Interim Staff Report

Trading in NYMEX WTI Crude Oil Futures Contract Leading up to, on, and around April 20, 2020

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COMMODITY FUTURES TRADING COMMISSION

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I. Introduction

Division of Market Oversight ("**DMO**") and Office of the Chief Economist ("**OCE**") staff of the U.S. Commodity Futures Trading Commission (the "**CFTC**" or "**Commission**") issue this interim report (the "**Report**")[1] to provide background, context, and observations regarding the trading activity leading up to, on, and around April 20, 2020 ("**April 20**"), for the West Texas Intermediate ("**WTI**") Light Sweet Crude Oil futures contract (the "**WTI Contract**"), traded on the New York Mercantile Exchange ("**NYMEX**").[2]

This Report focuses on the WTI Contract's May 2020 expiration (the "**May Contract**"), which settled on April 20 at a price of -$37.63 per barrel. The May Contract's April 20 negative settlement price was the first time the WTI Contract traded at a negative price since being listed for trading 37 years ago.[3]

This Report includes: (i) an executive summary; (ii) background on the WTI Contract; (iii) a discussion of fundamental factors that impacted supply and demand for domestic crude oil; and (iv) an interim analysis of trading activity in the WTI Contract on April 20.

II. Executive Summary

This Report outlines the events of the WTI Contract market between January 1, 2020, and April 21, 2020. This Report also sets forth data on the geopolitical and fundamental economic drivers, as well as certain technical factors, preceding and coinciding with the negative settlement price of the WTI Contract on April 20.[4]

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[1] Consistent with Section 8(a) of the Commodity Exchange Act ("**CEA**"), this Report does not contain data or information that would separately disclose (i) the business transactions or market positions of any person, or (ii) trade secrets or names of customers. In addition, this Report concerns only the observations by DMO and OCE staff and does not represent a legal conclusion with respect to the applicability of any provision of the CEA or the Commission's regulations. Furthermore, this Report is based upon the information available to such staff at the time this Report was written, and any different, changed, or omitted facts or circumstances may require additional analysis and result in different observations. This report is interim as a result of the above and the proximity to the events. "Interim" does not suggest that any further reports will or will not be forthcoming. Commission Staff may identify additional information or conduct additional analysis over time, and the determination of next steps or reports, if any, will be made at that time in light of the facts and circumstances at that time. The Commission has not expressed any view regarding the observations contained herein.

[2] NYMEX is a Designated Contract Market ("**DCM**") regulated by the CFTC and is part of the Chicago Mercantile Exchange Group Inc. ("**CME**"). The trading day for WTI Contracts (and many other CME contracts) is nearly 24 hours, Sunday through Friday. The April 20 trading session actually began at 6:00 p.m. Eastern Time ("**ET**") on Sunday, April 19. Unless otherwise indicated, reference herein to trading on April 20 refers to the trading session beginning at 6:00 p.m. ET Sunday, April 19, ending at 2:30 p.m. ET Monday, April 20. Also, all times in this Report reference ET, unless otherwise indicated.

[3] This Report is limited to analysis of the NYMEX WTI Contract and does not include analysis of trading activity in the ICE Futures Europe WTI crude futures contract, a cash-settled contract.

[4] This Report does not analyze the propriety of trading by any particular trader or group of traders. Additionally, to the extent any trading activity may have been abusive, manipulative, disruptive, or otherwise unlawful, an evaluation of that activity is beyond the scope of this Report. As such, this Report does not consider whether forces outside of supply and demand impacted prices leading up to, on, or around April 20, nor does this Report identify the root cause(s) of any price movement of the WTI Contract leading up to, on, or around April 20. Furthermore, as is customary, nothing in this Report should be interpreted to either confirm or deny the existence of an enforcement investigation by the Commission related to the matters addressed herein.

The negative settlement price of the WTI Contract occurred on the penultimate day of trading for the May Contract, which expired on April 21. For the WTI Contract May expiry, market participants who were not intending to make or take delivery of the crude oil underlying the futures contract were expected to close out of their positions by April 21 (the May Contract's expiration date and last day of trading). As described in detail below, the process of reducing the amount of the total number of futures contracts that remain open without an offsetting position or fulfilled by delivery, or "open interest" ("**OI**"),[5] through trading or netting is known as "**compression**." The level of compression for the May Contract on April 20, and the level of trading to achieve compression, was historically high, resulting in OI in the May Contract reducing markedly throughout the day.

This Report reviews the fundamental factors of supply, demand, and storage as well as technical trading factors surrounding the May Contract as it traded on April 20. Fundamental factors that coincided in and around the May Contract's trading and settlement at negative prices on April 20 discussed in this Report include the following:

- An already oversupplied global crude oil market was hit with an unprecedented reduction in demand caused by the novel coronavirus pandemic ("**COVID-19**").[6] Uncertainty over both the magnitude and duration of that loss of demand increased volatility to historic levels.[7] This Report observes how certain actions in response to the decline in demand by the Organization of Petroleum Exporting Countries ("**OPEC**"), along with 10 non-OPEC oil-exporting nations, colloquially referred to as "**OPEC Plus**," impacted market volatility.
- Concerns were growing in the marketplace about whether OPEC Plus or other global producers could respond quickly to the reduction in demand. These concerns raised questions about the availability of storage for excess production, and were particularly pressing at the Cushing, Oklahoma, oil terminal, which serves as the delivery point for the physically-settled WTI Contract.
- By March 2020, the working storage available at the Cushing facility was near capacity. The scarcity in capacity raised procedural concerns related to the mechanics of pipeline transportation and storage at the Cushing terminal, both of which are required to support the physical delivery process for the WTI Contract. Procedural concerns about the physical delivery process included questions about whether the WTI Contract would trade at negative prices. In or about late March and early April, NYMEX and some industry participants began preparing for the prospect of negative WTI crude oil prices,

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[5] OI refers to the total number of futures contracts long or short in a delivery month or market that has been entered into and not yet liquidated by an offsetting transaction or fulfilled by delivery. OI is also referred to as "**open contracts**" or "**open commitments**." *See* CFTC Futures Glossary, https://www.cftc.gov/LearnAndProtect/AdvisoriesAndArticles/CFTCGlossary/index.htm#O (last visited November 20, 2020).

[6] *See* Scott Tong, '*Suppliers are Sexy,' But the Real Oil Collapse Story is Demand,* MARKETPLACE (April 3, 2020), https://www.marketplace.org/2020/04/03/why-are-oil-prices-low-covid19/. The World Health Organization declared the coronavirus disease 2019 outbreak a global pandemic on March 11, 2020. *See* https://www.who.int/director-general/speeches/detail/who-director-general-s-opening-remarks-at-the-media-briefing-on-covid-19---11-march-2020.

[7] *See* Figure 1, *infra* at p. 11.

changing technology and pricing models to account for this contingency.[8] As discussed below in Section III.A., while prices in futures contracts of other commodities (such as natural gas and interest rates) traded at negative levels at various points during the last decade, the WTI Contract had not.

In addition to the fundamental factors summarized above, a number of technical factors related to market structure coincided with, and may have influenced, the April 20 negative settlement price. As discussed in more detail below, these factors included the following:

- Generally, in the weeks prior to the expiration of the May Contract, and specifically at the start of the April 20 trading session, OI in the May Contract was much higher than usual.
- The majority of traders holding positions in the May Contract had traded out of their positions prior to April 20. OI fell from 634,727 contracts at the start of the month of April to 108,593 contracts at the start of the April 20 trading session.
- OI was high entering the April 20 trading session, but the number of reportable traders holding positions at expiry on April 21 was consistent with prior contract months.
- Limit order book activity related to multiple products show a decrease in liquidity in the May Contract starting well before April 20.
- During the April 20 trading session, exchange-based control mechanisms (such as dynamic circuit breakers ("**DCBs**")[9] designed to impose pauses in the event of rapid or large price moves) were triggered. Nevertheless, the speed and magnitude of the price moves observed on April 20 in the May Contract (particularly between 1:00 p.m. ET and the end-of-day settlement at 2:30 p.m. ET) were exceptional.[10]

In summary, a variety of factors coincided leading up to, on, and around April 20, when WTI Contract prices fell from $17.73 per barrel at the beginning of the trading session to finally settle at -$37.63 per barrel. An oversupplied global oil market faced an unprecedented reduction in demand due to COVID-19 slowdowns and shutdowns, and the uncertainty over supply, demand, and storage capacity coincided with price volatility in the WTI Contract observed at historic levels that day.

III. Background

A. Oil Market and Relationship to WTI Futures

In 2018 and 2019, the United States was the top producer of crude oil in the world.[11] The U.S. assumed this role for the first time in decades primarily as a result of expanded use and development of hydraulic fracturing technology in the Permian region of western Texas and eastern New Mexico, the Federal Offshore Gulf of Mexico, and the Bakken region of North

[8] *See* Section III.C., *infra*.
[9] DCBs define an upper and lower limit of how far an instrument is allowed to move in a configured time interval.
[10] *See* Section V.E. Market Integrity Controls.
[11] *See* U.S. ENERGY INFORMATION ADMINISTRATION ("**EIA**"), OIL AND PETROLEUM PRODUCTS EXPLAINED: WHERE OUR OIL COMES FROM (2020).

Dakota and Montana.[12] The increase since 2011 in U.S. production of light sweet crude oil grades has been particularly notable.[13]

Increases in national crude oil production coincided with growing export activity. In December 2015, the U.S. ban on oil exports was lifted, propelling the U.S. to become a leading crude oil exporter.[14] These dynamics further strengthened the importance of the crude oil industry to the overall U.S. economy.

The United States' role as a top crude oil producer and exporter highlights the WTI Contract's function as a global benchmark and the utilization of the oil facilities in Cushing, Oklahoma by domestic oil producers. Alongside the Brent Crude futures contract,[15] the WTI Contract is one of the largest and most widely-traded crude oil futures contracts in the world. The WTI Contract is used by both commercial and non-commercial participants to hedge and manage risk.

As a global benchmark for crude oil, the WTI Contract serves as a key reference rate for pricing physical and financial oil transactions. For example, in the physical oil commercial market, the WTI Contract is used as a reference rate for pricing U.S. domestic and regional crude oil production, which is generally priced at a differential to the WTI Contract price.[16] The WTI Contract is also utilized as a pricing reference rate for imports and exports of crude oil, both to and from the U.S., as well as regional markets in Canada, Mexico, and some Central and South American crude oil markets.[17]

Logistics, operational costs, and other constraints also play a role in setting crude oil futures contract prices. [18] In addition, the ability to standardize pricing of different grades of crude oil against a benchmark across various production, refining, and distribution regions allows the physical cash markets to operate more transparently.[19]

The WTI Contract also serves as the basis for the calculation of a spot contract price, that is, the price at which crude oil or a commodity may be bought or sold for immediate delivery. Physical

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[12] *See* EIA, THE UNITED STATES IS NOW THE LARGEST GLOBAL CRUDE OIL PRODUCER (2018).

[13] *Id*. There are several types of crude oil, each priced according to various characteristics, two of which - density and sulfur content - are key. Density ranges from light to heavy. The level of sulfur content determines whether crude oil is graded sweet or sour. Generally, products such as gasoline and diesel fuel are more readily refined from light and sweet crude oil than from heavy and sour crude oil. *See* EIA, Crude Oils Have Different Quality Characteristics, (2012).

[14] Consolidated Appropriations Act of 2016, Pub. L. No. 114-113, 129 Stat. 2242. President Obama signed the $1.15 trillion Consolidated Appropriations Act into law, which, among other things, appropriated funds to renewable energy producers while repealing the crude oil export ban.

[15] The Brent Crude futures contract is traded on Intercontinental Exchange ("**ICE**") Futures Europe. Unlike WTI, Brent Crude oil refers to oil from the North Sea.

[16] Secondary benchmarks include WTI Houston, WTI Midland, LLS, Mars, Argus Sour Crude Index, and WCS Cushing/WCS Houston.

[17] *See* EIA, BENCHMARKS PLAY AN IMPORTANT ROLE IN PRICING CRUDE OIL (2014).

[18] Bottlenecks, access to water, refinery, and export demand can have a marked effect on prices at different locations notwithstanding consistent crude oil quality. *See generally* EIA, PIPELINE CONSTRAINTS, REFINERY MAINTENANCE PUSH WESTERN CANADIAN CRUDE OIL PRICES LOWER (2018).

[19] Generally, commodities are traded in two separate but related markets: the cash market and the futures market. The cash market refers to the buying and selling of physical commodities where the price and exchange of product occurs in the present. In contrast, the futures market deals with the buying or selling of future obligations to make or take delivery of the commodities at some future date. Commodities can also be traded through swaps. Swaps are outside the focus of this Report.

crude oil cash trades are generally structured either as a differential or a basis through an exchange of barrels ("**barrel back**"), whereby one grade of regional crude oil can be valued, assessed, or exchanged against another grade. Cushing, Oklahoma, is conveniently situated and used for these trades, allowing producers and refiners to leverage the physical cash market and the WTI Contract to price, hedge, transfer, and settle these trades. Outright (non-derivative) commercial transactions often use a calendar month average ("**CMA**") pricing mechanism. This mechanism employs a volume-weighted average price ("**VWAP**") of (i) a crude oil contract such as the WTI Contract, or (ii) a price differential to the WTI Contract across a range of days or a period (typically a calendar month). In the case of CMA contracts referencing WTI Contract prices, the futures contract expires prior to the actual calendar month end. As a result, the contract term for the commercial transaction determines the contract price by computing the VWAP of the remaining period with the following near month in the WTI Contract series.

The WTI Contract also impacts financial markets, as a variety of transactions use the WTI Contract as a key reference price, including international derivative markets, crude oil swap transactions, commodity index transactions, and exchange traded funds ("**ETFs**") in the U.S. and internationally.[20] Many commodity index funds also include the WTI Contract as a component of their index funds. Canadian and Mexican grades of crude oil sold in the U.S. are reliant on the WTI Contract as a benchmark. The Bloomberg Sour Crude Index ("**USCRSRIN**") and Argus Sour Crude Index ("**ASCI**") are among the reference prices used by various nations, such as Saudi Arabia, Kuwait, and Iraq, to set the price of their exports to the U.S. These prices also bear a strong relationship to WTI prices, so much so that the USCRSRIN and ASCI also experienced negative prices on April 20.[21]

As indicated above, the WTI Contract's benchmark status means that a negative price shock can have broad implications. While negative prices in energy markets are not common, they have occurred. For example, negative prices have transpired in a European electricity market, where market commentators concluded that a high renewable energy supply combined with low consumer demand on a Sunday in May 2019 caused electricity prices to go negative in the EPEX SPOT market.[22] Negative prices have also been observed in a U.S. regional natural gas market, where market commentators noted that spot prices for natural gas dropped below zero in March 2019 as increased supply outstripped pipeline capacity near the Waha hub in the Permian Basin of Western Texas.[23]

The robustness, reliability, price formation, and price discovery roles of the WTI Contract are relied upon not only to meet the risk-management and hedging needs of commercial and non-commercial participants in the crude oil markets, but also as part of a critical infrastructure that is

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[20] An example of such an offering is the Bank of China's wealth-management product issued to the Chinese high net-worth sector and linked to the WTI crude oil prices. This product is named "**Yuányóu Bǎo**" or "**原油宝**").

[21] *See* Bloomberg L.P. for USCRSRIN index, www.bloomberg.com/energy, and Argus Media.com for ASCI, https://www.argusmedia.com/-/media/Files/methodology/argus-sour-crude-index.ashx.

[22] *See* AleaSoft Energy Forecasting, "Negative prices in some European power markets thanks to a high renewables production" (May 28, 2019), https://www.pv-magazine.com/press-releases/negative-prices-in-some-european-power-markets-thanks-to-a-high-renewables-production/.

[23] *See* Scott DiSavino, *Explainer: Why are U.S. Natural Gas Prices in Texas Below Zero?* REUTERS, April 9, 2019, *available at*: https://www.reuters.com/article/us-natgas-pipelines-flaring-explainer/explainer-why-are-u-s-natural-gas-prices-in-texas-below-zero-idUSKCN1RL2NL.

vital for the oil industry and the well-being of regional and state economies, as well as the economy of the U.S. and beyond.[24]

As the main delivery and price settlement point for the WTI Contract, Cushing is a vital transshipment point with many intersecting pipelines and storage facilities, providing easy access to refiners and suppliers. Crude oil flows inbound to Cushing from a number of sources and outbound through dozens of pipelines.[25] Cushing serves as a central hub and way-station allowing the exchange, transfer, or trade of various grades of crude oil and refined products. Cushing's central location between the Gulf Coast, Midcontinent,[26] and Midwest producing basins, and refineries, storage, and export hubs, serves to reduce regional price differences,[27] creating a more uniform pricing structure. As a result, the WTI Contract is the central benchmark for domestic crude oil.[28]

B. NYMEX WTI Crude Oil Futures

NYMEX's WTI Contract is the most actively traded crude oil futures contract in the U.S. Each contract is for 1,000 barrels of physically-deliverable crude oil that meets specific standards set by NYMEX. The WTI Contract is priced in U.S. dollars and Cushing, Oklahoma is the delivery point. The WTI Contract series lists for trading monthly futures contracts for the current year, the subsequent 10 calendar years, and two additional months.[29] The contract trades nearly 24 hours a day, Sunday through Friday ET. Daily traded volume averages approximately 1.2 million contracts per day.[30]

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[24] *See* U.S. DEPT. OF HOMELAND SECURITY & U.S. DEPT. OF ENERGY, CRITICAL INFRASTRUCTURE AND KEY RESOURCES SECTOR-SPECIFIC PLAN AS INPUT TO THE NATIONAL INFRASTRUCTURE PROTECTION PLAN (REDACTED) (2007).

[25] Pipelines deliver the vast majority of domestic crude oil to U.S. refineries. The pipelines connect domestic production regions to Cushing, Oklahoma, reducing logistical constraints and expanding the utility of a large secondary physical market with local storage capability.

[26] The Midcontinent region is a physiographic province that extends from northern Texas and covers portions of Nebraska, Kansas, and Oklahoma.

[27] The crude oil price differential among domestic producing regions has narrowed as a result of infrastructure spending. For example, the price difference between WTI Midland crude oil and WTI Cushing and Magellan East Houston crude oil has narrowed since 2018, as investments have removed most of the pipeline capacity constraints from the Permian region to Cushing. Conversely, WTI Midland prices still trade slightly lower than Houston crude oil prices, suggesting that the region still faces some takeaway constraints in shipping Permian crude oil to the U.S. Gulf Coast.

[28] While WTI is the most widely-known U.S. crude oil stream, other crude oil streams do exist, including (i) Light Louisiana Sweet (LLS) crude, which has become the local benchmark for sweet crude oil in the U.S. Gulf Coast; (ii) US-Gulf Coast Sour and Medium crudes, such as Mars and Poseidon (produced offshore Louisiana); and (iii) Southern Green Canyon produced offshore Texas.

[29] These forward periods are referred to as the "**term structure**" of the WTI Contract markets. The term structure of the WTI markets extends beyond 10 years, allowing participants to buy or sell futures contracts to hedge, risk manage, and invest. *See* https://www.cmegroup.com/trading/energy/crude-oil/light-sweet-crude_contractSpecs_futures.html for additional contract specifications.

[30] The WTI Contract market for April 20 opened on Sunday, April 19 at 6:00 p.m. ET, as Asian markets opened for trading on April 20. NYMEX cycles through a number of pre-defined market states at the open. These include: (1) Pre-Opening: a predetermined time before the trading session opens when participants are able to enter, modify, and cancel orders for the trading day that is going to start shortly. However, no trades are executed at this time; (2) Pre-Opening/No-Cancel: During the Pre-Opening period, the last 30 seconds prior to transitioning to Open. This Pre-Opening/No-Cancel period allows participants to place orders, but it does not allow orders to be canceled or

1. Settlement Process

Under NYMEX rules, the nearest of the contract months listed for trading is designated as the active month. However, the active month becomes a non-active month effective two business days prior to the spot month expiration.[31] April 20 was the penultimate day of the May Contract, meaning the May Contract, as the near-month contract, was no longer the active month on April 20. Instead, the June WTI Contract became the active contract on Friday, April 17, two business days prior to the May Contract's expiration day of April 21. As a result, under the NYMEX rule the May Contract (and all months other than the designated active month of June) would settle on April 20, based upon the VWAP of accumulated calendar spread transactions occurring between 2:28 p.m. and 2:30 p.m. ET, the calendar spread settlement period (calendar spreads are explained below).

2. Execution Types

There are many trade execution types available in the WTI Contract (*see* Table 1 for a full list of trade and execution types transacted on April 20).[32] Three of the most commonly-used types are relevant to the intraday trading dynamics observed on April 20: outright trades, calendar spread trades, and Trade at Settlement ("**TAS**") trades. Each is described in more detail in the following sections and formally defined on the CME's website.[33]

a) Outright Trades

Outright trades are the most direct futures trading instrument available. They represent the single purchase or sale of a futures contract for delivery at a single future date. For example, if a trader thinks oil prices will rise, he or she will want to establish a long position in WTI Contracts and might place an outright trade to buy WTI Contracts to do so. This provides an immediate position in the market on a single expiration. The position's profit or loss is calculated based on the movements of that single futures expiration (*e.g.*, the May Contract).

b) Calendar Spreads

Calendar spread trades are common in WTI Contracts and many other futures contracts. A calendar spread trade involves the simultaneous purchase and/or sale of two different expirations

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modified. Trades are also not executed during this period; and (3) Markets Open: the period of time when orders are sent and matched in real time, based on the product's trading times.

[31] CME Group Daily Settlement Procedures, Light Sweet Crude Oil (CL) Futures Daily Settlement Procedure, *available at*: https://www.cmegroup.com/confluence/display/EPICSANDBOX/NYMEX+Crude+Oil#NYMEXCrudeOil-ActiveMonth. CME Group Daily Settlement Procedures, Light Sweet Crude Oil (CL) Futures Daily Settlement Procedure, *available at*: https://www.cmegroup.com/confluence/display/EPICSANDBOX/NYMEX+Crude+Oil#NYMEXCrudeOil-ActiveMonth.

[32] Table 1 is found on page 18, *infra*.

[33] For the instrument types available on CME's Globex trading platform ("**Globex**"), *see* https://www.cmegroup.com/confluence/display/EPICS ANDBOX/Instrument+Types+Available+on+CME+Globex. Globex is an electronic trading system providing global connectivity to derivatives, including the WTI Contract. CME technology facilitates electronic trading, providing global users with virtually 24-hour access to its markets. *See* https://www.cmegroup.com/globex.html.

in the same contract. Individual positions in the spread are referred to as "**legs**." Calendar spread trades generally involve buying one expiration and selling another in the same contract.

Calendar spreads are priced off the differential between the two contracts. This means a trader holding a calendar spread is less interested in the price of each individual contract expiration than the *difference* between the two.

c) Trading at Settlement (TAS)

TAS trades are an order type that allows a participant to execute a trade at a spread, or defined number of tick increments, above or below that day's settlement price, at any time during the trading session. TAS has been a trade type for crude oil contracts since 2001.[34] TAS allows market participants to establish new, or adjust existing, positions using the trading day's settlement prices, without actually trading in the market during the closing period.

TAS prices are derived from the settlement price of the underlying futures contract after the settlement is complete. TAS contracts are bought and sold at a price differential from the daily settlement price, so the final price of the TAS contract is the settlement plus or minus a premium or discount. The allowable price increments and differential are defined by NYMEX. TAS trades provide a mechanism to access the markets for traders who want to capture the day's settlement price.

Spread TAS trades are also available in the WTI Contract, operating in a similar manner to outright TAS. Spread TAS trades are priced at a differential from the day's settlement for the given spread. The spread TAS position is then converted into a calendar spread after the daily settlement.

C. Overview of April 20 Events

On Monday, April 20, between approximately 2:08 p.m. ET and the end of the daily settlement period at 2:30 p.m. ET, the May Contract traded at prices below $0 per barrel for the first time since the inception of the WTI Contract in 1983. On April 20, the May Contract recorded an all-time intraday trading low price of -$40.32 per barrel before a final settlement of -$37.63 per barrel.[35] All other expirations in the WTI Contract settled at positive prices on April 20.[36]

As indicated above, April 20 was the May Contract's penultimate day, one day before the contract's expiration date.[37] The April 20 trading session commenced the preceding Sunday evening at 6:00 p.m. ET, when WTI Contract markets opened in Asia. The May Contract opened

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[34] *See:* NYMEX Notice to Members No. 41, 1/31/2001. Amendments to NYMEX Rule 6.40B (Trading at Settlement (Pilot Program)): Extension of Pilot Program.

[35] Daily market information is widely available. *See* https://www.wsj.com/market-data/quotes/futures/CRUDE%20OIL%20-%20ELECTRONIC?mg=prod/com-wsj.

[36] Markets with an upward sloping futures curve are referred to as being in "**contango**." *See* https://www.cmegroup.com/education/courses/introduction-to-ferrous-metals/what-is-contango-and-backwardation.html.

[37] Per the contract specifications, trading terminates three business days prior to the 25th calendar day of the month prior to the contract month, unless the 25th calendar day is not a business day, in which case trading terminates four business days prior. *See* https://www.cmegroup.com/trading/energy/crude-oil/light-sweet-crude_contractSpecs_futures.html.

the session on Sunday at a price of $17.73 per barrel. During the trading session from Sunday's open to Monday's intraday low, the May Contract price ultimately fell by $58.05 per barrel. The price drop was particularly pronounced during a 20-minute period between 2:08 p.m. and 2:28 p.m. ET, when May Contract prices moved from $0 to -$39.55 per barrel, before reaching the all-time low of -$40.32 at 2:29 p.m. ET.

Thus, the settlement price of the May Contract reflected the difference in price, or the "**spread**," between the May Contract and the active[38] June 2020 contract ("**June Contract**") (the "**May-June Spread**").[39] During the April 20 trading session, the May-June Spread widened from the previous trading day's closing spread of -$6.76 to -$58.06 per barrel.

The next trading session, which as is customary began the evening before, was the April 21 trading session. The April 21 trading session began on the evening of April 20. During the April 21 trading session, at approximately 8:04 p.m. ET on April 20, approximately six hours after prices dropped to negative prices during the April 20 trading session earlier that day, the May Contract traded above $0 per barrel.[40] During the overnight session of April 20 to 21, May Contract prices dipped below zero again when the European markets opened, and remained at or near negative prices until U.S. markets opened the morning of April 21. The price settled at expiration on April 21 at a price of $10.01 per barrel. At the end of the April 21 trading session, the May-June spread settled at -$1.56 per barrel, consistent with levels seen in mid-March.

As set forth in detail in the next section, coming into the penultimate trading day for the May Contract, the marketplace appeared to focus increasingly on the imbalance between supply and demand in the crude oil markets and the shortage of crude oil storage, particularly in light of the WTI Contract's terms requiring physical delivery in Cushing.[41] In the weeks prior to April 20, NYMEX announced it was preparing for negative prices in the WTI Contract, issuing a number of advisories and actions in preparation for such an event.[42] On or about April 1, the CME

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[38] The active month is the nearest of the contract months listed. Two business days prior to the spot month expiration, the active month becomes a non-active month. For example, if the spot month expires on a Friday, the next-listed contract will be considered the active month contract on the Wednesday prior to the spot month expiration. Here, the May Contract transitioned from active to non-active status at 6:00 p.m. ET on April 16, 2020 (the start of the April 17, 2020 trade date).

[39] *See* https://www.cmegroup.com/confluence/display/EPICSANDBOX/NYMEX+Crude+Oil.

[40] Oil markets and trading that day were referenced in a White House press conference that began at approximately 5:39 p.m. ET, before the April 21 session opened at 6:00 p.m. ET on April 20. https://www.whitehouse.gov/briefings-statements/remarks-president-trump-vice-president-pence-members-coronavirus-task-force-press-briefing-29/.

[41] *See* International Energy Agency ("**IEA**"), IEA Oil Market Report (OMR), April 2020, *available at*: https://www.iea.org/reports/oil-market-report-april-2020.

[42] On April 3, CME issued a notice entitled "Changes to Price and Strike Price Eligibility Flags for Certain Energy Products," indicating that CME was flagging certain products, including WTI Contracts, for potential negative price trading. *See* https://www.cmegroup.com/notices/electronic-trading/2020/04/20200403.html. On April 8, CME issued a notice entitled "CME Clearing Plan to Address the Potential of a Negative Underlying in Certain Energy Options Contracts," stating that the CME Clearinghouse would provide one day's notice before allowing negative options pricing and strikes, in order to allow the clearing participants to switch to the Bachelier model. *See* https://www.cmegroup.com/notices/clearing/2020/04/Chadv20-152.html. The Black-Merton-Scholes options pricing model, among others, relies on logarithms in the calculations. As a result, models of this type cannot calculate a price for the option if the underlying asset has a negative price. As the Bachelier model does not rely on logarithms for its calculations, it is particularly useful in situations where the underlying asset on which the option is written may have a negative price. On April 13, CME issued a Globex notice announcing that firms wishing to test negative and zero trade, settlement, and strike prices for Crude Oil futures and options on Crude Oil futures could utilize the

advised CFTC staff that CME was taking operational steps toward supporting negative pricing, as needed, for futures and strikes for options for certain energy products traded on CME's Globex, including the WTI Contract. On April 3, 8, 13, and 15, CME issued public notices and communications to its members in this regard.[43]

IV. Fundamental Factors

This section describes fundamental factors that may have influenced the May WTI Contract price on April 20 based on reporting staff's interim perspective.

A. Impact of Global Economic Slowdown, COVID-19, and Other Factors

The COVID-19 pandemic significantly reduced demand for crude oil, driving prices lower and increasing the 90-day historical price volatility[44] to extreme levels (*see* Figure 1 below). Between January 2 and February 6, 2020, WTI Contract price levels dropped steadily from $61.18 per barrel to $50.95 per barrel. By March 2, they had fallen to $41.28 per barrel. The price drop from January through February may be attributed, at least in part, to the reduction in crude oil demand in China[45] and other Asian countries, in addition to the expanding concerns of a more widespread impact of the pandemic.

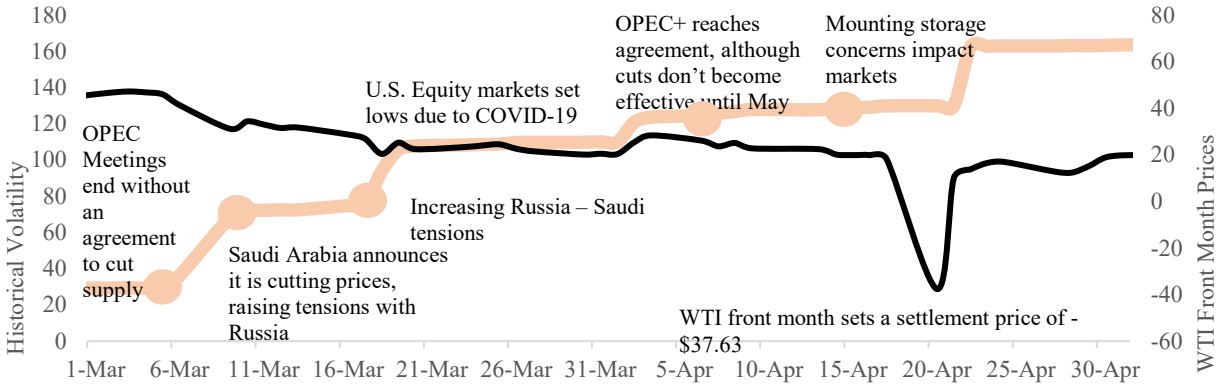

Figure 1: May Contract Performance during March and April 2020. Source: CFTC

CME Group New Release testing environment. The April 13 notice also noted that "as an operational step toward potentially supporting negative pricing and strikes," these energy outright futures and options were flagged as eligible to trade at negative prices on the CME market data platform. *See* https://www.cmegroup.com/notices/electronic-trading/2020/04/20200413.html. On April 15, CME issued a further notice to its clearing members entitled "Testing Opportunities in CME's 'New Release' Environment for Negative Prices and Strikes for Certain NYMEX Energy Contracts" about the possibility of negative prices. *See* https://www.cmegroup.com/notices/clearing/2020/04/Chadv20-160.html. On April 20, before WTI Contracts went negative, the CME Global Command Center notified its NYMEX exchange members that certain energy futures contracts, including the WTI Contract, would have no low limits and could trade negative.

[43] *See supra* n. 42.

[44] This volatility measurement was calculated using the standard historical volatility calculation by measuring price dispersion in the May Contract on a 90-days rolling basis.

[45] The International Energy Agency March Oil Market Report stated "Covid-19 (coronavirus) has spread beyond China and our 2020 base case global oil demand forecast is cut by 1.1 mb/d (million bpd). For the first time since 2009, demand is expected to fall year-on-year, by 90 kb/d. In 1Q20, China's demand falls by 1.8 mb/d y-o-y (year-on-year) with global demand down 2.5 mb/d…." *See* https://www.iea.org/reports/oil-market-report-march-2020.

In response to this decline in demand, OPEC Plus members sought to modify their existing agreement to reduce production in early March. However, they failed to do so and dissolved the agreement, further increasing downward pressure on WTI Contract prices.[46]

As the pandemic spread globally, global demand for crude oil fell further, and WTI Contract prices dropped to $28.70 per barrel by March 16.

Subsequently, as WTI Contract prices and Brent futures prices fell to $22.76 per barrel and $31.48 per barrel, respectively,[47] OPEC Plus members reached a historic agreement to cut the world's crude oil output by 9.7 million barrels per day ("**bpd**"), the largest single production cut in history.[48] On April 13, 2020, OPEC Plus announced this agreement prior to crude oil markets opening. Under the agreement, the cuts were to begin on May 1 and extend through the end of June 2020. The cuts would then be tapered to 7.7 million bpd from July 2020 through the end of 2020, and 5.8 million bpd from January 2021 through April 2022. OPEC Plus members planned to meet again in June 2020 to assess whether further actions would be needed.[49]

The initial price response to the April 13, 2020 OPEC announcement of production cuts was muted, with the WTI Contract prices continuing to decline, although the Brent futures prices increased briefly on Monday, April 13. However, by the end of Friday, April 17, both the WTI Contract and Brent futures prices had further declined, as the production cuts were not slated to begin until May 1. In the near term, crude oil markets were still subject to unconstrained production at a time when global demand had been blunted by the COVID-19 pandemic. At the close on Friday, April 17, the May Contract price fell below $20 per barrel to $18.27 per barrel and Brent futures prices fell to $28.08 per barrel.

B. Storage Concerns

The COVID-19 pandemic significantly reduced demand in a global crude oil market that was already over-supplied.[50] Although OPEC Plus members had agreed to reduce supply, the production reductions were not expected to commence until May 2020. Accordingly, concerns continued to increase around oversupply of crude oil production and undersupply of crude oil storage availability in the near term. In the U.S., with production unabated, similar concerns arose in late March, becoming increasingly persistent and pertinent as the May Contract approached expiration.[51]

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[46] *See* Sam Meredith, *OPEC+ Fails to Agree on Massive Supply Cut, Sending Crude Prices to 2017 Lows*, CNBC (March 6, 2020), https://www.cnbc.com/2020/03/06/opec-meeting-coronavirus-weighs-on-oil-demand-as-oil-prices-fall.html.

[47] Near month futures prices at close of business April 9, 2020.

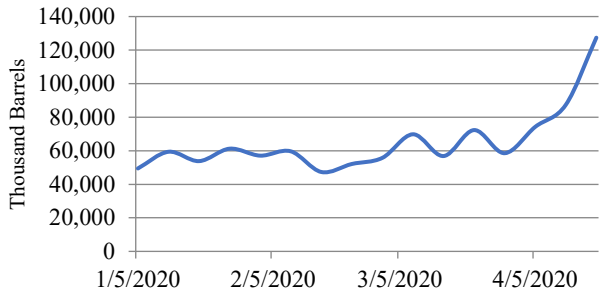
[48] *See* Pippa Stevens, *OPEC and Allies Finalize Record Oil Production Cuts After Days of Discussion*, CNBC (April 12, 2020), https://www.cnbc.com/2020/04/12/opec-and-allies-finalize-record-oil-production-cut-after-days-of-discussion.html#:~:text=OPEC%20and%20its%20oil%20producing%20allies%20on%20Sunday%20finalized%20a,largest%20output%20cut%20in%20history.

[49] At the June meeting, OPEC Plus members decided to extend the first level of production cuts for one month. Further meetings are scheduled for November 30, 2020 and December 1, 2020.

[50] *See* Scott Tong, '*Suppliers are Sexy,' But the Real Oil Collapse Story is Demand,* MARKETPLACE (April 3, 2020), https://www.marketplace.org/2020/04/03/why-are-oil-prices-low-covid19/.

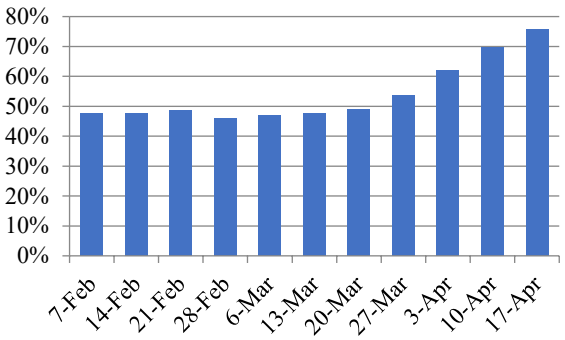
[51] *See* Stanley Reed, *The World is Running Out of Places to Store Its Oil*, THE NEW YORK TIMES March 26, 2020, https://www.nytimes.com/2020/03/26/business/energy-environment/oil-storage.html.

At the start of 2020, there were approximately 49.4 million barrels of oil in floating storage worldwide.[52] While the number fluctuated week-to-week based on economic conditions, global floating storage inflows exceeded 10 million barrels during the week ending March 8, following the collapse of the first OPEC Plus agreement.[53] During the first three weeks of April, when the OPEC Plus members were not subject to any production quotas, the amount of oil in floating storage rose by almost 69 million barrels to about 127 million barrels, a 117% percent increase from the March 29 level (*see* Figure 2). The bulk of that increase, about 40 million barrels, came during the week ending April 19. At this point in time, the May Contract had entered its last three days of trading, referred to as the "**spot period**."



Note: Total barrels of crude oil observed in floating storage globally.

Figure 2: Global Floating Storage of Crude Oil. Source: Bloomberg Finance L.P.



Note: Net stocks as a percentage of working storage capacity.

Figure 3: Weekly Crude Oil Storage at Cushing, OK. Source: EIA

While U.S. crude oil stockpiles remained little changed in the early stages of the COVID-19 pandemic, stockpiles began to escalate rapidly as the pandemic persisted through the first quarter of 2020. During the week of March 27, crude oil stocks swelled by 13.8 million barrels, compared to an average increase of just three million barrels per week in February and early March.[54] Over the next four weeks, U.S. crude oil stocks increased by 15.8 million barrels per week. By April 17, U.S. crude oil stockpiles were just 17 million barrels short of the all-time peak.[55]

The buildup of oil in storage facilities significantly impacted available storage capacity. As Figure 3 indicates, data from the EIA shows that storage facilities at Cushing had increased from about 50% of capacity in mid-March to approximately 76% of capacity by April 17. Anecdotal press reports[56] during the week leading up to the April 20 trade date suggested that crude oil

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[52] Source: Bloomberg Finance L.P.
[53] *Id*.
[54] For weekly information on U.S. crude oil stocks, *see* https://www.eia.gov/dnav/pet/pet_stoc_wstk_dcu_nus_w.htm.
[55] *See* EIA, WTI CRUDE OIL FUTURES PRICES FELL BELOW ZERO BECAUSE OF LOW LIQUIDITY AND LIMITED AVAILABLE STORAGE (2020).
[56] *See* Laila Kearney and Devika Krishna Kumar, *No Vacancy: Main U.S. Oil Storage in Cushing is All Booked*, REUTERS, April 21, 2020, https://www.reuters.com/article/us-global-oil-usa-storage/no-vacancy-main-u-s-oil-storage-in-cushing-is-all-booked-idUSKCN22332W, and Myra P. Saefong, *The Oil Market is Running Out of Storage Space and Production Cuts Loom*, MARKETWATCH April 21, 2020, https://www.marketwatch.com/story/the-oil-market-is-running-out-of-storage-options-2020-04-21.

storage was in particularly short supply. Some reports indicated that most, if not all, of the empty storage space had already been committed.[57]

Storage levels at Cushing (*see* Figure 3) are important not only because Cushing serves as the delivery point for the WTI Contract, but also because Cushing is a critical hub in the U.S. network of crude oil pipelines and accounts for a significant percentage of U.S. storage capacity. According to EIA, the 75.8 million barrels of storage capacity in Cushing represents about 44% of all crude oil working storage capacity in the Midwest (as defined by Petroleum Administration for Defense District 2), and about 11% of all commercial crude oil storage in the U.S. as a whole.

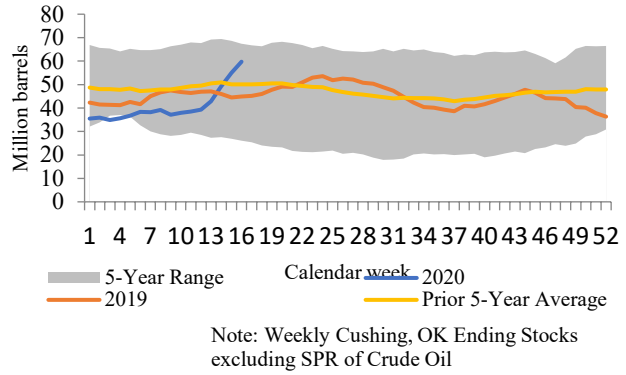


Figure 4: Weekly Cushing, OK Ending Stocks. Source: EIA

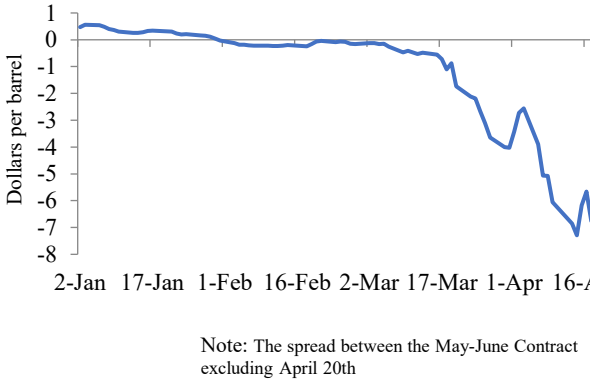


Figure 5: WTI May-June Spread January to April 2020. Source: CFTC

As the May Contract approached expiration on April 21, spreads between the May and June Contracts widened, consistent with an increase in storage capacity concerns (*see* Figure 5).[58] On January 6, 2020, the May-June Spread closed at $0.55 per barrel, indicating the May Contract was trading at a slight premium to the June Contract. The spread later widened, consistent with increasing concerns about the impact on demand of the COVID-19 pandemic. The May-June Spread declined below zero on January 31, hovering between $-0.04 per barrel and -$0.24 per barrel until early March, at which point the spread began to widen rapidly, indicating the May Contract was trading at significantly lower levels than its June counterpart. By the close of trading on Friday April 17, the trading day prior to the April 20 trading session, the spread settled at -$6.76 per barrel, perhaps reflecting market concerns about the lack of available storage for barrels scheduled to be delivered in May, among other factors.

The crude oil industry's demand response to COVID-19 was faster than its supply response, leading to an increase in the oversupply problem in the crude oil markets. Consumption of refined production and crude oil fell at a rapid pace as the global economy slowed while attempts to curtail production lagged behind the dramatic demand loss. This created a buildup of oil that would be available for immediate use, pushing nearby prices lower. At the same time, the expectation that demand would recover in the future kept forward prices elevated. As more oil flowed into storage, particularly at Cushing, near-term prices continued falling, in part to

[57] *See* EIA, LOW LIQUIDITY AND LIMITED AVAILABLE STORAGE PUSHED WTI CRUDE OIL FUTURES PRICES BELOW ZERO (2020).
[58] The widening of spreads meant the price of the May Contract traded at a lower price point to the June Contract.

discourage the continued flow of oil into facilities that were reaching their maximum operational capacity, further widening the spread between the May and June Contracts.

In summary, a wide-ranging set of fundamental factors coincided as crude oil fell over 70% in the days leading up to the April 20 trade date. An oversupplied global crude oil market was hit with an unprecedented reduction in demand, and the uncertainty over both the magnitude and duration of that loss helped push volatility to historic levels. The dissolution of the OPEC Plus agreement in March, coupled with the delay in resuming the production cuts until May, further exacerbated crude oil oversupply concerns, ultimately raising fears about the market's ability to store excess production. These concerns were particularly pressing at the Cushing storage facilities that serve as the delivery point for the physically-settled WTI Contract.

V. Trading Activity

This section reviews trading activity in the WTI Contract market leading up to, on, and around April 20. This section covers four main areas: (1) OI in the May Contract and related position changes; (2) aggregated intraday trading activity; (3) liquidity and related order book analysis; and (4) market integrity controls.

Multiple sources of information, collected and maintained by the CFTC, are incorporated into this analysis covering end-of-day positions, aggregated intraday transactions, and market depth information from the electronic central limit order book. DMO and OCE staff sought to review all relevant, reported derivative transactions involving the May Contract during the spot period, April 17 to 21. Staff of those divisions analyzed approximately 500,000 futures transactions (*see* Table 1). Staff also reviewed the use of commodity swaps hedged with WTI Contracts.[59]

Table 1: April 20 All Traded Sides of May 2020 NYMEX WTI Contract. Source: CFTC

Trade Category	Description	Buy Volume	Sell Volume	% of Total
Outright Regular	Both the Buyer and Seller are transacting an outright transaction (OR).	45,292	45,292	18.3%
Outright Implied	Outright trade for one participant is part of a spread trade by the other (OI).	13,401	46,093	12.0%
Regular Spread Trade	Both buyer and seller are executing a spread trade (SR).	49,056	49,056	19.8%
Spread Implied Trade	These trades face another leg that is either an outright or another spread (SI).	46,303	13,611	12.1%
Outright TAS	A type of outright trade that is assigned a price after the settlement price is determined (OT).	51,867	51,867	20.9%
Spread TAS	Spread trade that is assigned a value after the settlement window (ST).	25,209	25,209	10.2%
Exchange for Physical	Futures positions exchanged for a physical position (EP).	11,300	11,300	4.6%
Block Trades	Privately-negotiated trades ex-pit (PB).	4,143	4,143	1.7%
Undetermined	Undetermined, usually a block trade (UM).	1,376	1,376	0.6%
Overall Total Sides		247,947	247,947	100%

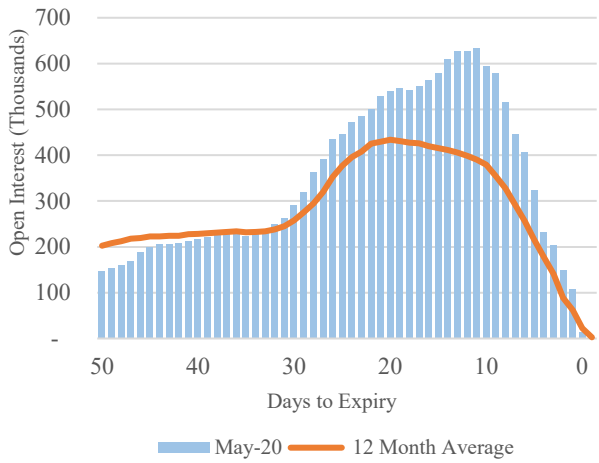
A. Open Interest in the May Contract

During the weeks prior to the May Contract's expiration through its penultimate trading day of April 20, OI was higher than in previous periods. As Figure 6 shows, the previous 12-month average OI in expiring WTI Contracts peaked around 430,000 contracts. In contrast, OI for the May Contract peaked at 634,727 contracts on April 2.

[59] DMO and OCE staff reviewed: reportable futures positions by significant market participants; large trader reporting obtained through Form 40 filings required under CFTC Regulation 18.04; Part 20 information for large traders for physical commodity swaps; Parts 45 and 46 swap data recordkeeping and reporting submissions made by various market participants in swaps and options; and trade information provided by DCMs under Part 16.

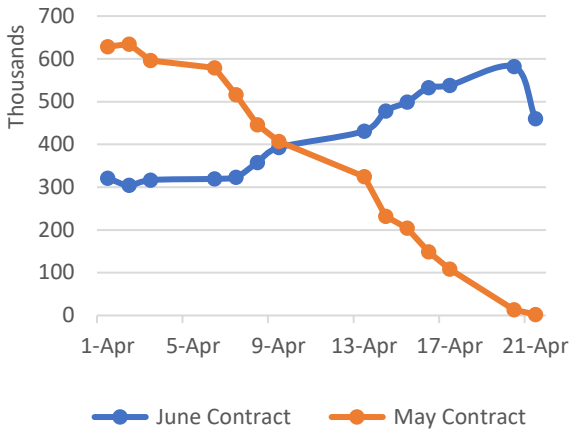
Figure 6 also shows that OI continued to increase until about 10 days prior to expiry of the May Contract. OI generally begins to decline around four weeks prior to expiry, when participants traditionally shift their focus away from the front month (here, May) to the next listed futures expiration month (here, June). Participants do so as the expiring contract market shifts to physical settlement and non-commercial participants shift to the more actively traded contract.[60] The need to roll contracts periodically is a common feature of all futures trading due to the expiration cycle.

Figure 7 shows the transition from May to June, with OI reduction observed in the expiring contract. Market participants, including those trading for commodity index funds or ETFs rolled their positions from the May to June Contract during the month of April. By the open of April 20, almost all of the OI in the May Contract was closed out or rolled to future expirations.



Note: OI is the number of WTI Contracts outstanding (1 contrract = 1,000 barrels of crude)

Figure 6: May Contract OI vs. 12-Month Average. Source: CFTC



Note: OI transition from the near month May Contract to the June Contract.

Figure 7: May vs. June Contract OI Transition. Source: CFTC

[60] By contrast to futures contracts that settle in cash, this physical settlement feature is unique and important to the futures markets, as it provides the basis for commercial participants to hedge their exposures directly to a physically-delivered commodity.

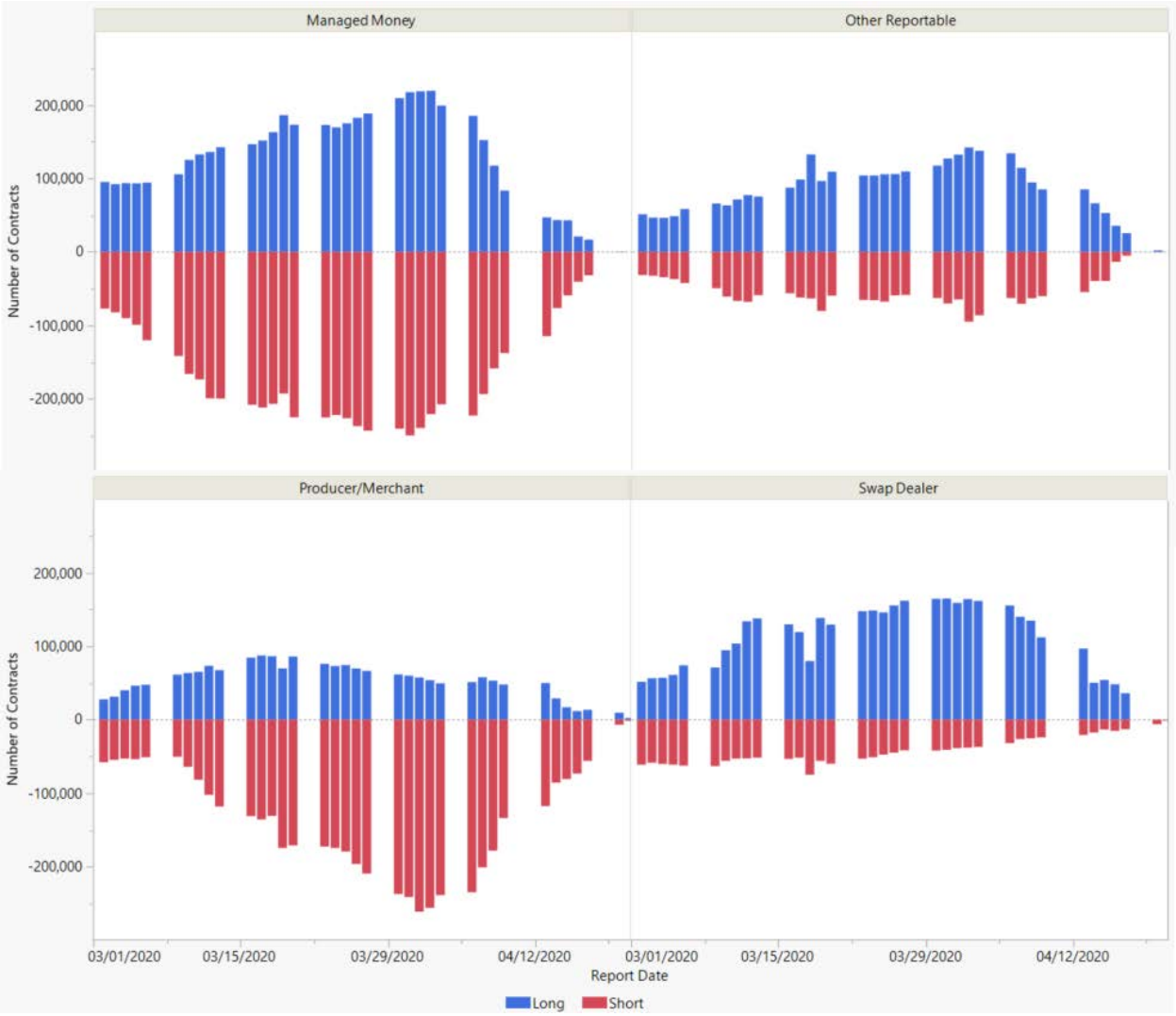


Figure 8: Market Participation of May Contract, March to April 2020 by DCOT Trader Classification. Source: CFTC

Figure 8 shows the reportable positions held by traders in the May Contract from March to until expiration on April 21.[61] Each panel displays the positions of an aggregated trader type, as reported in the Disaggregated Commitments of Traders report ("**DCOT**"). Traders from all four categories increased positions in aggregate in the contract through the beginning of April before reducing their positions in the second week of April consistent with Figure 8 above. While overall non-commercial participants' share of OI as a percentage of the overall OI decreased throughout April, 'Other Reportable' increased their share of reportable OI from 23.3% to 27.9%. As the May Contract expiration neared, most traders had closed their positions or rolled positions into contracts expiring at a later date, exiting their May Contract positions. OI at the end of the month was a small fraction of peak OI in the beginning of April.

Table 2: Reportable Trader Positions in May Contract. Source: CFTC

			Reportable Positions			
	Trader Count		Commercial		Non-Commercial	
Date	Commercial	Non-Commercial	Long	Short	Long	Short

[61] *See* https://www.cftc.gov/MarketReports/CommitmentsofTraders/index.htm.

April 1 (Open)	122	217	211,217	298,944	356,553	304,975
April 20 (Open)	95	78	49,430	68,482	42,601	36,782
April 20 (Close)	59	16	9,715	12,845	2,473	90

Table 2 depicts the number of reportable[62] commercial and non-commercial traders in the May Contract at various points in April, along with their long and short positions. From April 1 to the opening of the April 20 trading session, commercial traders reduced their short positions in the May Contract by 77.1%, while the long positions of non-commercial traders fell by 88.1%. Similarly, 64.1% of non-commercial traders had left the May Contract by the session opening of April 20, the penultimate day of trading.

Table 3: Beginning OI, Trading Volume and Reportable Initial Trader Counts on April 20, 2020. Source: CFTC

	Beginning OI		Initial Trader Counts		Trading Volume	
Contract	Contracts	Percent	Distinct Trader IDs	Percent of Total	Contracts	Percent
May	108,593	4.5%	173	38.6%	247,947	10.4%
June	538,038	22.5%	352	78.6%	1,319,926	55.2%
Other	1,744,304	73.0%	367	81.9%	823,247	34.4%
Total	2,390,935	100.0%	448	100.0%	2,391,120	100.0%

Table 3 shows the breakdown of OI at the opening of the April 20 trading session, across different expirations for the WTI Contract. At the start of session trading, most traders had already rolled their positions into the following contracts, and only 4.5% of WTI Contract OI was still held in the May Contract versus all other expirations. Similarly, most of the trading volume on this date occurred in the June Contract. On April 20, out of the 448 distinct traders with reportable positions, 173 held positions in the May Contract. This is roughly half the number of traders who held reportable positions in WTI Contracts for June or later months.

In summary, over the first three weeks of April, and before the May Contract's penultimate trading day, 76.9% of commercial positions, and 88.0% of reportable non-commercial positions were closed out. Consistent with orderly rolls in previous periods, at the start of the April 20 trading session, the vast majority of reportable positions were in later contract months. Similarly, 89.6% of volume on April 20, was in June or later contracts.

[62] Reportable and non-reportable positions refer to data collected under the CFTC's Large Trader Reporting Program. At the time of this Report, any trader with a position of 350 contracts or larger in any single futures or option expiration month must report all their positions to the CFTC. Such traders are referred to as "reportable" traders, and traders below the 350-contract threshold are "non-reportable." *See* https://www.cftc.gov/IndustryOversight/MarketSurveillance/LargeTraderReportingProgram/ltrp.html.

Table 4: Reportable and Non-Reportable Trader Positions on April 20, 2020. Source: CFTC

	Beginning OI	Reportable		Non-Reportable		CFTC Coverage	
Contract	Contracts	Long	Short	Long	Short	Long	Short
May	108,593	92,031	105,264	16,562	3,329	84.7%	96.9%
June	538,038	506,125	504,095	31,913	33,943	94.1%	93.7%
Other	1,744,304	1,683,633	1,701,498	60,671	42,806	96.5%	97.5%
Total	2,390,935	2,281,789	2,310,857	109,146	80,078	95.4%	96.7%

In addition to the reportable positions described above, the May Contract also had non-reportable traders holding positions. Table 4 shows the breakdown of OI at the start of the April 20 trading session, between reportable and non-reportable positions. Across all of the WTI Contract month expirations, 95.4% of long interest and 96.7% of short positions were held by traders whose positions were reported to the CFTC. At the beginning of the April 20 trading session, for the May Contract, 84.7% of the longs and 96.9% of the short positions were held by traders registered with the CFTC. CFTC coverage is the percent of total positions reported to the CFTC by large traders. Between the May 2019 and April 2020 contracts, average CFTC coverage was 89.7% for the long positions, and 91.4% for the short positions on the penultimate day of the maturing WTI Contract.

In addition to the reportable positions described above, non-reportable traders held positions the May Contract approaching April 20. Figure 9 and Figure 10 depict the non-reportable positions in the May Contract over the course of March to April 20. While the magnitude of open non-reportable positions decreased in the second and third weeks of April, the proportion of total May Contract OI in non-reportable positions increased from 4.8% at the beginning of March to a peak of 21.2% of OI in the third week of April.

Figure 9: Long and Short Non-Reportable Positions as a Percentage of Positions in the May Contract. Source: CFTC

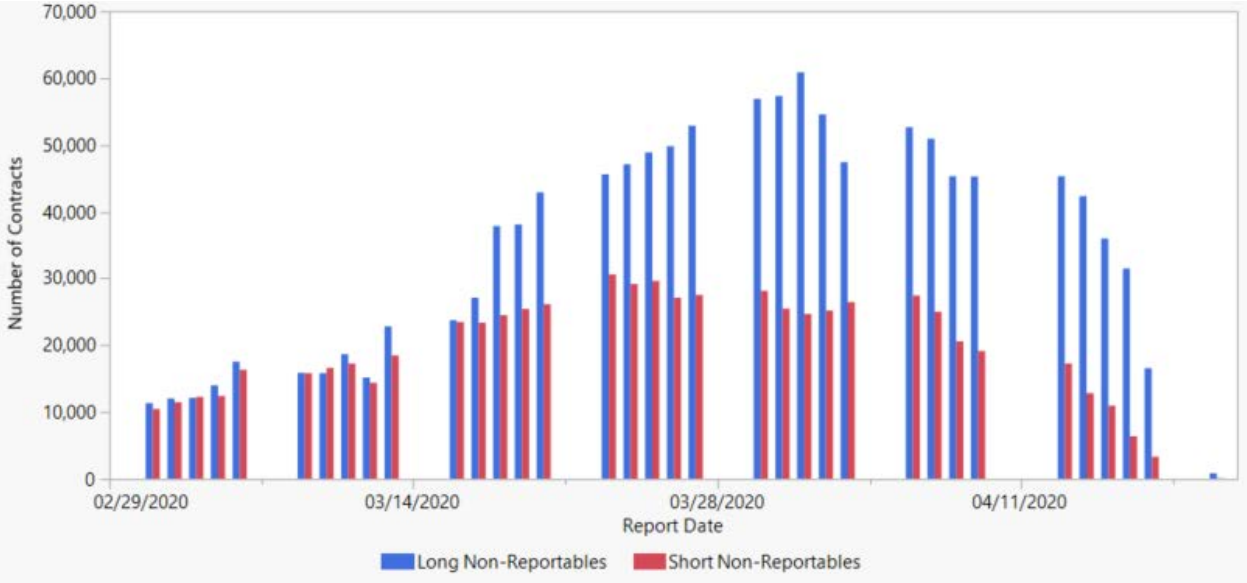


Figure 10: Long and Short Non-Reportable Positions in the May Contract. Source: CFTC

B. Starting Open Interest on April 20

This section of the Report reviews the significant reduction, or compression, of OI during the April 20 trading session. Relative to recent prior contract months, the amount of OI was significantly higher at the start of the April 20 trading session.

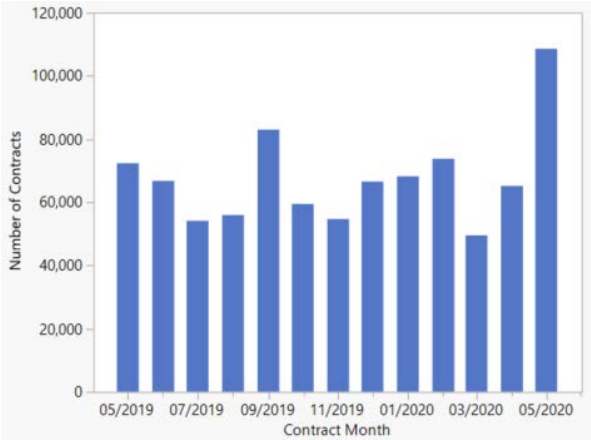


Figure 11: Penultimate Day Starting OI by Contract. Source: CFTC

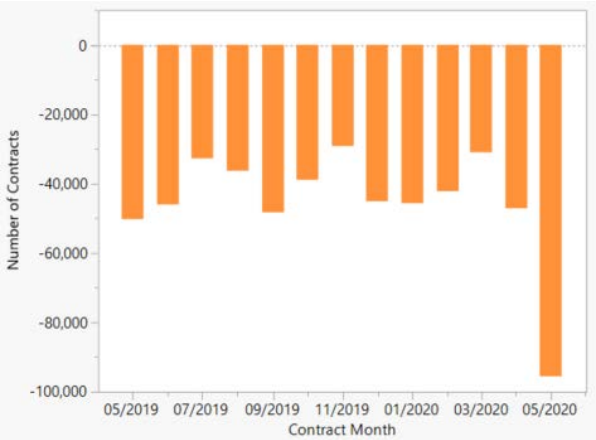


Figure 12: Penultimate Day OI Reduction by Contract. Source: CFTC

As Figure 11 shows, the May Contract's OI at the start of the April 20 trading session was 108,593 contracts, approximately 69.4% higher than the trailing 12-month average penultimate day OI of 64,101 contracts. Figure 12 shows the OI reduction on April 20, of approximately 95 thousand contracts, was more than double the average penultimate day reduction of 41,096 contracts observed during the prior 12-month period. NYMEX rules require any contract that remains open after the last day of trading be either settled by delivery or liquidated by an

Exchange for Physical Related Product, or "**EFRP**."[63] As such, Figure 13 shows almost all long non-commercial participants, or 54.2% of OI, needed to either exit or roll their contracts prior to the expiry. Of these positions, 15.3% were held by non-reportable traders and 23.6% belonged to the "**Other Reportable**" category.

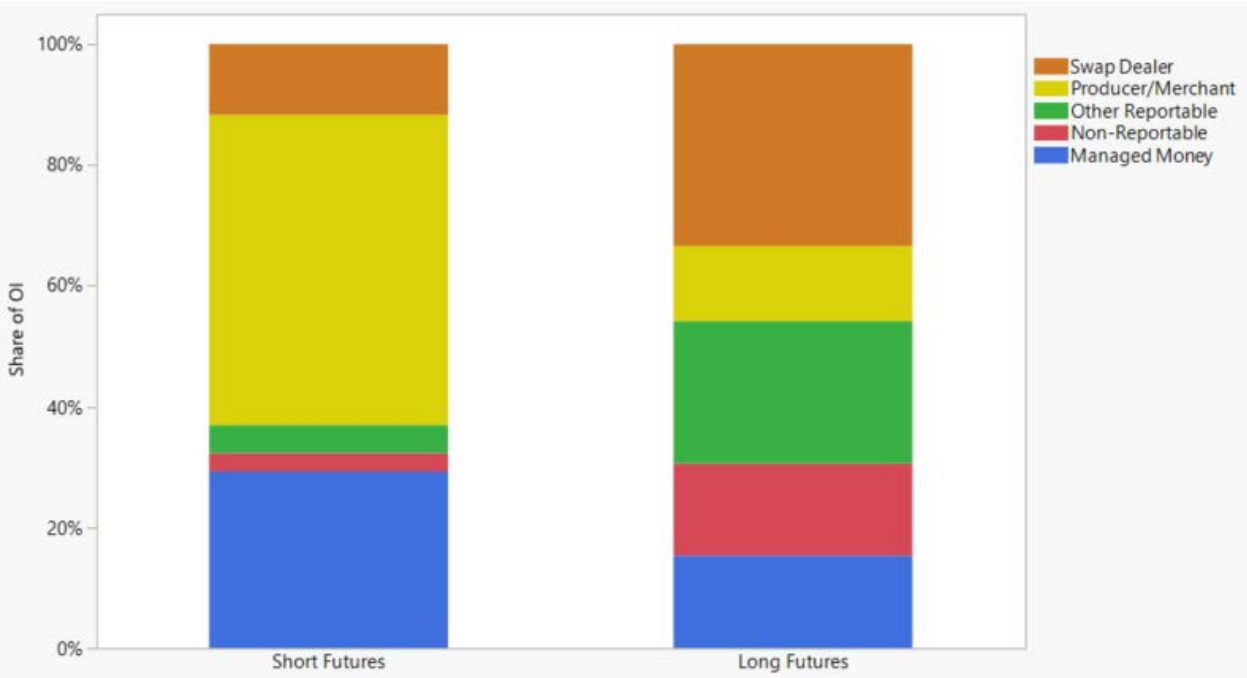


Figure 13: Starting OI on April 20, 2020 for May Contract, by DCOT Trader Type. Source: CFTC

[63] *See* NYMEX Rulebook 200102.F. Termination of Trading, available at https://www.cmegroup.com/content/dam/cmegroup/rulebook/NYMEX/2/200.pdf at "200102.F." *See also* https://www.cmegroup.com/education/courses/market-regulation/efrp/what-is-an-efrp.html. An EFRP is a transaction that involves a privately negotiated, off-exchange execution of an exchange futures or options contract and, on the opposite side of the market, the simultaneous execution of an equivalent quantity of the cash product, by-product, related product, or OTC derivative instrument corresponding to the asset underlying the exchange contract. Futures and options on futures must be executed openly and competitively on the exchange. EFRPs are one of the permitted exceptions to this general requirement, as they are privately negotiated away from the exchange and subsequently submitted to CME Clearing for clearing purposes.

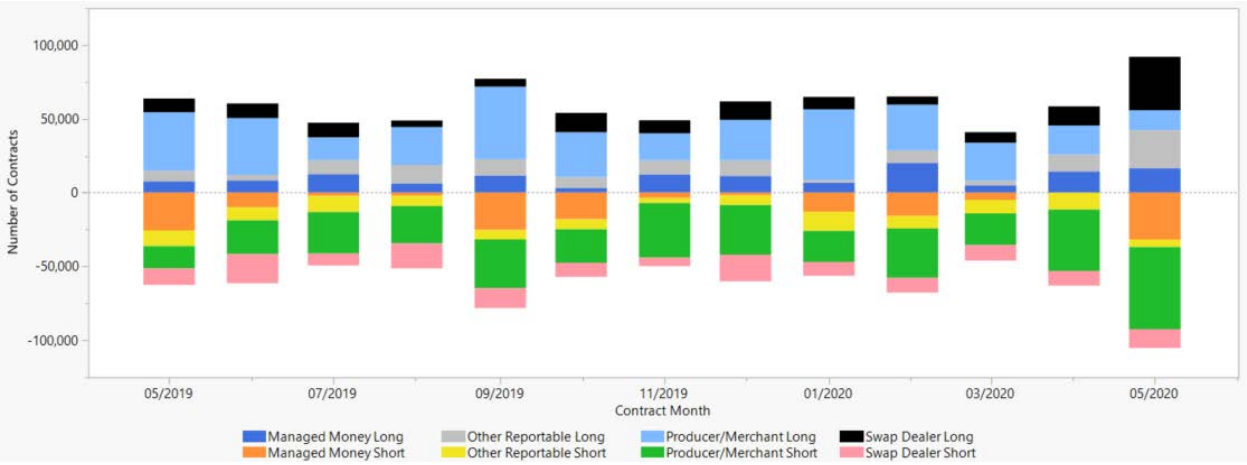


Figure 14: Penultimate Day Reportable Starting OI by Contract Month and DCOT Trader Type from May 2019 to May 2020. Source: CFTC

At the opening of the April 20 trading session, 27.9% of long reportable OI was held by traders in the "Other Reportable" DCOT category. Figure 14 shows the comparison of opening OI on the penultimate day trading session for contracts for reportable positions expiring May 2019 to May 2020. Compared to previous months, April 2020 observed an above-average portion of OI held by this category whose trailing 12-month average was 14.3%.

Traders in the "Producer/Merchant" DCOT category held below average long positions in the May Contract. This group held 14.7% of reportable OI compared to the 52.5% trailing 12-month average. With respect to short positions, commercial trader positions are in line with their 12-month averages while "Other Reportables" have below average positions.

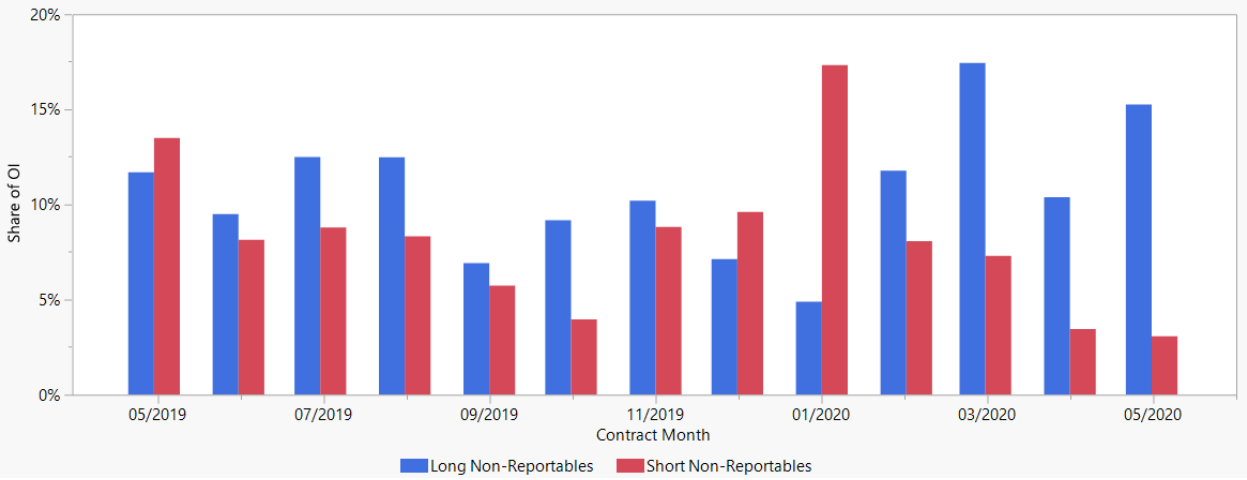


Figure 15: Long and Short Non-Reportable Positions on the Penultimate Trading Day by Contract Month, May 2019 to May 2020 Contracts. Source: CFTC

On the penultimate day of trading, 15.3% of long WTI Contract OI belonged to the non-reportable group. Figure 15 plots the percentage of non-reportable positions at the beginning of the penultimate day of trading, for contracts maturing from May 2019 to May 2020. The trailing 12-month average non-reportable percent is 10.3% for long positions and 8.6% for short positions. The percentage of non-reportable positions is above average, but similar in magnitude to the March 2020 contract.

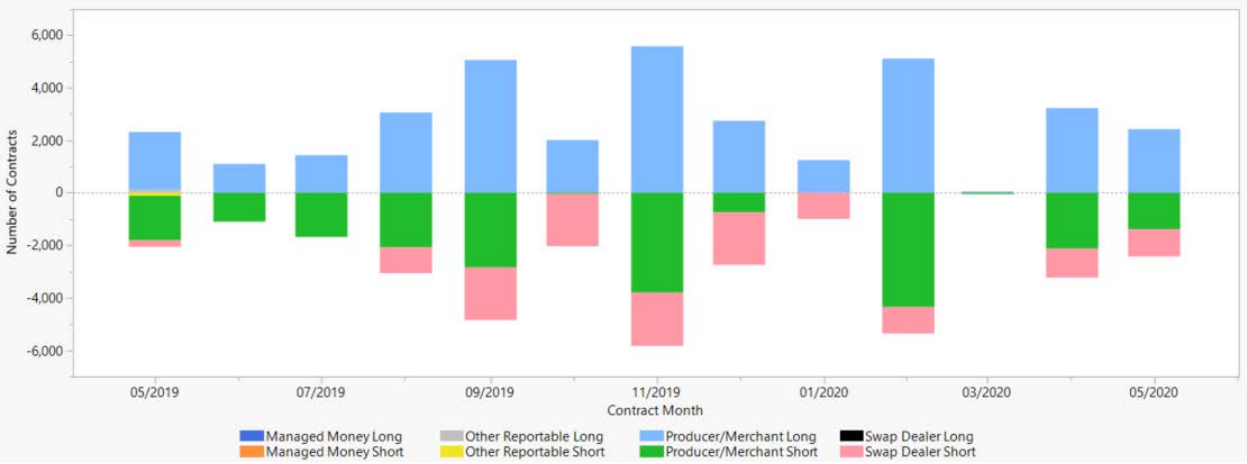


Figure 16: Reportable OI by DCOT Trader Type at Expiration. Source: CFTC

At expiration, positions left open are typically held by commercial producers and merchants, swap dealers, and a few other reportable traders. On April 21, the proportion of reportable OI held by different DCOT trader groups remained largely in line with the contracts that expired in the past 12 months.[64] While the number of open contracts was 69.4% higher than the prior 12-month average on the penultimate day, most of these open positions were closed during the April 20 trading session, reflecting an above average level of compression. At the expiry of the May Contract on April 21, the number of contracts that remained open was 2,427, below the prior 12-month average of 2,815, or less than 1% of the peak OI during that period.

C. Intraday Trading

This section analyzes aggregated intraday trading activity using a comprehensive transaction dataset collected by the CFTC.[65] The examination starts with a study of intraday prices, followed by volume, and finally, specific facts conditioning on customer account details. Unlike the end-of-day position data, the transaction data can be linked to specific product descriptions within a single expiration. This allows for the option to break down activity within the May Contract into the outright, spread, and TAS components – all of which are considered as distinct instruments on the exchange.

The study begins by looking into realized transaction prices within the day to help guide the analysis of volume and account participation. Figure 17 shows prices corresponding to all outright trades on April 17 and 20 and shows markets declined the day prior to April 20. Furthermore, the downward pressure in the market following the increased volatility and volume in late February and March pushed down the front month contracts, which resulted in a contango market with significant differences between individual expirations. The activity on April 20

[64] According to CFTC data, as displayed in Figure 16, market participants classified as commercial producers accounted for 100% of the long OI at the end of April 21 and approximately 57% of the short OI. The remaining 43% of short OI was held by commercial participants classified as swap dealers intermediating commercial interests.
[65] The CFTC collects daily files from trading exchanges for each transaction. While the information covers all trades, the majority are trades executed on an electronic venue.

shows how only the May Contract exhibited negative prices while the remaining expirations held relatively stable.

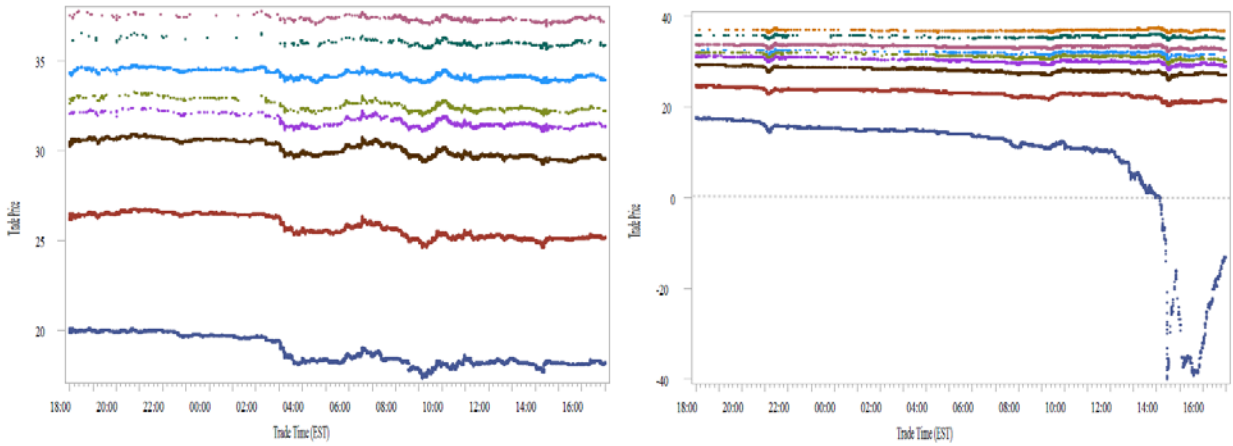


Figure 17: Intraday Prices for all Contracts on April 17, 2020 (Left) and April 20, 2020 (Right). Source: CFTC

The May Contract opened the April 20 trading session at $17.73 per barrel, fell $58.05 to reach an intraday low of -$40.32, before rebounding slightly to settle at -$37.63 per barrel. Prices in the May Contract fell below zero at 2:08 p.m. ET, close to the end of the trading day. Prices trended down for most of the April 20 trading session but the speed of price declines began to accelerate around noon ET. This also impacted the May-June spread, which widened from the previous trading day's closing spread of -$6.76 to settle at -$58.06 per barrel.

Figure 18 and Figure 19 focus on the afternoon of April 20 on the specific products with extreme price movements. This shows that TAS products (the May TAS, June TAS, and the May-June TAS Spread) all displayed extreme prices all hitting their exchange defined limit of 10 ticks and 20 ticks from the settlement price, for outright and spread, respectively.

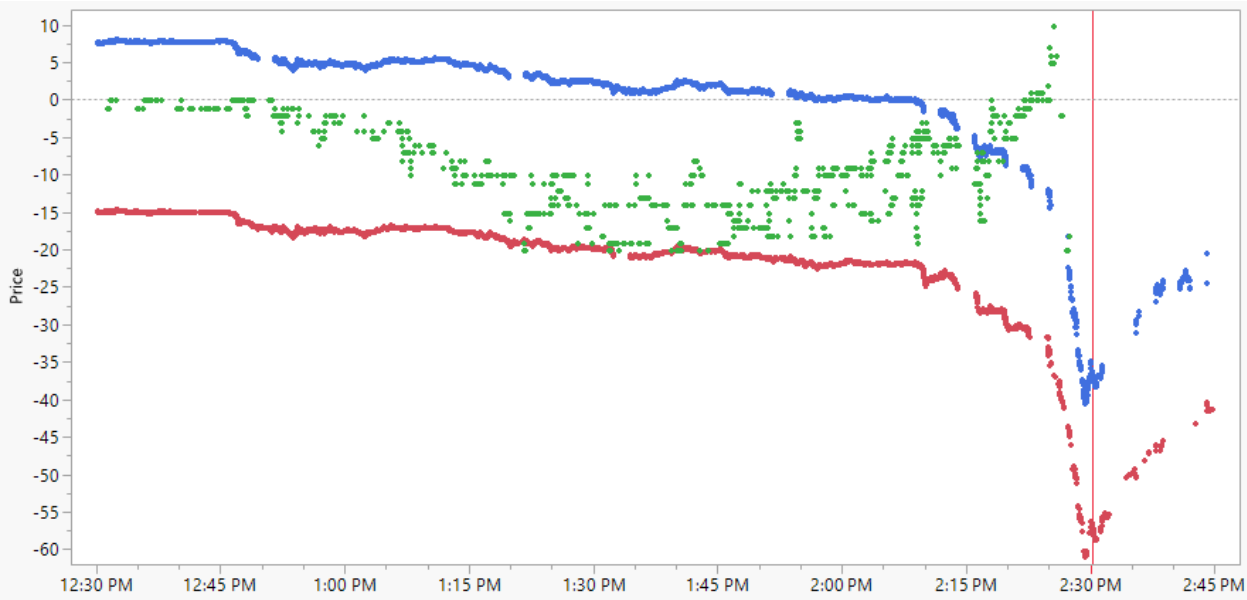


Figure 18: Intraday Prices for May Contract (Blue), May-June Spread (Red), May-June TAS Spread (Green); April 20, 2020 12:30 p.m. to 2:45 p.m. ET. Source: CFTC

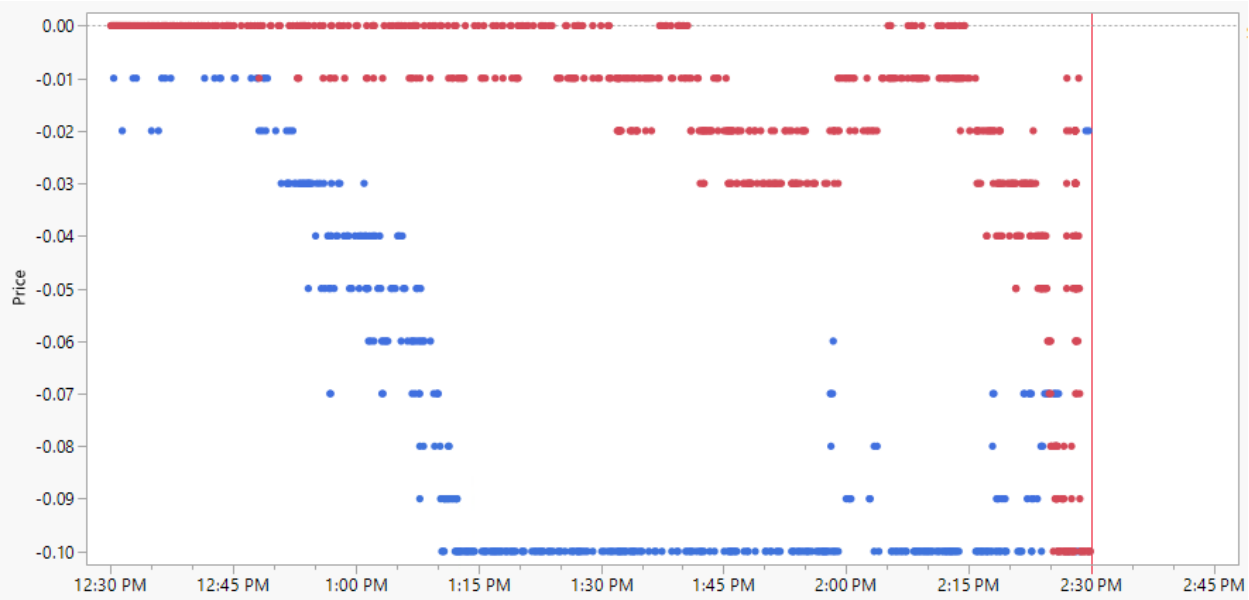


Figure 19: Intraday Prices for May TAS Contract (Blue), June TAS Contract (Red); April 20, 2020 12:30 p.m. to 2:45 p.m. ET. Source: CFTC

TAS contracts trade at a differential to the settlement price and are quoted as a premium/discount from the settlement price (*e.g.*, settlement price +0.02). Each contract has established limits for TAS pricing and in the case of the WTI Contract, the TAS limits are +/- 0.10 for outright TAS and +/- 0.20 for spread TAS. Figure 18 and Figure 19 show outright and spread TAS began trading at their minimum limits before prices in the May Contract went negative at 2:08 p.m. ET (2:30 p.m. ET is marked on the charts by the vertical red line).

TAS contracts do not trade at their price limits very often, and the number of TAS contracts traded at the maximum price differentials during the April 20 session in all contract months were well above average. During the April 20 trading session, the number of outright TAS contracts traded at the maximum price limit was more than 70 times higher than all of 2019. Spread TAS did not trade at its price limits at all in 2019 or any other day from January through May 2020, aside from April 20 (*see* Table 5).

Table 5: Summary of NYMEX WTI TAS Trades Executed at Maximum Price Differentials, January 2019 to May 2020. Source: CFTC

Time Period	TAS Type	Trade Count	Volume
All 2019	Limit Outright TAS	49	164
All 2019	Other TAS	234,432	8,106,679
2020, Jan 31- Apr 17	Limit Outright TAS	264	941
2020, Jan 31- Apr 17	Other TAS	104,552	4,255,584
April 20th	Limit Outright TAS	1,101	11,568
April 20th	Limit Spread TAS	41	241
April 20th	Other TAS	9,978	255,491
2020, Apr 21 - May 31	Limit Outright TAS	412	851
2020, Apr 21 - May 31	Other TAS	58,519	2,252,190

Moving to observed volume, Panel A of Table 6 presents a summary of volume and trades for the six futures products of interest based on the study of observed transaction prices. Comparing volume on April 20, the May TAS Contract has half the volume of the June TAS Contract. The

table shows TAS trades tend to have larger trade sizes – a fact that will be explored later in this section.

Table 6: Overview of Transaction Data by Product on April 20, 2020[66]. Source: CFTC

Panel A: Market Activity Information:

Product	Type	Month	Full Day Volume	Trade Count	Avg Trade Size	Volume Before 2:00 p.m. ET	Volume After 2:00 p.m. ET	Volume After 2:00 p.m. % of Total
CLK0	Outright	May	58,693	40,098	1.5	50,672	8,021	13.7%
CLTKO	Outright TAS	May	51,867	1,949	26.6	48,871	2,996	5.8%
CLM0	Outright	June	914,148	724,999	1.3	692,440	221,708	24.3%
CLTM0	Outright TAS	June	104,270	2,645	39.4	83,911	20,359	19.5%
CLK0-CLM0	Spread	May-June	142,667	71,310	2.0	125,247	17,420	12.2%
CLTK0-CLTM0	Spread TAS	May-June	41,836	3,616	11.6	36,188	5,648	13.5%

Panel B: Trader/Account Information:

Product	Type	Month	# of Active Accts	Avg Qty per Acct	Avg Trade Size per Acct	Active Only Before 2:00 p.m. ET	Active Only after 2:00 p.m. ET	Active During Full Day
CLK0	Outright	May	1,911	78.5	1.5	1,021	400	490
CLTKO	Outright TAS	May	269	385.6	34.2	172	36	61
CLM0	Outright	June	5,888	305.5	1.2	1,934	1,493	2,461
CLTM0	Outright TAS	June	241	865.3	46.0	105	69	67
CLK0-CLM0	Spread	May-June	490	582.3	2.2	245	66	179
CLTK0-CLTM0	Spread TAS	May-June	99	845.2	34.0	42	9	48

The majority of the volume traded in the May and June Contracts, including outrights, spreads, and TAS was traded prior to 2:00 p.m. ET, meaning most of the volume was traded when prices were positive. The composition of trading accounts and volume in the May Contract on April 20 differed from the June Contract and May-June spread (*see* Table 6). The May Contract saw similar outright and outright TAS volume totals for the full day session, which is not the case for the June Contract or the May-June spread and spread TAS – those products show much higher volumes in non-TAS trading. In terms of magnitude, the June Contract traded over 15 times more volume than the May Contract.

The composition of active accounts in each contract on April 20 reflects the roll period having already largely occurred – over 5,000 accounts actively traded in the June Contract while about

[66] CME product codes are used to differentiate products in this table (*e.g.*, "CLK0"). The product types and contract months associated with each code are defined in this table not repeated in subsequent tables. Spread numbers include the volume for each leg and also include each leg as a trade. For example, a 200-lot CLTK0-CLTM0 trade would appear in the table as 400 contracts for volume (200 for each leg) and 2 trades (one trade for each leg).

1,900 traded in the May Contract (*see* Table 6). The May Contract had a higher proportion of accounts active only before 2:00 p.m. ET compared with the June Contract, which had more accounts active during both the pre- and post-2:00 p.m. ET periods. The number of accounts actively trading TAS was also much smaller than the number of accounts trading outrights.

Figure 20 and Figure 21 show intraday volume aggregated at one-minute intervals for the six futures contracts of interest. These figures demonstrate several things. For example, the figures demonstrate the importance of the settlement period for the active June Contract, relative differences between the TAS contracts, volume in the June TAS Contract being concentrated closer to the settlement window, and very little activity over the day in the May Contract.

Figure 20: Volume of Futures Linked to the May Contract on April 20, 2020. Source: CFTC

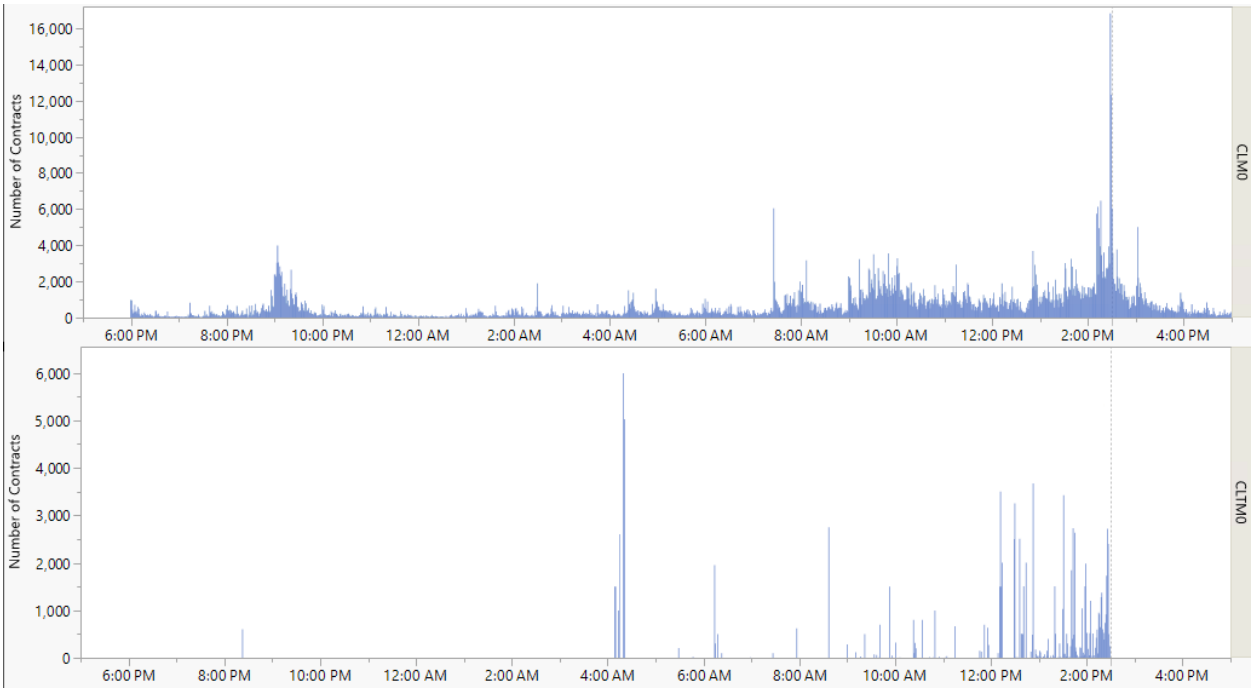


Figure 21: Volume of Futures Linked to the June Contract on April 20, 2020. Source: CFTC

Panel B of Table 6 provides a summary of account level activity by product. Most accounts are in the June Contract relative to the May Contract. Accounts in TAS tended to have larger quantity and larger average trade sizes.

D. Liquidity & Order Book Analysis

This section considers market depth information from the central limit order book.[67] DMO and OCE staff utilized the information made available by the CME to market participants to test trading models and feed into near real-time trading algorithms. This data is useful in exploring market liquidity because the electronic limit order book represents all available liquidity (visible resting limit orders) and provides multiple price levels on both sides of the market.

For this analysis, daily market depth files, for dates April 13-20, 2020, are collected from Vertex Analytics for the May Contract, the June Contract, the July Contract, the May-June Spread, the June-July Spread, the May TAS Contract, the June TAS Contract, the May-June TAS Spread, and the June-July TAS Spread.[68] The raw data from Vertex is a collection of updates to the limit

[67] A limit order book is a collection of open limit orders sequenced by market side (buy vs. sell), entry time, and price level. For example, focusing on the best quotes, each will have a depth reflecting the number of contracts available at the price to buy or sell. The "**market**" is commonly defined by the best bid and ask price level and often the difference between these, in the most actively traded markets, is equal to the minimum tick size. Market participants use this information to assist with trading decisions as well as back-test trading strategies and trading algorithms. *See* https://www.cmegroup.com/market-data/datamine-historical-data/. This information is commonly used to study market liquidity. A limit order book with lots of depth at both best quotes is considered liquid as a market participant can buy or sell with no price impact. During times of elevated volatility, depth often decreases and the bid-ask spread is expected to widen, reflecting reduced liquidity.

[68] Vertex is a technology company focused on providing easy access and interactive visualizations of every message from the CME. The subscription allows for direct download of daily files across all the products traded on the CME. Once downloaded, raw message data is processed to rebuild the top ten levels of the limit order book. *See* https://vertex-analytics.com/.

order book and are then used to construct the full 10-deep book of resting depth at all 20 price levels.[69] Once the book is constructed, it is possible to select any point during the day and observe the current price levels and how many contracts are available for trade.

Table 7 provides total counts on the number of updates to the limit order book conditional on trade date and product. Each time a new limit order arrives, or an existing limit order is canceled or modified, an update message is created and made available for market participants to pick up and process. Therefore, the number of updates can serve as a proxy for activity in the limit order book. To provide additional details, counts are provided for the full day (Panel A), an hourly average (Panel B), an interval prior to the settlement window (Panel C), and during the 2-minute settlement period (Panel D).

Focusing on outrights, there was a general decreasing trend in activity in the May Contract, while there was an increasing trend in activity in the June Contract between April 13 and April 20. This is a common pattern in the market during roll periods as the nearby contract approaches expiration and traders migrate to the next contract with the most trading activity. The update counts, during our short sample of dates, show the TAS order book was updated less frequently than outright and spread markets, which is in line with observed transactions and the number of market participants (*see* Table 6).

Table 7: Activity in the Limit Order Book by Date and Product. Source: CFTC

	Number of Book Updates					
Trade Date	**CLK0**	**CLTK0**	**CLM0**	**CLTM0**	**CLK0-CLM0**	**CLTK0-CLTM0**
Panel A: Full Day						
4/13/2020	2,471,378	27,070	2,081,084	24,233	748,602	9,924
4/14/2020	2,356,864	24,649	1,823,570	25,566	862,084	9,165

[69] There are approximately 41 million observations in the sample.

4/15/2020	2,009,674	24,143	2,266,737	20,145	849,938	10,241
4/16/2020	1,491,536	19,608	2,208,738	17,983	858,685	7,506
4/17/2020	970,846	16,083	3,198,937	26,954	890,589	5,971
4/20/2020	409,676	4,281	4,746,611	11,123	536,066	3,166
Panel B: Average/Hour (9:00 a.m. to 2:00 p.m. ET)						
4/13/2020	197,614.0	154.8	173,028.4	98.2	54,407.2	46.6
4/14/2020	212,473.2	119.8	182,269.4	79.0	84,011.8	67.2
4/15/2020	178,575.8	625.6	219,473.4	64.8	71,390.0	16.4
4/16/2020	141,525.0	53.8	203,114.0	137.0	64,216.2	19.4
4/17/2020	88,869.2	42.0	270,470.2	122.8	63,594.4	19.6
4/20/2020	39,207.0	495.0	397,187.0	547.0	40,648.4	377.8
Panel C: 2:00 p.m. - 2:28 p.m. ET						
4/13/2020	113,657	448	103,783	297	59,462	153
4/14/2020	164,756	930	141,796	317	80,075	323
4/15/2020	107,712	396	149,885	302	66,078	178
4/16/2020	77,959	181	127,724	432	38,719	85
4/17/2020	33,996	146	202,658	449	54,627	127
4/20/2020	17,344	499	328,506	2,033	11,942	1,058
Panel D: 2:28 p.m. - 2:30 p.m. ET						
4/13/2020	47,554	25,485	33,242	23,231	17,645	9,345
4/14/2020	55,394	22,633	38,835	24,490	18,612	8,209
4/15/2020	26,599	17,379	27,131	19,293	18,432	9,933
4/16/2020	28,410	18,928	29,741	16,553	10,157	7,251
4/17/2020	22,077	15,454	48,525	25,558	10,193	5,688
4/20/2020	1,157	17	81,186	5,632	294	6

Table 8 shows resting depth at the best bid and ask quotes across our sample of dates and contracts. Comparing the May and June Contracts, this shows the natural change in depth during the roll period as the market transitions to the new actively traded contract. The May Contract shows a 50 percent decline between April 13 and April 20. There is a larger decrease observed in the May-June Spread. TAS markets display a significant quantity of contracts at the best quotes with often large imbalances – a pattern not observed in outright and spread markets in this sample period. The largest imbalance observed in the June Contact occurs on April 20. The differences between outrights and TAS may relate to the larger TAS trade sizes observed in Table 6.

Table 8: Resting Depth in the Limit Order Book by Date and Product (1-minute Average). Source: CFTC

	CLK0	CLTK0	CLM0	CLTM0	CLK0-CLM0	CLTK0-CLTM0

Date	Best Bid	Best Ask	Best Bid	Best Ask	Best Bid	Best Ask	Best Bid	Best Ask	Best Bid	Best Ask	Best Bid	Best Ask
4/13/20	8	8	10,950	8,623	5	5	6,363	5,986	16	15	2,062	3,824
4/14/20	12	11	11,691	22,724	8	6	7,680	7,796	17	18	6,750	6,619
4/15/20	10	11	5,255	5,127	8	7	3,598	4,243	16	26	924	4,483
4/16/20	7	8	5,659	3,316	9	9	8,950	11,904	12	15	1,766	4,578
4/17/20	4	6	5,867	3,692	11	10	10,280	8,138	14	10	1,341	4,607
4/20/20	4	5	1,169	10,402	12	11	5,063	21,305	4	3	949	2,976

Figure 22 and Figure 23 shows intraday depth at the best quotes for outrights and TAS, respectively. For comparison, information from April 17 is displayed (left side). For most of that day, the May Contract depth at the best quotes was close to five contracts, but there were intervals within the day with large imbalances, specifically on the sell side.

Figure 23 shows the imbalance between the bid and ask depth in the TAS contracts on April 20, which was due to the depth at the best ask being relatively larger than the depth at the best bid. As TAS markets pushed toward the -10-tick limit, this imbalance decreased.

Figure 22: Limit Order Book Depth at Best Quotes (Bid=Blue; Ask=Red) on April 17 and 20 – Outrights. Source: CFTC

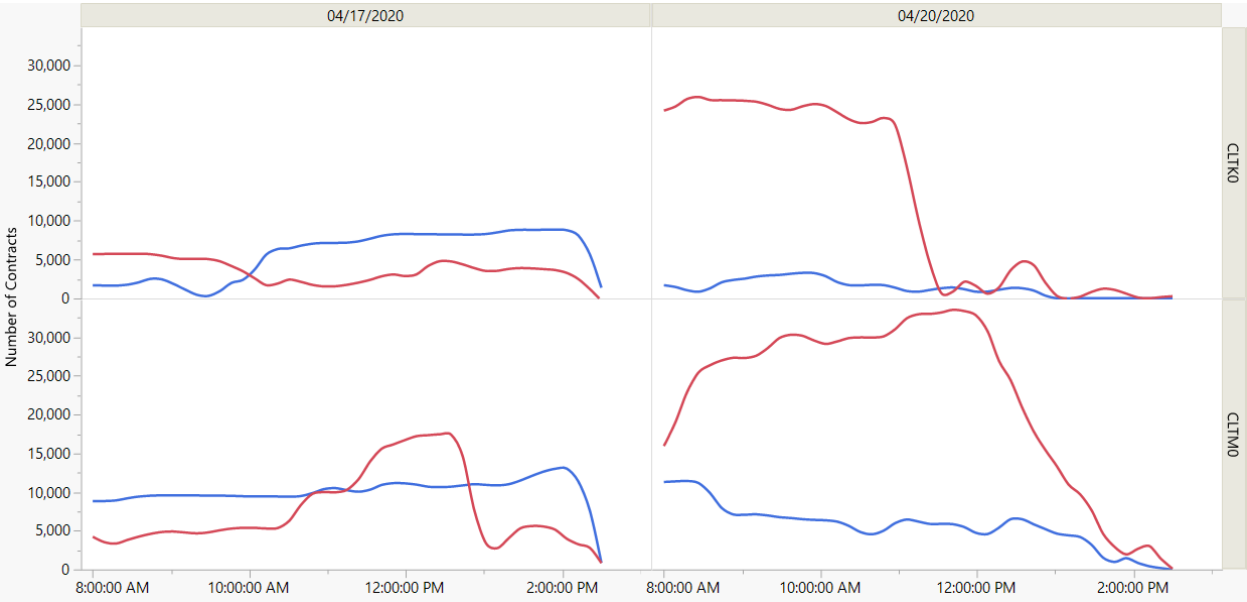


Figure 23: Limit Order Book Depth at Best Quotes (Bid=Blue; Ask=Red) on April 17 and 20 – TAS. Source: CFTC

Besides resting depth, the reconstructed limit order books may allow for study of the bid-ask spread, a common measure of market liquidity.[70] Figure 24 shows intraday bid-ask spreads for the May and June Contracts by trade date. From the upper panel, we see the changes occurring during the week prior to April 20. As observed above, as activity moved from the May Contract to the June Contract, the bid-ask spreads increased in the May Contract and decreased in the June Contract. On April 17, the bid-ask spread in the May Contact was significantly higher than the bid-ask spreads observed in previous days.

The lower panel of Figure 24 shows the intraday bid-ask spread in the May Contract on April 20 and shows an increase in the bid-ask spread (the June Contract's bid-ask spread was similar to its pattern observed on April 17). The increase in the bid-ask spread started at noon and remained elevated for the rest of the afternoon.

[70] The bid-ask spread is computed by taking the difference between the best ask and the best bid quoted prices and then dividing by the minimum tick size, which results in a bid-ask spread measured in number of ticks. A reconstructed limit order book allows one to compute the bid-ask spread at all instances of a change in either best quote. Using the bid-ask spread at each book update and the duration between updates, a time-weighted measure is computed to more accurately capture the bid-ask spread in a market.

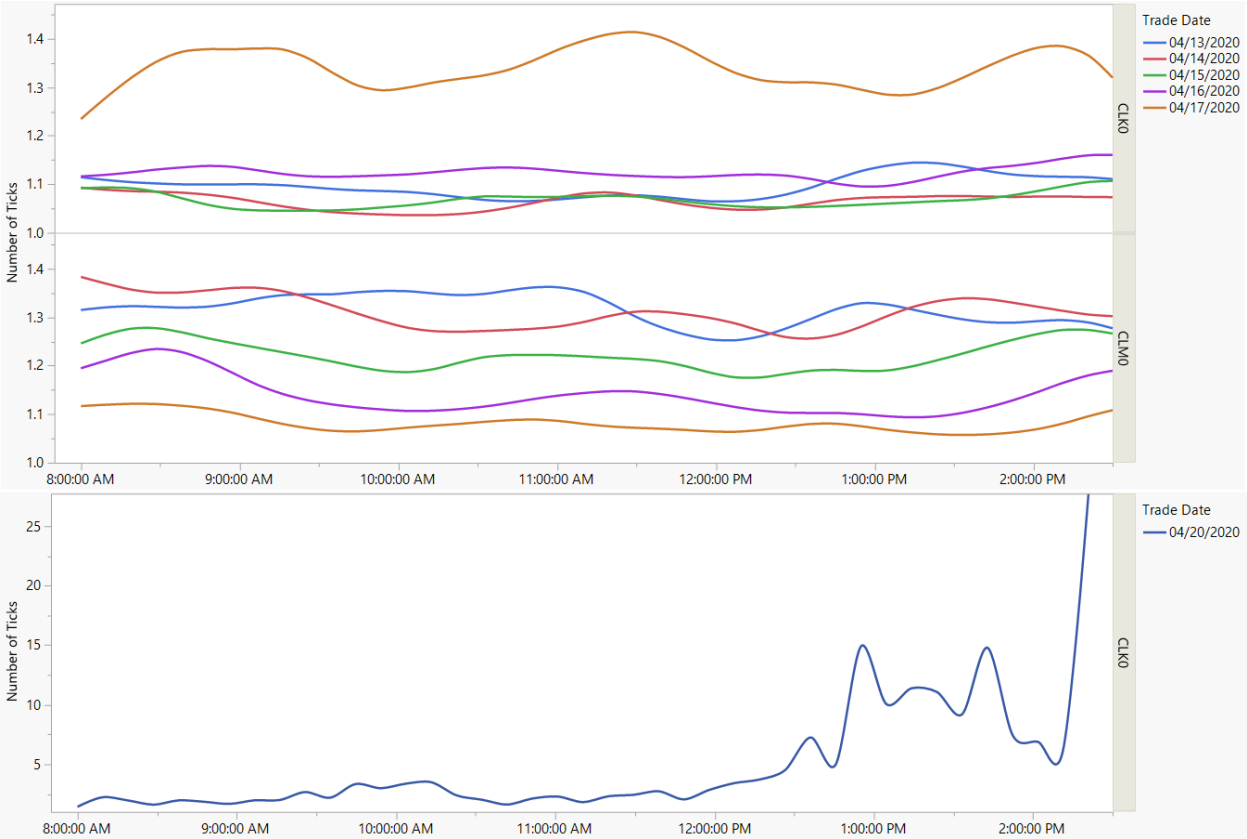


Figure 24: Intraday Bid-Ask Spreads by Date and Product. Source: CFTC

Next, we turn to examining resting depth away from the best quotes. The quantity of resting liquidity at levels deeper in the book provides additional information related to the amount of buying and selling interest away from the best bid and ask prices. Furthermore, knowledge of depth at deeper levels typically provides traders with information on price slippage if their demand exceeds depth at the best quotes. Figure 25 contrasts depth across the top five book levels on April 13 and April 20 in the May and June Contract. We can see the shift in depth over the week – the May Contract depth has significantly decreased across all book levels and became inverted as the largest depth was at the best quotes.

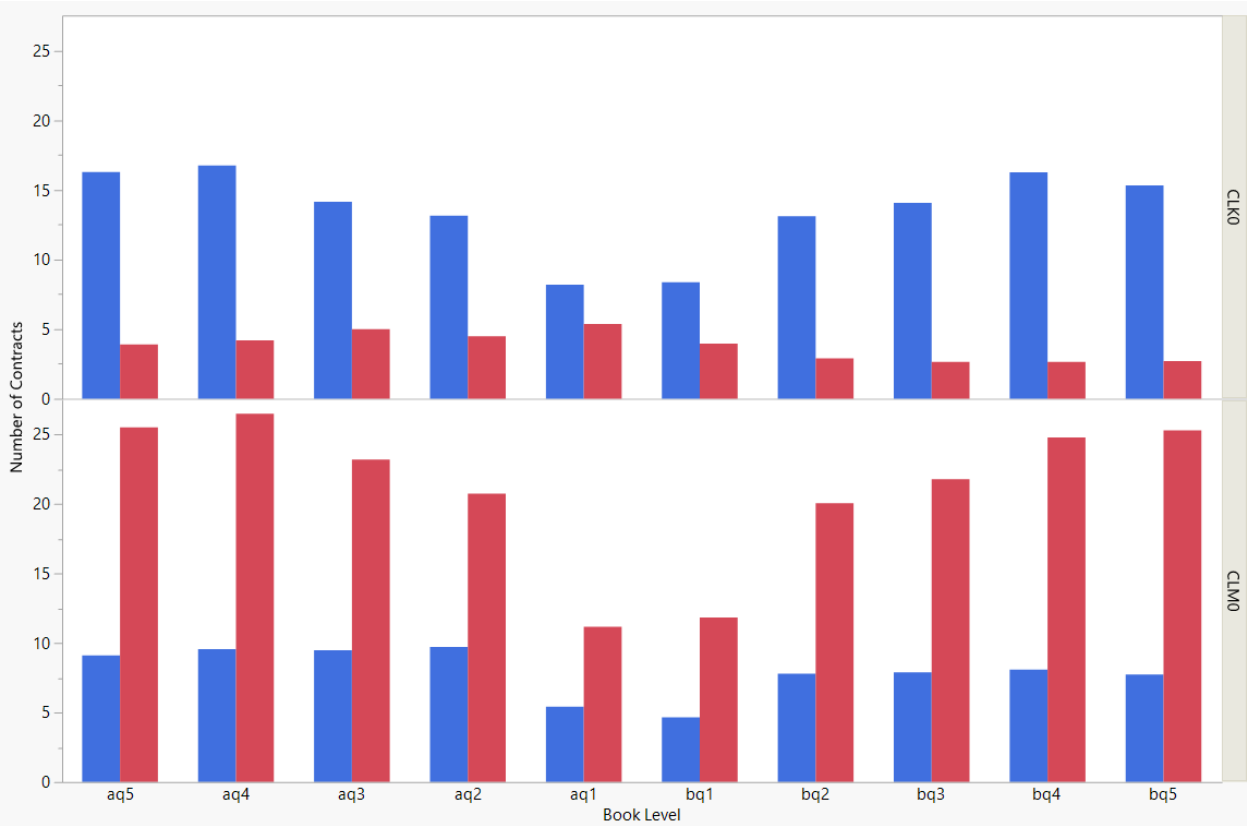


Figure 25: Average Depth by Book Side and Level on April 13, 2020 (Blue) and April 20, 2020 (Red) – Outrights[71]. Source: CFTC

[71] Figure reflects the average quantities resting on the top five book levels, which should be distinguished from the average quantities resting on the top five price levels.

Figure 26 extends the prior discussion and focuses attention on depth of the book in the two TAS markets for the May and June Contracts. Unlike the outright contracts, TAS order books appear to have most available liquidity at the first two levels of the limit order book.

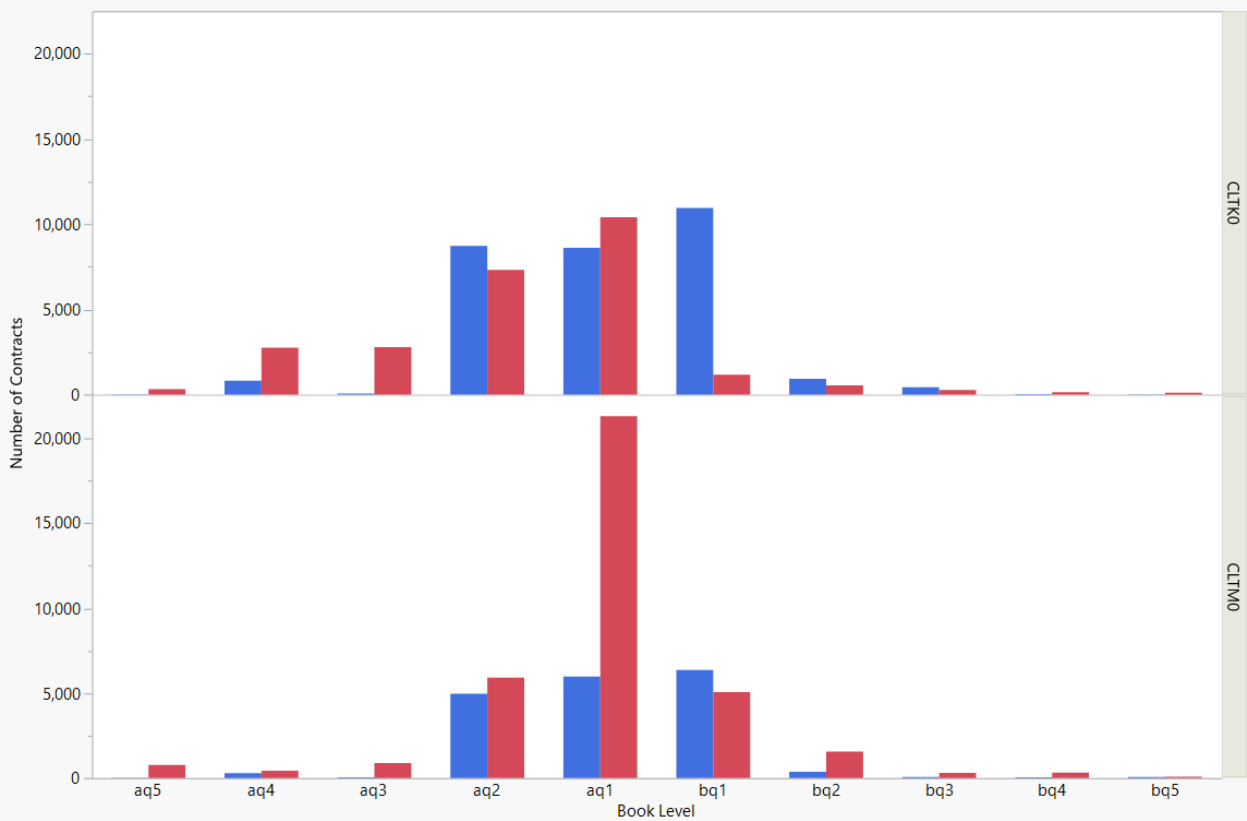


Figure 26: Average Depth by Book Side and Level on April 13, 2020 (Blue) and April 20, 2020 (Red) – TAS. Source: CFTC

E. Market Integrity Controls

The CME's electronic trading platform provides several types of market integrity controls designed to ensure fair and efficient trading for all participants. The market integrity control mechanisms are designed to strike a balance between maintaining orderly markets and ensuring price formation and price discovery are not hindered by limits or controls that stop markets from functioning. These exchange-based trading controls are applied to all markets that trade on the Globex.[72] These controls are an important safeguard for modern electronic trading.

An example of a control is the DCB, which sets a range in which prices can move and are reset continuously on a rolling 60-minute lookback window. If markets move +/- 15% in that time, a two-minute halt is initiated. Another is velocity logic ("**VL**"), a control designed to limit significant price movements in an extremely small time increment.[73]

[72] *See* CME Market Integrity Controls, *available at*: https://www.cmegroup.com/confluence/display/EPICSANDBOX/Market+Integrity+Controls.

[73] VL monitors potential significant price movements in extremely small time increments on Globex. VL works in conjunction with price banding to preserve the integrity of markets. Whereas price banding monitors futures price movements that would go too far, VL monitors futures price movements that would go too far, too fast. VL is calculated using the highest and lowest prices within a predetermined lookback window.

Several of the market integrity controls triggered in and around the May Contract trading on April 20. As Figure 27 indicates, market integrity controls began to trigger shortly before 1:00 p.m. ET as the price of the May Contract approached zero and continued to trigger while prices traded below zero.

In total, on April 20, over 30 DCBs were triggered in the May Contract and more than 10 DCBs were triggered in the May-June Spread contract. Over 15 other DCBs were triggered in various spread contracts and multiple VL events also affected various other related crude oil contracts.

In the WTI Contract, DCBs will halt the overall WTI Contracts market if there is a trigger event in the active contract. On April 20, the active contract was the June Contract. To the extent a non-active period or underlying spreads are triggered, the market only halts for that particular contract. VL also has a similar method in the WTI Contract where the specific contract is placed in a reserve status when a non-active VL is triggered.[74]

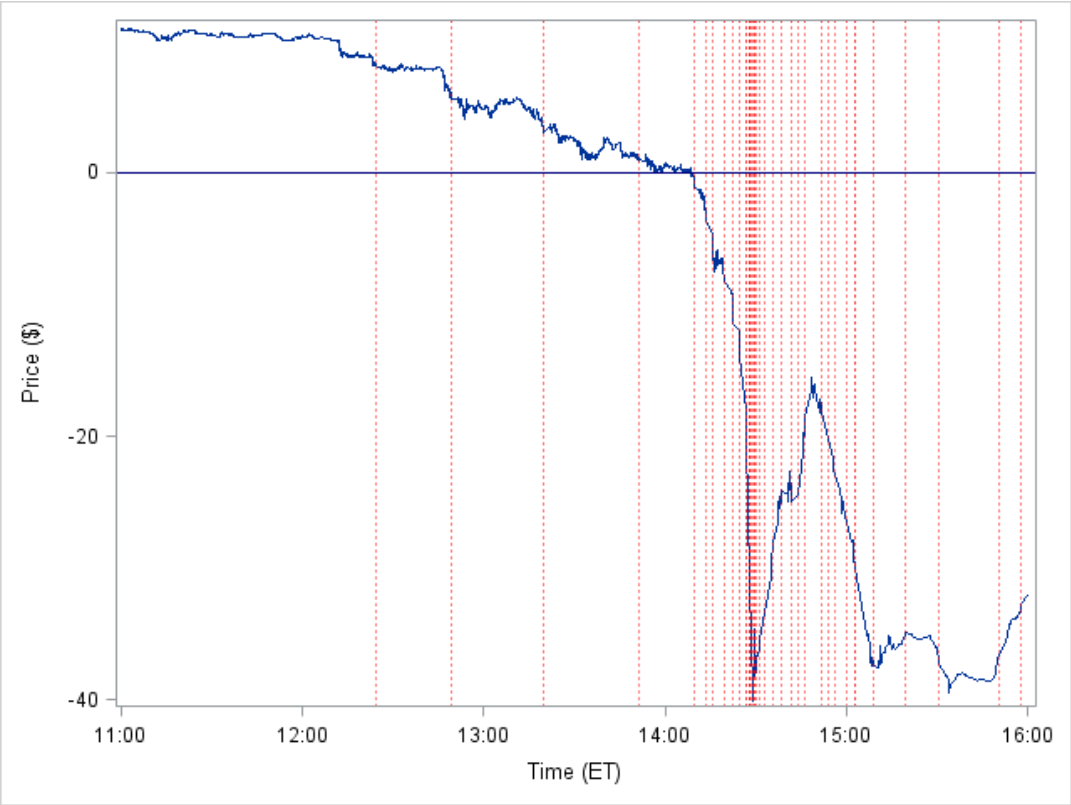


Figure 27: Sample of May Contract Market Control Events on April 20, 2020. Source: CFTC

VI. Conclusion

This Report describes interim observations concerning certain fundamental factors as well as certain trading activity related to the WTI Contract leading up to, on, and around April 20, 2020.

[74] VL introduces a momentary suspension in matching by transitioning the futures instrument(s). When a lead month futures instrument triggers an event, unless the lead month futures instrument belongs to an equities, metals, or FX instrument group when the entire group transitions into the Pre-Open state, the WTI Contract VL will transition that underlying contract into the Reserved/Pause state.

An oversupply of global crude oil, along with unprecedented reduction in demand due to the COVID-19 pandemic, increased concerns about the availability of storage for excess production. These fundamental factors coincided with a number of technical factors related to trading and liquidity which saw the May Contract trade and settle at negative prices on April 20.

Over the first three weeks of April, 2020 – and before the penultimate trading day – over 77% of commercial positions, and 88% of non-commercial positions, were closed out. At the start of the April 20 trading session, the vast majority of both positions were in later contract months. Roughly 90% of volume on April 20 was in June or later contracts.

The majority of the volume traded in the May and June Contracts, including outrights, spreads, and TAS, was traded prior to 2:00 p.m. ET, meaning most of the volume was traded when prices were positive. Limit order book activity related to multiple contracts show a decrease in liquidity in the May Contract, and this decrease started well before April 20.

Several of the market integrity controls triggered in and around the May Contract trading of April 20. In total, over 30 DCBs were triggered in the May Contract and more than 10 DCBs were triggered in the May-June Spread contract. The speed and magnitude of the price moves observed on April 20 in the May Contract, particularly between 1:00 p.m. ET and the end-of-day settlement at 2:30 p.m. ET, were exceptional. The market integrity controls triggered in the May Contract did not halt trading in the active June Contract or the WTI market as a whole.

The observations concerning certain fundamental factors discussed and various CFTC and market data preliminarily analyzed in this Report provide the public with an understanding of the WTI Contract market and aggregated trading activity leading up to, on, and around April 20.