

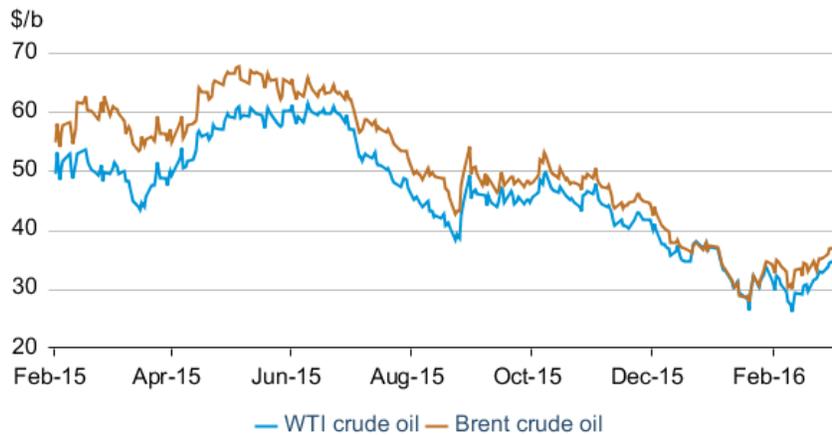


Short-Term Energy Outlook Market Prices and Uncertainty Report

Crude Oil

Prices: The North Sea Brent front month futures price rose \$2.83 per barrel (b) from February 1 to settle at \$37.07/b on March 3 (**Figure 1**). The West Texas Intermediate (WTI) front month futures price rose \$2.95/b and settled at \$34.57 over the same period.

Figure 1. Historical crude oil front month futures prices



Crude oil prices began to increase during the second half of February in response to potential future supply reductions and better economic data in the United States. Discussion of a potential plan to freeze production at January levels among leading Organization of Petroleum Exporting Countries (OPEC) and non-OPEC oil producers may have contributed to some covering of short positions ahead of a long weekend in U.S. markets. Such a plan, if adopted, could help support prices but recent statements suggest that such collaboration is not imminent. On the demand side, a larger-than-expected rise in both U.S. industrial production and existing home sales in January along with continued gains in U.S. employment supported crude and equity markets.

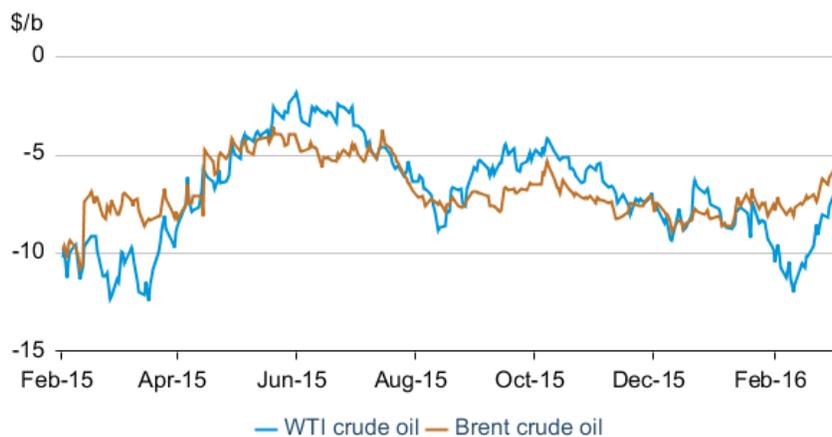
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The rise in front month crude oil prices toward the end of February was largely responsible for the decline in the price discount of near-term contracts to further-dated ones (contango) in the Brent market. The Brent 1st-13th spread decreased \$1.76/b since February 1 to settle at -\$5.78/b on March 3 (**Figure 2**). The contango in the WTI 1st-13th spread declined \$2.38/b over the same period to -\$7.43/b. After the front month WTI contract reached a price discount of \$12.01/b to the contract for delivery one year out on February 11, the contango began to decline despite [U.S. crude oil inventories](#) reaching a record high as of February 26. A rebound in gasoline consumption in February, along with declines in U.S. crude oil production and reductions in the number of U.S. oil rigs to the lowest level since 2009, may have lessened market participants' fears that storage capacity limits may be reached in the near future.

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



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Crude oil prices on the U.S. Gulf Coast strengthened over other domestic crudes and Brent crude prices in February. The Louisiana Light Sweet (LLS)-WTI spread increased 95 cents/b from February 1 to settle at \$2.15/b on March 3 (**Figure 3**). [Gross inputs to refineries in PADD 3](#) rose 0.1 million b/d from January to February, compared to a decline of 1.1 million b/d on average over the last five years. Higher LLS prices may have encouraged crude movements into the U.S. Gulf Coast, as [crude stocks rose in PADD 3](#) by 11.4 million barrels since January compared to an increase of 2.4 million in PADD 2. The Brent-LLS spread declined \$1.07/b from February 1 to settle at 35 cents/b on March 3 (**Figure 3**). With LLS at parity to Brent, the U.S. Gulf Coast may see an increase in crude imports in the coming weeks.

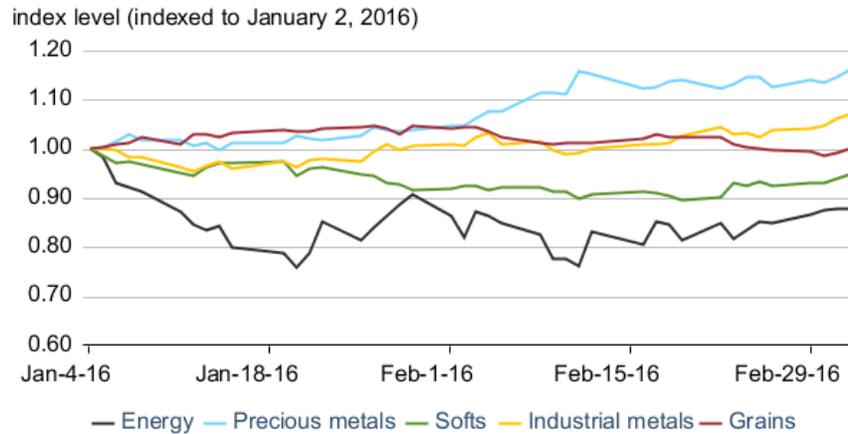
Figure 3. Historical crude oil differentials



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Energy and non-energy commodities: Since the beginning of 2016, energy commodity prices fell relative to nonenergy commodity prices. As of March 3, the energy component of the [S&P Goldman Sachs Commodity Index](#) (GSCI) declined 12% from January 4 (**Figure 4**). The precious metals and industrial metals components of the S&P GSCI rose 16% and 7%, respectively, while the grains component remained stable and the softs components (coffee, sugar, cocoa and cotton) declined 5% over the same period. Prices of different commodity groups typically move together when the main driver of commodity markets is global economic growth. When price movements diverge, it indicates there are market-specific or supply-side issues also affecting these commodities. Precious metals, specifically, tend to respond more to the risk of future economic growth and are also affected by volatility in foreign exchange markets. For energy commodities, increased crude oil production and rising crude and product inventory levels have contributed to the decline in prices so far in 2016. Commodities included in the industrial metals, grains, and softs components have responded primarily to changes in exports and production levels within their individual markets this year.

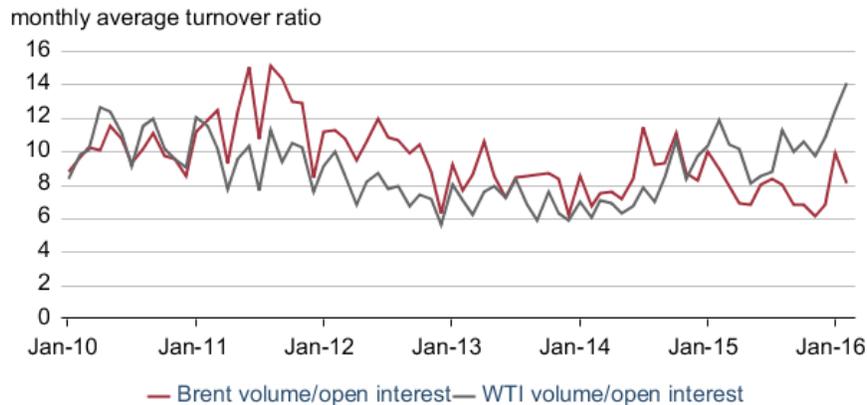
Figure 4. Select S&P GSCI components



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Crude oil trading volume and open interest: A measure of trading activity and liquidity of futures contracts is the average turnover ratio, calculated by the total monthly trading volume divided by the average monthly open interest in all futures contracts. The average turnover ratio for all WTI futures contracts reached a record high of 14 per day in February, and the average turnover ratio for all Brent futures contracts was 8 per day in February (**Figure 5**). Trading activity often increases when volatility rises. Historical volatility in the WTI front month futures contract was much higher than the historical volatility in the Brent front month futures contract recently, from a difference of near zero in November 2015 to a difference of over 9 percentage points in February. This divergence in volatility may have contributed to the recent rise in the turnover ratio for WTI futures contracts. In addition, in early 2015, open interest in Brent futures contracts surpassed the open interest in WTI futures contracts for the first time. Higher open interest without a corresponding increase in trading volume kept the turnover ratio for Brent futures contracts lower than that of WTI since 2015.

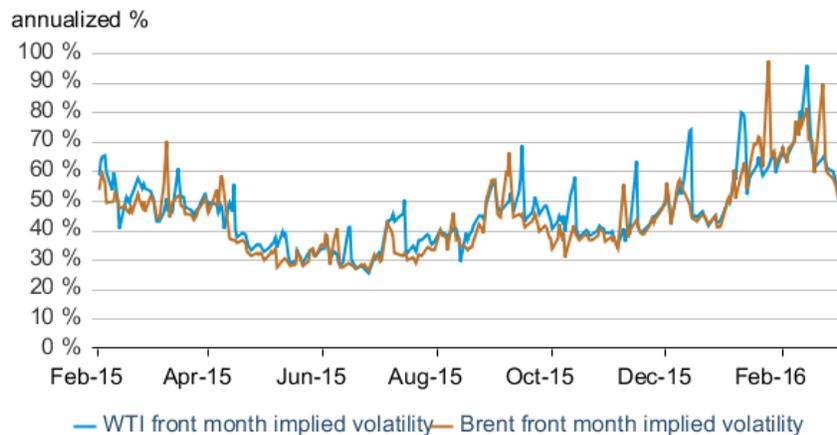
Figure 5. Crude oil futures total monthly volume divided by average monthly open interest



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Volatility: The implied volatility for both Brent and WTI front month futures contracts declined since February 1 by 16 and 14 percentage points, respectively, to settle at 50.4% and 51.6%, respectively, on March 3 (**Figure 6**). Despite the decline in implied volatility, both Brent and WTI had the highest average implied volatility in February since 2009, as uncertainty grew about potential changes to future global crude oil production growth.

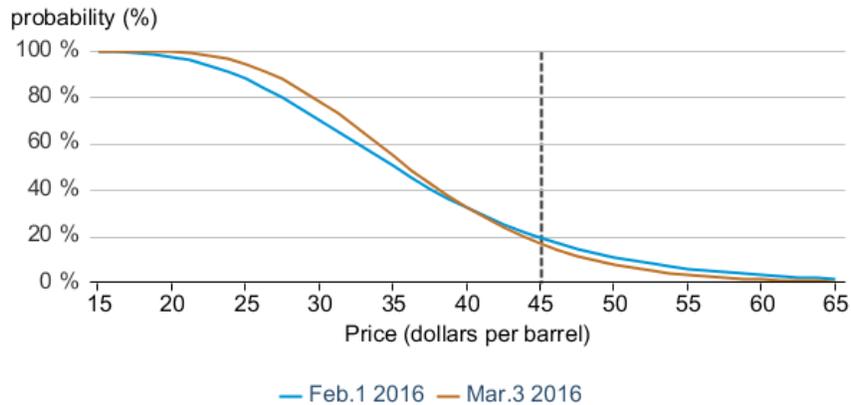
Figure 6. Crude oil implied volatility



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Market-Derived Probabilities: The June 2016 WTI futures contract averaged \$36.98/b for the five trading days ending March 3 and has a 17% probability of exceeding \$45/b at expiration. The same contract for the five trading days ending February 1 had a 19% probability of exceeding \$45/b (**Figure 7**).

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



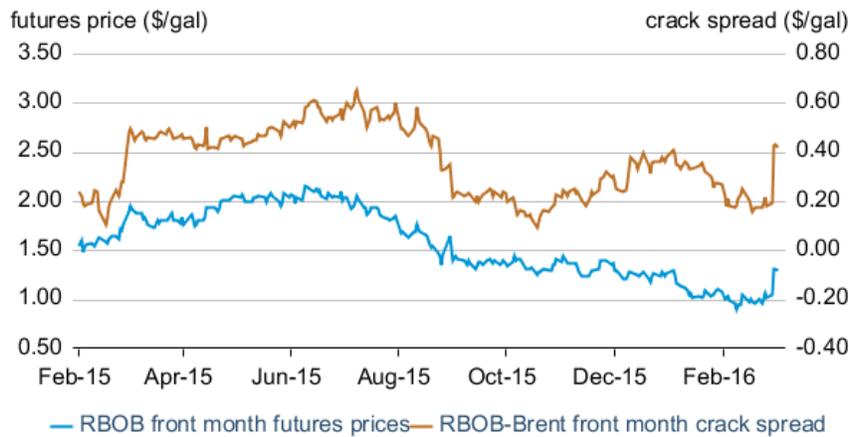
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Petroleum Products

Gasoline prices: The reformulated blendstock for oxygenate blending (RBOB, the petroleum component of gasoline) front month futures price increased 22 cents per gallon (gal) from February 1 to March 3, settling at \$1.30/gal (**Figure 8**). The RBOB-Brent crack spread increased by 15 cents/gal over the same period, settling at 42 cents/gal. Nearly all of the increase in gasoline prices was because of the contract rolling from March to April delivery, which represents a change from winter grade to more expensive summer grade gasoline.

Estimates from the [Weekly Petroleum Status Report](#) show that U.S. gasoline consumption plus exports were 5.5% higher in February compared with February 2015. Some of the increase is because February 2015 consumption was reduced by severe winter weather, but recent consumption plus exports data does indicate a return to strong gasoline consumption growth in the United States after slowing in January. As of February 26, total motor gasoline inventories were 14 million barrels above this time last year and production was 0.10 million b/d above year-ago levels. With gasoline crack spreads at similar levels to this time last year, upward price pressures from strong domestic demand for gasoline seems to be balanced against similar downward price pressure from elevated gasoline inventories and production.

Figure 8. Historical RBOB futures prices and crack spread

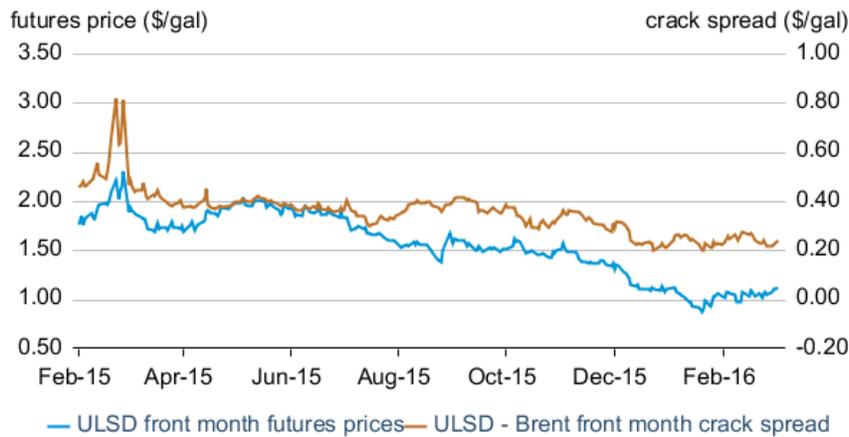


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Ultra-low Sulfur Diesel Prices: The front month futures price for the New York Harbor Ultra-low Sulfur Diesel (ULSD) contract rose 8 cents/gal from February 1 to settle at \$1.12/gal on March 3 (**Figure 9**). The ULSD-Brent crack spread increased by 2 cents/gal from February 1, settling at 24 cents/gal on March 3.

Despite the increase during February, the ULSD-Brent crack spread remains well below the levels of the past several years. U.S. consumption plus exports for ULSD and heating oil were 14.5% lower compared with February 2015 levels as warmer winter temperatures reduced U.S. consumption of heating oil, leading to higher inventories and lower prices compared to last year. Inventories in the [New England](#) and [Mid-Atlantic](#) regions (PADD 1A and PADD 1B) are a combined 19.6 million barrels above the five-year average and displayed a smaller seasonal decline than previous winters. PADD 1A and PADD 1B combined distillate inventories fell by 6.1 million barrels from the end of December to the week ending February 26, compared with the five-year average decline of 8.4 million barrels.

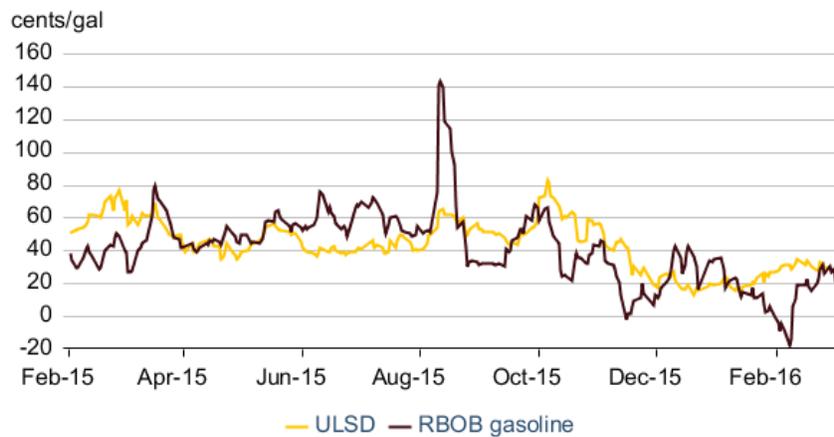
Figure 9. Historical ULSD futures price and crack spread



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Midwest crack spreads: Product market dynamics in the Midwest are creating higher volatility in gasoline and ULSD crack spreads for the Chicago area compared with New York Harbor or the Gulf Coast. In January, utilization of refineries in PADD 2 reached 97.4%, leading to rising petroleum product inventories in the region. Both total motor gasoline inventories and distillate inventories in PADD 2 reached near-record highs. Crack spreads responded by moving lower, with the Chicago ULSD-WTI crack spread dropping under 20 cents/gal in mid-January and the Chicago RBOB-WTI crack spread turning negative in early February (**Figure 10**). Although refineries reduced production, with utilization dropping to 91.7% for the week ending February 26, Midwest product prices will likely remain volatile with market participants needing to push out winter grade gasoline to make room for summer grade gasoline and with distillate inventories ending winter still near record highs.

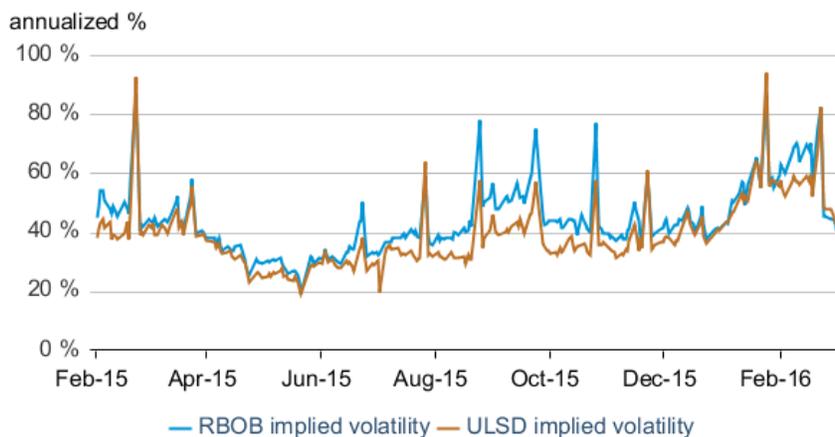
Figure 10. Chicago ULSD and RBOB gasoline crack spreads



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Volatility: Volatility for petroleum product futures fell as the front month contracts rolled to reflect April delivery instead of March. Petroleum product prices are usually more volatile in March as refinery turnarounds peak and the chance for severe winter weather remains. Implied volatility for the front month RBOB and ULSD futures contracts settled at 41% and 42%, respectively, on March 3, a decline of 19 and 13 percentage points, respectively, since February 1 (**Figure 11**).

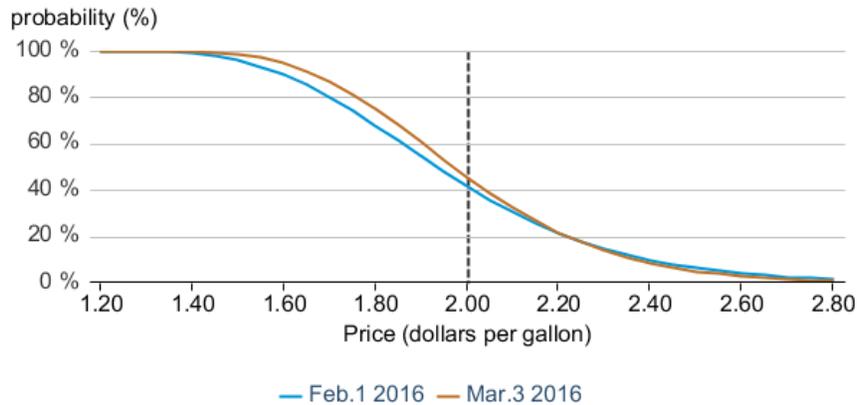
Figure 11. RBOB and ULSD implied volatility



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Market-Derived Probabilities: The June 2016 RBOB futures contract averaged \$1.35/gal for the five trading days ending March 3 and has a 46% 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 February 1 had a 42% probability of exceeding \$1.35/gal (**Figure 12**).

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

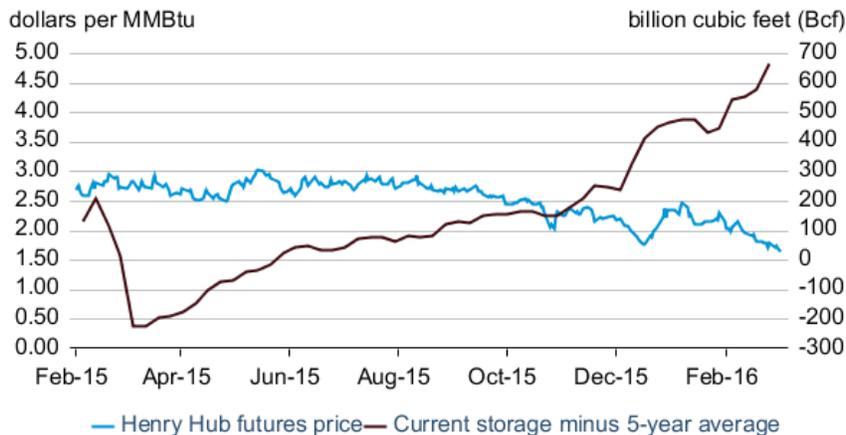


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Natural Gas

Prices: Although [U.S. working natural gas inventories](#) declined in February, the withdrawals from storage were less than the five-year average for this time of year. Inventories were 666 billion cubic feet (Bcf) above the five-year average for the week ending February 26, and prices moved lower in response (**Figure 13**). The front month contract for delivery of natural gas at Henry Hub, Louisiana, settled at \$1.64 per million British thermal units (MMBtu) on March 3, a decline of 51 cents/MMBtu from February 1. Natural gas futures prices are at the lowest levels since December 1998.

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

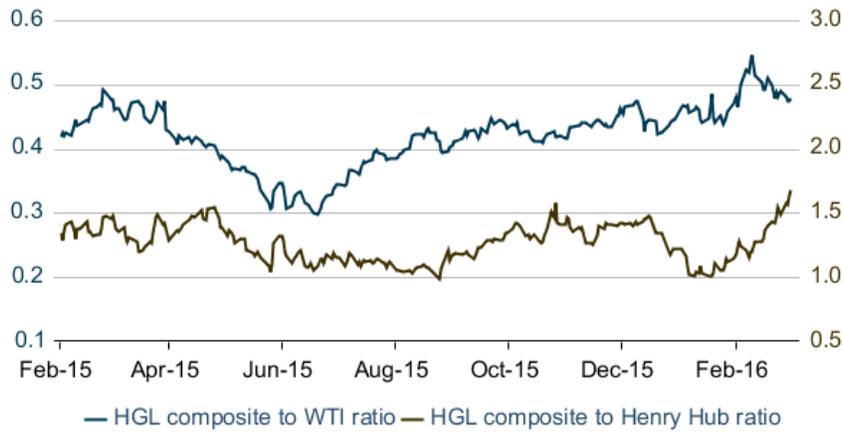


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Hydrocarbon Gas Liquids (HGL) Prices: Despite both crude oil and natural gas prices decreasing, the HGL market is showing some price strength. The ratio of the HGL

composite price index (an average price of propane, butane, isobutene, ethane, and pentanes plus, weighted by production) to both WTI and natural gas increased since the start of the year. The ratio of the HGL composite price to natural gas rose from 1.15 to 1.68 from February 1 to March 3 and the ratio to WTI peaked at 0.55 on February 11 (**Figure 14**). Recent price increases in propane and pentanes plus markets were the main drivers and make up 45% of the HGL composite price. Increased export capacity for HGL combined with strong international demand may be providing price support.

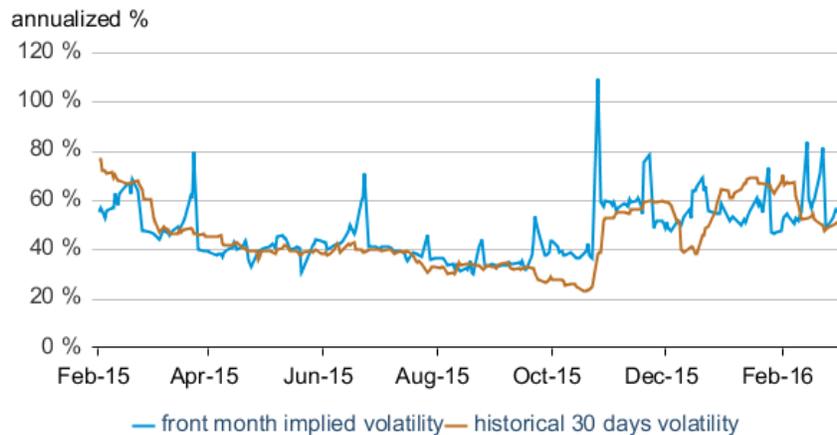
Figure 14. HGL price ratios



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Volatility: With the winter heating season coming to an end, natural gas volatility began its seasonal decline. Historical volatility declined 16 percentage points from February 1 to 51% on March 3, while implied volatility rose 9 percentage points to 56% over the same period (**Figure 15**).

Figure 15. Natural gas historical and implied volatility



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Market-Derived Probabilities: The June 2016 Henry Hub futures contract averaged \$1.91/MMBtu for the five trading days ending March 3 and has an 8% probability of exceeding \$2.50/MMBtu at expiration. The same contract for the five trading days ending February 1 had a 34% probability of exceeding \$2.50/MMBtu (**Figure 16**).

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

