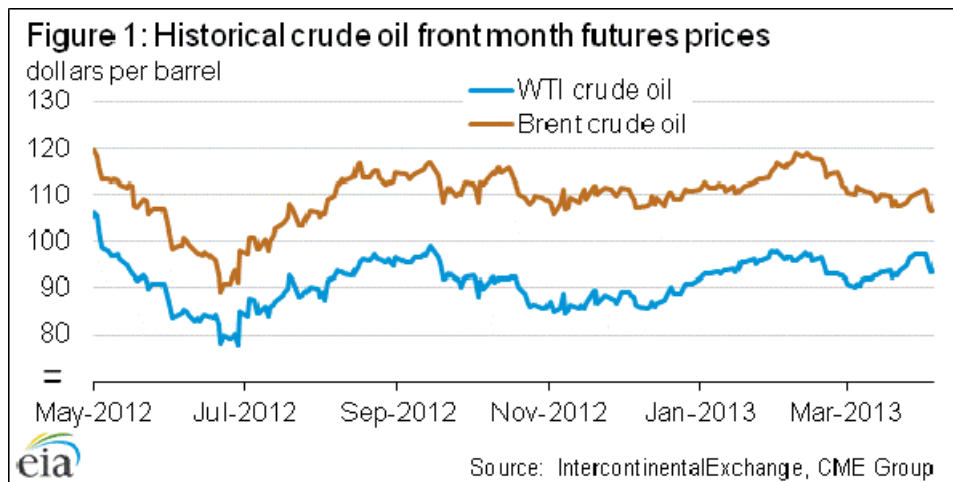




Short-Term Energy Outlook Market Prices and Uncertainty Report

Crude Oil

Prices: Brent crude oil prices moved lower from the beginning of March to the first week in April. The Brent front month crude oil futures price settled at \$106.34 per barrel on April 4, \$4.06 per barrel lower than on March 1 (**Figure 1**). The West Texas Intermediate (WTI) crude oil benchmark, on the other hand, rose over the last month, nearly reaching its 2013 high in March. The WTI front month futures price settled at \$93.26 on April 4, an increase of \$2.58 per barrel since March 1.



Recent disappointing employment, manufacturing, and service sector data in the United States has lowered expectations for economic growth and world crude oil and petroleum product prices. Financial uncertainty in the Eurozone in March, including challenges surrounding the solution of the banking situation in Cyprus, exemplified continuing economic challenges within the region, where economic malaise lingers.

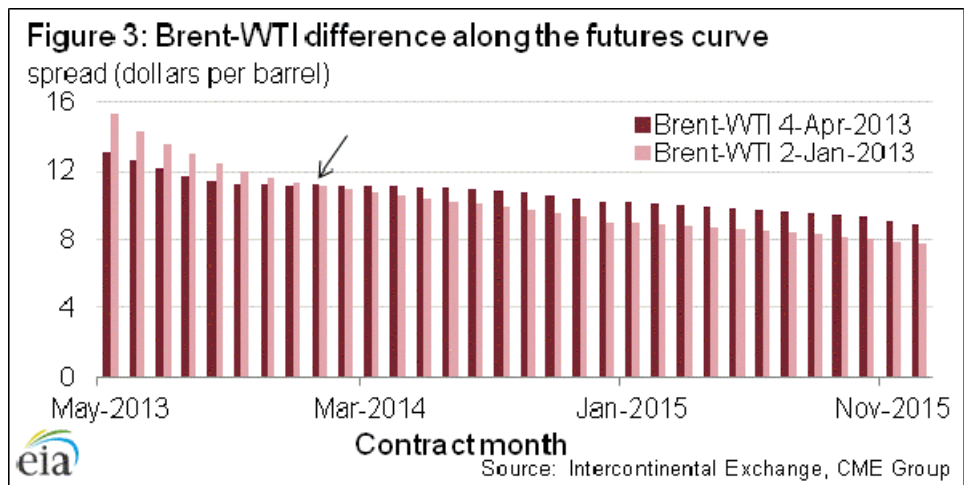
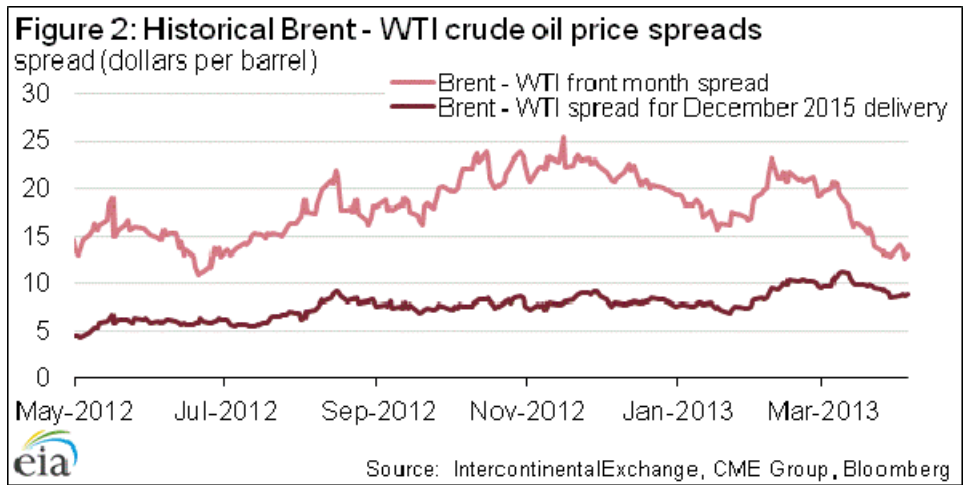
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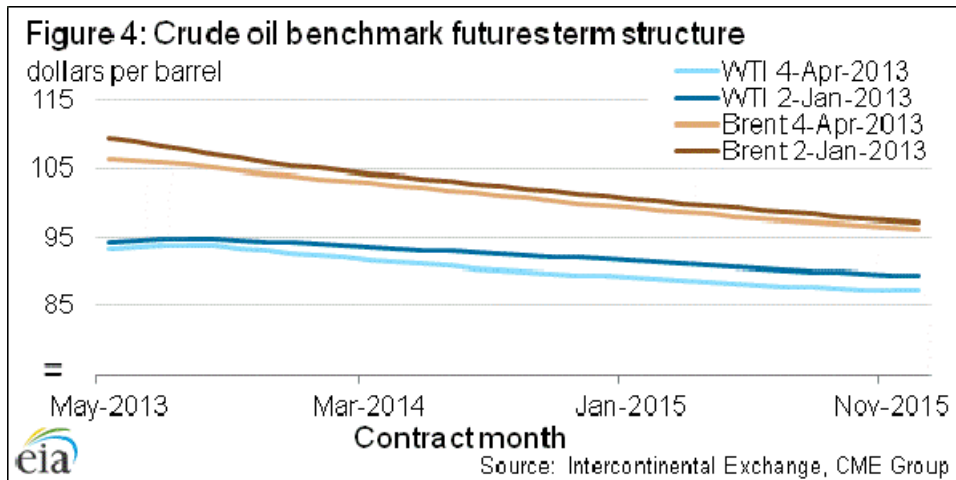
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Brent-WTI spread: The front month Brent-WTI spread narrowed to \$13.08 per barrel on April 4, its lowest difference since June 2012 and \$6.64 per barrel lower than on March (Figure 2). Several short-term factors affecting transportation constraints and production affecting these streams appear to be contributing to the narrower spread.

Apart from these short-term developments, however, long-term expectations for the Brent-WTI spread appear to be narrowing for 2013 deliveries but widening for later ones. In fact, since the beginning of this year, the spread has increased for all months of delivery after January 2014 and decreased for all deliveries before then (Figure 3).

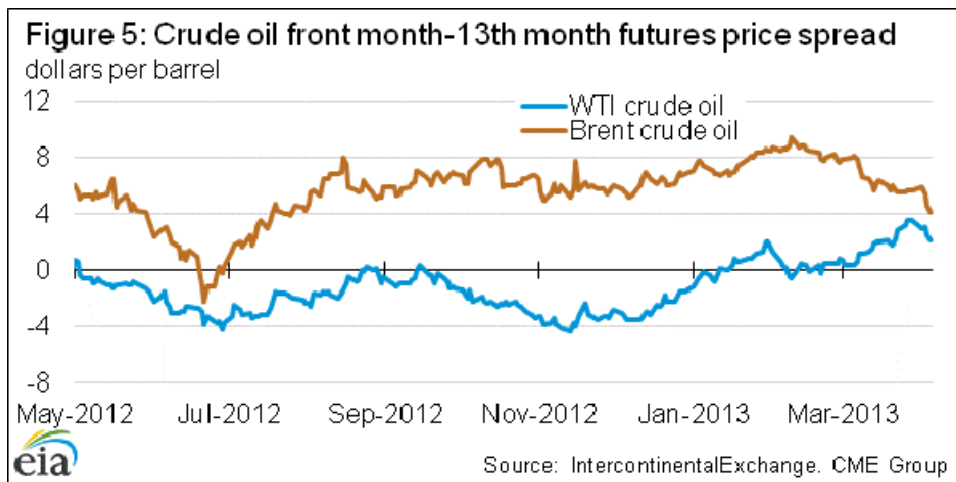


Due to this twist, the slope of the WTI futures curve is now approaching the same slope of the Brent futures curve (Figure 4). If this price pattern develops in reality, it would suggest that the forecasted increases in crude oil production in the United States will be met with additional transportation capacity either to refineries on the United States Gulf Coast via pipeline or from expanded rail capacity to refineries on the East and West coasts, with the marginal barrel of crude oil still being moved by rail.



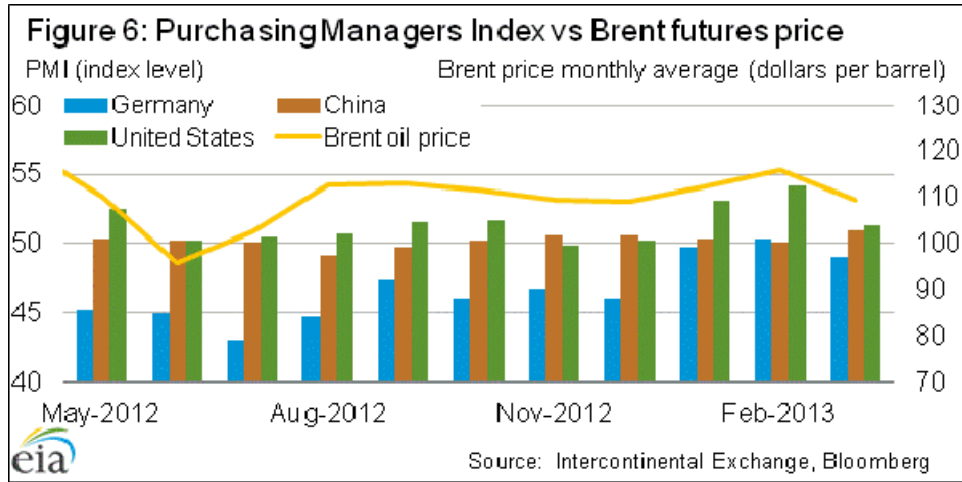
The 1st-13th time spread for WTI has increased to its highest level of backwardation (when near-term prices are greater than farther dated ones) since November 2011 during March and settled at \$2.17 per barrel on April 4 (**Figure 5**). Backwardation in the Brent futures curve is currently at its lowest point since December 2012 as the 1st-13th spread settled at \$4.17 per barrel on April 4.

The difference between the Brent-WTI spread was last this low in late June 2012; however, it was for very different reasons. At that time, the Brent futures curve moved into contango as uncertainty over world economic growth lowered expectations for near-term crude oil demand. The narrowing of the Brent-WTI spread in March 2013 is due to the WTI futures curve moving into backwardation.

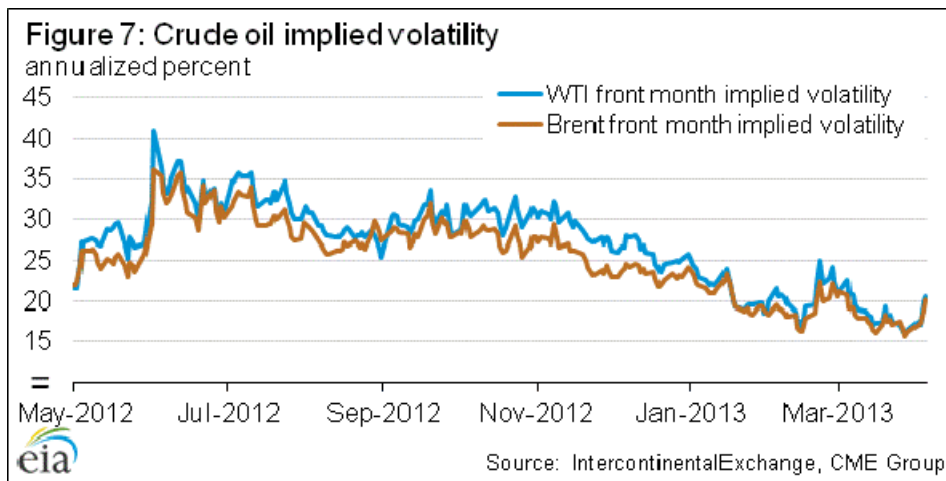


Purchasing Managers Index: The manufacturing Purchasing Managers Index (PMI) is a closely watched leading economic indicator that measures whether or not the manufacturing sector for a country is expanding or contracting (a level above 50 indicates expansion and a level below 50 indicates contraction). March PMI levels fell in both the United States and in Germany compared to February. The United States PMI

was 51.3 for March and indicated slower expansion than the previous month and the PMI for Germany was 49.0, representing contraction for the manufacturing sector in Europe’s largest economy (**Figure 6**). The PMI for China increased by 0.8 to a level of 50.9 in March; however, the increase in PMI from February to March, the first month after Chinese New Year, has averaged 2.1 over the previous three years, so the reading for March 2013 was relatively weak. These bearish manufacturing indexes for major oil-consuming nations around the world has lowered expectations for economic activity, a key driver of energy use.

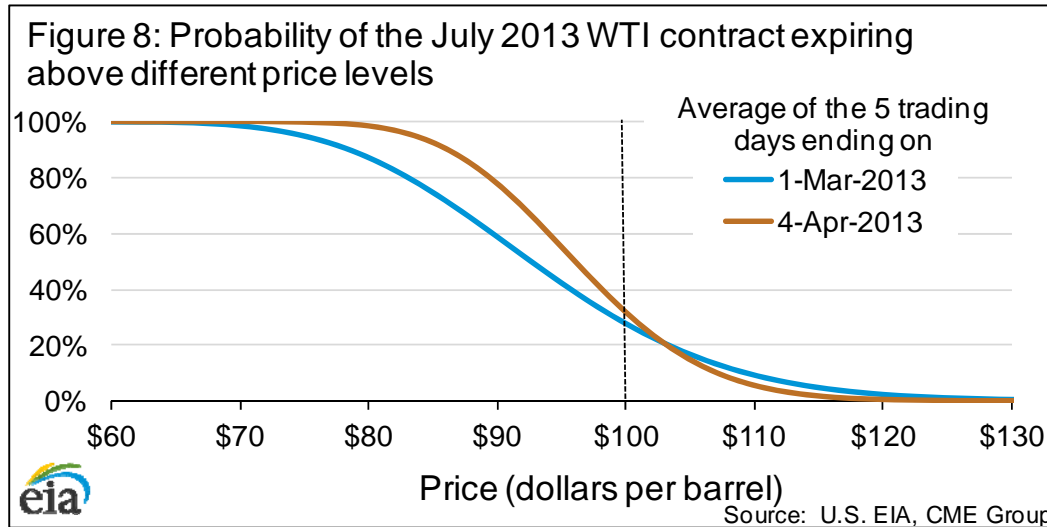


Volatility: Front month implied volatility for both the Brent and WTI crude oil benchmarks moved lower in March but then increased during the first week of April. Brent implied volatility settled at 20.2 percent and WTI implied volatility settled at 20.6 percent on April 4, 1.0 and 0.6 percentage points below their levels on March 1, respectively (**Figure 7**).



Market-Derived Probabilities: The July 2013 WTI futures contract averaged \$96.35 per barrel for the five trading days ending April 4 and has a probability of exceeding \$100

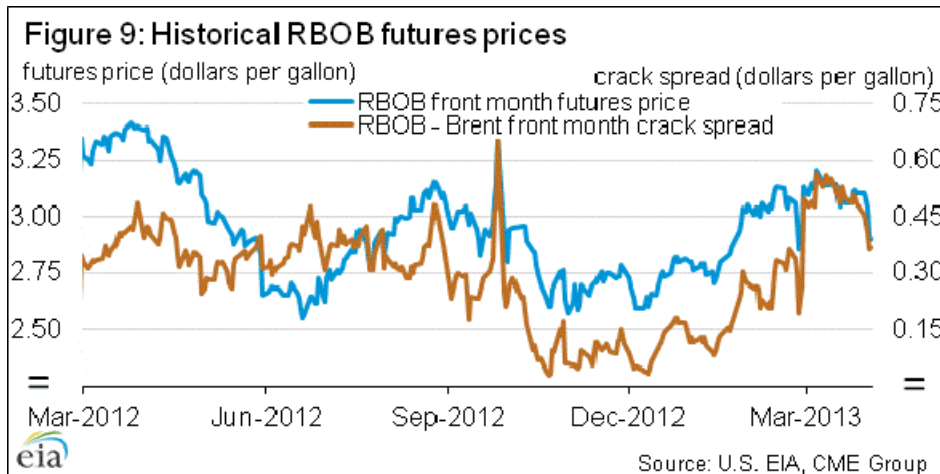
per barrel at expiration of approximately 32 percent. The same contract for the five trading days ending March 1 had a probability of exceeding \$100 of 28 percent (**Figure 8**). Given the elevated price of Brent relative to WTI, the probability of Brent futures contracts expiring above the same dollar thresholds is higher.



Petroleum Products

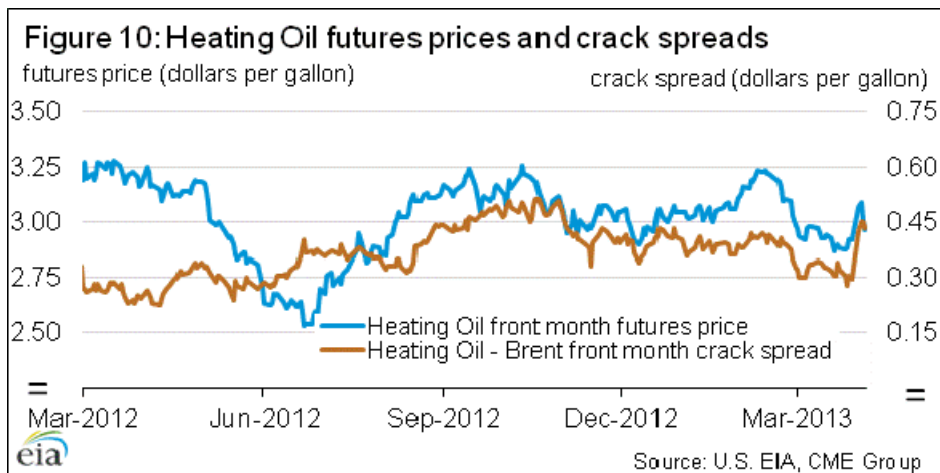
Gasoline prices: Reformulated blendstock for oxygenate blending (RBOB) futures prices remained relatively constant in March but declined in the first week of April. The front month contract settled at \$2.90 per gallon on April 4, \$0.23 per gallon lower than its settle price on March 1 (**Figure 9**). Over the same time, the RBOB-Brent crack spread decreased by \$0.13 per gallon. RBOB futures prices are currently \$0.43 per gallon below their levels at this time last year. The RBOB-Brent crack spread was higher in March 2013 compared to March 2012 but has since moved lower and is slightly below levels from this time last year.

United States refinery utilization rose over the past few weeks to 86.3 for the week ending March 29, the highest level since the first week of 2013. This has eased previous tightness in the gasoline market and led to lower prices and crack spreads compared to the beginning of March. Gasoline inventories have been declining over the last month but at a rate that's less than the draws that usually occur at this time of year. Gasoline inventories are within their five-year averages, signaling the market may be looser going into the summer driving season compared to conditions a few months ago.



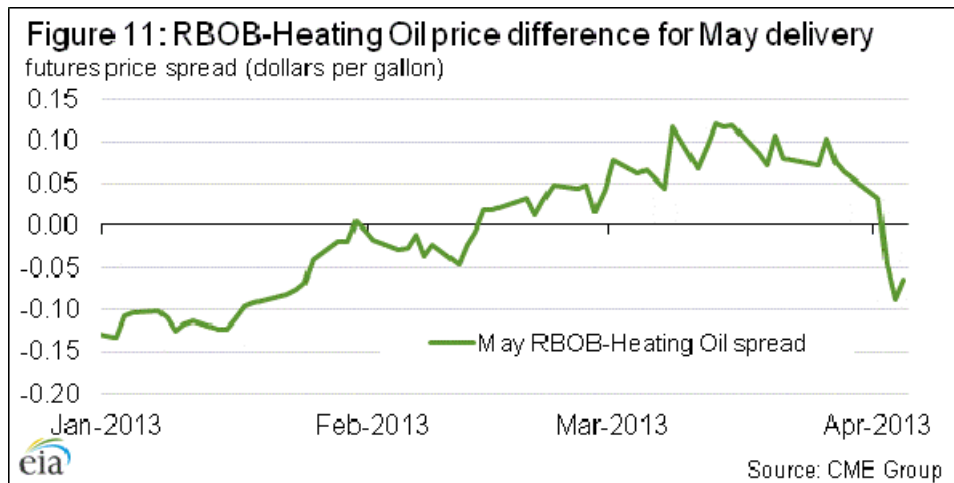
Heating Oil prices: The front month heating oil futures contract settled at \$2.96 per gallon on April 4, an increase of \$0.03 per gallon from March 1. The front month futures crack spread between heating oil and Brent settled at \$0.43 per gallon on April 4, a rise of \$0.13 per gallon since March 1 (**Figure 10**).

Unlike gasoline, middle distillate prices have been showing strength recently. Colder weather in the U.S. may be contributing to more demand of heating oil as temperatures in March were below normal, particularly in PADDs 1A and 1B where most of the distillate is consumed for heating purposes. Distillate inventories in the United States have experienced large draws over the last few weeks and are currently well below their five-year averages.

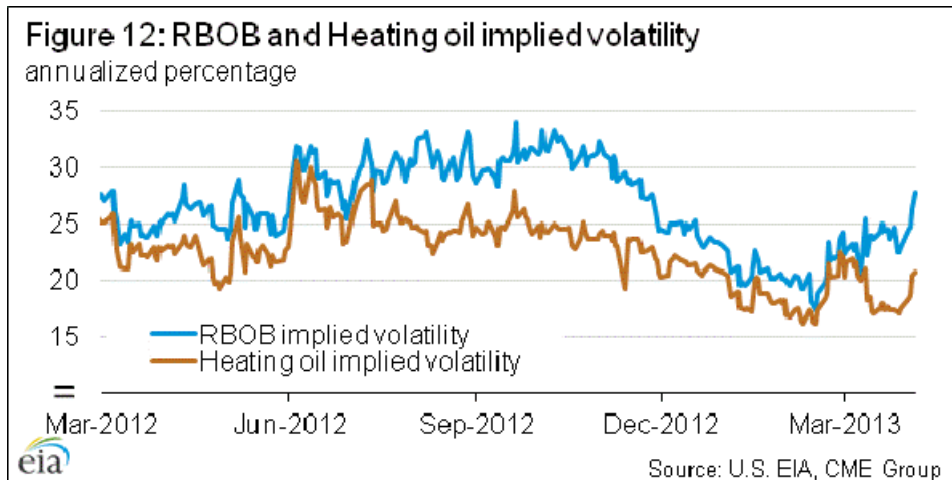


Gasoline-Heating Oil spread: Since January 2, the RBOB-Heating Oil spread for May delivery moved from -\$0.13 per gallon to a peak of \$0.12 per gallon on March 8 (**Figure 11**). Throughout the first quarter, refinery outages in the Atlantic basin pushed gasoline prices higher relative to middle distillate prices as those outages had a greater impact on gasoline production than on distillate production. At the same time, U.S. economic

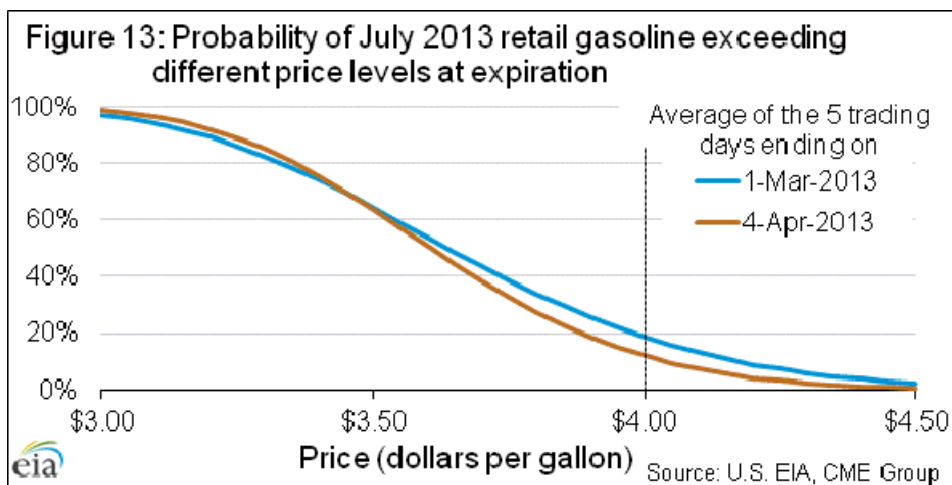
news was more positive in the first quarter compared to the rest of the world, particularly Europe and China. Since the rest of the world uses relatively more distillate than gasoline compared to the U.S., the situation caused expectations for gasoline demand to increase compared to distillate demand. With both of those causes for higher gasoline prices alleviating over the last week as refinery utilization increased amid disappointing economic news in the U.S., the May RBOB-Heating Oil spread has rapidly reversed and fallen back below zero, settling at -\$0.07 per gallon on April 4.



Volatility: Implied volatility for the front month RBOB and Heating Oil contracts diverged in March. RBOB implied volatility increased by 5.1 percentage points since March 1 to settle at 27.8 percent on April 4 (**Figure 12**). Over the same time, implied volatility for the front month heating oil contract declined by 1.0 percentage points to settle at 20.7 percent on April 4. Higher implied volatility in the gasoline market relative to heating oil may just be a return to the relationship that occurred last year, when RBOB implied volatility traded above heating oil implied volatility every day of the year. In recent years, RBOB prices have tended to move in greater magnitudes in reaction to refinery outages or closures, while movements in heating oil prices have been more consistently tied to Brent crude oil prices.

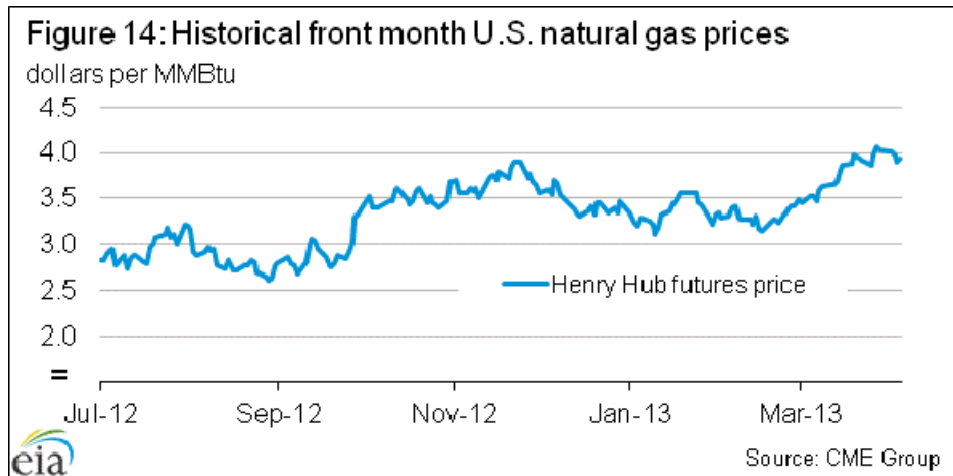


Market-Derived Probabilities: The July 2013 RBOB futures contract averaged \$2.97 per gallon for the five trading days ending April 4 and has a probability of exceeding \$3.35 per gallon (typically leading to a retail price of \$4.00 per gallon) at expiration of approximately 12 percent. The same contract for the five trading days ending March 1 had a probability of exceeding \$3.35 of 19 percent (**Figure 13**).



Natural Gas

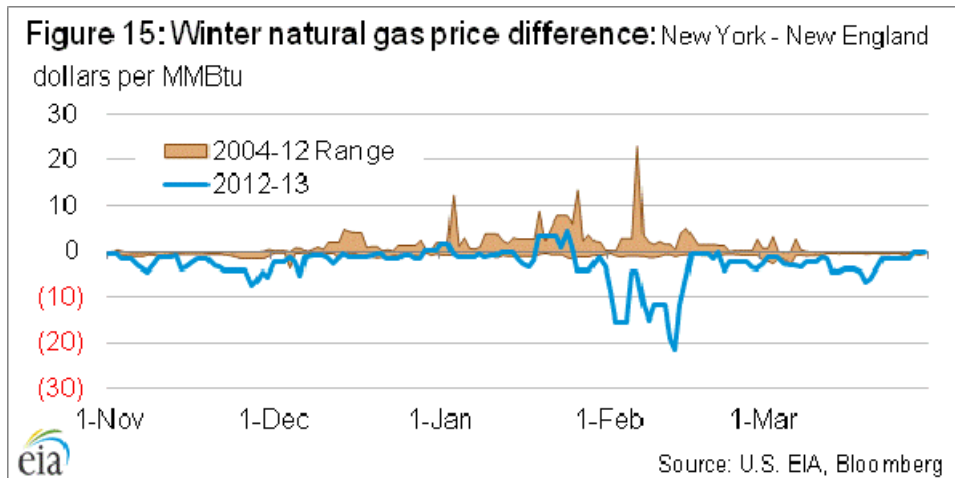
Prices: The front month futures price settled at \$3.95 per MMBtu on April 4, increasing \$0.49 per MMBtu from the price on March 1 (**Figure 14**). Colder weather compared to last year continued to contribute to higher year-on-year growth in natural gas consumption and rising prices over the past month.



Price and Storage Level: Natural gas prices tend to be inversely correlated to the difference between the current year storage level and the five-year average. According to EIA, the storage level was 37 Bcf below the five-year average as of March 29, 2013, compared to 900 Bcf higher at the end of March 2012. In winter 2011-12, warm temperatures resulted in low natural gas consumption and historically high storage levels, driving natural gas prices down to the very low level of under \$2 per MMBtu in April 2012. Lower prices also helped to stimulate higher consumption. As storage returned to seasonal norms near the end of March 2013, prices rose to around \$4 per MMBtu.

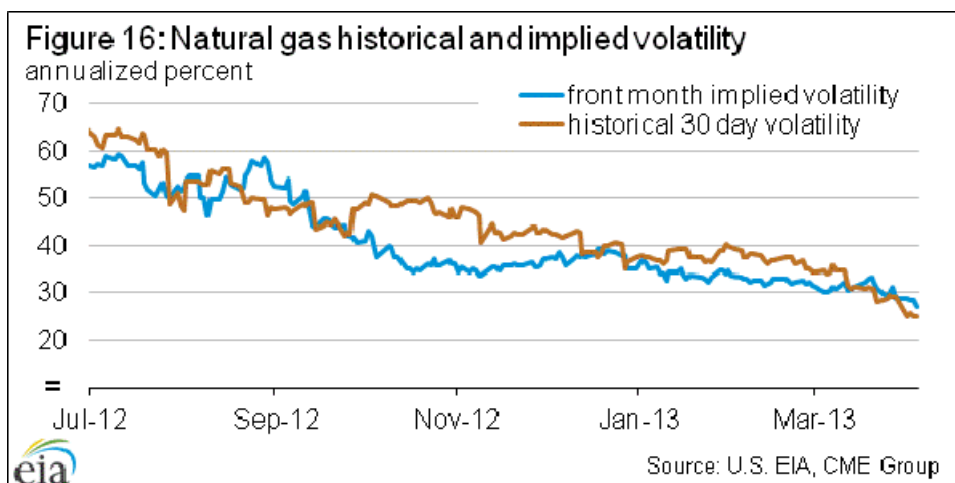
New York and New England Basis Differential: In periods of peak demand during the winter, it is not unusual for “citygate” wholesale natural gas prices in New York and New England, which are distant from traditional production areas, to rise above prices elsewhere due to transportation constraints.

Between 2004 and 2012, the winter spot prices of New England and New York City moved together with differences typically in a small range of a few dollars. In extreme weather conditions, prices in New York City briefly jumped much higher. But the dynamics changed abruptly during winter 2012-13, with New England prices higher most of the winter, and more than \$10 higher for 11 days (**Figure 15**).

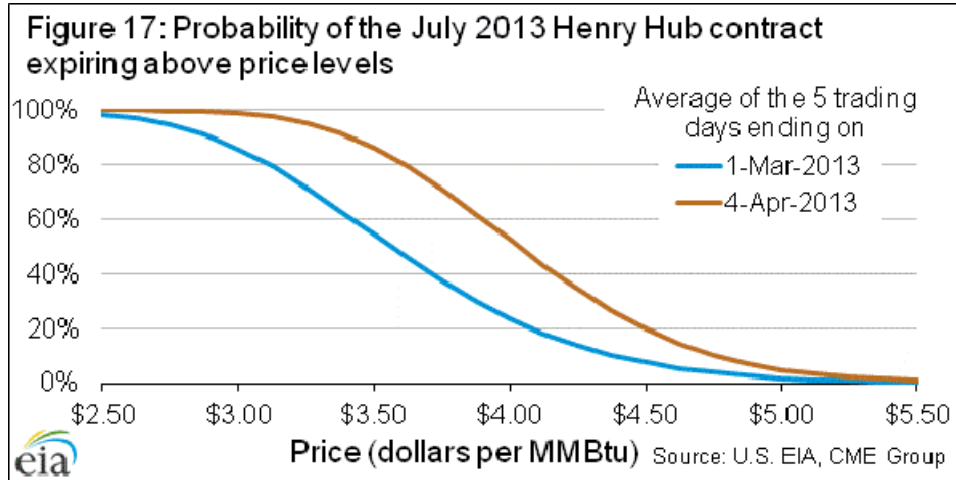


This change coincided with significant growth in production from the Marcellus shale in Pennsylvania and ongoing and planned increases in incremental pipeline capacities to increase supply to New York City. But similar activities are not as strong in New England. In addition, the dwindling of supplies from eastern Canada, particularly from Sable Island aggravated the supply constraint in New England. More importantly, because natural gas prices have generally been lower in North America than in international markets, liquefied natural gas (LNG) imports have fallen. These factors have contributed to the changing relationship between New York City and New England spot prices.

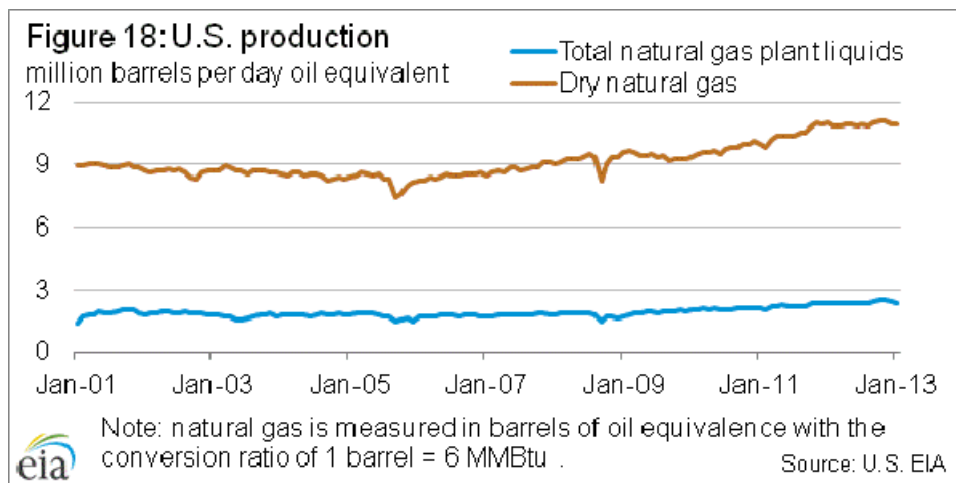
Volatility: Implied volatility for the front month futures contract continued to decline in March, settling at 27.1 percent on April 4, 4.0 percentage points lower than at the beginning of March. Historical volatility declined sharply during March, settling at 24.9 percent on April 4, 9.6 percentage points lower than at the beginning of March (**Figure 16**). Because volatility is measured as a percentage, it often is reduced when prices go higher. Implied volatility also decreased in March, but at slower rate.



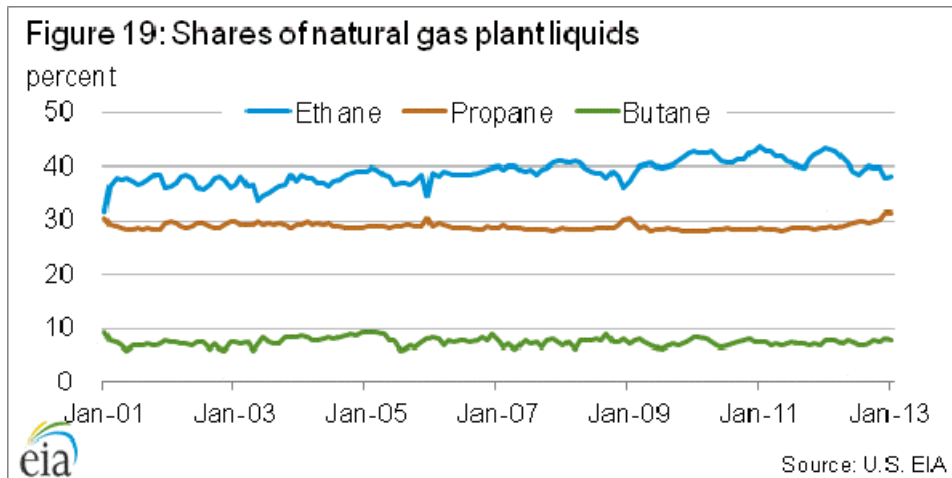
Market Derived Probabilities: The probability that the July 2013 contract will settle higher than \$4.00 per MMBtu increased 29 percentage points, from 24 percent to 53 percent, when compared to market conditions on the five trading days ending March 1, mostly a result of the increase in price (**Figure 17**).



Natural Gas versus Natural Gas Plant Liquids (NGPL): The U.S. shale gas and tight oil boom changed the landscape of North American energy supply. Production of NGPL increased accordingly. The monthly average of daily production volumes of dry natural gas and NGPL delivered from natural gas processing plants are plotted (**Figure 18**), where dry gas is converted to barrels of oil equivalent with the ratio of 1 barrel = 6 MMBtu. NGPL production amounts to approximately 20 percent of dry gas production on equivalent basis.

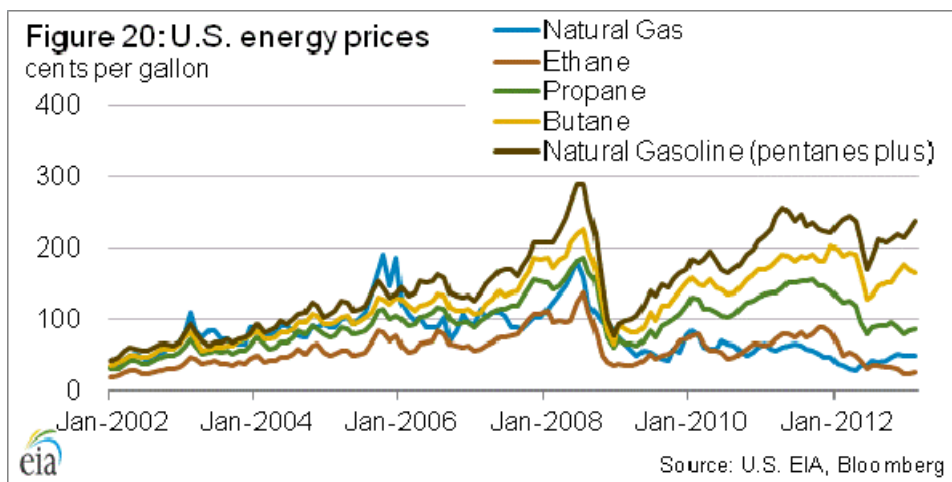


The shares of specific products in the total liquids produced from natural gas processing plants differ by source and by region. For the United States as a whole, producers obtain about 40 percent ethane, 30 percent propane, and 10 percent butane (**Figure 19**).



With the increase of production, U.S. natural gas prices declined. But natural gas liquid (NGL) prices remained strong in 2010 and 2011, which encouraged natural gas producers to drill more wells to extract value from the liquids, despite the downward pressure on natural gas prices as a result of additional production of dry natural gas. Prices of natural gas and all NGL declined significantly in the first half of 2012. Prices of natural gas, butane, and natural gasoline recovered somewhat in the second half of 2012, but the propane and ethane prices remain down (**Figure 20**).¹

The impact of ongoing developments and proposed projects to expand markets and export opportunities for NGL may help to increase demand and support a turnaround in prices. While exporting liquefied natural gas (LNG) requires capital investment of billions of dollars to build liquefaction plants, the barrier for exporting NGL is much lower.



¹ The natural gas price is the monthly average of Henry Hub spot prices in cents per gallon, using the conversion factor of 1 barrel = 6 MMBtu; prices of ethane, propane, butane, isobutene, and natural gasoline are spot prices traded at Mont Belvieu, Texas. Natural gasoline, also known as pentanes plus, is not the same as motor gasoline used in vehicles.