buoyed most asset prices. With most of the issues affecting crude oil supplies remaining unchanged over the last month, the increased expectations for global economic growth have driven expectations for crude oil demand higher and were mostly responsible for increased prices.

[1] This is a regular monthly companion to the EIA Short-Term Energy Outlook (http://www.eia.gov/forecasts/steo/)
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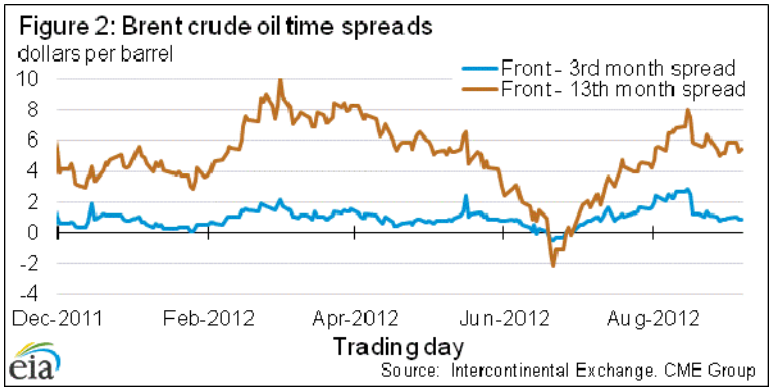
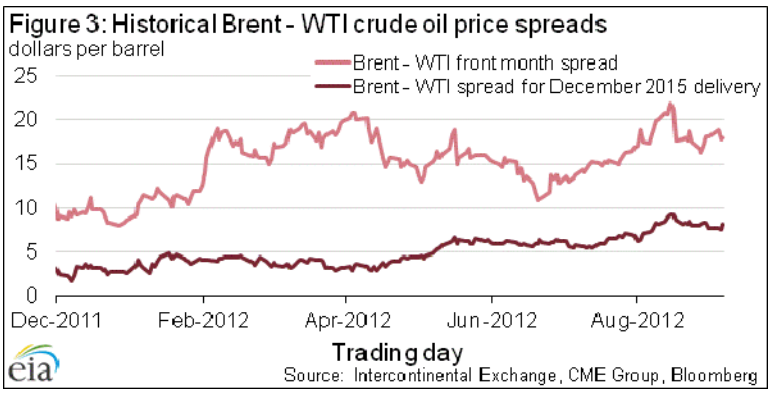
A combination of unplanned production outages and maintenance led the number of cargo loadings for Brent crude oil out of the North Sea scheduled for September to be at the lowest level in 5 years. The low number of Brent cargoes being offered contributed to some of the increased backwardation in the Brent future curve. When Brent futures contracts rolled on August 17 and the September contract expired, making October the front month, there was a $1.66 and $1.27 per barrel drop in the 1st-13th and 1st-3rd Brent time spreads, respectively. A more robust loading schedule set for October eased some of the tightness in the Brent market. Currently, the front month Brent futures contract is $5.44 per barrel above than the 13th month contract, a slightly higher spread than on August 1 but still lower than the $10 per barrel peak spread in February of this year **(Figure 2)**.



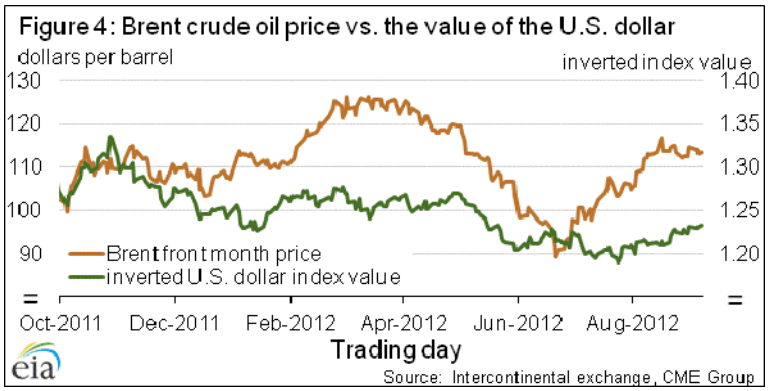
The front month Brent-WTI spread was also affected by the September production problems in the North Sea. The spread increased in the first half of August, rising by $4 per barrel from August 1 to 16, but then returned to its beginning of the month levels once the September Brent futures contract expired. The spread is currently at $17 per barrel, the higher end of its 2012 range **(Figure 3)**.

The market's longer term expectation for the Brent – WTI spread also increased in August, as indicated by the difference between the December 2015 Brent and WTI futures contracts. This spread rose to a peak of more than $9 per barrel in August, the highest differential ever for these two contracts. Three possible reasons for the increase in the longer-dated spread are that market participants believe that:

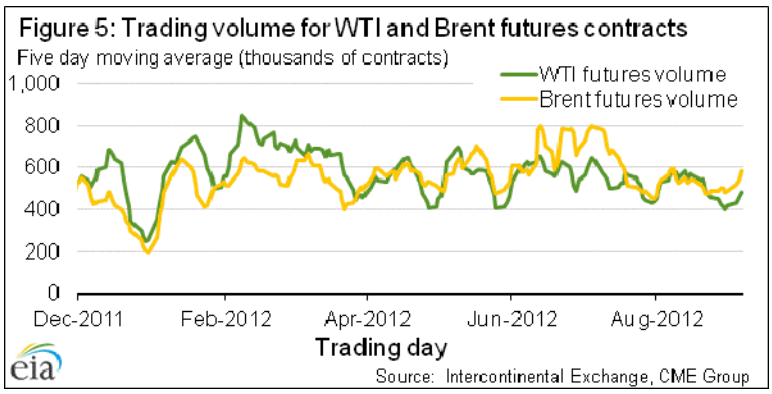
- pipeline infrastructure projects to deliver crude oil production out of central North America are less likely to be completed;
- the extra pipeline capacity due to come online in the next three years will not be enough to match continued growth in Central North American crude oil production;
- even with additional pipeline capacity, a spread between Brent and WTI may persist because of pipeline tariffs and refining constraints on the ability of refineries in the U.S. Gulf Coast to process light sweet crude oil.



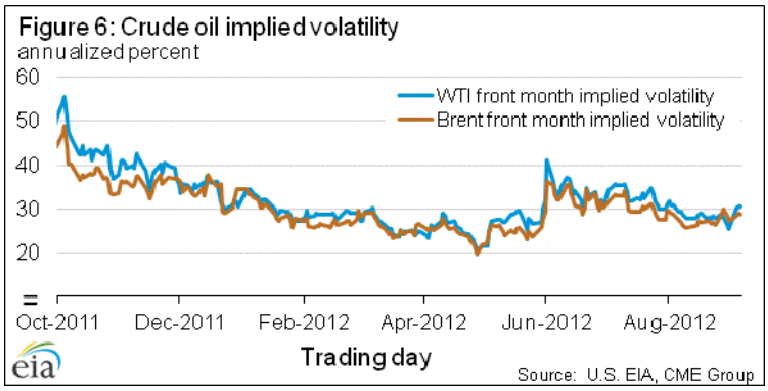
Crude Oil and the U.S. Dollar: Improving economic conditions, particularly in Europe where fears surrounding the euro have eased, contributed to a decrease in the value of the U.S. dollar. During the month of August, the U.S. Dollar Index, a weighted average of the value of the U.S. dollar against a basket of other major currencies, declined by 2.4 percent, with a large portion of that decline coming against the euro **(Figure 4)**. Since crude oil prices and the value of the dollar are negatively correlated, the decrease in the value of the U.S. dollar over the last month may be contributing to the recent rise in oil prices. For a further discussion of the relationship between oil prices and exchanges rates, please see EIA's *What Drives Crude Oil Prices?* website.



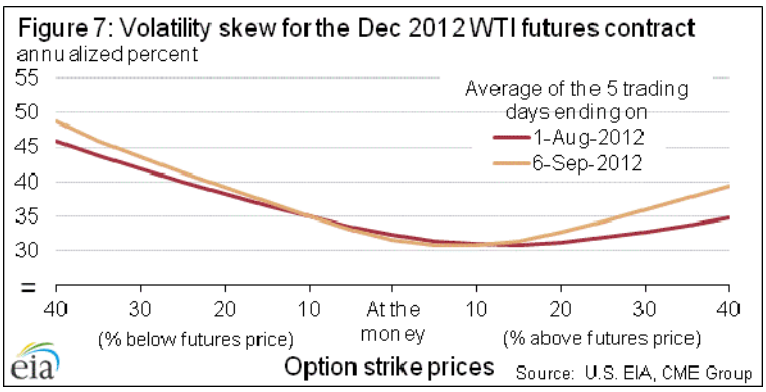
Volume: In April of this year, Brent surpassed WTI in monthly trading volume for the first time and remained above WTI trading volume in the following months. August then displayed the typical seasonal drop in trading and brought Brent volumes closer in line with WTI. In August, 12.1 million Brent contracts traded while 11.7 million WTI contracts changed hands and trading in both contracts was light. As volume picked up after the Labor Day holiday in early September, Brent has showed greater increases in trading volume **(Figure 5)**.



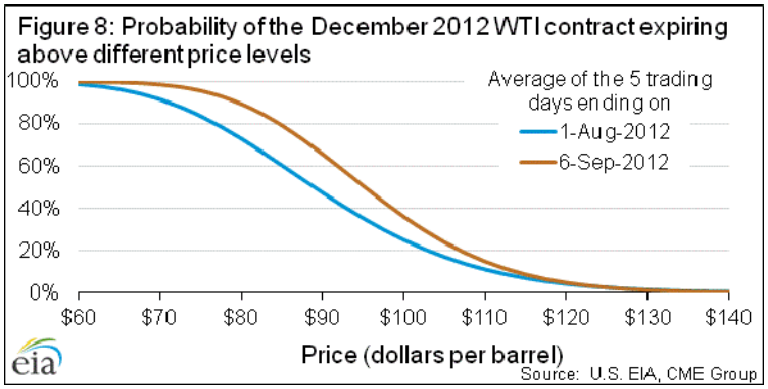
Volatility: Crude oil implied volatility was relatively unchanged during August. Implied volatility for the front month Brent futures contract settled at 29 percent on September 6, a 0.5 percentage point decrease since August 1. WTI implied volatility was 30.5 percent on September 6, a 1.1 percentage point decline since the beginning of August. These implied volatility measures use the prices of at-the-money call options to calculate implied volatility **(Figure 6)**.



Information about the chance of crude oil prices moving up or down in the future can be gained from the WTI crude oil options market by examining implied volatility for individual out-of-the-money call and put option contracts. The volatility skew is constructed by graphing implied volatility for out-of-the-money call and put option contracts by their strike price, expressed as percent differences from the price of the futures contract. For the five trading days ending September 6, implied volatility for out-of-the-money call options increased more than implied volatility for out-of-the-money put options compared to levels for the five trading days ending August 1 **(Figure 7)**. The change in the shape of the volatility skew shows that the market's expectation for crude oil prices to move higher has increased since August 1 while the probability for prices to move lower has increased slightly or remained flat.



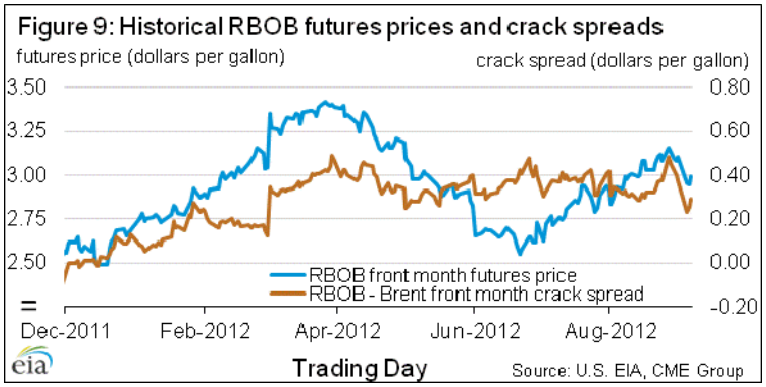
Market Derived Probabilities: The probability of the December 2012 WTI futures contract expiring above $100 per barrel is now 36 percent, an 11 percentage point increase from the five-day period ending August 1 (**Figure 8**).[2] Even though implied volatility dropped over the last month, the increase in price had a greater effect and was the cause for the rise in the probability of exceeding $100 per barrel at expiration compared to market conditions on August 1. Given the higher level of Brent prices relative to WTI prices, the probabilities that the December Brent contract will exceed specified dollar thresholds are higher.



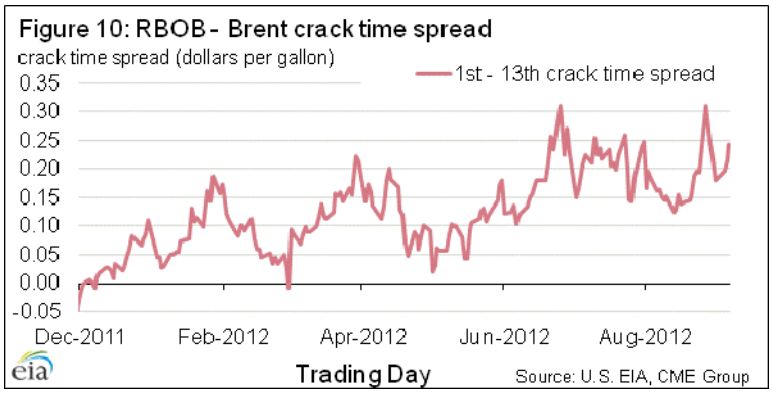
[2] These probabilities are based on the cumulative normal densities derived from market expectations using futures and options prices. See Appendices I and II of EIA's October 2009 ***Energy Price Volatility and Forecast Uncertainty*** article for discussion on how these probabilities are derived.

Gasoline

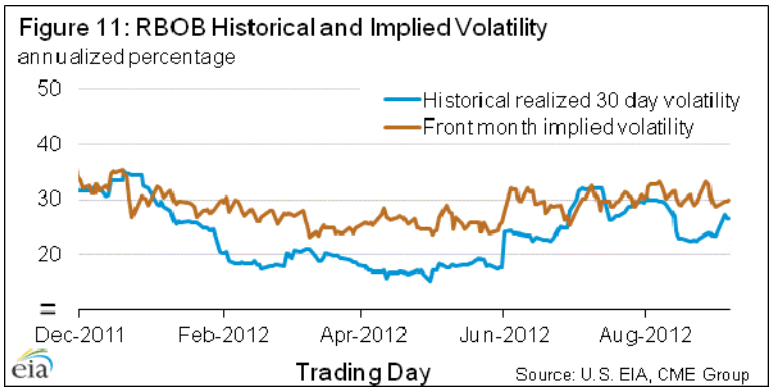
Prices: Gasoline futures prices for delivery in New York Harbor rose during August, with the front month futures contract settling at $2.99 per gallon on September 6, an increase of $0.16 per gallon from August 1 **(Figure 9)**. The rise in the first half of the month was largely due to increases in oil prices. The RBOB – Brent front month crack spread increased by $0.17 per gallon from August 1 to its 2012 peak of $0.48 per gallon on August 27. A large refinery outage in Venezuela and some disruptions in refining on the U.S. Gulf Coast due to Hurricane Isaac are likely to have contributed to the late-August peak in the crack spread.



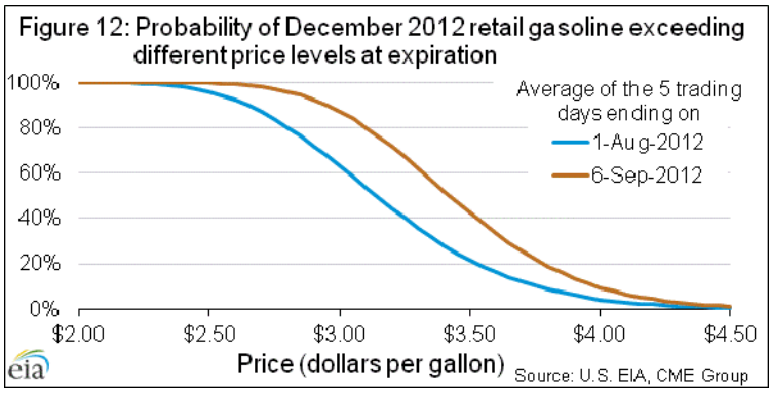
The potential impacts of refinery outages are heightened by the low amounts of U.S. gasoline inventories compared to historical averages. Starting in June of this year, the total U.S. gasoline inventories fell below their five year averages. It was at this same time that the 1st-13th RBOB – Brent crack time spread began increasing, an indication of tightness in gasoline market **(Figure 10)**. The spread is calculated by taking the front month RBOB contract, less the price of Brent crude oil, and subtracting the price of the 13th month RBOB contract, less the 13th month price of Brent. The spread settled at $0.24 per gallon on September 6, an increase of $0.07 per gallon since August 1. The spike seen on August 27 was further indication of the short-term concerns over refinery outages and potential disruptions from Hurricane Isaac.



Volatility: Historicaly volatility for the front month RBOB futures contract decreased during August while implied volatility was relatively flat. 30-day historical volatility was 26.5 percent on September 6, a decrease of 4 percentage points since August 1, and implied volatility settled at 29.8 percent on September 6, a slight decrease over the same time period **(Figure 11)**.

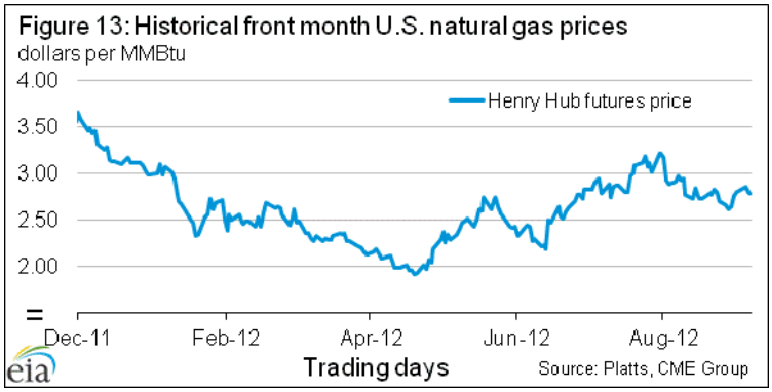


Market Derived Probabilities: The December 2012 RBOB futures contract averaged $2.80 for the five trading days ending September 6 and has a probability of exceeding $2.85 per gallon ($3.50 retail) at expiration of approximately 42 percent. The same contract as of the five trading days ending August 1 had a probability of exceeding $3.50 retail of 22 percent. Higher crude oil prices as well as tightness in the gasoline market contributed to an increased probability of the December contract exceeding price levels when compared to market conditions on August 1 (**Figure 12**).

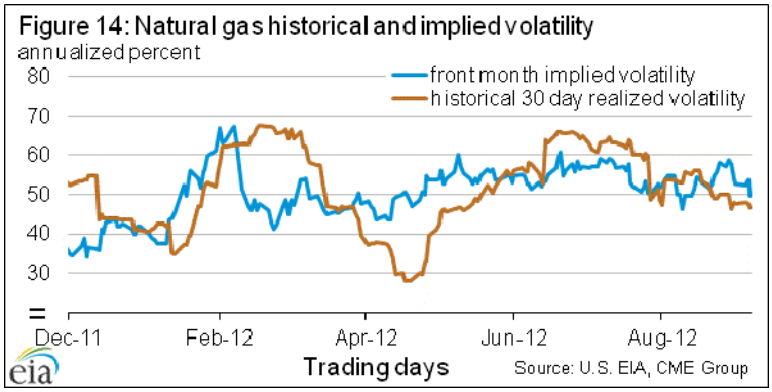


Natural Gas

Prices: The front month futures contract price for delivery of natural gas to Henry Hub in Louisiana fell during the month of August, hitting a ten-week low of $2.61 per MMBtu on August 28 **(Figure 13)**. The contract settled at $2.77 per MMBtu on September 6, $1.16 per MMBtu lower than this time last year. *Natural gas storage* has been unusually high all year; August 31 inventories were still 13 percent higher than this time last year and 12percent higher than the 5 year average, providing downward pressure on prices. Reduced electricity demand brought on by cooler weather in the United States during August compared to July has also contributed to lower natural gas prices.



Volatility: Historical and implied volatility for the front month natural gas futures contract have remained relatively unchanged during most of the month of August and early September. The brief rise in implied volatility from August 20 to 28, increasing by 7 percentage points during that time, could be attributable to production and demand concerns due to Hurricane Isaac. Both historical and implied volatility decreased over the last week after the market gathered information about Isaac's aftermath, settling at 46.6 percent and 49.5 percent on September 6, respectively **(Figure 14)**.



Market Derived Probabilities: The probability that the December contract will settle higher than $3.50 per MMBtu fell by 20 percentage points from 48 to 28 percent when

compared to market conditions on the five trading days ending August 1 (**Figure 15**). The average price over the five trading days ending on September 6 for the December 2012 natural gas futures contract decreased by $0.35 per MMBtu, compared to the five trading days before August 1. Implied volatility has risen by 4.5 percentage points during that time, meaning that the decrease in price was responsible for the lower probability of natural gas prices exceeding different price levels compared to market conditions a month ago.