
Coronavirus and negative U.S. oil prices : what happened ?

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This article explains why crude oil prices went negative in April 2020 and gives an insight into oil markets and futures contracts. It will provide you with the necessary tools to deal with this commodity

Introduction

At the end of April 2020, an uncommon situation happened in the financial markets. In a 1-day interval markets experienced what seems counter-intuitive to an economist : crude oil prices went negative for the first time in history. Although oil is the most traded commodity in the world [1], WTI crude oil future prices experienced a sharp -305.97% decrease to close at -37.63 the 20st of April 2020. However, it does not mean that gasoline was free, or that you could have made money from storing oil. So ... What does a negative price concretely mean ?

Oil markets and futures contracts

First, we need to provide a glimpse of how futures contracts work in contrast to the spot market. On the one hand the spot market is defined as “the market where financial instruments, such as commodities, currencies and securities, are traded for immediate delivery”. [2] On the other hand the futures market is “an auction market in which participants buy and sell commodity and futures contracts for delivery on a specified future date. Futures are exchange-traded derivatives contracts that lock in future delivery of a commodity or security (the underlying asset) at a price set today” [3]. An example of a future contract in the context of crude oil is an agreement to buy

1000 barrels in 1 month at a predetermined price set today, or in other words to be “long” on a 1-month future contract for 1000 barrels. One of the main advantages to buy or sell this type of derivative is hedging. Futures contracts are designed to neutralize the market risk by fixing the price that the investor will pay or receive for the underlying asset. [4] Furthermore, one last important feature of futures contracts, especially for commodities, is the notion of delivery arrangements. This is the place where the delivery of the underlying asset will be made, and it must be specified by the exchange. [4] Therefore buyers who maintain their position have to pick up the underlying at the delivery point.

Second, let's get into the oil market. There is an important range of different crude oils, each with their own prices and characteristics [5] (API gravity, sulphur content, ...) : crude oil from Saudi Arabia does not have the same price than American or Russian oil. Each is traded in its respective spot market in which there is an immediate delivery of barrels (in reality “immediate” means 1 or 2 days, as oil barrels cannot be teleported). The spot market only concerns commercial players (producers and industries) since there is a true exchange of barrels at the end of the transaction. In order to have a reference price at which to buy or sell crude oil, traders rely on the oil futures market. This one is more particularly characterized by 3 main benchmarks : The Brent (for oil in North Sea) exchanged at the ICE Futures, the WTI (for American oil) exchanged at the New York Mercantile Exchange, and the Dubai crude (for Asian oil). [6] When a newspaper reports that oil is selling for \$50, it refers to these benchmarks, considered as industry standards. If you are interested in

the different oil markets, you can take a look at this website : <https://oilprice.com/oil-price-charts/>.

In the crude spot market, when one enters a position there is a trade of barrels of oil. Only commercial players (oil users) are willing to participate in this exchange place. However, the actors in the oil futures markets are more diverse since there is a gap between the moment when you enter a position and the maturity of the contracts (that could be months, semesters, or even years). Therefore, in addition to commercial users who use futures contracts to hedge their positions, this gap allows non-commercial players - who do not want to receive a barrel at home - to enter in the market and to speculate on the price of the underlying.[7] Indeed, arbitrageurs who are not interested in any physical delivery of oil may take short or long positions depending on the expected change in the price of oil in order to make a profit. The majority of the futures contracts are sold before expiry date and there are very few contracts that lead to an exchange of goods.[8]

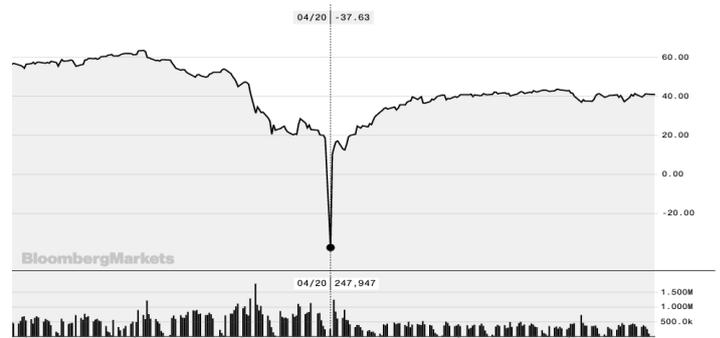
There is a special case that we did not mention yet, what happens if a speculator maintains its position in a future contract until maturity, i.e the date of delivery ? The first option would be to take the physical delivery on the settlement date of the contract as described above. The second is called the "cash settlement". In this method the long position of the contract does not take the delivery of the underlying but receives or pays the net cash depending on whether the spot price is higher or lower, respectively, than the future price on the settlement date. Let's take an example. A speculator bought a 1-month oil future contract on June 10th for a delivery on July 10th at \$30. By doing this, he hopes that the spot price will be higher than \$30 in July. Suppose that on July 10th the spot is equal to \$25. The speculator (who does not need a barrel of oil) lost his bet. In that case, he will virtually (because all of this is automatized) ask the seller to keep the barrel and to sell it on the spot market and will give an additional \$5 per barrel since the seller will only sell its oil on the spot for \$25. Of course, all of this could have been the other way around and a speculator could have sold (we say that he takes a "short" position) a contract to sell oil one month later. This illustrates something important in futures commodity markets : supply and demand are biased by speculators. There are investors who buy contracts without real needs of the underlyings and others that sell contracts without truly having the goods. *Fattouh, Kilian and Mahadeva (2012)*

argue that the financialization of oil futures markets and the role of speculation in the price volatility of this commodity is still subject to debate among economists.[9]

Causes of the negative oil price

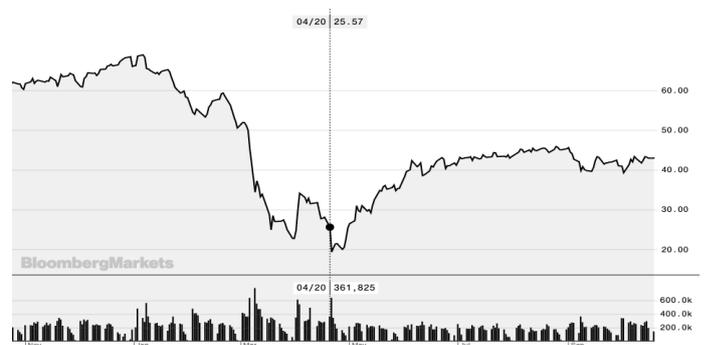
Since the key characteristics of the oil market have been described, we can more easily understand what happened on the 20st of April 2020. The first important thing to notice is that only the 1-month WTI futures contracts with a delivery in May suffered from a negative price on April 20. As you can see on the graph, The Brent - the North Sea benchmark -, despite a sharp decrease, did not drop below 0 on that day. You can also notice the correlation between both benchmarks that follow a similar trend except for that day. This difference can be explained by the difference in delivery points of both futures contracts. Whereas Brent could theoretically have access to all shore tanks in North West Europe, WTI delivery point is "land-locked" and limited to a little town in Oklahoma called Cushing. The town has a limited capacity of approximately 76 million barrels and due to the macroeconomics circumstances of this period, it was close to the limit.[10]

WTI (\$/bbl) Front Month Futures Price



Source : Bloomberg

Brent (\$/bbl) Front Month Futures Price



Source : Bloomberg

For oil futures prices to turn negative, a range of different factors need to line up perfectly[11] :

- (i) Demand for oil needs to fall.
 - (ii) Supply needs to exceed demand.
 - (iii) Storage space needs to be running out.
- (i) As the coronavirus turned into a pandemic at the beginning of 2020, all corners of the economy were devastated. This led to an elimination of almost all the needs for oil : a sharp decrease in the fuel needed to ship goods, ride on airplanes or commute to work has been experienced by the market.[12] This global lockdown caused the demand for crude oil to collapse. *Juvenal and Petrella (2012)*[7] argue that global demand shocks are the most important driver of oil prices, accounting for up to 43% of oil price fluctuation.
- (ii) Whereas demand for oil was at rock-bottom, the world's biggest producers did not cut their production, or to a certain extent, with a bad timing. In fact, after a price war that began in March 2020 between Saudi Arabia and Russia and that went hand in hand with an intensive oil production, the Organisation of the Petroleum Exporting Countries (OPEC) and Russia finally scheduled to reduce their production by 10%[13], but only from the 1st of May 2020 - After the expiry date of April futures to be delivered in May.[11] Remember that negative prices only concerned few futures contracts for delivery barrels in May.[12]
- (iii) This oversupply quickly overwhelmed the world's crude tanks and supertankers and the industry severely began running out of storage space to put their oil. Therefore, it might be cheaper for some producers to pay to sell their oil rather than finding extra places to store their oil or, worse, closing down production.[14] At this period the crude stockpiles at Cushing, Oklahoma - the delivery point of WTI futures contracts - had increased by 48% since the end of February, which led to an increase in storage price. This shows the overload in storage capacity and explains partly how WTI futures prices went negative at the end of April.

Furthermore, it is worth noting that there are 2 additional reasons that played a key role in the negative oil prices. First, whereas the causes described above were focused on commercial players, non-commercial

players also participated in the sharp price drop. Remember that futures can be a tool for protagonists in the oil market to hedge against price variation as well as a means of speculation for some investors. Speculators who buy oil futures contracts generally roll over them shortly before expiration, otherwise they must take the oil delivery. However, non-commercial players who were long on contracts for May delivery with expiry date on April 20 did not find other investors to release their positions. Therefore they were better-off selling at a negative price rather than taking delivery of actual oil, especially when storage prices steeply increased.

Second, after the announcement of an agreement between Russia and Saudi Arabia concerning the crude oil supply, many investment funds (which are mainly American) thought that the response will be an increase in the price. Thus, they put a part of their ETFs (Exchange Traded Funds) in futures oil contracts (mainly WTI). This created a high share of "speculative" demand which exacerbated the oversupply.

Putting it into perspective

If we put into perspective what happened, on 155,000 futures contracts traded that day, only 18,475 were exchanged with a negative price. In only a few days, the price of crude oil returned to normal values. Therefore, the interesting part of this case relies on how the use of derivatives can lead to extraordinary situations in financial markets.

Nevertheless, with regard to the current global health conditions and the crisis that countries are facing, nothing prevents the situation from happening again if the circumstances were reunified. A second wave of coronavirus infections has overwhelmed many European countries at a fast pace. New lockdown restrictions in the EU have already partially fueled the latest market downturn.

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