Record Low Price and High Volatility

Crude market fundamentals review 2020.

Morningstar Commodities Research
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Sandy Fielden
Director, Oil and Products Research
+1 512 431-8044
sandy.fielden@morningstar.com

Data Sources for This Publication
EIA
CME Group
U.S. Census

Crash Response

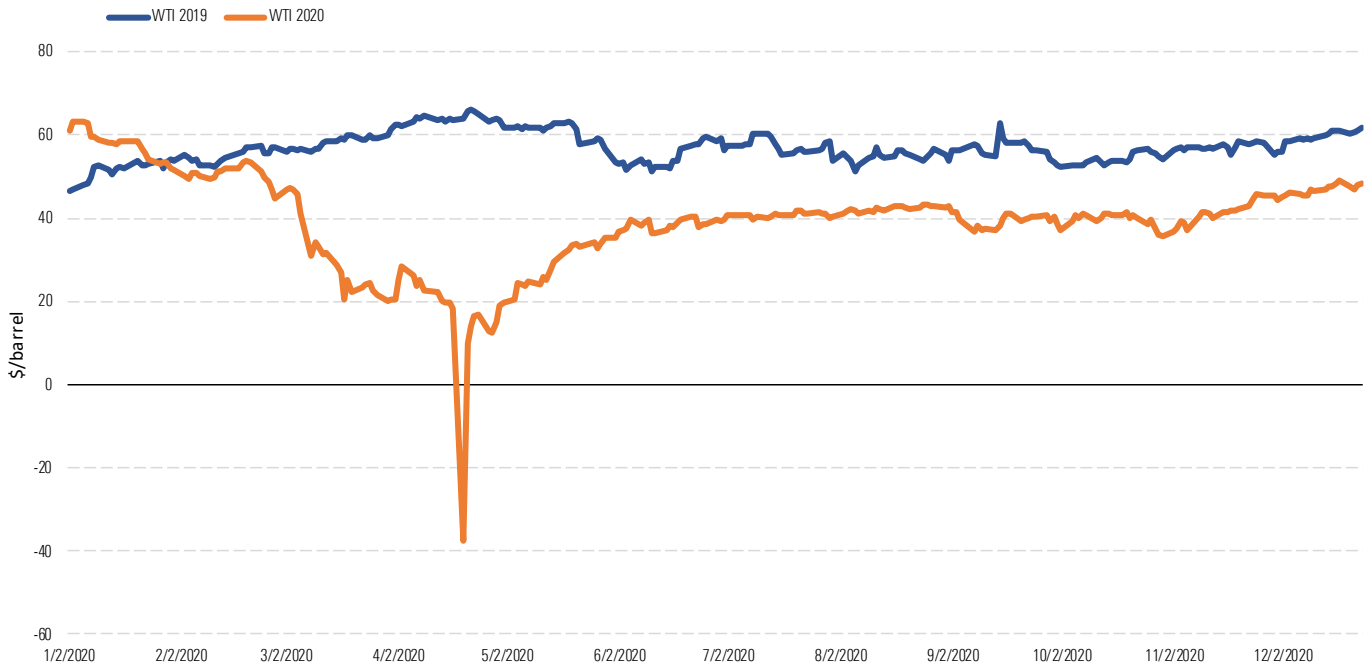
It's no surprise our year-end analysis of the U.S. crude market is a report card on the effects of the coronavirus pandemic. The impact took hold in early March as government lockdowns destroyed demand for transport fuels and refiners slashed crude consumption. The low point came on April 20, when prices on the CME Group futures exchange for the West Texas Intermediate, Cushing, Oklahoma, May delivery contract settled at negative $37.63/barrel. That record low is destined to haunt every historical crude chart axis and anchor one tail of every risk manager's distribution analysis for the foreseeable future. The crash triggered production shut-ins and storage builds as well as the worst year for refining margins in a decade. By year-end, vaccine-fueled hopes pushed crude prices back close to $50/barrel, but second waves of the virus and uncertainty about the length of recovery still weigh on the market.

Crude Prices

As of Dec 24, average prices for benchmark WTI crude prompt futures this year were ~$18/barrel lower than last (Exhibit 1). This year's high came on Jan. 6 at $63.27/barrel and prices fell slowly from then on, dipping below $50/barrel at the end of February before collapsing 25% in one day to $31/barrel on March 9. That followed Russia and Saudi Arabia embarking on a price war for market share after they failed to agree on extending OPEC+ production cuts. That decision came just as western economies commenced lockdowns that reduced U.S. refinery demand for crude by 3.5 million barrels/day in April, compared with January levels according to the Energy Information Administration. With no demand to mop up surplus crude, access to scarce storage capacity took precedence. A lack of storage to deliver May WTI futures contracts at Cushing was the fundamental straw that broke the market's back on April 20 when prices settled in negative territory for the first time ever at the year's low of negative $37.63/barrel before recovering to $10.01/barrel the following day.

Exhibit 1 WTI Prompt Crude Prices 2019 and 2020

	2019	2020
Average	57.04	39.20
High	66.30	63.27
Low	46.54	-37.63
Range	19.76	100.90
Historic Volatility	25.91	147.99



Source: CME Group, Morningstar.

By June 22, WTI prices recovered above $40/barrel after OPEC+ agreed to a drastic production cut of 9.7 mmb/d and U.S. producers shut in 2.8 mmb/d during May in an effort to stem the crude surplus. The drastic cuts balanced the market and restored relative calm as prices traded in a $7.60/barrel range between the end of June and Thanksgiving, before pushing up close to $50/barrel during November and December on vaccine news and an OPEC+ agreement not to taper their cuts too rapidly next year. Crude prices this year settled over a $101/barrel range that was widened by the April 20 volatility. This year's range was 5 times higher than the $20/barrel range in 2019.

Historic Volatility

Our measure of historic volatility is 21-day WTI settlement returns within a 253-day annualization period. In 2019 crude volatility averaged 26%, within normal range. This year's April 20 black swan event blew annual average volatility out to 146% with crude prices averaging 1,160% volatility during the month after the negative settlement (Exhibit 2).

Exhibit 2 WTI Historic Volatility and Prices 2020

Source: CME Group, Morningstar.

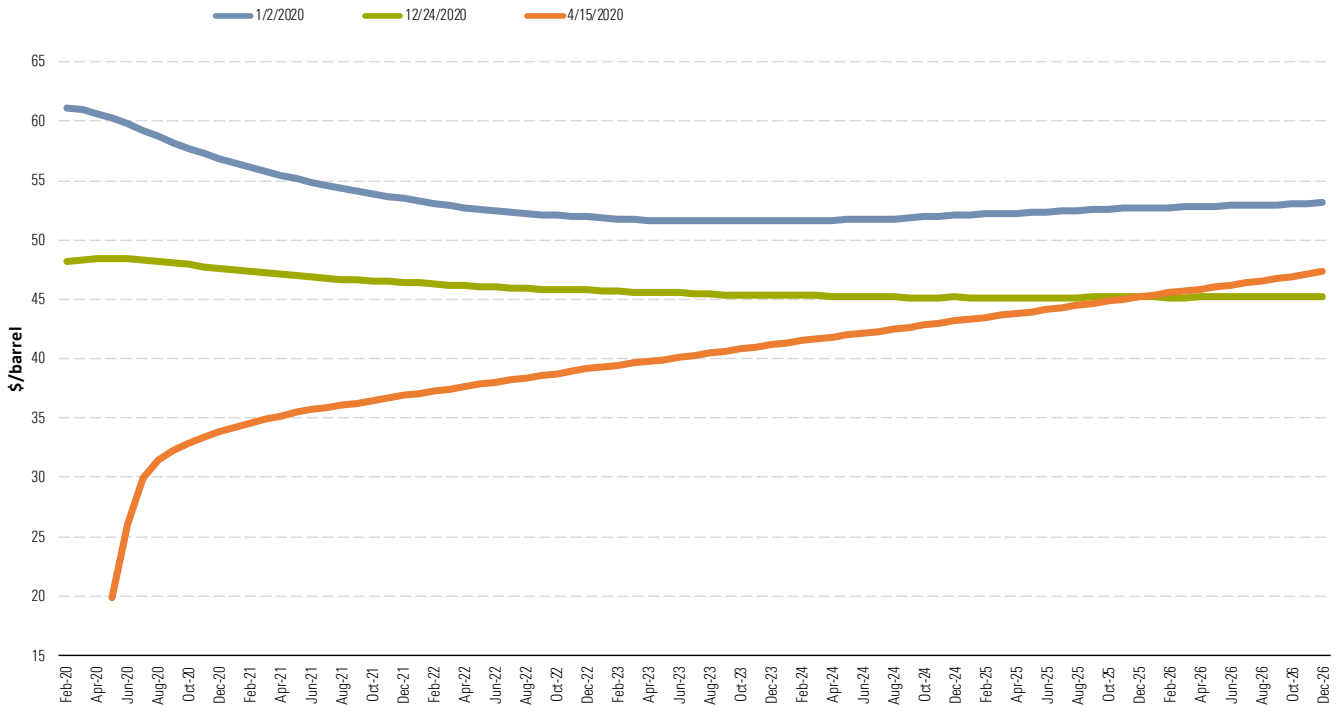
Forward Curves

Bookend futures curves for CME WTI crude this year were both in backwardation—a market condition where prices in the future are lower than today—with Jan. 2, 2020 printing a $4.28/barrel premium for the February 2020 prompt contract over the December 2020 contract and the Dec. 24, 2020 curve showing backwardation of $0.58/barrel between the February and December 2021 contracts (Exhibit 3).

At the start of the year, prompt prices were over $60/barrel and crude inventories and refinery throughput below 2019 levels. Markets expected increased U.S. shale output as growing Permian production took advantage of new pipelines online to Corpus Christi and Houston, Texas. This past Thursday on Dec. 24, the curve was also in backwardation. The current curve has recovered from lows earlier in the year but is relatively flat as questions persist over when demand recovery will occur and how long it will take for transport consumption to return to 2019 levels.

Despite the bookends reflecting lower price outlooks, the forward curve actually spent the majority of the year in the opposite market condition, contango—where future prices are higher than today—reflecting surplus supply and encouraging storage. Looking at the spread between prices for delivery 12 months forward and prompt delivery, the market was in contango on 83% of 2020 trading days with an average forward premium of $4.58/barrel. The highest contango was $71.98/barrel on April 20 when WTI prices settled negative. Market contango had been building in the weeks before that dramatic event, ever since the OPEC+ agreement broke down after disagreement between Saudi Arabia and Russia led both countries to open up the taps and discount prices to gain market share. Resulting concern about a glut and a rapid inventory build caused prompt prices to collapse and a strong contango curve to develop that saw a $14.39/barrel 12-month spread between the May and December 2020 contracts on April 15, providing a strong incentive to store (orange line in Exhibit 3).

Exhibit 3 WTI Forward Curves

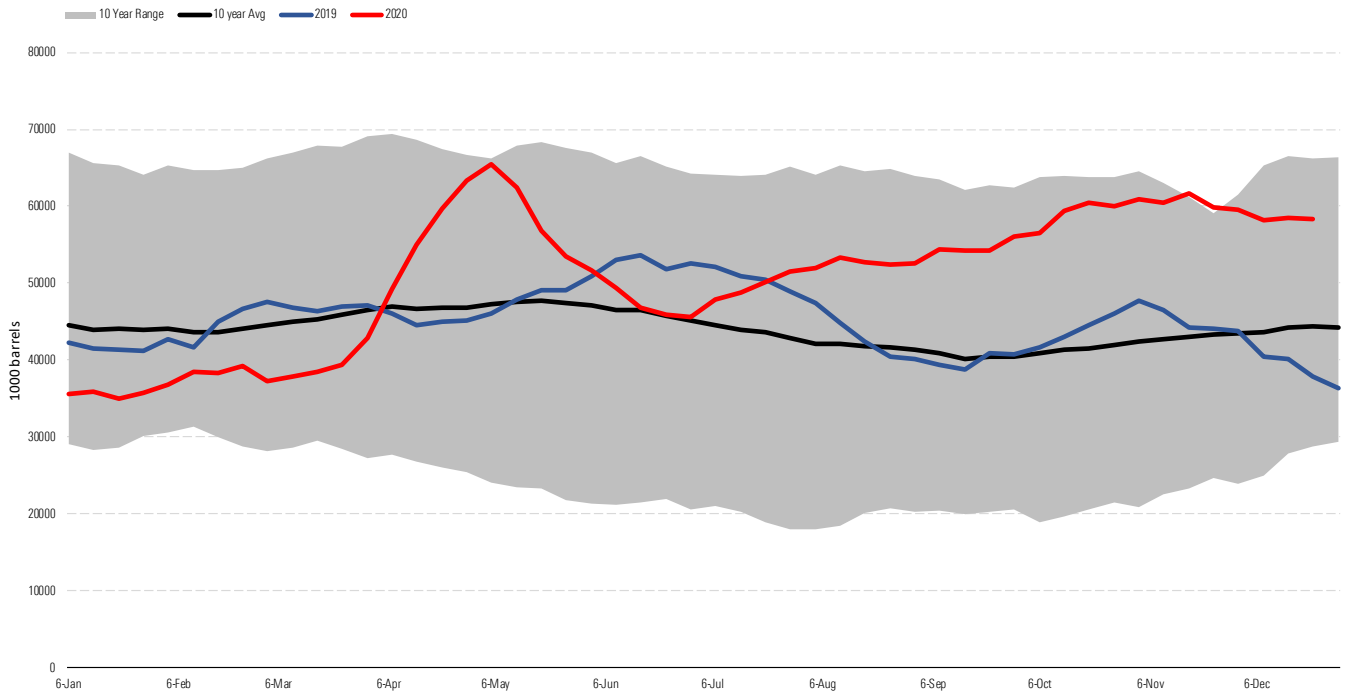


Source: CME Group, Morningstar.

Incentive to Store

A mostly contango market resulted in crude tanks filling up rapidly after prices started dropping in March and although some inventory was removed after production cuts, storage remains at record levels as the year ends. Cushing inventory started the year at a low point of 35.5 million barrels according to weekly EIA Petroleum Supply estimates. Storage increased rapidly from late March to May in response to the growing crude surplus, topping out at 65.4 mmbbl. Inventories retreated during June and July after producer cuts pared the crude surplus, then grew again to 61.6 mmbbl in mid-November as a second wave of the virus stunted demand recovery (Exhibit 4). Inventories at Cushing spent most of the year above their 10-year average. Total U.S. crude inventories started the year at 431 mmbbl and grew gradually before briskly adding 100 mmbbl between March and June, tapering through December and pushing back to 500 mmbbl at year-end when demand recovery fizzled. Total crude stocks were above their previous 10-year range from the end of April through year-end.

Exhibit 4 Seasonal Cushing Crude Inventories

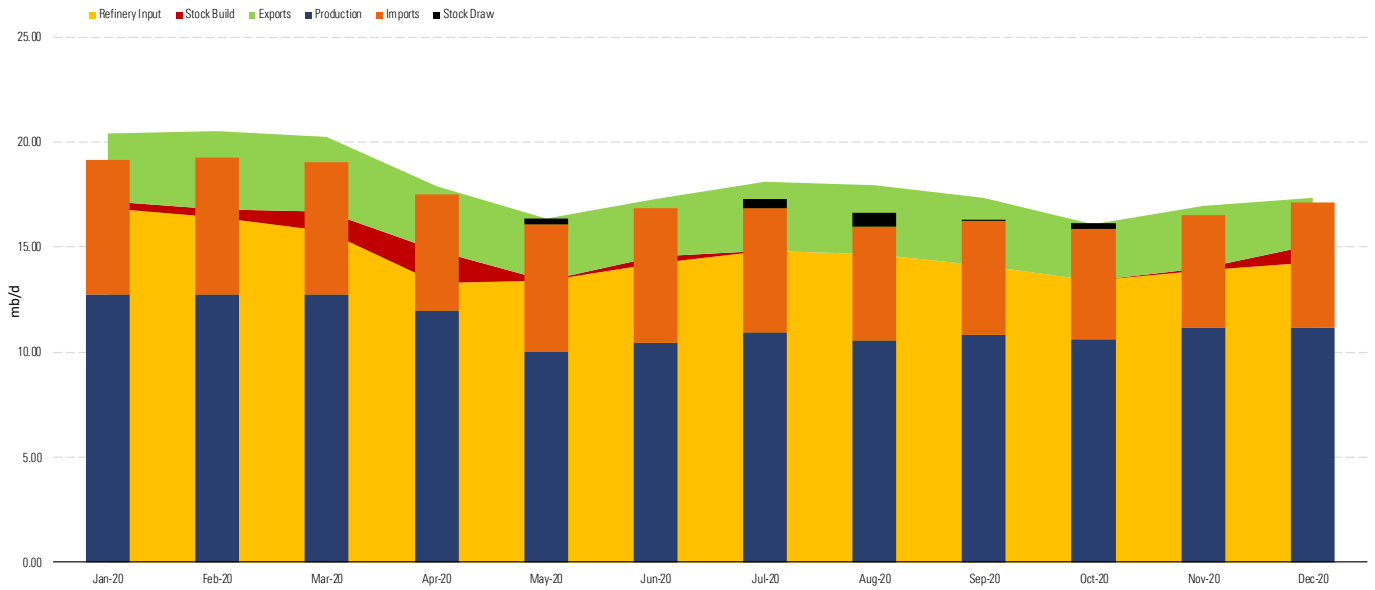


Source: EIA, Morningstar.

Crude Supply/Demand Balance 2020

Exhibit 5 shows 2020 crude balances based on EIA's actual monthly data and Short Term Energy Outlook forecasts. On the chart, bars represent supply and areas demand. Despite the turbulent environment, crude markets remained balanced as storage proved adequate to buffer supply/demand swings. Balance was maintained when refinery input (yellow area) fell by 21% or 3.5 mmb/d between January and April by production shut-ins and reduced imports (orange bars). Exports (green area) proved stable throughout the year, up slightly to an average 3.1 mmb/d versus 3.0 mmb/d in 2019. Crude production (blue bars) topped out in January at 12.8 mmb/d then fell 23% to 10.0 mmb/d in May—recovering by year-end to 11.2 mmb/d, down 12.5% over the year.

Exhibit 5 Monthly U.S. Crude Balance



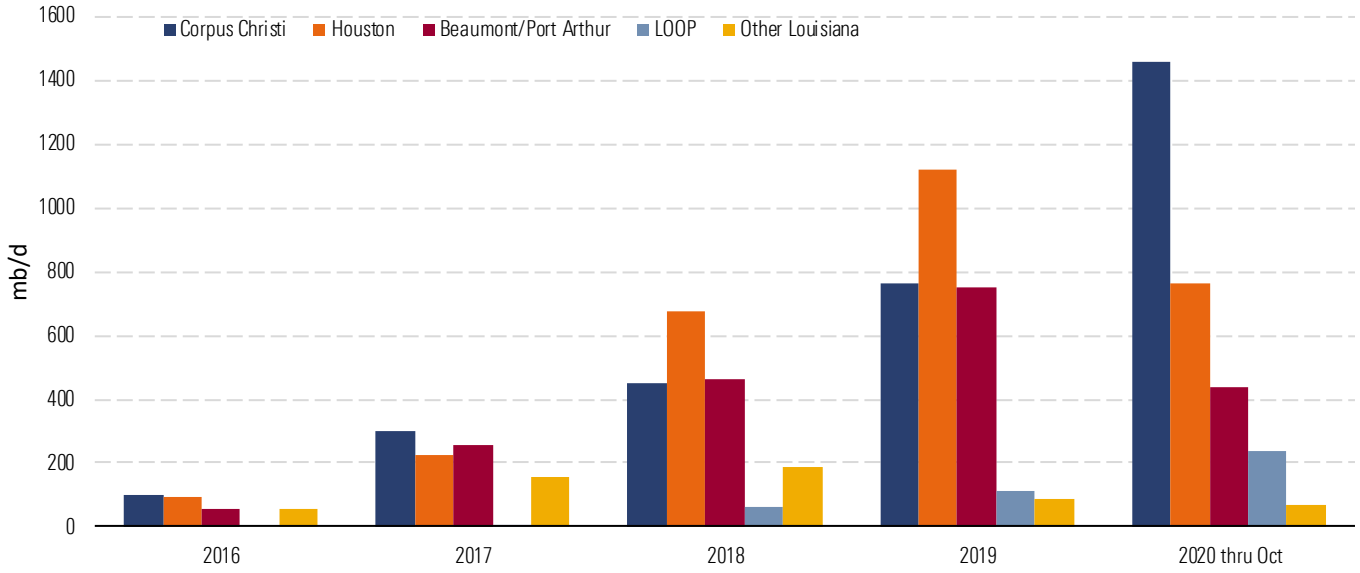
Source: EIA, Morningstar.

Exports

Five years after the federal export ban was lifted in December 2015, U.S. overseas crude shipments averaged 3.1 mmb/d according to EIA and U.S. Census data. Exports kept pace with 2019 levels despite lower crude production and imports, proving the ongoing popularity of U.S. grades in international markets. Most crude exports leave Gulf Coast ports because that's where pipelines deliver the most barrels. Expansions to West Texas and New Mexico Permian basin oil production in 2019 and build out of pipelines to the South Texas Port of Corpus Christi meant the latter took over from Houston as top export hub in 2020. Corpus Christi handled 49% of volume between January and October 2020 according to U.S. Census, compared with 26% for the Port of Houston, Texas, 15% for Beaumont/Port Arthur, Texas, and 8% for the Louisiana Offshore Oil Port at Morgan City, Louisiana. (Exhibit 6).

Export destinations in 2020 were broadly in line with 2019 according to U.S. Customs data for January to October. Volumes shipped to Asia and the Europe, Middle East and Africa region increased at the expense of shipments to Canada. In all, 39% of Gulf Coast exports went to EMEA and 47% to Asia (mostly China) while 8% went to Canada and 6% to Latin America.

Exhibit 6 Gulf Coast Crude Exports by Port Region

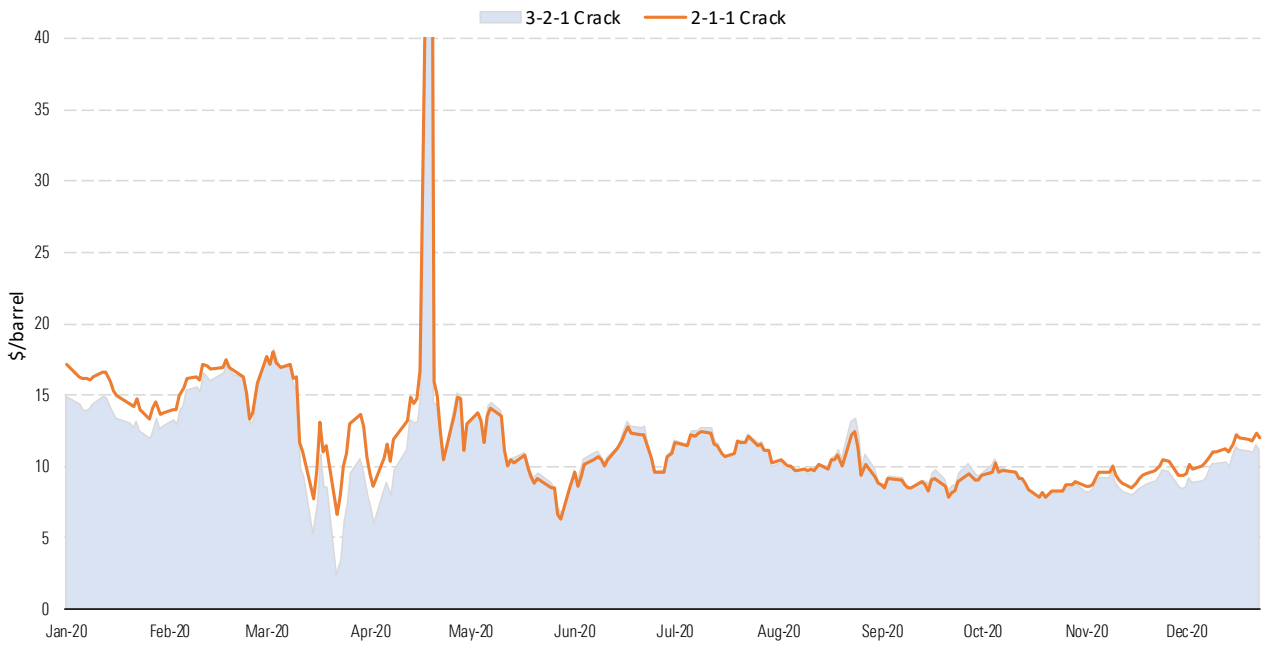


Source: U.S. Census, Morningstar.

Refining Margins

Low transportation demand eroded prices and refined product inventories built, causing the worst refining margins in a decade this year. After the end of March refining runs averaged 2.2 mmb/d below their 10-year average and 2.4 mmb/d or 14% below 2019. Refiners haven't yet recovered from the impact, and a number of plants have been mothballed for the immediate future with others being permanently shuttered. Based on rule of thumb crack spread calculations, refining margins this year fell by about 40% compared with 2019. Exhibit 7 shows crack spreads with the value axis truncated to remove the $70/barrel values resulting from the negative crude price on April 20. The annual average 3-2-1 crack that represents a refinery producing two barrels of gasoline for every barrel of diesel was $11.25/barrel—down $7.18/barrel over 2019 (gray shading, Exhibit 7). The 2-1-1 crack margin for a refinery producing equal volumes of gasoline and diesel averaged $11.72/barrel, down $8.21/barrel over 2019 (orange line, Exhibit 7).

Exhibit 7 Refinery Crack Spreads, 2020

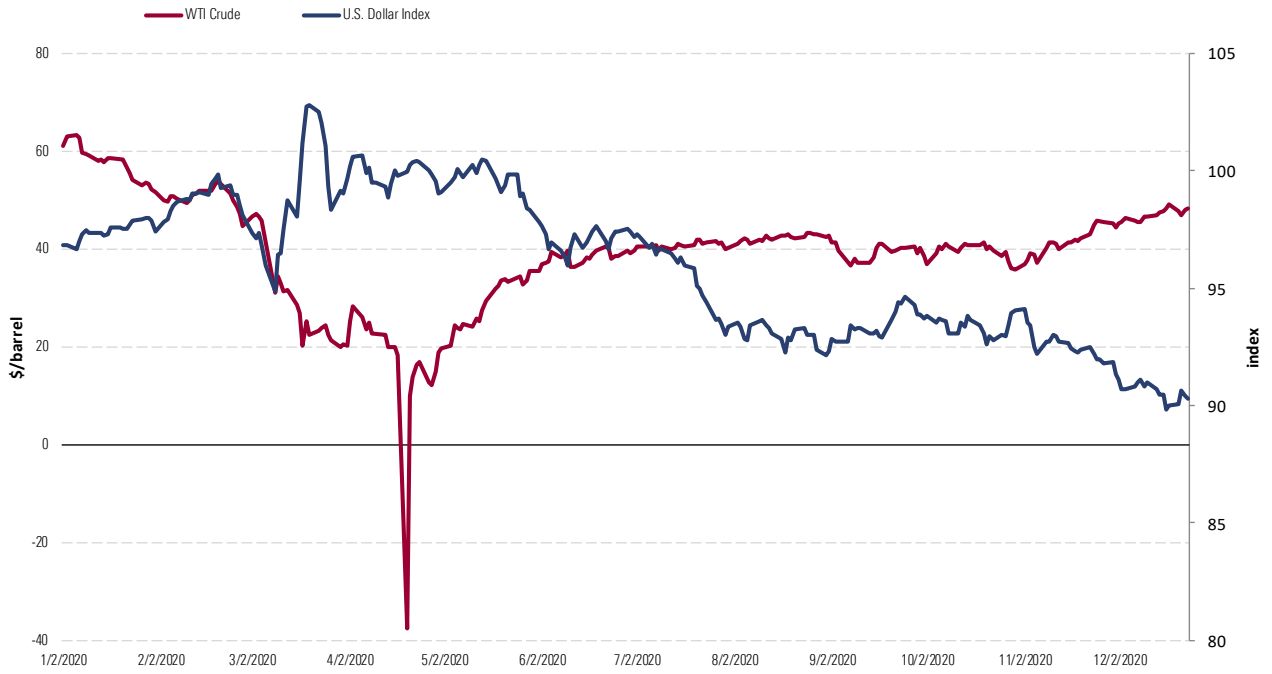


Source: CME Group, Morningstar.

Dollar Index

The final fundamental indicator on our radar this year is the inverse relationship between the strength of the U.S. dollar—as defined by an index of currencies against the dollar—and crude prices (Exhibit 8). Crude is bought and sold in dollars per barrel, and the strength or weakness of the currency is an important factor in purchases by countries that don't use the dollar. If the U.S. dollar is strong, that makes crude more expensive for importers outside the United States and reduces demand, putting downward pressure on prices. Conversely, if the dollar is weak, then oil is cheaper and demand increases, pushing crude prices higher. Hence the inverse relationship where a rising dollar means lower crude and a falling dollar supports crude prices. The inverse relationship broadly held true this year despite market volatility, although tepid demand worldwide reduced its significance to the oil market.

Exhibit 8 WTI Crude and Dollar Index



Source: CME Group, Morningstar.

Outlook 2021

Oil market recovery next year depends on the speed and extent to which demand returns to 2019 levels. December hiccups in the recovery caused by second waves and new strains of the coronavirus emerging, showed that a return to normal isn't guaranteed. Commentators have called peak oil demand in 2019—meaning the market will never regain its footing. Work-from-home trends and lower commercial travel could dent transport demand for years to come. Should refined product demand bounce back to previous levels, refinery closures could constrain future growth opportunities.

If demand recovers bringing higher crude prices and refinery margins, we expect a return to high levels of refinery throughput. Crude production will recover momentum supported by prices and export demand, although more conservative producer spending will slow new investment and output growth. The looming prospect of an energy transition—away from fossil fuels and internal combustion engines—will gain support from the Biden administration. This places an end date on refinery investments and crude production projects. That end date—whether its 2040 or 2050—together with greater investor sensitivity to environmental, social, and governance or ESG issues, will impact the hydrocarbon industry's access to equity capital.

The crude oil extraction and downstream refining industries should therefore prepare for a shrinking footprint in the future with lower demand and capacity. As a dress rehearsal for that eventuality, 2020 showed little mercy to refiners, leaving them with 40% lower margins and shuttered plants. Crude producers fared no better as many flirted with bankruptcy. This experience portends further painful industry rationalization in the years ahead.

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For More Information

+1 800 546-9646 North America
+44 20 3194 1455 Europe
commoditydata-sales@morningstar.com

MORNINGSTAR®

22 West Washington Street
Chicago, IL 60602 USA