
Final-Quarter Supply Doubts Mar Record Year

2018 U.S. crude market fundamental highlights.

Morningstar Commodities Research

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Data Sources for This Publication

U.S. Energy Information Administration,
CME, Baker Hughes, Commodity Futures
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To discover more about the data sources
used, [click here](#).

Rosy Picture

During the first three quarters of 2018, the U.S. crude market experienced few constraints. Crude producers surpassed output records set in 1970, refiners processed record quantities, and exports reached new highs as resurgent shale production set the agenda, marred only by pipeline constraints in the Permian. The rosy picture began to crack in October as world supply exceeded expectations and West Texas Intermediate prices began a 44% decline in the final quarter. Uncertainty about Iranian deliveries after the U.S. reimposed sanctions and then issued waivers, as well as concerns about the determination of OPEC and its partners to cut production, muddied the supply picture. A trade war between the U.S. and China threatens demand growth. The effectiveness of OPEC's December agreement remains unclear, and the year ended with heightened crude price volatility and forward curves in contango territory.

The following analysis highlights nine fundamental trends in the 2018 North American crude market based on Morningstar C&E research during the past year.

Crude Prices

Exhibit 1 shows WTI crude prices during 2017 and 2018 together with summary statistics comparing with 2017. At \$64.90/barrel, average WTI prompt crude futures were \$14.05/barrel higher in 2018 than in 2017 (\$50.85/barrel). After increasing steadily in the second half of 2017, WTI prices continued their bullish run through the first three quarters of 2018 to peak at \$76.41/barrel on Oct. 3 in response to expectations that renewed U.S. sanctions against Iran would tighten supplies by year-end. Instead, higher output by Saudi Arabia and Russia, together with ongoing increases in domestic production and waivers issued to Iranian crude buyers by the U.S. Treasury, combined to demolish bearish supply sentiment, leading to a 44% price crash in the final quarter of 2018 to a low of \$42.53/barrel on Christmas Eve, which was coincidentally the lowest settle in 2017 on June 21. Prices ended December at \$45.41, down \$15.01/barrel, or 25% for the year.

Compared with 2017, the range of WTI prices was \$16/barrel wider at \$33.88/barrel in 2018. Annual average 21-day historical volatility (see our September 2016 note [Short Speculators Chase Crude Price Volatility](#) for more on the volatility calculation) was 1.9 percentage points higher in 2018 (25.81%) than 2017 (23.91%). Both years were relatively calm compared with 2016, when volatility averaged 43.6%. The price plunge increased volatility in the final quarter of 2018 to average 33.6%, and daily volatility ended the year above 55%.

Exhibit 1 WTI Crude Prices 2017 and 2018 and Comparative Statistics With 2017

| | 2017 | 2018 |
|---------------------|-------|-------|
| Average | 50.85 | 64.90 |
| High | 60.42 | 76.41 |
| Low | 42.53 | 42.53 |
| Range | 17.89 | 33.88 |
| Historic Volatility | 23.91 | 25.81 |



Source: CME Group, Morningstar.

Forward Curve

Exhibit 2 shows CME Nymex forward curves for the first trading day of 2018 (red line), the last days of quarter 1 (dark blue), quarter 2 (green), quarter 3 (yellow), and quarter 4 (pale blue) aligned over the same delivery range.

For most of the year, the futures market had a backwardated structure where forward prices were lower than today, but in the final quarter, the curve flipped to contango (see our May 2016 note [Lengthy Heating Oil Contango](#) for more on contango).

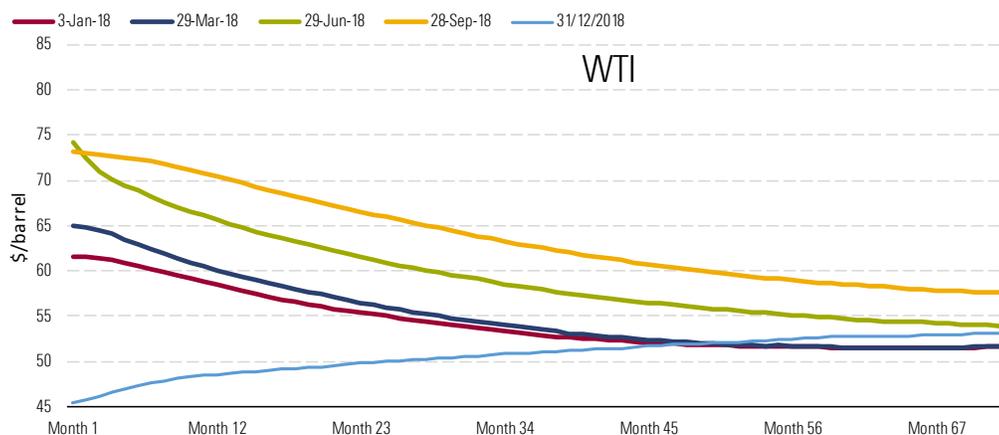
The back end of the curve beyond month 56 had a very similar shape at the start and the end of the year, suggesting prices in the low \$50s/barrel five years out. Higher values at the front of the curve during the second and third quarters raised the five-year horizon to the mid- and upper \$50s at the back of the curve.

One- and five-year backwardation were highest in the end-June curve at negative \$8.56 and negative \$20.25, respectively, with those values narrowing by the end of September. By the end of December one-year contango had reached \$3.09 and five-year \$7.60 as the crash at the front of the curve implied an oversupplied prompt market providing an incentive to store for future consumption.

Most analysts expect prices to recover somewhat at the start of 2019, as the 1.2 million barrels/day production cut announced by OPEC and partners on Dec. 7, 2018, in Vienna begins to take effect. We note that the previous production cut agreed in December 2016 did not propel prices consistently higher until the second half of 2017, showing that it can and does take time to convince the market that supplies have tightened sufficiently to warrant higher values.

Meantime, higher prices in the first three quarters of 2018 created great opportunities for U.S. producers to hedge future output. Calendar strips for 2019, 2020, and 2021 were between \$64 and \$71/barrel at the end of September, but 2019 and 2020 had both fallen below \$50/barrel by year-end.

Exhibit 2 WTI Forward Curves



Source: CME Group, Morningstar

Commitments of Traders: Speculation

In a September 2016 note, [Short Speculators Chase Crude Price Volatility](#), we discussed the activity of managed money or hedge funds in the crude oil futures market. Our analysis of 2016 showed good correlation between prompt futures price volatility and the accumulation of short positions by hedge funds.

In 2017, with lower volatility and a long spell of rising prices in the second half, the speculative story was all about bullish funds building a record long position that continued into the first quarter of 2018. During the remaining three quarters of 2018, the bulls slowly trimmed their long positions—speeding up their sales in the final quarter (Exhibit 3). The forward curve flip to contango at the end of 2018 discourages long speculators, since rolling their prompt positions before they expire and buying new positions further out generates a negative roll yield. Higher volatility at the end of 2018 encouraged increased short selling, but we expect the OPEC agreement to underpin prices in 2019 and draw a line under bearish sales.

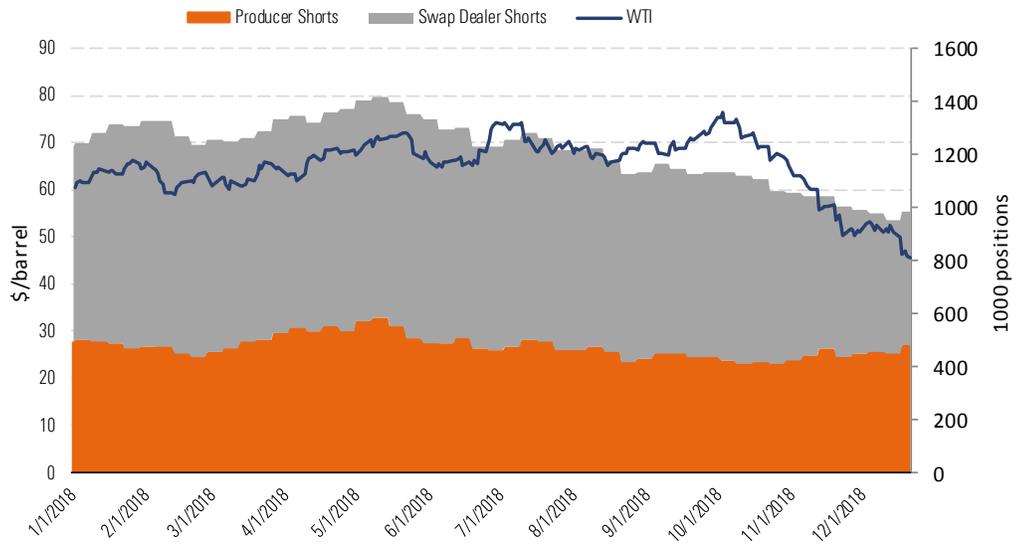
Exhibit 3 Speculator Long Positions

Source: CFTC, Morningstar.

Commitments of Traders: Hedging

The Commodity Futures Trading Commission data provides an estimate of U.S. crude hedging based on the number of short contract positions held by the "producer/merchant/processor/user" category—otherwise known as physical hedgers—combined with short contracts held by intermediaries called swap dealers, which reflect producer option purchases. Exhibit 4 shows the number of shorts held by both categories in 2018 as well as prompt WTI crude. Such hedges increased during the first five months as crude prices rose, suggesting U.S. shale producers locked in prices for increasing volumes of future production in 2019 and beyond. Hedging levels fell during the second half of the year, perhaps initially in hopes of yet higher prices in the wake of Iranian sanctions, and later as crude prices crashed in the final quarter of the year making hedging uneconomic as prices fell below the \$50/barrel level considered critical for typical U.S. shale producers to break even.

Exhibit 4 Producer and Swap Dealer Short Positions With WTI Prompt



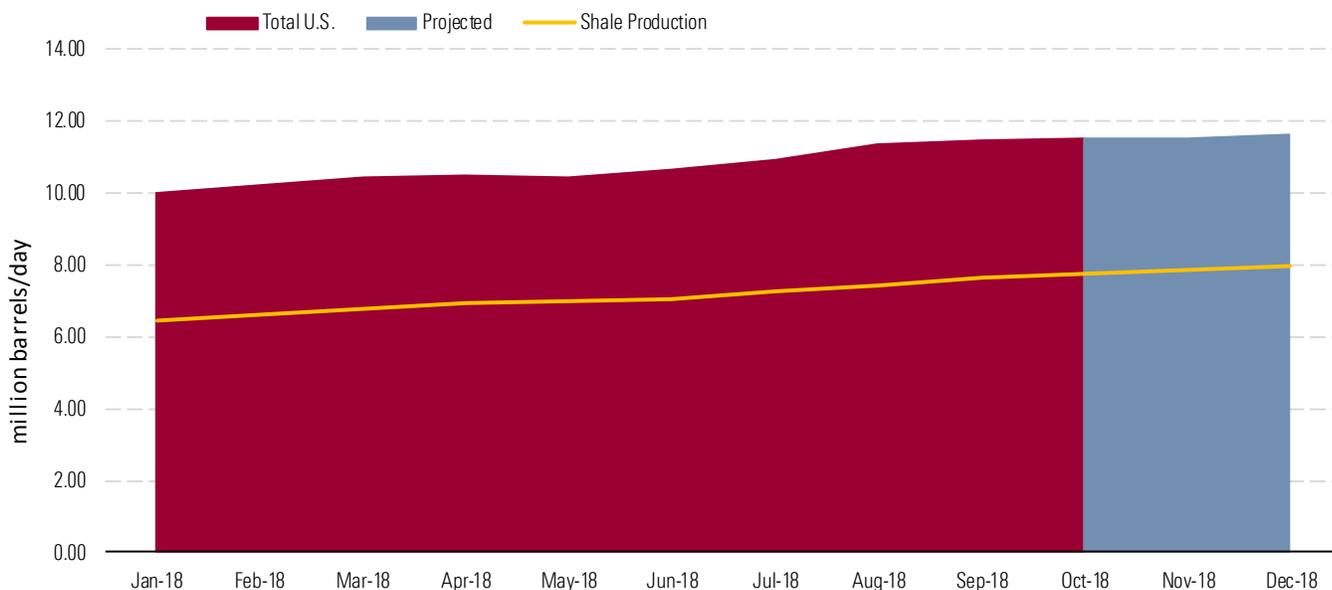
Source: CME Group, CFTC, Morningstar

Crude Production

U.S. crude production reached new highs in 2018, surpassing the previous record monthly output of 10.044 mmb/d in November 1970 during February and ending the year with confirmed October numbers from EIA of 11.54 mmb/d and estimates for November and December of 11.51 and 11.62 mmb/d, respectively (Exhibit 5). These volumes put the U.S. at the top of the world production league table ahead of Saudi Arabia and Russia. The estimated 2018 average output of 10.9 mmb/d easily surpasses the previous U.S. record of 9.6 mmb/d set in 1970 and represents a year-over-year increase of 1.55 mmb/d. EIA is forecasting 2019 output to increase by another 1.2 mmb/d to average 12.06 mmb/d.

Record production was encouraged by rising prices during the first three quarters of 2018 as well as continued improvements in rig productivity that kept shale drilling and recovery rates growing even as prices crashed during the fourth quarter. The EIA monthly Drilling Productivity report indicated that shale output represented the bulk of 2018 growth (yellow line in Exhibit 5). December estimated shale crude output of 8 mmb/d represents 69% of total U.S. production that month. Shale oil drilling rig counts continued to increase—up by 138 between January and November 2018 although December prices below \$50/barrel threaten to slow drilling activity if they do not recover in 2019.

The production stats for 2018 would probably have been higher were it not for transportation constraints in the largest basin, the Permian in West Texas. Here, pipeline congestion discouraged producers from taking full advantage of high prices as shippers bid down prices in the Midland production hub. A slowdown in the Permian and elsewhere in 2018 led to a 26% increase in wells drilled but not completed to produce oil (known as DUCs).

Exhibit 5 Total U.S. and Shale Crude Production 2018

Source: EIA, Morningstar

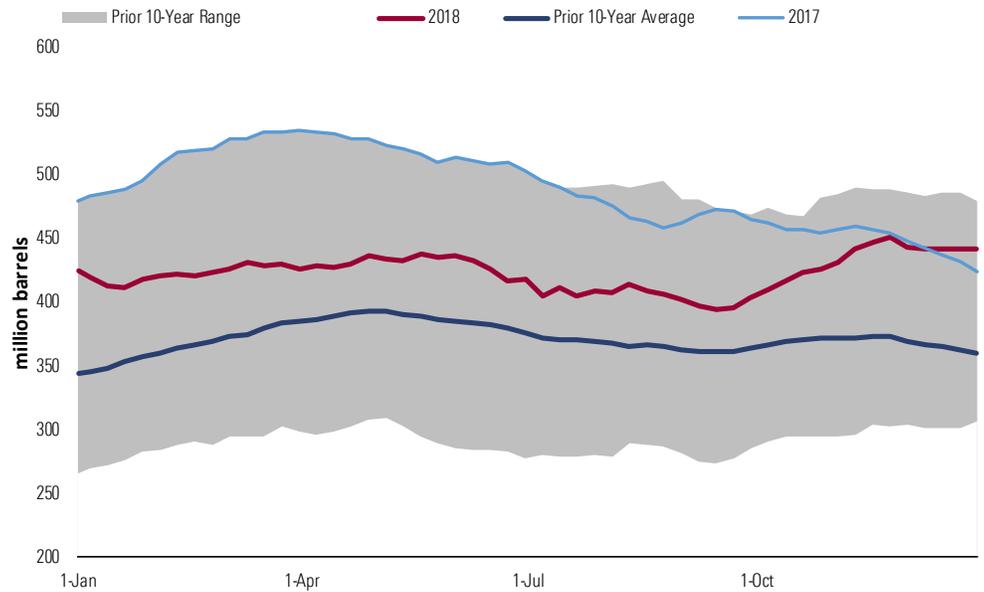
Crude Inventory

Total U.S. commercial crude inventories ended 2017 at 424 million barrels after falling 21% from a peak of 535 mmbbl at the end of the first quarter as OPEC production cuts encouraged draws. Inventory declines continued through mid-January 2018, but the slide ended then and tank levels followed seasonal norms through the end of September before growing again in October and November and remaining flat in December (Exhibit 6). At year-end, stocks were just 18 mmbbl higher year on year and 82 mmbbl, or 23% above the 10-year average.

Much of the inventory build in the final quarter of 2018 occurred in the Gulf Coast region as crude production continued to increase and exports leveled off when China reduced purchases. Also significant was an end to the long decline in Cushing crude stocks that peaked at 70 mmbbl in March 2017 and fell below 22 mmbbl in August 2018. Increased production in the Rockies and midcontinent, together with congestion out of the Permian in West Texas, led to a renewed build at Cushing that added 17 mmbbl in the fourth quarter.

The inventory builds in the final quarter of 2018 cause concern that overproduction in the U.S. is not being absorbed by international export demand. These levels don't yet offer decisive evidence of surplus supplies but combined with the advent of a contango futures market in December they warrant close monitoring as the OPEC production cuts are implemented in the new year.

Exhibit 6 Total U.S. Crude Inventory

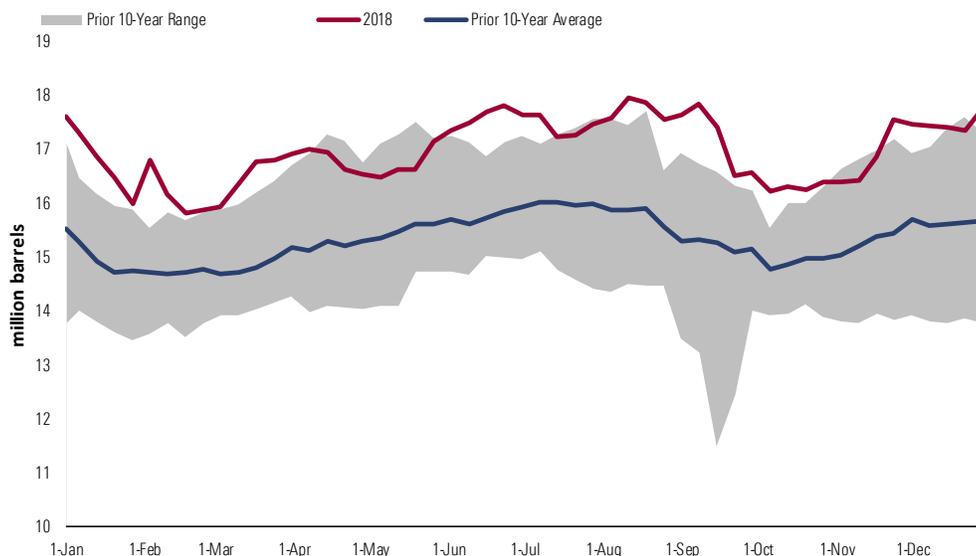


Source: EIA, Morningstar.

Refinery Throughput

After a record 2017, when they processed an average 16.57 mmb/d of crude, according to EIA, U.S. refiners upped their game again and input an average 16.99 mmb/d in 2018 (Exhibit 7). Increased throughput in 2018 came with minimal additions to operable capacity and represent an annual average 93.1% utilization rate based on weekly EIA data. The 2018 refinery input levels were consistently above the prior 10-year average.

Exhibit 7 Refinery Throughput



Source: EIA, Morningstar.

Crack Spreads

Record crude processing reflected strong refining margins realized throughout the year, as demonstrated by the 3-2-1 crack spread that averaged \$18.19/barrel and the 2-1-1 crack spread that averaged \$19.43/barrel in 2018 (Exhibit 8).

The 3-2-1 crack spread is a representative measure of U.S. refiner margins based on producing two thirds of a barrel of gasoline and one third of a barrel of diesel for every barrel of crude processed and using CME Nymex crude (WTI Cushing), unleaded gasoline (New York Harbor), and ultra-low-sulfur diesel (New York Harbor) contracts. The 2-1-1 crack reflects equal output of diesel and gasoline. During 2018, diesel prices were higher than gasoline except for a 20-day period in March, meaning refiners able to boost diesel output to the same level as gasoline achieved better returns.

Both the 3-2-1 and 2-1-1 crack spreads represent margins for processing domestic light sweet crude. Refiners on the Gulf Coast, in the Midwest, and the Rockies that could process heavier grades achieved higher margins if they processed western Canadian crude that was heavily discounted below WTI due to transport constraints.

An undesirable side effect of higher diesel margins is that record refinery runs produce similar if not larger volumes of gasoline that exceeded domestic and export demand, leading to high inventory levels by year end. Higher gasoline stocks have resulted in a price collapse that threatens refinery margins unless demand picks up in 2019.

Demand for diesel will strengthen further in 2019 as the January 2020 implementation of new low sulfur IMO bunker specifications nears. Higher volumes of ultra-low sulfur distillates will be needed both to replace high sulfur fuel and to blend it down to meet the new 0.5% sulfur requirement.

Exhibit 8 Crack Spreads

Source: CME Group, Morningstar

Crude Exports

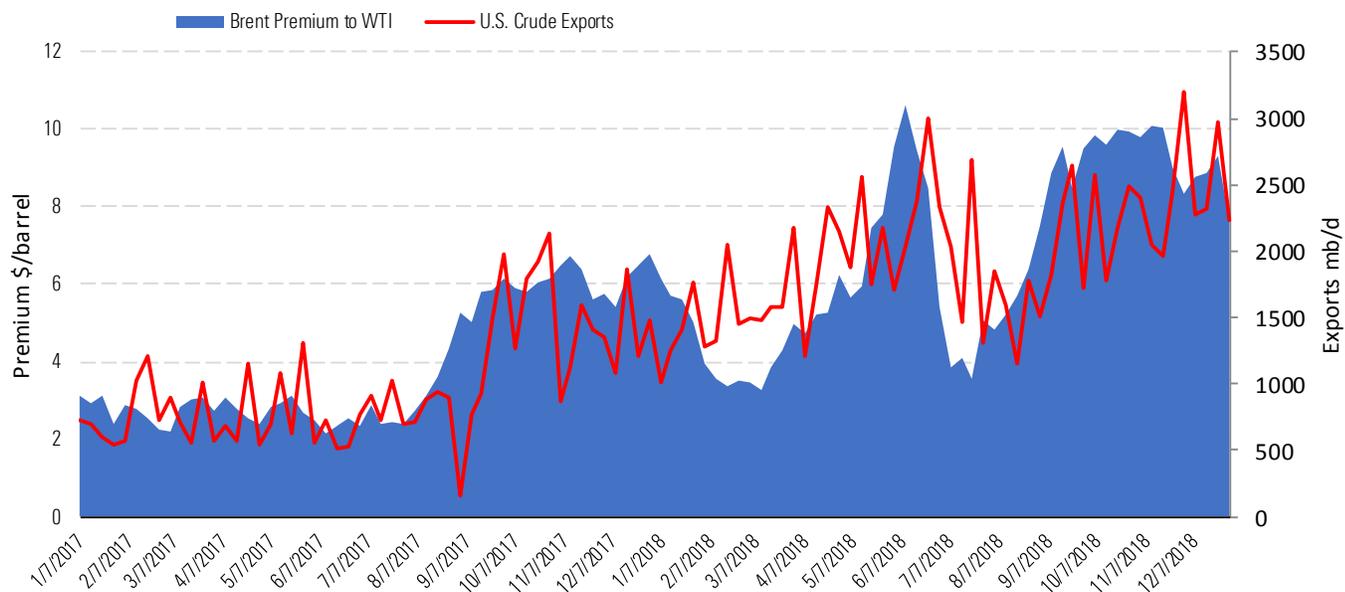
After more than doubling in 2017 to average 1.16 mmb/d, crude exports increased an estimated 73% to an average 1.98 mmb/d in 2018, according to EIA monthly data through October and weekly averages for November and December. The continued strength of exports is underpinned by record U.S. production of shale oil that is not needed by U.S. refiners as well as a wide premium over WTI for competing international-grade North Sea Brent crude.

Exhibit 9 shows weekly EIA crude export estimates (red line) and the weekly average Brent premium to WTI Cushing (blue shading) during 2017 and 2018. The weekly average Brent premium increased to \$6.78/barrel in 2018 from \$3.89/barrel in 2017, encouraging higher export volumes.

As stated in our December 2017 note ([Weekly Crude Exports Now Significant Indicator](#)), we believe exports are now the most significant factor in the U.S. crude market. That's because they are the default destination for incremental shale production if prices are competitive in international markets and U.S. supplies can replace those of other international producers.

Factors that slow exports are a narrowing Brent premium over WTI and an oversupplied market. In this respect, the futures curve switch to contango and a narrowing of the Brent premium during the last week of December are cause for concern over exports. If exports slow while domestic production remains high, then inventories will increase accordingly.

Exhibit 9 Crude Exports and Brent Premium



Source: CME Group, EIA, Morningstar

In 2018, destination markets for crude were led by Asia, with an average 45% of shipments (based on EIA monthly data through October) then Europe with 32%, Canada 19%, and 5% to South America and the Caribbean. Asian shipments were led by deliveries to China between January and July, when Chinese refiners stopped purchases in response to the U.S.-China trade war. Increased shipments to India and Korea in the third quarter made up for some of the lost China trade.

Although crude exports to Europe are typically carried on 1-million-barrel capacity Suezmax tankers that can be loaded at several U.S. Gulf Coast docks, Asian buyers prefer to use larger VLCC supertankers that carry 2 million barrels. These supertankers are too big to load directly at Gulf Coast ports (except for the offshore LOOP terminal in Louisiana). During 2018, several proposals to build deep-water load facilities that can handle VLCCs have been made. The first of these will not be built until 2021 at the earliest, so we expect some dock congestion if export volumes continue to grow rapidly in 2019.

2019 Outlook

Increased crude price volatility in the final quarter of 2018 reflects market uncertainty about the supply/demand balance that will continue into 2019 until the impact of OPEC and partners' production cuts is better understood. We believe WTI prices bottomed out just before Christmas at \$42.53/barrel, but lower-than-expected demand or poor production discipline will increase downward pressure. If supply and demand are balanced by the end of the first quarter, then prices will recover above \$55/barrel. Assuming that to be the case, U.S. crude production and exports will continue to break records in 2019 and infrastructure issues will come to the fore until new pipelines come on line out of the Permian during the third quarter. The refining market will be dominated by the transition required to meet new bunker fuel specifications in January 2020. ■■■

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