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# Cornhusker Economics

## Can Commodity Prices Be Negative? Revisiting the Events in the Crude Oil Market in April.

Market Report	Year Ago	4 Wks Ago	6-12-20
<b>Livestock and Products,</b>			
<b>Weekly Average</b>			
Nebraska Slaughter Steers, 35-65% Choice, Live Weight. . . . .	114.00	*	*
Nebraska Feeder Steers, Med. & Large Frame, 550-600 lb. . . . .	170.33	167.52	166.12
Nebraska Feeder Steers, Med. & Large Frame 750-800 lb. . . . .	150.28	134.92	132.45
Choice Boxed Beef, 600-750 lb. Carcass. . . . .	222.11	459.04	240.77
Western Corn Belt Base Hog Price Carcass, Negotiated . . . . .	*	*	*
Pork Carcass Cutout, 185 lb. Carcass 51-52% Lean. . . . .	81.75	111.36	67.79
Slaughter Lambs, woolled and shorn, 135-165 lb. National. . . . .	163.93	162.25	NA
National Carcass Lamb Cutout FOB. . . . .	392.83	408.91	415.16
<b>Crops,</b>			
<b>Daily Spot Prices</b>			
Wheat, No. 1, H.W.			
Imperial, bu. . . . .	4.26	3.96	3.96
Corn, No. 2, Yellow			
Columbus, bu. . . . .	4.63	2.85	3.01
Soybeans, No. 1, Yellow			
Columbus, bu. . . . .	8.14	7.84	8.04
Grain Sorghum, No.2, Yellow			
Dorchester, cwt. . . . .	7.14	6.18	6.05
Oats, No. 2, Heavy			
Minneapolis, Mn, bu. . . . .	3.23	3.54	3.42
<b>Feed</b>			
Alfalfa, Large Square Bales, Good to Premium, RFV 160-185 Northeast Nebraska, ton. . . . .	*	*	*
Alfalfa, Large Rounds, Good Platte Valley, ton. . . . .	110.00	90.00	*
Grass Hay, Large Rounds, Good Nebraska, ton. . . . .	97.50	80.00	*
Dried Distillers Grains, 10% Moisture Nebraska Average. . . . .	133.50	154.00	121.67
Wet Distillers Grains, 65-70% Moisture Nebraska Average. . . . .	50.00	47.86	35.00
* No Market			

Preventive measures adopted during the COVID-19 pandemic have changed our lives and businesses in many ways. Commodity markets have also witnessed unique events that were partially influenced by those changes. In April, for the first time in history, prices in a large exchange-traded futures market turned negative. Crude oil futures prices for May 2020 delivery were traded below zero on April 20 and 21, reaching a minimum of -\$40.32/barrel. If I am selling crude oil to you for -\$40.32/barrel, it means that I am giving you the contracted amount of crude oil and paying you \$40.32/barrel to take my oil.

As unusual as it is, the negative crude oil prices in April actually reflected the current state of the cash market in April, as well as the structure of the futures market and how it is supposed to work. This unique event also highlighted the importance of understanding what futures prices really represent and how they are traded.

### *What the crude oil futures price represents*

The crude oil that we are talking about in this article is specifically the WTI (West Texas Intermediate), which is “a light, sweet crude oil blend” that is typically used for conversion to gasoline and diesel fuel. This futures contract is deliverable and priced out of Cushing, Oklahoma, i.e. deliveries against the futures market “shall be made free-on-board at any pipeline or storage facility in Cushing, Oklahoma.” This implies that the cash market in Cushing is the reference for the WTI futures price. Therefore, the WTI crude oil futures price should reflect the supply and demand conditions of the cash market in Cushing, Oklahoma, particularly when we approach delivery time.

In April, the WTI crude oil market was going through unique supply and demand conditions. In a nutshell, the COVID-19 pandemic led to an economic slowdown and one of the consequences was the decrease in demand for crude oil. The main crude oil producers did not cut down supply fast enough, hence there was an excess of crude oil in the market for a while. As should be expected in situations like this, prices decreased. In more extreme situations, if storage capacity is limited in a market with over-supply, it may happen that storage itself becomes more valuable than the commodity (remember that oil cannot just be dumped and “stored” on the ground).

Figure 1 shows the daily spot price and WTI futures price for crude oil since the beginning of the year, and we can see prices dropping from around \$60/barrel in January to around \$20/barrel in early April. In a well-functioning market, the spot price in the area where futures contracts are delivered should show the same behavior as the futures price over time, both reflecting supply and demand conditions in the market. This is essentially what we see in Figure 1 for the crude oil market.

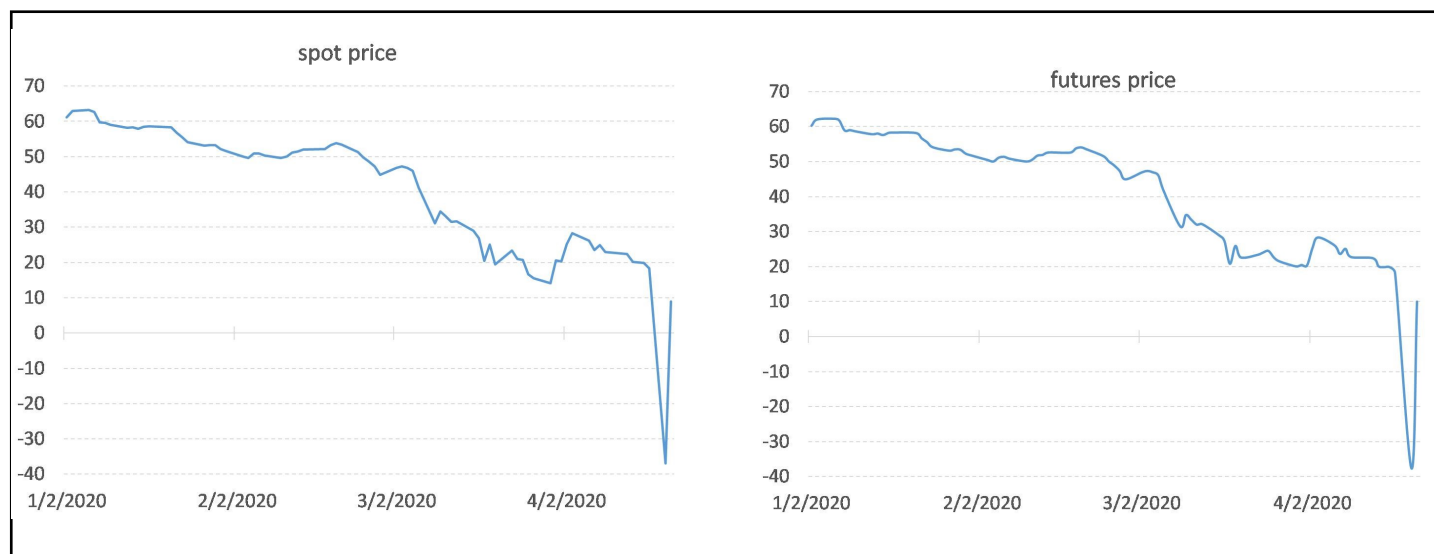
### ***How (crude oil) futures markets work***

Speculators are one type of trader who buy and sell in the futures market with the objective of making money. They have no interest in the physical commodity. For example, I (speculator) buy crude oil using ten futures contracts for October 2020 delivery for \$37/barrel today, so I now have a “long” (buy) position in the futures market for October 2020 delivery. This means that I have a commitment to take delivery of crude oil in October 2020 and pay \$37/barrel then. But I don’t really want the physical commodity (crude oil). Not today, not in October, not ever. My strategy with this trade is to wait for the crude oil price for October 2020 delivery to increase and then I can sell at a higher

price and make a profit. Let’s say that, on a given day in August, the crude oil futures price for October 2020 delivery will be trading at \$41/barrel. I can then sell crude oil using ten futures contracts for October 2020 delivery at \$41/barrel.

Now I have a commitment to deliver (sell) crude oil in October at \$41/barrel and also to take delivery (buy) the same amount of crude oil in October at \$37/barrel. Since I have commitments to buy and sell the same amount of crude oil in the same month, my net position in the futures market is zero (it is as if I am delivering to myself). As far as the commodity exchange is concerned, the ‘buy’ and ‘sell’ trades offset each other and I no longer have any commitments in the futures market (i.e. no obligation to deliver or take delivery of anything). So I leave the futures market with a gain/loss based on the difference between the futures price from my ‘sell’ trade and the futures price from my ‘buy’ trade. In our example, I have a profit of \$4/barrel, because I bought at \$37/barrel and later sold at \$41/barrel.

Since the futures market is a market for future delivery, speculators can buy and sell as many barrels of crude oil as they want without actually having either the physical commodity to deliver or the intent to take delivery of the physical commodity. As long as they offset their futures contracts before the delivery month, there is no need to worry about the physical commodity. This is why speculators always make sure to offset their futures contracts before the delivery month, otherwise they may find themselves in a position to have to deliver or take delivery of several thousands of barrels of crude oil. In the crude oil futures market, delivery happens during the delivery month, but the last trading day is “3 business days prior to the 25th calendar day of the month



**Figure 1: Daily crude oil spot price in Cushing, OK and WTI futures prices for May 2020 delivery (\$/barrel)**

prior to the contract month” (or a day earlier if the 25th calendar day is not a business day).

### ***What happened in the crude oil futures market in April***

Let’s go back to our negative futures prices and talk about the futures contract for May 2020 delivery. For this contract, physical delivery would happen during the month of May 2020, but it could be traded only until April 21. At the end of the day on April 21, all outstanding futures contracts for May 2020 delivery would have to be delivered during the month of May. Therefore, any speculator holding futures contracts for May 2020 delivery would have to offset them before the end of the day on April 21, otherwise they would have to deliver or take delivery of thousands of barrels of crude oil in May.

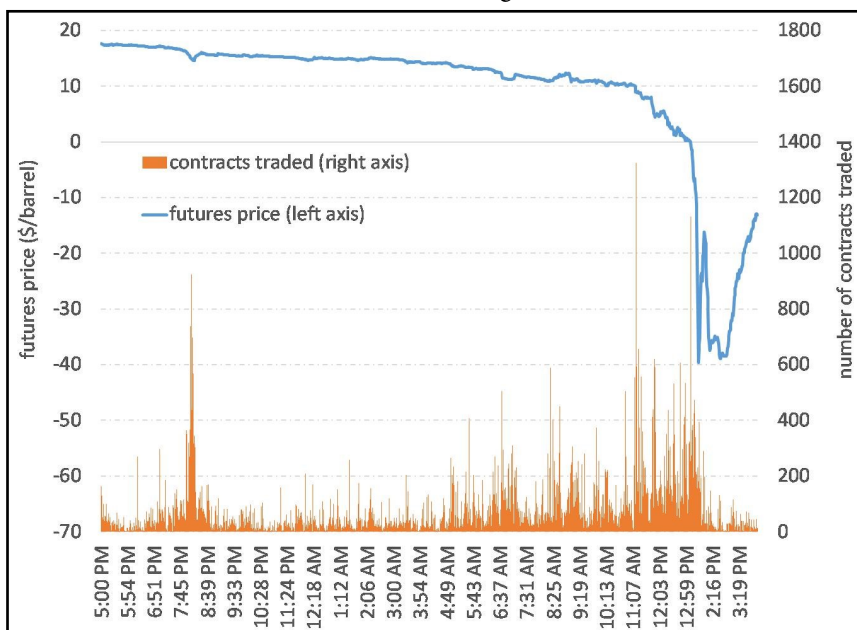
The WTI crude oil futures contract trades from Sunday to Friday on 23-hour trading sessions, starting at 5:00 p.m. and running until 4:00 p.m. the next day. After the Saturday break on April 18, the market resumed trading on Sunday (April 19) at 5:00 p.m. with only two more trading sessions until the last trading day of the contract for May delivery. When the market opened that Sunday evening, there were over 100,000 futures contracts still open, which is equivalent to over 1,000,000 barrels of crude oil. On a regular day, the crude oil futures market trades more contracts than that, but 100,000 contracts is still a relatively large number of contracts.

Traders who had initially sold crude oil in the futures market now needed to buy crude oil in order to offset their contracts before delivery. Actually, when trading started on April 19, prices were around \$17/barrel, which was the lowest price until then (see Figure 1). So these traders could already offset their contracts at a profit and move on. Alternatively, they could wait for prices to go even lower and then offset their contracts at a larger profit.

Why would prices go down even more? Because traders who had initially bought crude oil now had to sell in order to offset their contracts and get out of the futures market before delivery. Since prices had been falling, these traders were concerned because they would likely end up selling at lower prices and hence leave the futures market with a loss. Still, they had to offset their contracts because they did not want to go to delivery. If they did go to delivery, they would have to take delivery of thousands of barrels of crude oil in a market already overflowed with oil and hence with limited storage capacity, especially in the delivery area of the WTI futures contract. If these traders were speculators who have no interest in the physical commodity, hav-

ing to take delivery of crude oil would normally be undesirable. In a market with oversupply and limited storage, this would be much worse.

Figure 2 shows minute-by-minute prices (blue line) starting on April 19 (Sunday) at 5:00 p.m. We can see prices slowly going down during Sunday night and Monday morning. Figure 2 also shows the number of contracts traded in each minute of the trading session (orange bars). Except for some activity around 8:00 p.m. on Sunday, we can see that a larger number of contracts started being traded only when prices approached \$10/barrel, and even more so when prices dropped below \$10/barrel and quickly moved towards zero and then towards negative values.



**Figure 2: Minute-by-minute WTI crude oil futures prices for May 2020 delivery and number of futures contracts traded from 5:00 p.m. on April 19 until 4:00 p.m. on April 20**

Basically, traders who needed to sell on April 20 (and April 21 too) had to accept much lower prices in order to execute their trades and finally offset their contracts. When traders place their orders in the futures exchange, they essentially need to enter the numbers in their computer and hit the ‘submit’ button. When they started trading in the evening of April 19, they tried to sell at \$17/barrel. Since there were not enough traders interested in buying from them at those prices, sellers started lowering their bids. So they started submitting orders to sell at lower and lower prices until they could find someone interested in trading with them. As they placed those orders in their computers, the price is just a number that the computer processes, be it 16, zero or -10. Regardless of the price, once traders finally execute their orders and offset their contracts, the calculation of the gain or loss as they leave the futures market is the

same, i.e. “selling price” minus “buying price.” If I initially bought oil in the futures market at \$30/barrel and later I sold at -\$20/barrel, I leave the futures market with a loss of \$50/barrel ( $= -20 - 30$ ).

***Do negative prices indicate that something was wrong in the market?***

No, it does not look like it. Supply and demand conditions in March and April set the stage for lower prices in the crude oil market. Then, during this period, the expiration of the futures contract for May 2020 delivery added an extra downward push which resulted in negative prices in the futures market for approximately 12 hours between the afternoon of April 20 and early morning of April 21. Had supply and demand conditions not reached a critical situation in April, or had the futures contract for May delivery expired a couple of weeks earlier or later, maybe nothing unusual would have happened on April 20-21. In other words, prices responded as expected to prevailing supply and demand, while the futures market operated as expected during the last days of trading for a futures contract. The price levels observed during those days could be discussed, but the overall behavior of prices appears to be consistent with supply and demand as well as the structure of the futures market.

Further, let us remember that the futures price for May 2020 delivery was the only one that became negative on April 20-21. Futures prices for other delivery months (June 2020, July 2020, August 2020, etc.) remained above zero during those days. In addition, negative prices only happened for WTI crude oil. The other type of crude oil that is also largely traded in the futures market, Brent, was never traded at negative prices (we can discuss the differences between WTI and Brent in another article).

***General take-away***

Going back to the title, can commodity prices be negative? As we saw recently, yes, it is possible. But as we discussed in this article, it happened in a particular market under specific circumstances. Commodity markets, especially for widely-traded commodities, can be complex structures with many different prices for different locations across the country and around the world, for different types/grades of the commodity, as well as different delivery times for forward transactions (which include, but are not limited to, futures markets). Understanding the structure of these markets and what each price represents is essential to make a good analysis of current events and what to expect in the future.

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