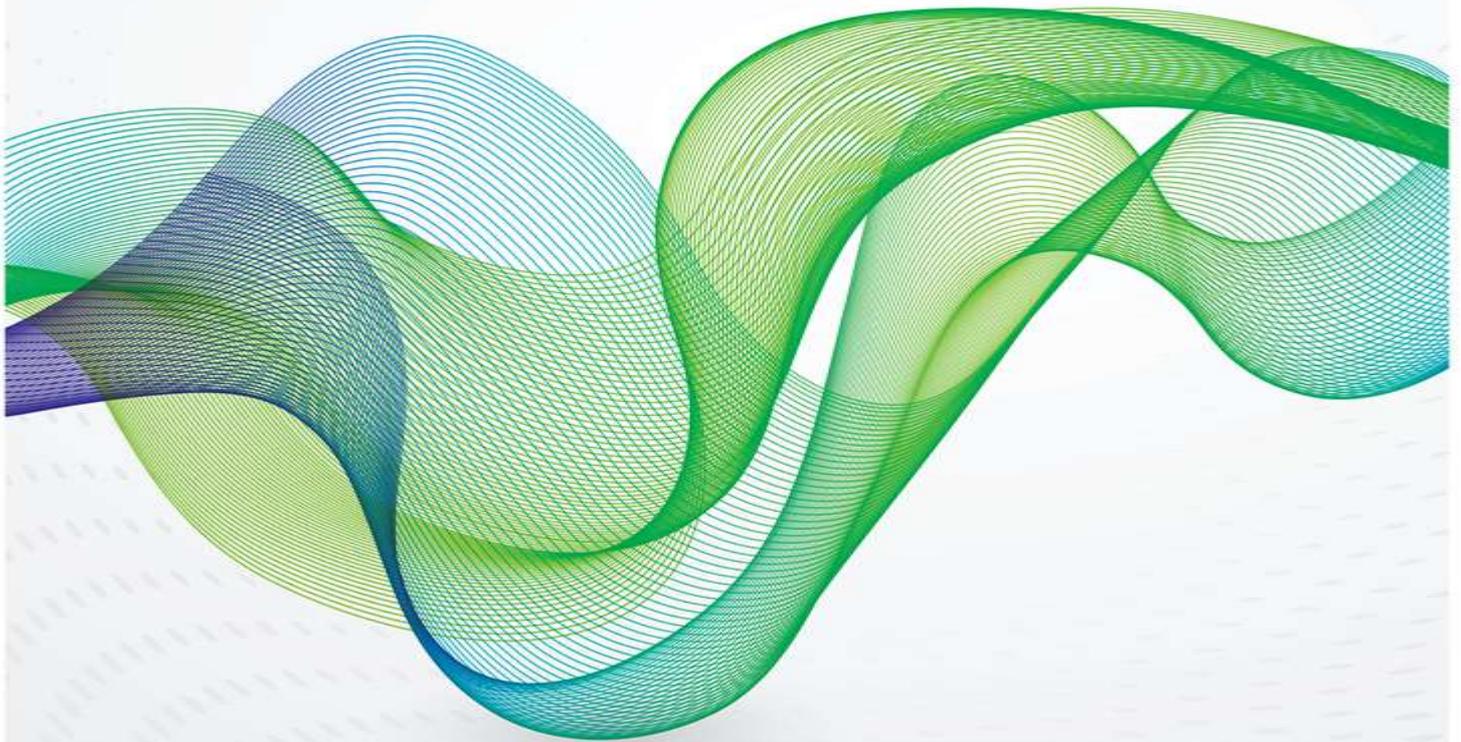




THE OXFORD
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The Rise of Retail and the Fall of WTI



OXFORD ENERGY COMMENT

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Financialization and the Roll Yield

The long-term impact of the Covid-19 crisis on various industries, including oil trading, remains highly uncertain. While some uncertainties, such as the magnitude of the demand destruction for petroleum products and the pace of global storage saturation are known unknowns, other consequences could come as a shocking surprise. It is very unlikely that any of us could have foreseen WTI ever trading at negative 40 dollars, and the critical role that retail-oriented derivatives products played in such historic event.

To better understand what happened with the recent behavior of WTI, it helps to briefly summarize how financial participation in oil markets evolved over the last decade. The early motivation for looking at oil as a financial asset class and adding it to investment portfolios was driven by anticipated diversification benefits supported by the historical evidence of oil being a good hedge against inflation and some geopolitical events. Since most financial assets are discounted claims on their future cash flows, the value of assets, especially bonds, could decrease if inflation spikes unexpectedly. Owning commodities such as oil was expected to provide some offset precisely at the times when it was most needed.

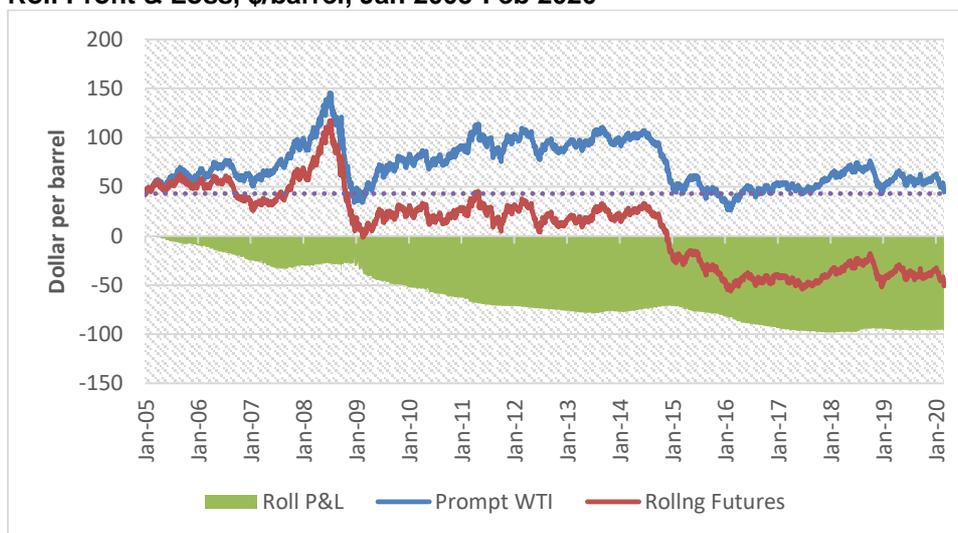
Unfortunately, for financial investors without access to proper storage infrastructure, it was not easy to get exposure to prices of the physical commodity traded in the spot markets. The closest approximation would be investing in the shortest maturity futures contract which then must be rolled to the following contract prior to expiry. Banks were eager to intermediate the access to the futures market by offering investors oil swaps which mimic the performance of rolling futures. Since financial markets are much larger than oil markets, it did not take long for investors' own flows, translated into futures markets by the banks, to start dominating oil producers' hedging needs. As a result, the net hedging pressure flipped from sellers to buyers, and around 2005 the market had moved into the state of so-called 'normal contango'. The risk premia from investing in oil futures quickly turned negative resulting in steady losses for investors over the last fifteen years.¹

These cumulative losses came almost entirely from rolling futures rather from changes in spot prices which tend to mean-revert around the marginal cost of production. Figure 1 shows that at the end of February, just before the recent collapse in demand, the spot oil price was basically the same as it was fifteen years ago at the beginning of 2005. On the contrary, the investment strategy of holding and rolling oil futures would have lost nearly \$100 per barrel over the same period. The difference between the two lines, or the roll yield, could be viewed as the compensation to the storage company for providing the service of storing oil on behalf of investors. The larger the cost of storage, the steeper the contango must be and, therefore, the larger the fee that investors transfer to storage owners indirectly via the negative roll yield.

The loss of such magnitude could not be justified by any portfolio diversification benefits especially when the world seems to be more concerned about deflation rather than inflation. As financial investors were gradually learning their lessons and dampening their enthusiasm for owning oil futures, similar investable products, in the meantime, were being designed and marketed for the new audience: the retail investor.

¹ I.Bouchouev, "Inconvenience yield, or the theory of normal contango", *Quantitative Finance*, December 2012, and "From risk bearing to propheteering", *Quantitative Finance*, April 2020.

Figure 1: Roll Profit & Loss, \$/barrel, Jan 2005-Feb 2020



Notes: Long futures are rolled monthly ten business days before the expiry of the prompt contract. Roll P&L (profit/loss) is the cumulative profit-loss from holding and rolling futures
 Source: CME, Pentathlon Investments.

The Optical Illusion of an Oil ETF

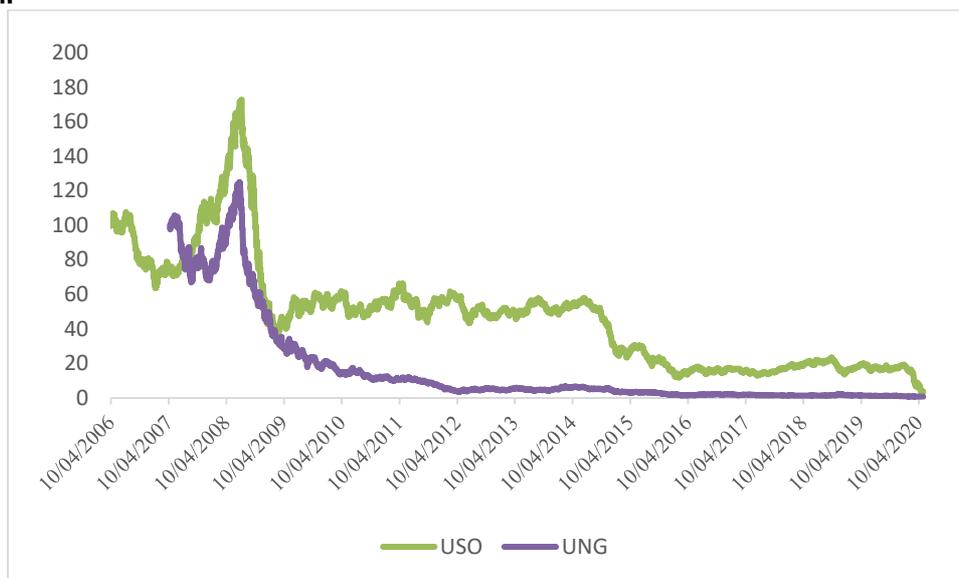
The instruments that got institutional investors into oil trading were over-the-counter total return swaps on commodity indices, such as S&P GSCI. They were designed like asset investments with the full notional value of oil futures held in Treasury securities serving as collateral for leveraged long positions in futures. The index products were tailored to the needs of large investors with high minimum investment requirements.

The trick to get smaller investors and speculators into the same game was to introduce investable products which could be easily traded directly in clients' equity brokerage accounts. Such products structured as ETFs, ETPs, and ETNs (exchange-traded funds, products, and notes, respectively) are conceptually similar with differences mostly related to taxation and regulatory treatments. For simplicity we will refer to all of them as ETFs.

Unlike widely traded equity ETFs, oil ETFs are not backed by the physical stock or asset, and instead are supported by the long position in the futures market which must be rolled before expiry. ETFs provider issues shares typically to designated market-makers who in turn trade them with retail customers while hedging their position mismatches in the futures market. Like index swaps, where the bank was holding long futures on behalf of their investors, ETFs, or more precisely their market-makers, are holding futures on behalf of retail investors. The only promise that ETF providers make to investors is that the percentage return of their product will match the percentage return on the futures subject to pre-defined rule for rolling them.

What ETFs promise to investors is essentially the rolling futures line in Figure 1, just expressed in percent to ensure that that it never drops below zero. Figure 2 shows this line as the actual performance of the largest oil ETF, United State Oil Fund (USO). Not surprisingly, the hidden burden of rolling futures translated into the fund's disastrous cumulative return of negative 94% since its inception in 2006. As Figure 1 highlights, most of this catastrophic return came from the negative roll rather than from the spot price which cumulatively has barely changed. The only related investment that fared even worse is USO's sister fund, United Natural Gas (UNG) which generated an astonishing negative 99.22% return since its inception. In other words, 100 dollars invested in this fund would have turned into a paltry 78 cents.

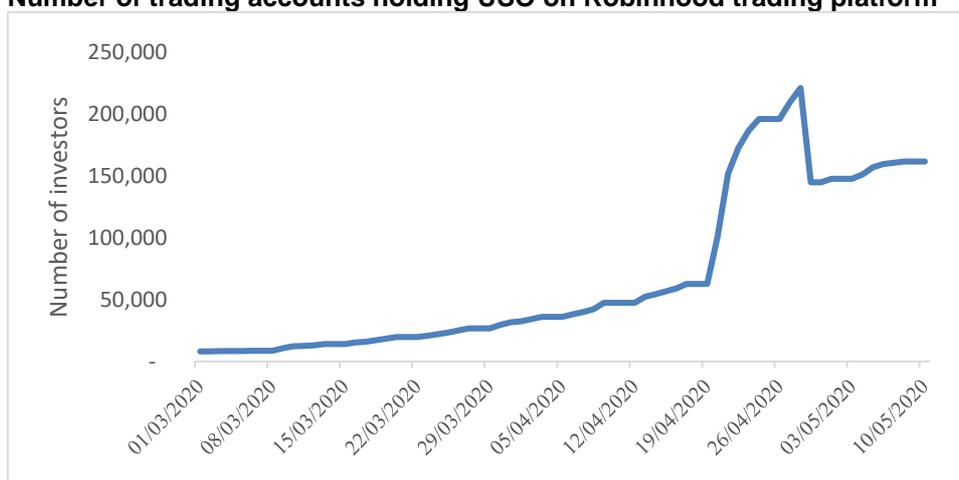
Figure 2: United States Oil (USO) and United States Natural Gas (UNG) Funds, scaled to 100 at inception.



Source: Yahoo Finance.

Despite such horrendous losses, the illusion of buying cheap oil continues to bring record inflows from small speculators into these funds. USO asset under management skyrocketed from \$1.2 billion at the end of 2019 to \$3.9 billion as of 8 May 2020. The appetite for buying paper oil is global as demonstrated by another stunning example of Hong Kong-listed Samsung S&P GSCI Crude Oil Futures ETF (HKEX-1375). At the end of February, this fund held less than 200 WTI contracts which within the following two months jumped to 20,000 contracts causing the fund's clearing broker to ban any further share creation. And this happened even though the fund was down 85 percent for the year. And the breadth of the retail participation is also striking. According to Robintrack.net, which tracks the number of users holding each asset on online trading platform Robinhood, the record 220,905 user accounts were holding USO fund on 28 April 2020, up from only 8,000 two months earlier.

Figure 3: Number of trading accounts holding USO on Robinhood trading platform



Source: Robintrack.net.

The situation that retail investors are placing themselves is even worse than institutional investors did during the past decade. In addition to fighting structurally negative contango roll, ETFs actual holdings of futures must be made public daily, making investors even more vulnerable. Figure 4 shows the snapshot of WTI futures holdings by five largest WTI funds, all available daily on their websites. This is

not hugely different from paying a large entrance contango fee for the privilege to play the poker game with professionals where you show them your cards but do not know anything about theirs.

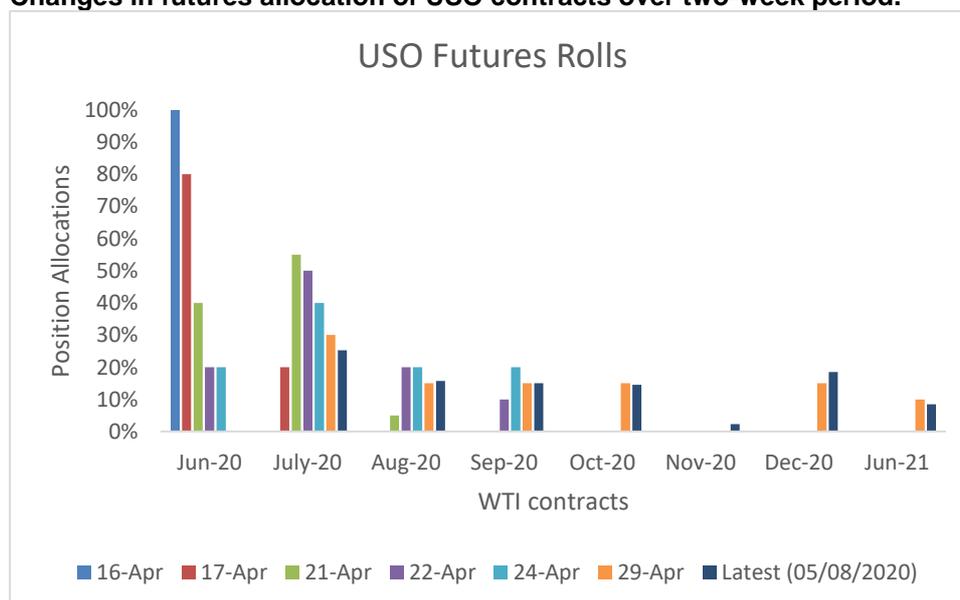
Figure 4: Holdings of WTI contracts by five largest funds as of May 8, 2020

Fund	Jul20	Aug20	Sep20	Oct20	Nov20	Dec20	Jan21	Feb21	Mar21	Apr21	May21	Jun21	Total
USO	33752	21091	20090	19480	3161	24731						11404	133709
UCO	18133 ¹		33138			22737							74008
HKEX:3175			6750 ²	6360		6000							19110
DBO									13759				13759
USL	734	735	734	734	735	734	734	734	734	734	735	734	8811

Note: ¹some holdings are reported as month 2 over-the-counter swaps with total notional of approximately \$475mm which was converted into estimated futures equivalent holdings based on the settlement price, ²-does not include the ownership of 6750 put options. United States Oil Fund (USO), ProShares Ultra Bloomberg Crude Oil (UCO), Samsung S&P GSCI Crude Oil ER Futures ETF (HKEX-3175), Invesco DB Oil Fund (DBO), United States 12 Month Oil Fund (USL). Source: companies' websites.

Furthermore, even if your poker game does not go well and you may start panicking, according to the rules of this game you must still provide regular updates to your opponents. In the last two weeks of April, the largest of such funds, United States Oil Fund (USO) which held over 25% of the open interest in June WTI contracts, issued regulatory 8-K form ten times updating the market on various changes in their investment policy. In more than half of these forms, the fund spelled out exactly how it was trying to get rid of June WTI futures and rolling them further out the curve being under pressure from regulators to stay within position and accountability limits. Figure 5 summarizes the evolution of these changes which were available for everyone to see. Other updates included an unusual one-for-eight reverse stock split needed to increase the share price by the factor of eight and to prevent it from delisting, and the announcement of the fund running out of allowable shares and waiting for SEC approval for the creation of new ones. After all of these changes, the last 8-K form simply reminded investors that USO could also make other permitted investments, including Brent, Ultra Low Sulfur Diesel, RBOB Gasoline futures all the way up to twelve months forward, and if necessary even trade WTI contracts listed in Dubai and Singapore and use other oil-related investments. Most of these documents were repeatedly warning investors that each of these changes would increase deviations from the stated benchmark and could create challenges for the fund in meeting its investment objectives.

Figure 5: Changes in futures allocation of USO contracts over two-week period.



Source: USO 8-K forms.

Recent regulatory filing by other funds provide equally fascinating stories. The second largest oil fund, ProShares Ultra Bloomberg Crude Oil (UCO) which promises shareholders two times the returns on oil futures and, therefore, holding larger future positions per dollar invested, followed the steps of USO first rolling out July futures to September, and then a portion into December contract also further deviating from its stated benchmark. The newcomer, Samsung S&P GSCI Fund, in addition to similar rolls also invested approximately 2% of its net asset value in buying put options on September contract. Despite such flurry of discretionary activities in the style of hedge funds, these publicly traded ETFs are still being perceived by investors as passive investment vehicles. It is probably safe to say that not as many out of 220,000 Robinhood accounts knew exactly what product they were buying, and even those who thought they understood it, ended up owning the product which morphed into something very different just over the course of two weeks.

We should also note that the rapid growth in USO shares issuance has been further increased by professional oil traders looking to sell rather than to buy these products to benefit from increasing contango. Some of such sales may never even end up in the hands of real buyers with dealers taking them and hedging their risks by selling futures. The net result is the massive value transfer from retail investors fooled by the optical illusion of cheap oil futures to professional traders shorting the product and collecting the roll, to market-makers collecting bid-asks, and to ETF providers collecting their fees.

YuanYouBao and Negative Oil Prices

While long-only ETFs always provide significant downward pressure on prompt WTI contracts as traders sell in anticipation of the product rolls, these funds did not have anything to do with the historic event of oil prices dropping to negative \$40 on the day before the expiry of May WTI futures. Also, contrary to often cited opinions, this episode was not directly caused by well-documented storage issues in WTI contract delivery location. The lack of storage was indeed the catalyst that started the fire. Subsequently, large ETFs, including USO, added some fuel to it by rolling their massive positions and pressuring May WTI by the middle of April. But the actual explosion and subsequent \$60 collapse in a single day down to minus \$40 was caused by small cousins within ETF family, which happened at the time when all large market participants already left the contract.

As we explained in more detail in the recent article published by *risk.net*,² most of the open interest on that day was held by price insensitive large physical players and banks whose risks were perfectly offset either by calendar spread options or some hedges against over-the-counter swaps and options with producers. Among those few still carrying positions was Bank of China, holding futures on behalf of its retail investors. While their futures exposure was also technically offset against the retail product, the peculiarity of their contract known as YuanYouBao (translated as “Crude Oil Treasure”) escalated the problem.

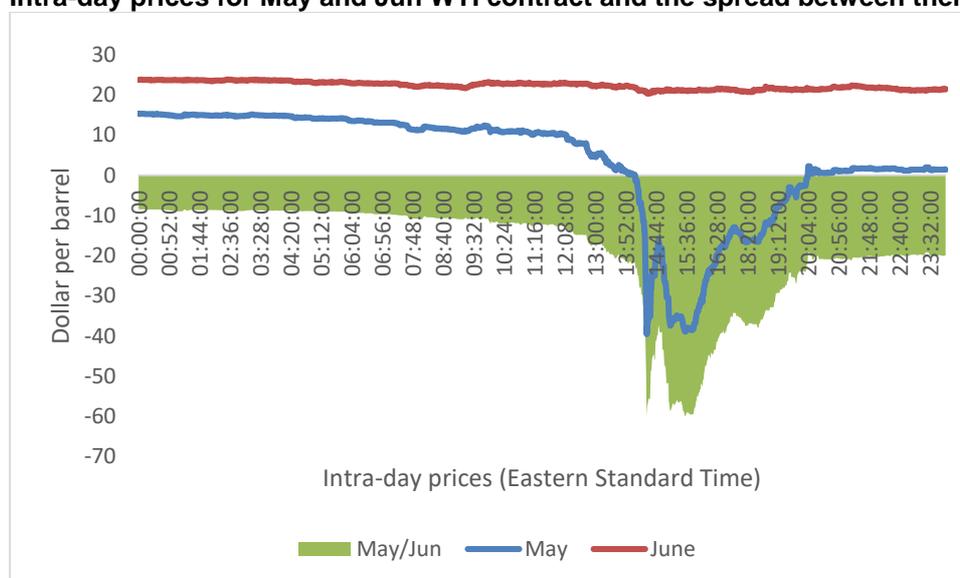
By heavily marketing YuanYouBao product to domestic investors as non-leveraged commodity account, meaning that the entire notional value of the futures contract must be prepaid upfront, the bank made investors comfortable that the losses were limited by their initial investment. In fact, the bank prudently inserted the clause to be able to force liquidate futures whenever investors’ account dropped below 20% of the initial investment. Importantly, the bank held the right but not the obligation to liquidate. In addition, investors must stop trading at 10:00 Eastern Time one day before the futures expiry. Since the price of May WTI contract on April 20 at that time already fell below \$12, many investors were reluctant to take losses relying on the bank to simply roll their positions at settlement. It is not yet clear why the bank traders chose not to force liquidate futures when contractual thresholds in their client accounts started to trigger. They could have been reluctant to sell on the lows and having to explain the stop-loss to their clients, or they could have tried to monetize their contractual optionality hoping to sell at a higher price later and force liquidate client accounts retroactively at lower prices at the time when the threshold was actually breached.

² <https://www.risk.net/investing/7536946/negative-oil-prices-put-spotlight-on-investors>

Once again, the game of poker was telegraphed to the market but this time via the mechanism known as trading at settlement where orders are placed by traders with offsetting exposures ahead of time at the price to be determined later during the closing window. For the first time ever, this mechanism could not find enough buyers and was shut down half an hour before the close, indicating to the market that the remaining volumes must be sold in the open market at the rapid fire pace within next twenty minutes. The volumes were small with less than 700 May WTI contracts trading during the closing window but when there is nobody left in the market, the price no longer has any boundary. The storage at WTI delivery point was, of course, filling up but the economics of storage does not deteriorate by \$40 in half an hour and then improves immediately shortly after the settlement.

The Bank of China's initial attempt to have clients pay for this loss caused outrage among investors with looming litigations. Finally, following the pressure from local regulators the Bank of China is now in the process of reimbursing investors a portion of their losses. Regardless of how the total loss will be split between investors and the dealer, both are clearly among the losers. It is also hard not to see some damage to WTI contract as well, which exposed contract vulnerability for price manipulation potentially making it an easy target for someone with the malicious intent to shake up confidence in functionality of US markets. It is encouraging to see CFTC now closely looking for any signs of potential misbehavior on that day.

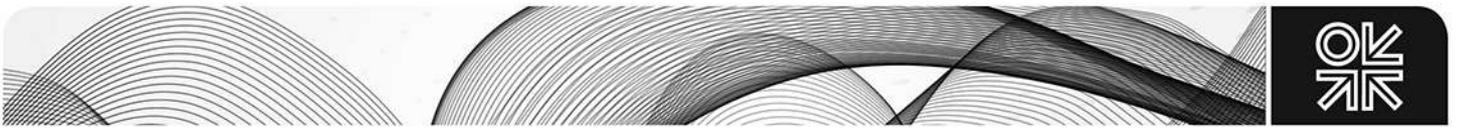
Figure 6: Intra-day prices for May and Jun WTI contract and the spread between them on April 20.



Source: CME, Bloomberg, Pentathlon Investments.

Out of June WTI, But Not Out of Business

Anyone familiar with the physical market knows very well that at \$60 discount to June contract, May barrels could have been easily transported and stored elsewhere despite genuinely tight storage capacity. Why did not professional traders take advantage of this unique opportunity? The short answer is that even for them the speed of the move was too fast to be ready to react within minutes. Most of the large trading houses follow strict operational and risk management processes and operate under very tight position limits around contract expiry. Besides, getting involved and initiating new futures positions at such late stage of the game could draw additional regulatory scrutiny causing distractions. Given very small traded volumes it simply was not worth it. Blaming negative \$40 trades on the inability to store is an easy excuse to divert from the real problems originated in poorly regulated foreign over-the-counter derivatives market. Such negative price can only happen when participants such as ETFs or other investor products are constrained by their mandates which are often well-known to professional traders. Regulators' requirements to make the rules for such products even more transparent make

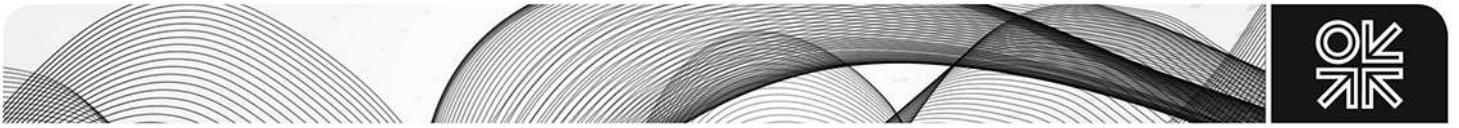


them an easy target for traders who ultimately came out as winners. The obvious question now is whether it could happen again around the expiry of the June contract.

As we stated at the beginning of this paper, the long-term impact of recent developments on the oil market is yet to be seen. However, a growing appetite among smaller retail investors to participate in the market supported by easier access to trading platforms and modern technology does not appear to be going away. While these products and funds may be out of June WTI, they are not out of business. Rolling further out and propping up futures relative to the value of spot barrels could only exacerbate the structural contango. As we have seen, even fifteen years of losses by financial oil investors have not been able to eliminate the paper demand for oil. And now such institutional demand for futures appears to be supported by retail investors. Financial engineering will adjust and make products better, but they are unlikely to disappear anytime soon and tracking their positions becomes as important to oil analysts as tracking fundamental balances.

In the near term, investors ongoing inflows will likely increase opportunities for US producers to place forward hedges at levels which can still ensure reasonable longer-term returns. Somewhat 'irrational' behavior among retail investors effectively subsidizes producer hedging and could delay fundamental market rebalancing if producers choose to take this opportunity and to hedge, instead of making more rational decisions to cut production. Ironically, one wrong business model prevents the other one from getting better at least until the invisible hand of free markets punishes both.

Assuming that the rationality and market forces will eventually prevail then two things must happen at the same time: the forward market should not exceed the level which allows producers to hedge but at the same time contango must stay steep enough to incentivize storage until the demand recovers. If both are to happen then the implication would be ongoing downward pressure on spot prices. The sharp blow inflicted by the collapse of May contract will not be repeated given some additional safeguards which have been put in place by dealers improving systems to handle negative prices, by prime brokers raising initial margins, by regulators asking funds to reduce positions, and by funds themselves rolling out of prompt WTI contract earlier. But ongoing dull pain inflicted on both investors and oil producers is there to stay longer.



About the author

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