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Physical delivery and what it means for digital assets

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What if there was no convergence risk on crypto derivatives?

Opinion Paper

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If you ever wondered about the difference between "cash settlement" and "physical delivery" in the world of derivatives, 2020 was a crash course on the matter. Yes, this was the year of negative oil prices, and many will remember those painfully. If Y2K was about fixing a trivial shortcut in date formats, you can bet software developers and risk managers alike were never quite ready for negative oil prices in their systems and scenarios.

What was it about anyway? As always when a situation is more or less "impossible", there were several converging factors to get to the impossible. The CFTC report names three: an already oversupplied global crude oil market at the beginning of 2020, an unprecedented reduction in demand caused by COVID-19; and concerns about the availability of global crude oil storage.

But what has storage space got to do with this? The missing link is that products exchanged on oil are in fact "physical delivery" futures. That is when a future expires, the buyer physically receives a fixed number of barrels. Furthermore, to standardize the market, deliveries are accepted at only specific locations (see for example the paragraph "delivery procedure" for NYMEX Crude Oil). Any disruption in the flow of oil and storage capacities are easily saturated. In March, this is exactly what happened: a sudden collapse in demand led to a withdrawal from buyers. Markets

participants equipped with adequate facilities could collect deliveries and wait it out by keeping their inventory in place. However for participants not properly equipped, holding a future contract meant taking delivery and that was simply not possible because storage at designated facilities was not available. Speculators and traders routinely trading oil without consideration for physical inventory were caught in a "fire sale" spiral in the days leading up to expiry, driving prices in uncharted territory.

You'd be tempted at this point to conclude that physical delivery is a nuisance. Not quite. First of all, it should be pointed out that the commodity market being what it is, physical delivery is the most natural outcome of a transaction between a buyer and a seller. Indeed, "cash settlement" is out of place: it encourages speculation without any consideration for the geographical location of products being traded. And then there's the other major advantage of physical delivery: it forces convergence between the expiry price of a derivative and the price of its underlying.

Consider for example a future on a stock, cash-settled at expiry. The final reference price of the future is the closing price of the stock (as is the case in the US for example). If you buy the future at $100, and the underlying stock closes at $110 on expiry, you will receive $10 as a final margin call and that'll be the end of it. If the future is physically delivered, you will receive the stock upon expiry, and the final price being $110 this is what you'll have to pay. The $10 margin call in your favor means that you effectively bought the stock at $100-that makes sense because that was the price of the future when you entered the position.

In a world of cash-settled derivatives, the expiry price is set by reference to the underlying, but it doesn't mean that you can acquire (or dispose of) the underlying at this price. There can be a divergence between those two prices. In a world of physical delivery there cannot-you automatically get ownership of the underlying at the expiry price.

To be specific, let's take BTC as an example, and in particular the CME BTC Future. The future expires on the CME Bitcoin Reference Rate (BRR), defined as "the aggregation of executed trade flow of major bitcoin spot exchanges during a specific one-hour calculation window". The future is cash-settled. Upon expiry, CME will calculate a price based on its BRR methodology and will settle the final margin call using that price. The problem is: how do you replicate this price? If you hold a delta-neutral position in bitcoin (long BTC, short future), at expiry you need to unwind

the cash BTC leg at the exact same price as the future. That means you need to sell your BTC at the BRR price, no more, no less. This is an ambitious proposition: it implies that i/ you are connected to all relevant exchanges, ii/ you are technology-savvy enough to replicate the BRR real-time exchange allocation, iii/ you can place orders and received executions at the right price at the right time on each exchange. If the BTC future was physically delivered, you would have absolutely nothing to do - you would automatically receive proceeds from delivering BTC as part of the short future.

In traditional markets, this is a well-known problem that occurs for all derivatives that are cash-settled on "exotic" references. For example in France, the CAC 40 index futures settle on an average price over 20 minutes ("Exchange Delivery Settlement Price"). Tradability of the EDSP is an issue for all participants, even those technologically equipped are subject to a convergence risk. This risk is vastly mitigated when settlement prices are set through an auction because the fundamental mechanism of an auction means that everybody is fully served at the same price or the auction doesn't conclude. Nothing of that sort for BTC or other digital assets: no closing auction, no physical delivery which means that future traders must cope with a simply unpredictable convergence risk.

Now you might wonder...why does it matter? After all, this doesn't prevent trading, nor does it affect the overall level of risk associated with digital assets. Well, it does affect the ability of the digital industry to introduce secured lending and through it credit-mitigated leverage. I have explained before how the convergence formula of a future contract enables un-coupling between market and credit risk. This however is only possible if convergence is certain. If it is not, secured lending introduces a market risk component which is likely to be unacceptable for yield-seeking lenders. Physical delivery would make secured lending much safer and in turn would pave the way for a truly new chapter: securities financing.

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