

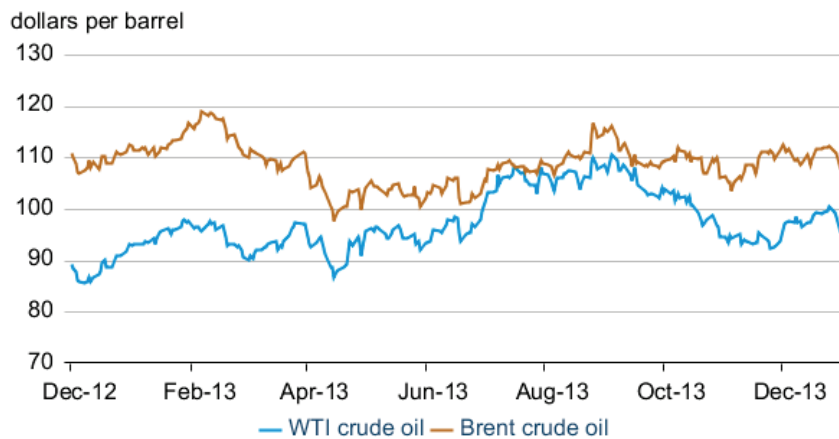


Short-Term Energy Outlook Market Prices and Uncertainty Report

Crude Oil

Prices: International crude oil prices were relatively stable throughout December before declining at the beginning of January, while U.S. domestic prices moved higher in December. The North Sea Brent front month futures price settled at \$107.78 per barrel (bbl) on January 2, a decline of \$3.67/bbl from its close on December 2 (**Figure 1**). Over the same period, the West Texas Intermediate (WTI) front month futures contract rose \$1.62/bbl, settling at \$95.44/bbl on January 2.

Figure 1. Historical crude oil front month futures prices



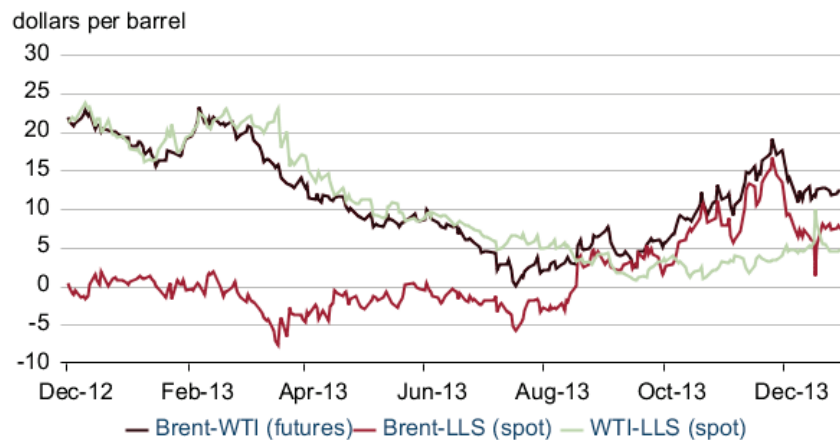
IntercontinentalExchange, CME Group

The same forces that kept international crude oil prices relatively stable through much of 2013, with Brent prices ending the year about \$2/bbl below where they ended 2012, also pertain to the last month. Supply disruptions within the Organization of Petroleum Exporting Countries (OPEC) continue to be largely offset by crude oil production increases in non-OPEC countries, while concerns over future economic growth broadly declined. Surplus crude oil production capacity in December was about 0.3 million barrels per day (MMbbl/d) higher compared to the previous month, likely applying slight downward pressure to crude 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)

The Brent-WTI differential settled at \$12.34/bbl on January 2, a decrease of \$5.29/bbl compared to December 2 (**Figure 2**). The differential is composed of a relatively stable Louisiana Light Sweet (LLS)-WTI difference of \$4.90/bbl, close to the cost of pipeline tariffs, and a much more volatile Brent-LLS spread of \$7.19/bbl. Before the second half of 2013, the Brent-WTI spread was dictated by the cost of transporting additional barrels of crude oil from Cushing, Oklahoma, to PADD 3 (U.S. Gulf Coast), with LLS and other PADD 3 crude oil prices closely tracking Brent. Starting in third quarter 2013, however, the Brent-WTI differential began to be influenced by local supply and demand dynamics on the U.S. Gulf Coast as increased transportation capacity reconnected these two markets. With larger amounts of Midcontinent crude oil production now able to move to refineries on the Gulf Coast, the Brent-WTI and Brent-LLS differentials will likely move together based on the discount needed to incentivize PADD 3 refineries to run light sweet crude oil.

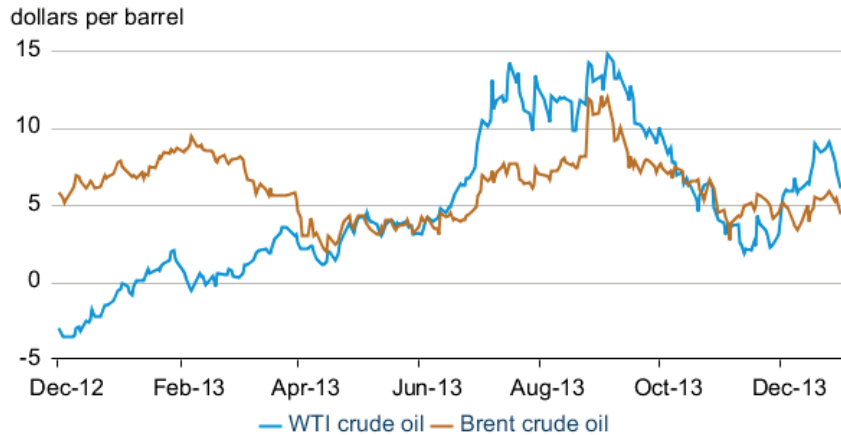
Figure 2. Historical crude oil differentials



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The WTI 1st-13th spread settled at \$6.08/bbl on January 2, an increase of \$2.99/bbl from the prior month (**Figure 3**). On December 27, the spread reached its highest point since early October, settling at \$9.03/bbl. Refinery utilization in PADD 2 (Midwest) and PADD 3 continued to move higher in December, increasing the backwardation (when near-term prices are greater than further-dated ones) in the WTI futures curve. The expectation is that U.S. refineries in PADD 2 and PADD 3 will continue to run high volumes of crude oil until entering into maintenance-outage season in the coming months. In the international market, the Brent 1st-13th futures price spread was nearly unchanged since December 2, settling at \$4.43/bbl on January 2.

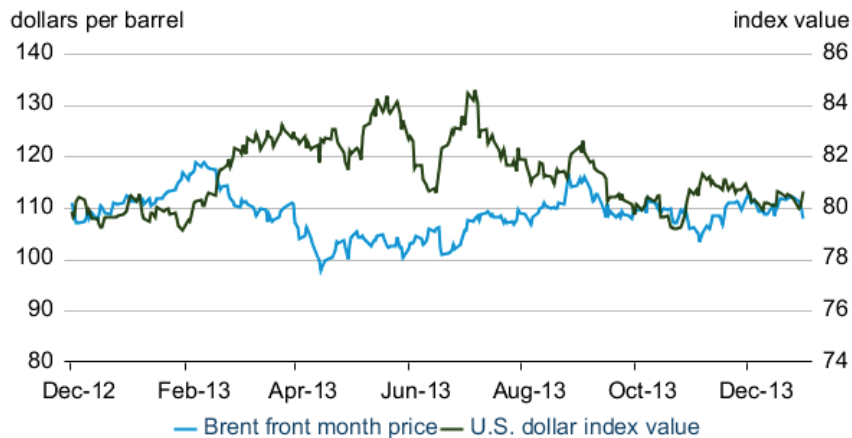
Figure 3. Crude oil front month - 13th month futures price spread



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Crude oil and the U.S. Dollar: From October 1 to December 31, the daily percent returns of Brent crude oil and the U.S. dollar index (a weighted basket of exchange rates between the dollar and other OECD currencies) showed a correlation of -0.02, essentially no relationship, and a contrast to the historically strong, negative correlation between these two series. The negative correlation broke down during the crude oil supply disruptions at the end of the third quarter and has not returned since. The persistent absence of a negative correlation provides further evidence that recent Brent crude oil price movements have been more strongly influenced by supply side factors rather than demand side ones (**Figure 4**).

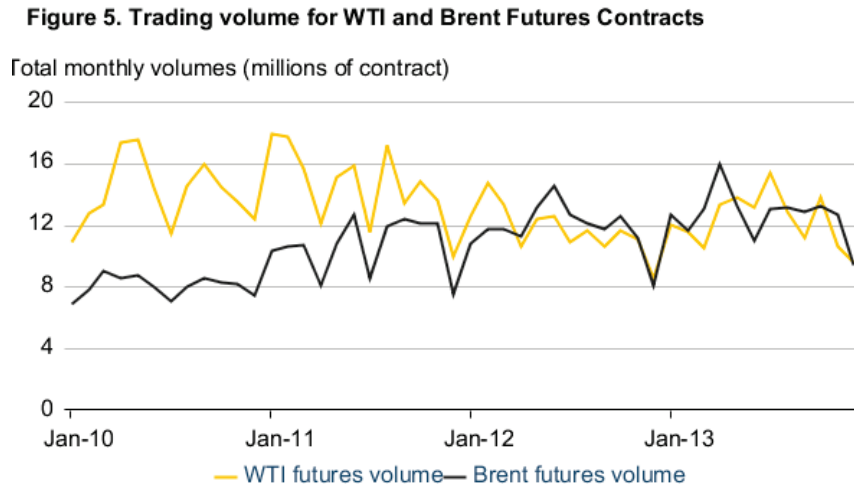
Figure 4. Brent crude oil price vs. the value of the U.S. dollar



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Trading Volume: Nearly 300 million Brent and WTI futures contracts traded in 2013, a 6% increase compared to their combined trading volume for all of 2012 (**Figure 5**). The

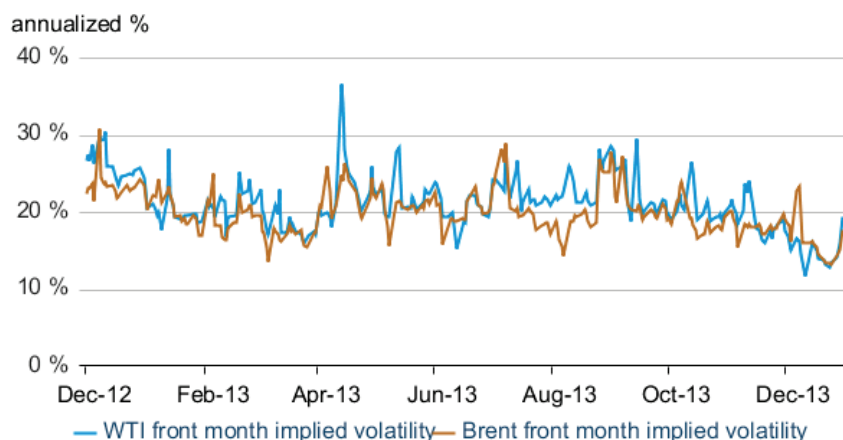
higher trading volume for crude oil futures contracts is a divergence from the decline in trading volume for petroleum product futures contracts discussed in November’s [Market Prices and Uncertainty Report](#). Volatility in the form of markets absorbing new information regarding the Brent-WTI spread may be one reason that crude oil contracts saw higher trading volumes, because trading the Brent-WTI spread generally involves taking futures positions in both markets. Crack spreads and cross-product differentials in petroleum product futures markets were less volatile in 2013 and largely followed seasonal patterns.



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Volatility: Implied volatility on the front month futures contract for both Brent and WTI fell to their lowest levels over the last year in December before increasing in the beginning of January. Implied volatility for Brent and WTI settled at 17.7% and 19.4% on January 2, respectively, with Brent decreasing by 2.0 percentage points and WTI relatively unchanged since December 2 (**Figure 6**). The decline of crude oil volatility during December was in line with reduced volatility in other asset markets, such as U.S. equities.

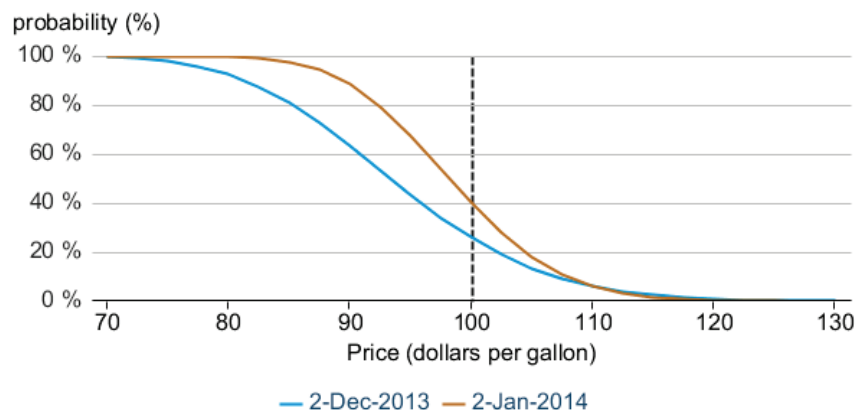
Figure 6. Crude Oil Implied Volatility



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Market-Derived Probabilities: The April 2014 WTI futures contract averaged \$98.48/bbl for the five trading days ending January 2 and has a probability of exceeding \$100/bbl at expiration of approximately 40%. The same contract for the five trading days ending December 2 had a probability of exceeding \$100 of 26% (Figure 7). Because Brent prices are higher than WTI prices, the probability of Brent futures contracts expiring above the same dollar thresholds is higher.

Figure 7. Probability of the April 2014 WTI contract expiring above price levels



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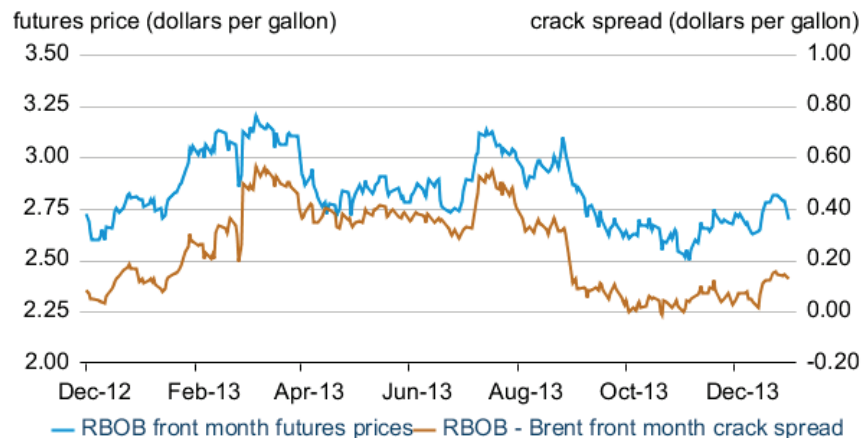
Petroleum Products

Gasoline prices: The reformulated blendstock for oxygenate blending (RBOB) front month futures contract price rose to its highest point since September on December 27, then declined to settle at \$2.70 per gallon (gal) on January 2, an increase of \$0.02/gal from

December 2 (**Figure 8**). The RBOB-Brent crack spread strengthened to its highest point since the contract rollover to winter grade gasoline specifications occurred in September. The crack spread increased \$0.10/gal from the beginning of December to settle at \$0.13/gal on January 2.

U.S. gasoline consumption plus exports showed a year-over-year increase in December, which helped to lift RBOB prices from their seasonal lows. Finished U.S. motor gasoline [consumption plus exports](#) for the four weeks ending December 27 reached 9.29 MMbbl/d, 0.31 MMbbl/d higher than December 2012. Finished motor gasoline and gasoline blending components [inventories](#) stood at 221 MMbbl as of December 27, ending the year 10 MMbbl lower than last year. Gasoline inventories typically rise during the fourth quarter, a trend that has continued this year. However, the rise in inventories from October to December 2013 was the lowest for any fourth quarter since 2001. This occurred even as refineries reported high gross inputs at the end of the year, resulting in a record high gasoline [production](#) for the four weeks ending December 27 of 9.27 MMbbl/d, further demonstrating the effect of strong U.S. consumption and exports in fourth-quarter 2013 on the gasoline market.

Figure 8. Historical RBOB futures prices and crack spread

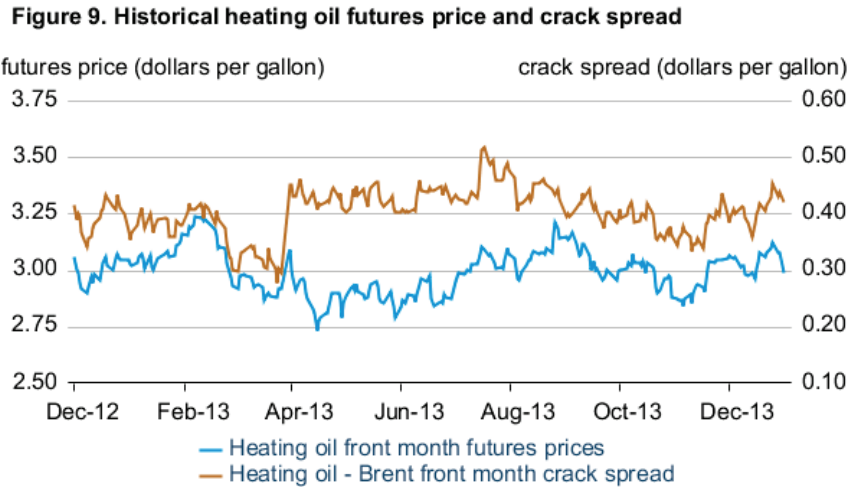


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Heating Oil prices: The front month futures price for heating oil decreased \$0.06/gal since December 2, settling at \$2.99/gal on January 2. The heating oil-Brent crack spread rose to its highest point since August, settling at \$0.42/gal on January 2, a gain of \$0.02/gal since the beginning of December (**Figure 9**).

Heating oil demand (measured by U.S. consumption plus exports) for December reached the second highest volume for any month on record. U.S. distillate [consumption plus exports](#) for the four weeks ending December 27 were 5.09 MMbbl/d. Distillate [production](#) was at an all-time high of 5.13 MMbbl/d.

The most [recent](#) release of EIA's Petroleum Supply Monthly, with October data, showed strong U.S. distillate consumption, supported by strong U.S. GDP growth in the second half of 2013. In October 2013, U.S. distillate consumption reached 4.1 MMbbl/d, the highest monthly total since November 2011. Meanwhile, the United States exported 1.29 MMbbl/d in October, nearly 0.25 MMbbl/d more than October 2012.



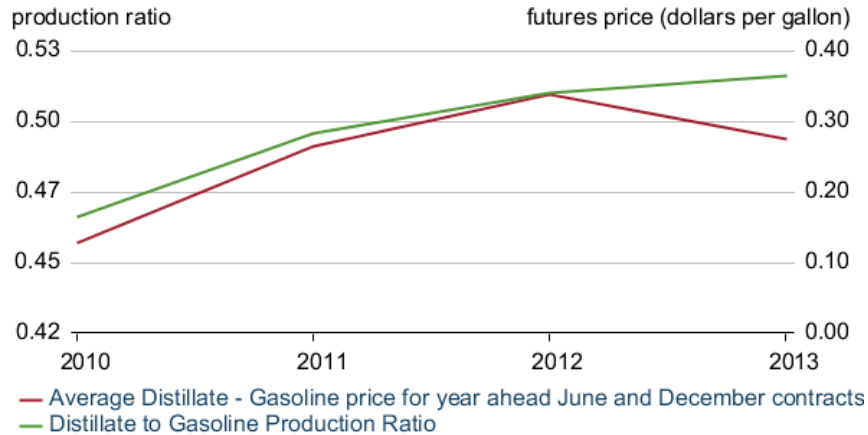
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Product Yield and Futures Prices: Over the long-term, refineries can adjust their ratio of petroleum product yields by modifying processes and adding new equipment in order to respond to price signals from the market. From 2010 to 2012, the difference between longer-dated distillate and gasoline futures contracts increased from \$0.13/gal to \$0.34/gal¹. The increase in price of distillate relative to gasoline can be attributed to the growth of international distillate demand each year over this period, encouraging distillate exports from the United States, while gasoline demand was more muted. U.S. refineries responded, with the production ratio of distillate-to-gasoline steadily increasing from 0.47 in 2010 to 0.51 in 2012 (**Figure 10**).

The upward trend of distillate prices to gasoline prices was broken in 2013, with the average longer-dated differentials declining to \$0.27/gal. The decline in distillate prices for the 2014 June and December contracts compared to gasoline futures prices may foreshadow a leveling off in the trend toward a higher distillate-to-gasoline production ratio in 2014.

¹ The difference between longer-dated distillate and gasoline futures contracts was calculated by taking one year's average price of both the June and December futures contracts dated one year ahead. For the year 2010, the difference of \$0.13 was calculated by averaging 2010 prices of 2011 June and December contracts. Note that 2013 contracts for heating oil were not available for trade until late April 2012 because of changes in contract specification.

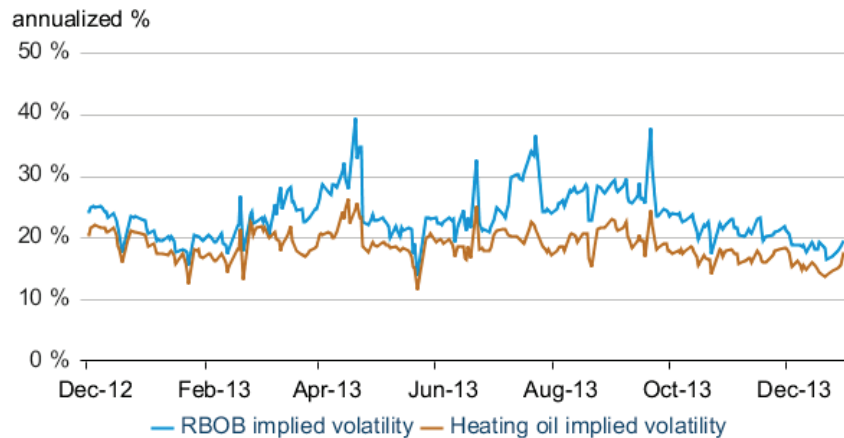
Figure 10. Distillate strength in refinery production and future prices



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Volatility: The implied volatilities for the front month RBOB contract and the front month heating oil contract both declined from the beginning of December and increasing at the beginning of January, closely tracking the movements in crude oil implied volatility. RBOB implied volatility decreased by 2.4 percentage points from December 2, settling at 19.5% on January 2. Implied volatility for the heating oil contract declined 0.8 percentage point, settling at 17.6% on January 2 (**Figure 11**).

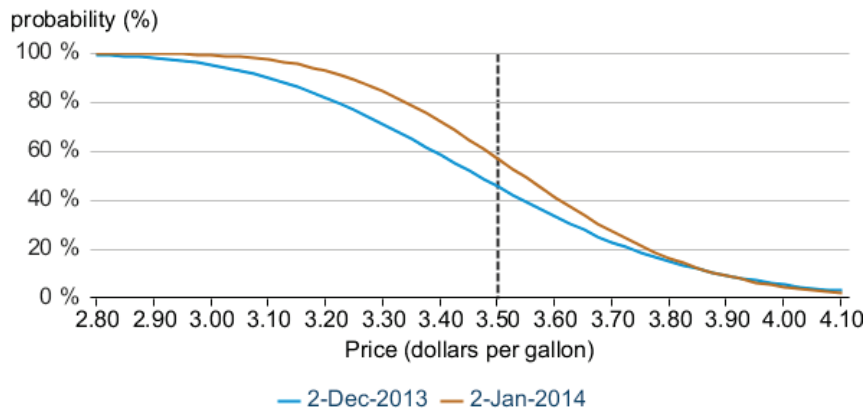
Figure 11. RBOB and Heating Oil Implied Volatility



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Market-Derived Probabilities: The April 2014 RBOB futures contract averaged \$2.95/gal gallon for the five trading days ending January 2 and has a probability of exceeding \$2.90/gal (typically leading to a retail price of \$3.50/gal) at expiration of approximately 57%. The same contract for the five trading days ending December 2 had a probability of 45% of exceeding \$2.90/gal (**Figure 12**).

Figure 12. Probability of April 2014 retail gasoline exceeding different price levels at expiration

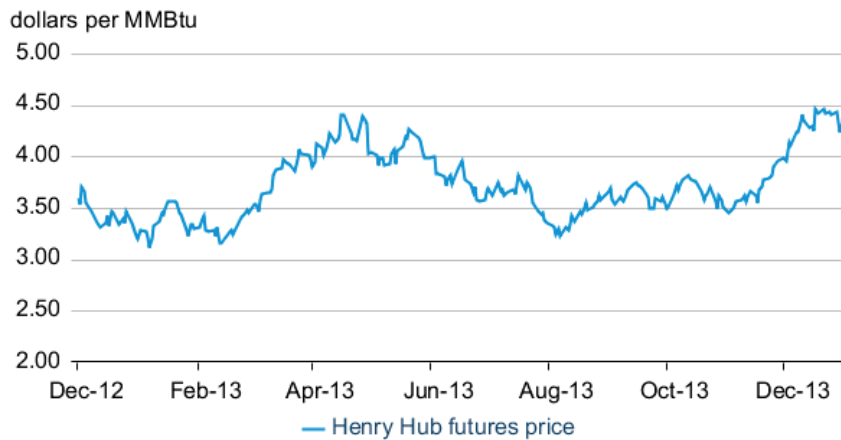


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Natural Gas

Prices: The upward price trend that began in November continued throughout December as a cold snap pushed prices to the highest levels of 2013 (**Figure 13**). The front month Henry Hub futures contract reached a 2013 high of \$4.46/MMBtu on December 23, settling at \$4.32/MMBtu on January 2, \$0.33 higher than the close on December 2.

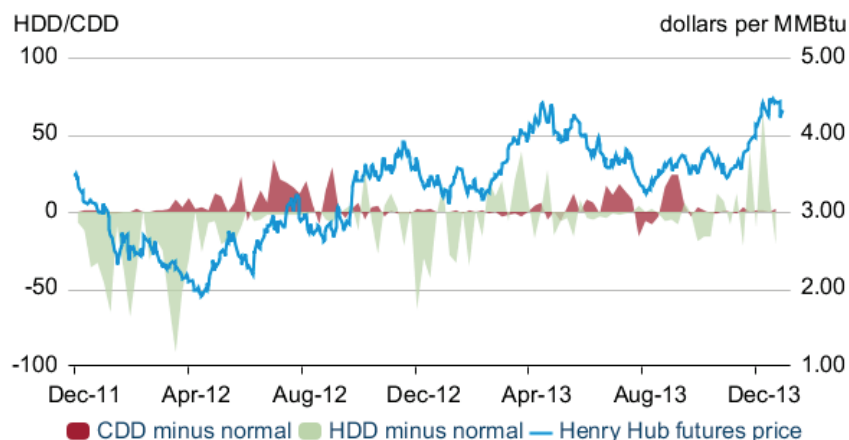
Figure 13. Historical front month U.S. natural gas prices



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Demand throughout the country increased to more than 100 billion cubic feet (Bcf) per day in mid-December as freezing temperatures increased heating demand (**Figure 14**). Heating degree days increased to 35% above normal in the week ending December 12, a sharp contrast to the mild weather in December 2011 and December 2012.

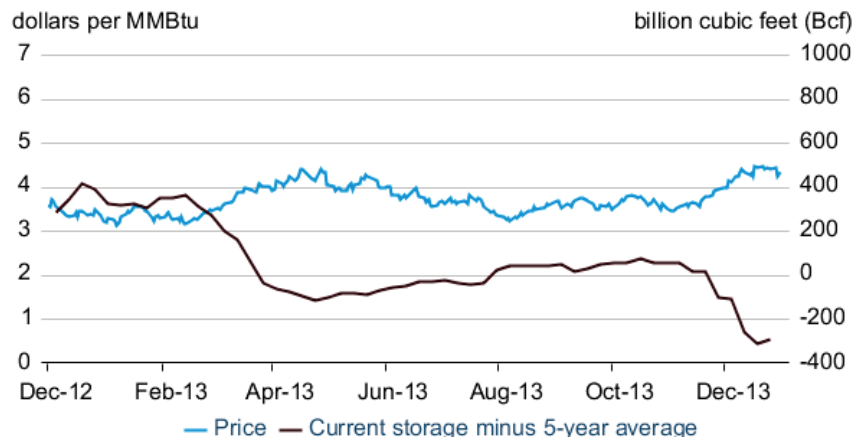
Figure 14. HDD minus normal and CDD minus normal



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Combined with the demand increases, the weather also caused freeze-offs in natural gas production lines in Colorado and Texas, reducing dry production [3.3% week-over-week ending December 12](#). This contributed to an all-time record withdrawal from storage of 285 Bcf for the week ending December 13 (**Figure 15**), 11 Bcf more than the last weekly record set on January 25, 2008.

Figure 15. U. S. natural gas prices and storage

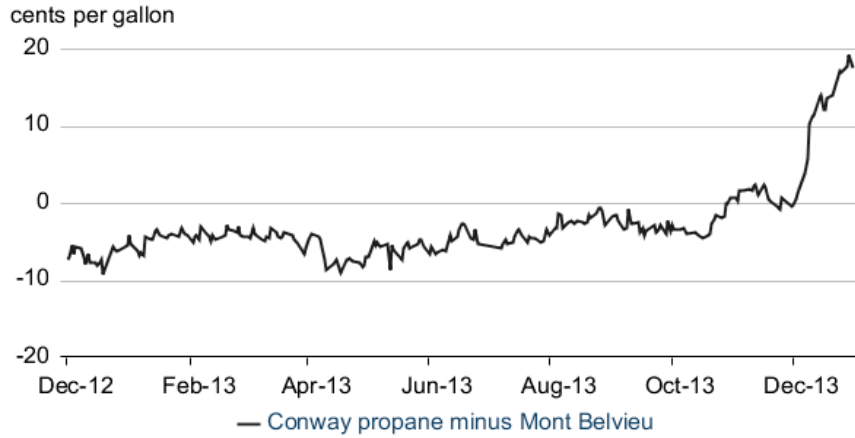


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Propane Prices: The [December 2013 MPUR](#) introduced the propane price disparity between its two pricing hubs, Conway, Kansas, and Mont Belvieu, Texas. The Conway price initially developed a premium to Mont Belvieu from Midwest demand for corn drying, as the harvest was larger and wetter than normal. But after falling to parity, the premium increased again in December, averaging \$0.10/gal (**Figure 16**). Approximately 7.5% of Midwest households use propane for space heating, and the cold weather

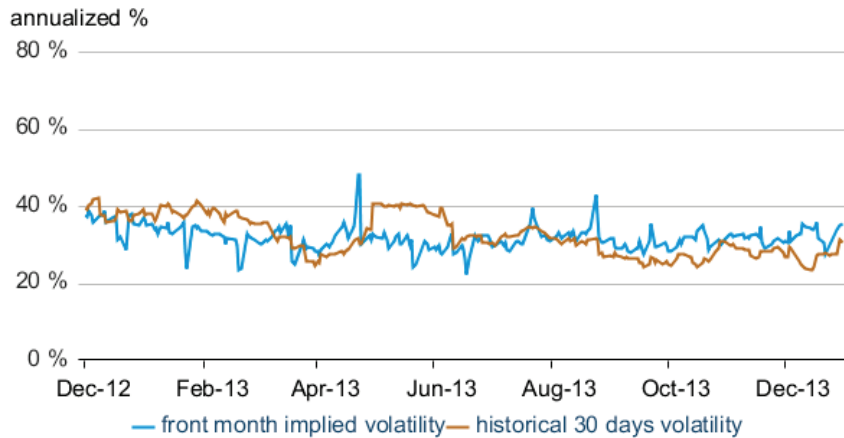
pressured demand for the fuel. PADD 2 propane inventories are approximately 7.5 MMbbl less than the 5-year average as of December 27.

Figure 16. Conway propane minus Mont Belvieu



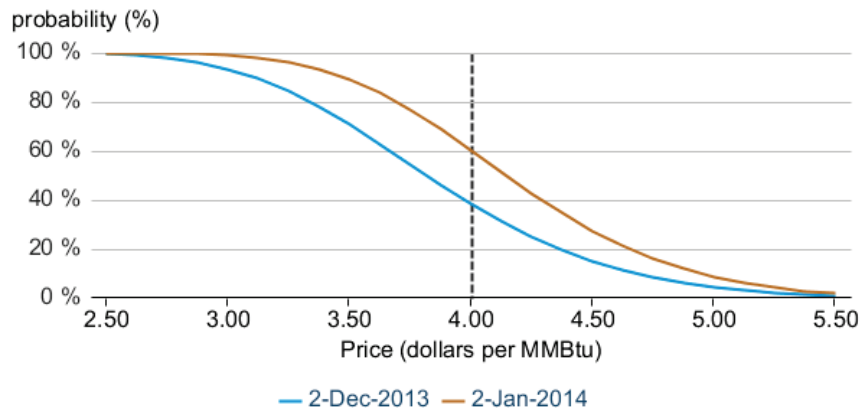
Volatility: Implied volatility settled at 35.2% on January 2, 4.7 percentage points higher than volatility on December 2 (**Figure 17**). Realized 30-day price volatility reached 23.5% on December 16, the lowest in over ten years.

Figure 17. Natural gas historical and implied volatility



Market-Derived Probabilities: The probability of the April 2014 Henry Hub contract expiring above \$4.00/MMBtu increased to 60% on January 2, 22 percentage points higher than the probability at the beginning of December (**Figure 18**).

Figure 18. Probability of the April 2014 Henry Hub contract expiring above price levels



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