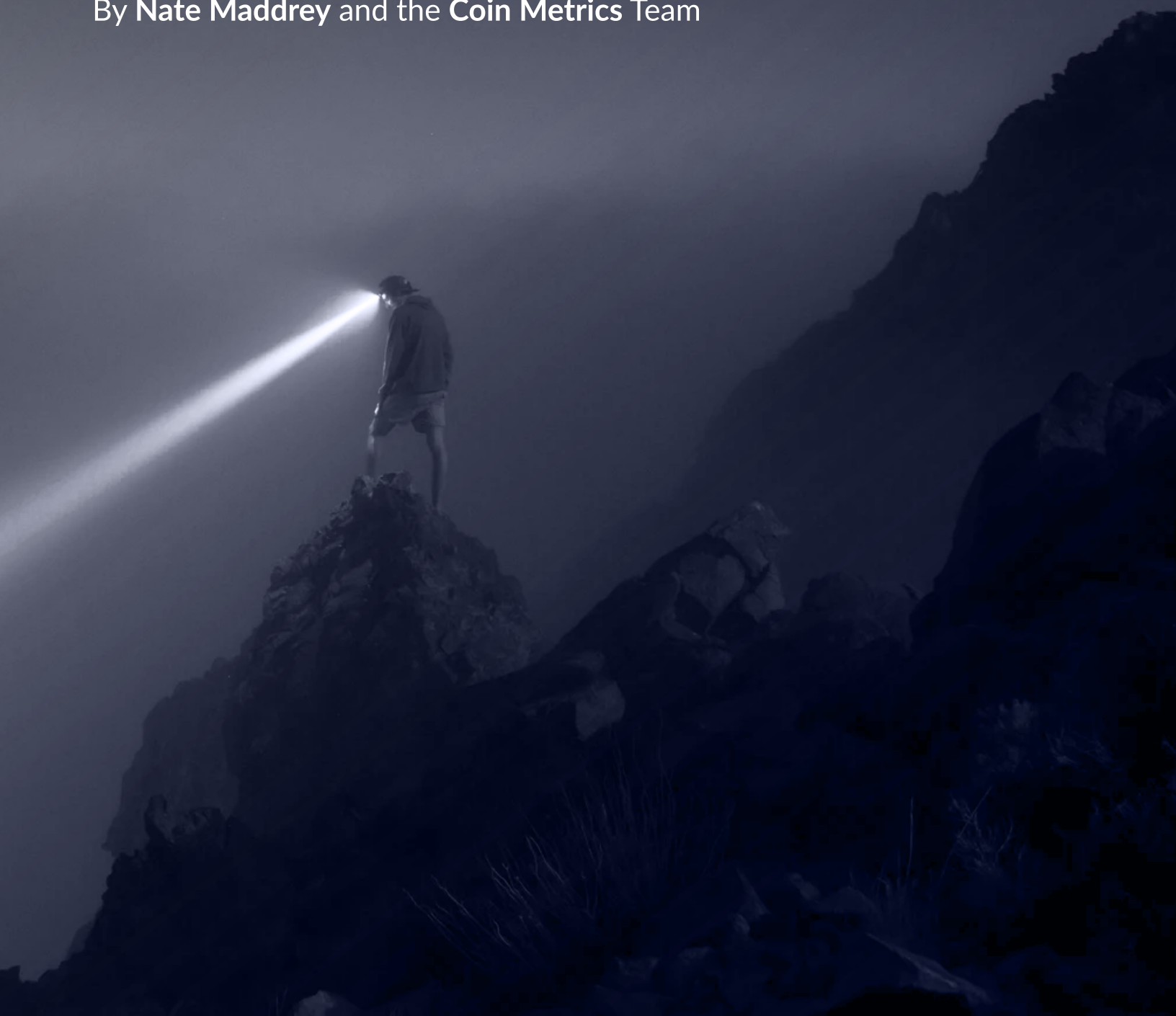


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CRYPTO FUTURES DATA PRIMER

By Nate Maddrey and the Coin Metrics Team



THE COIN METRICS CRYPTO FUTURES DATA PRIMER

Derivatives can get endlessly complex and are often used as part of advanced trading strategies. But even just understanding the fundamentals can give you deeper insight into market dynamics and the forces pulling price in different directions.

In this piece we explore the basics of crypto futures data. In particular, we look at five key measurements: price, basis, funding rates, open interest, and liquidations.

To learn more about Coin Metrics' futures data products check out our [Market Data Feed](#) or contact us [here](#).

INTRO TO FUTURES

Derivatives are tradeable contracts that derive their value from an underlying asset. Futures, one of the most common types of derivatives, are contracts that represent an agreement to buy or sell an asset for a specific price at a future date. Futures contracts can be used to [hedge against future uncertainty](#) but are often also used as a speculative investment.

Expiration & Settlement

Traditional futures contracts specify a defined time when the contract expires, known as the expiration date. At expiration, the contract will settle at a price based on the spot price of the futures contract's underlying asset. Alternatively, investors can "roll" the contract by moving their position to a contract with a later expiration date. To learn more about the nuances of rolling futures positions read our prior research piece [here](#).

While some futures contracts are physically delivered (e.g. a delivery of corn from a farmer to the buyer upon the contract expiration date), many are "cash settled." For cash settled contracts the buyer receives the difference between the contract's price at date of purchase and the contract's price at the date of closure, paid in an agreed upon currency. The settlement currency depends on the specifications of the contract - fiat (e.g. USD), stablecoins, or the underlying asset may be used.

With a cash settled futures contract, ownership of the underlying asset is not necessary as a physical delivery does not need to occur. This makes futures a good option for investors interested in getting exposure to an asset like bitcoin (BTC) without necessarily needing to hold or custody it. It also makes it so an effectively endless amount of crypto futures contracts can be created, since it's not inherently limited by the supply of BTC or any other underlying asset.

Exchanges & Markets

Futures contracts are standardized and can be freely interchanged on secondary markets. To facilitate these markets, exchanges serve as the central clearinghouse for the contracts and act as the counterparty for every trade. This gives the owner of the contract flexibility and liquidity as it allows them to sell at current market price before the contract's expiration date.

Crypto futures are traded by a variety of different investors, including both retail and institutional traders. Some buy and sell futures purely to speculate, while others might trade to hedge mining revenue or other investments. Futures are available on a variety of crypto exchanges including FTX,

BitMEX, and Binance. The Chicago Mercantile Exchange (CME) also offers BTC and ETH futures trading and is preferred by institutional investors since it is regulated in the US.

Contract Specifications

Futures contracts have contract specifications which describe the underlying asset, how it is quoted, the date of expiration, the size of the contract, and other details necessary for market participants to enter into the contract. Each exchange may have different futures contract specifications. But the industry is converging on three types of futures contracts: [linear contracts](#), [inverse contracts](#), and [quanto contracts](#).

A linear contract, also commonly referred to as a stablecoin-margined contract, is sized in arbitrary units of the underlying base asset. The margin asset is often, but not always, the underlying quote asset - typically a stablecoin or fiat currency (see the “Leverage and Liquidations” section for more information about margin). It is referred to as a linear contract because the gains and losses are a linear function of the underlying price.

An inverse contract, also commonly referred to as a coin-margined contract, is sized in arbitrary units of the underlying quote asset and the margin asset is the underlying base asset. It is referred to as an inverse contract because the gains and losses are an inverse function of the underlying price.

Quanto contracts are contracts where the margin asset is neither the underlying base asset or underlying quote asset. Depending on which margin asset a market participant wishes to hold and the desired payoff function, all these contracts are valid choices.

Some exchanges trade all varieties, while some just trade the inverse and linear contracts, and some just the linear contracts. There is a wide variety in margin assets and contract sizes as well. Coin Metrics has [created a harmonized futures contract specification](#) so data can be compared across contracts, regardless of the underlying specifications.

In the following sections we dive into crypto futures data and how to analyze and understand it.

PRICE & BASIS

Just like any other asset, futures contracts can be freely bought and sold. While the price of a futures contract is often relatively close to the price of the underlying asset it can sometimes diverge. As buyers and sellers trade the contract on the open market the price changes due to supply and

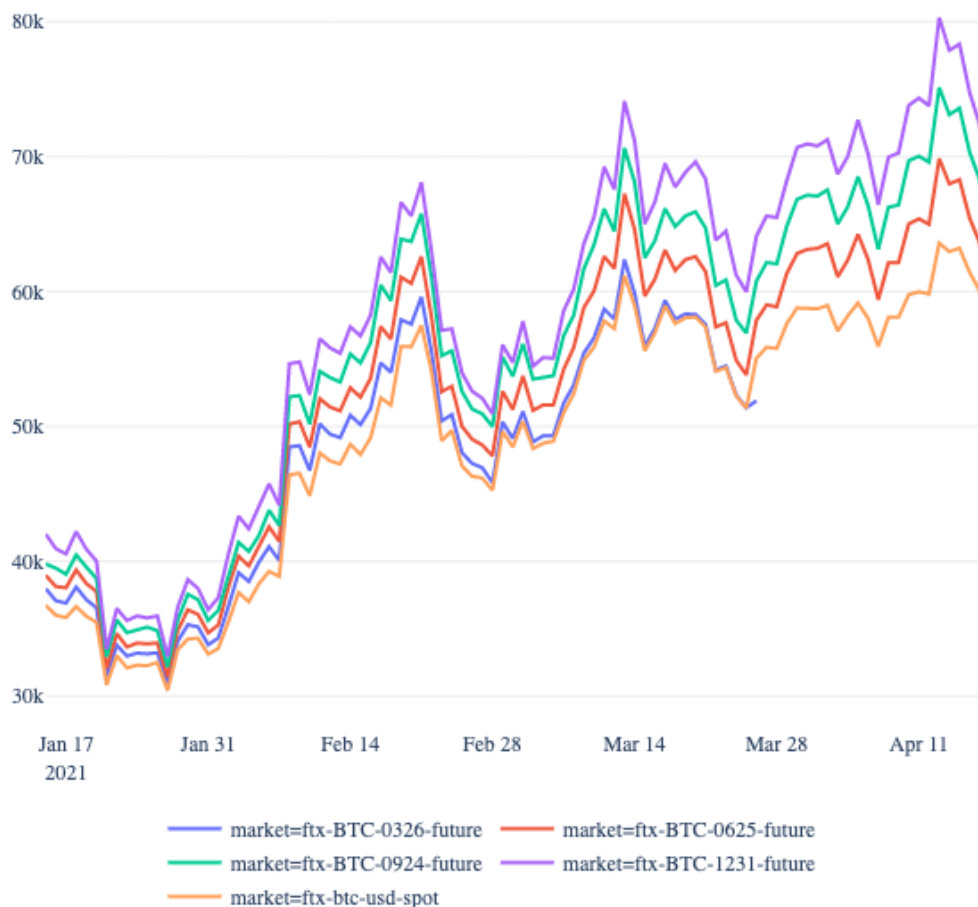
demand. The price of any given futures contract can fluctuate over time, but the futures price typically converges with the underlying spot price at the contract's expiration date.

The spread between the futures price and spot price (i.e. spot of the underlying asset) is called the basis. Crypto futures' basis is typically calculated by subtracting the spot price from the futures price.

The below chart shows BTC spot price compared to the price for FTX BTC futures contracts with different expiration dates: March 26th, June 25th, September 24th, and December 31st. In this instance, the contracts with the furthest out expiration dates have higher premiums compared to spot price.

FTX Bitcoin Futures Price

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It can be tempting to think of a future contract's price as a prediction of the future price of the underlying asset. For example, if the current price of a BTC futures contract that expires on December 31st, 2021 is \$100K, some may interpret that to mean that the market thinks BTC's price will be \$100K at the end of 2021. But in reality a future contract's [price is not a reliable indicator of the future price of an asset](#).

A better mental model is to think of a future contract's price as a premium on future delivery of an asset. For example, if you bought a futures contract for delivery of BTC for six months from now the seller would incur costs for holding it in the meantime. There's storage costs for custodying the BTC, security costs to protect it (and the risk that it could get lost or stolen), and opportunity costs of capital. The contract's buyer bears some of these costs in the price difference between the futures contract and spot and effectively pays a premium for the luxury of buying at a later date. The future price of the asset also factors in, but it's not the only consideration.

In reality, the reason for a futures contract premium is often complex, and not always so clearcut. For example, part of the premium on CME Bitcoin Futures is likely due to the fact that it's currently one of the only vehicles for institutional investors to get BTC exposure, which [leads to excess demand](#). Additionally, in the current market regime the largest factor may be the funding rate on the perpetual contract, as traders using leverage are forced between the choice of paying daily variable funding or a fixed futures premium (you can find more information on funding rates and perpetual contracts in the below "Funding Rates" section). Futures pricing theoretically would sit at a premium or discount equivalent to the market's expectation of funding payments during the period leading up to contract expiry. Taking this into account, it's helpful to think of a future contract's price as a premium (or discount) to spot price, as opposed to a prediction of the future.

The Basis Trade

Traders can take advantage of the difference between futures price and spot price by what's known as basis trading. Basis trading consists of buying the spot and selling the futures contract of a particular asset to take advantage of the price difference between the two.

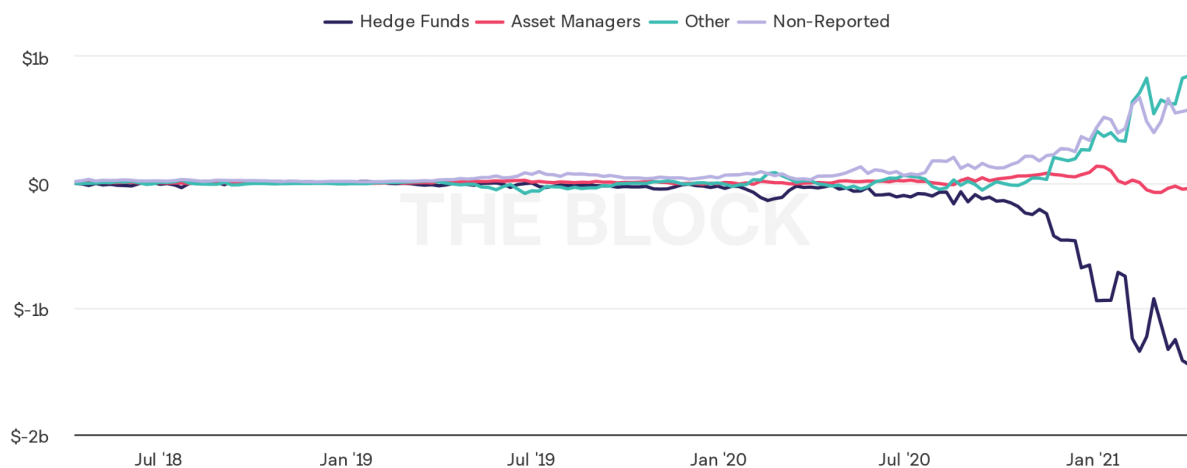
For example, if BTC's spot price was \$50K and futures price was \$55K, a trader could simultaneously buy 1 BTC spot while opening a 1 BTC short futures position. The trader's unrealized profits would fluctuate up and down as the basis changed while the futures position neared expiration. At expiration the trader would sell their spot BTC and close out the short position, pocketing the basis as profit minus any trading fees and borrowing costs.

Basis trading is a popular strategy in crypto, especially amongst institutional investors. This likely partially explains why hedge funds have over \$1B of open BTC short positions on CME - they are taking advantage of the relatively high premium on BTC futures and other derivatives.

A portion of the short positions were executing a [similar trade using the Grayscale Bitcoin Trust \(GBTC\)](#), which has historically traded at a premium to BTC. However, this GBTC premium recently flipped negative, and turned into a discount.



Net Positions of CME Bitcoin Futures by Trader Category



SOURCE: CFTC COT
UPDATED: APR 17, 2021

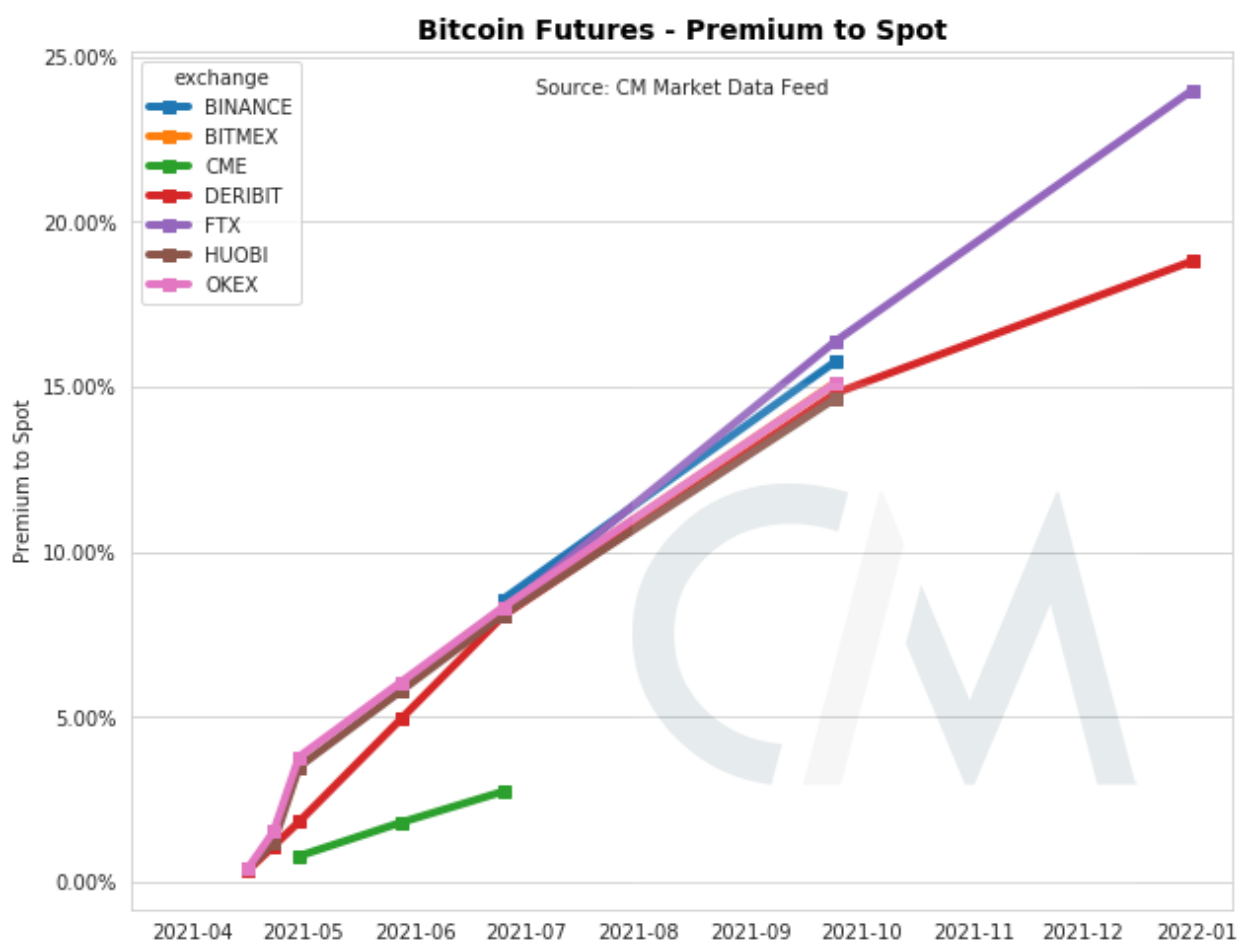
[Source: The Block](#)

Futures Curves

Futures curves can be created by plotting out the current price (or premium/discount) of contracts at different expiration dates. For example, as covered in the “Price & Basis” section, FTX BTC futures charts expiring in March, June, September, and December have a gradually higher premium to spot

price the further out they are from expiration. Plotting out the current price of all four contracts gives a curve. The curve could either slope upward or downward, but in this case it would slope upward.

The following chart shows the current premium to spot for BTC futures contracts on different exchanges, with expiration dates plotted on the x-axis. BTC futures curves typically slope upward, as seen in the below chart. CME's premium is noticeably lower than the other exchanges in the sample. This is likely because CME does not allow the level of leverage as most crypto exchanges, which keeps spreads tighter. CME also typically has well capitalized market participants, which helps bring the futures price closer to spot.



However the difference between futures price and spot price is not always positive. For example, if the market expects the price of the asset to be significantly lower at the future delivery date the futures price may be lower than spot price. This also sometimes happens with commodities if there's a short-term shortage causing a temporary spot price spike. In this case the futures curve would be inverted and the futures buyer would effectively be buying at a discount, assuming the market thought the shortage would not last long.

Changes in the slope of the futures curve can reflect changes in market sentiment. For example, if the curve flips from positive to negative the market may be shifting from bullish to bearish. However the slope of the curve also depends on many other factors, so cannot always be used as a reliable indicator.

FUNDING RATES

The most common type of crypto futures contracts are perpetual futures. Unlike traditional futures, perpetual futures don't have expiration dates.

Typically, at a futures contract's expiration date the contract's price and spot price will converge and the contract is settled. But since they have no settlement date, perpetual futures contracts need a mechanism to keep price relatively tethered to the underlying spot price. Funding rates accomplish this by requiring periodic payments between long position holders and short position holders. Who pays who depends on whether the perpetual future's price is higher or lower than the underlying's spot price.

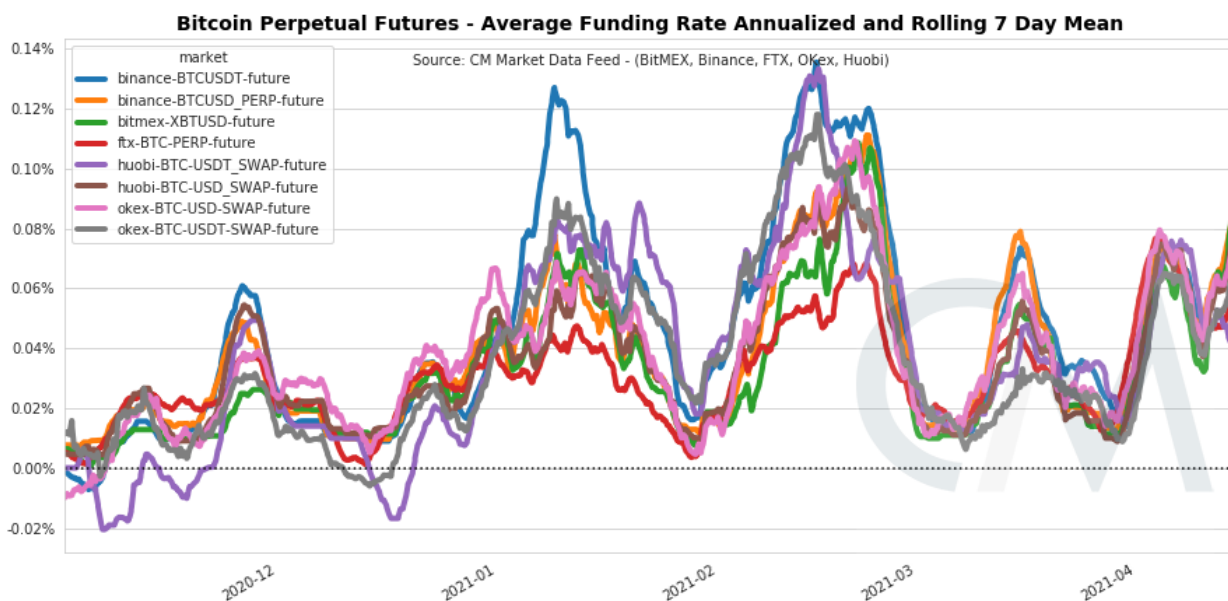
While different exchanges have [different methods for calculating the funding rate](#), the biggest variable is typically the difference between spot and futures price (aka the basis). The general principle is that the funding rate is positive if the perpetual futures's price is higher than the underlying's spot price. Conversely, funding is negative if the perpetual futures's price is lower than the underlying's spot price.

When the funding rate is positive, holders of long positions pay short positions. If the funding rate is negative, short positions pay long positions.

The higher the basis gets, the higher the funding rate gets, and the more expensive it becomes to hold an open long position. This helps keep the perpetual futures contract's price from getting too high compared to spot, since it can become prohibitively expensive for some investors to hold the contract

if the funding rate gets too high. This also incentivizes investors to take the other side of the trade since they can earn money through the funding rate if the market is overly bullish or bearish. While BTC's funding rate has historically been mostly positive, the funding rate for smaller cap cryptoassets often turns negative.

The chart below shows the annualized funding rate on the perpetual contract across exchanges during the last quarter of 2020 and first quarter of 2021. The rates generally stay in line with one another, however they can vary due to slight differences in market structure. Some examples of differences are maximum leverage limits, collateral requirements, and the make up of retail and professional traders.



Funding rate payments occur at regular intervals, known as the “funding period.” Most exchanges have an 8 hour funding period, meaning payments are made once every 8 hours. But some exchanges (like FTX, for example) have a 1 hour funding period, or different intervals. The funding rate is calculated after the end of each funding period.

Like futures curves, [funding rates](#) can sometimes be used to gauge market sentiment. For example, if an asset's funding rate is negative, shorts have to pay longs. If the market was bullish, investors would be incentivized to open up long positions, since they would be paid to open them in addition to the added potential of price increasing. Therefore if an asset's funding rate stays consistently negative there's a good chance that the market is overall bearish on the asset. Conversely, if the funding rate gets too high it could be a signal that the market is overly bullish.

In a similar sense, changes in funding rates can sometimes be indicative of trends. If funding rates get increasingly positive over time this potentially signals that the market is getting more bullish.

However, the same caveats as futures curves apply - there are many other factors at play, so funding rates should not be used as a standalone indicator.

LEVERAGE & LIQUIDATIONS

Leverage can be used to increase the potential returns of a futures contract. Using leverage effectively allows a trader to wager larger amounts of capital than they currently have in the account. But using leverage also amplifies risk.

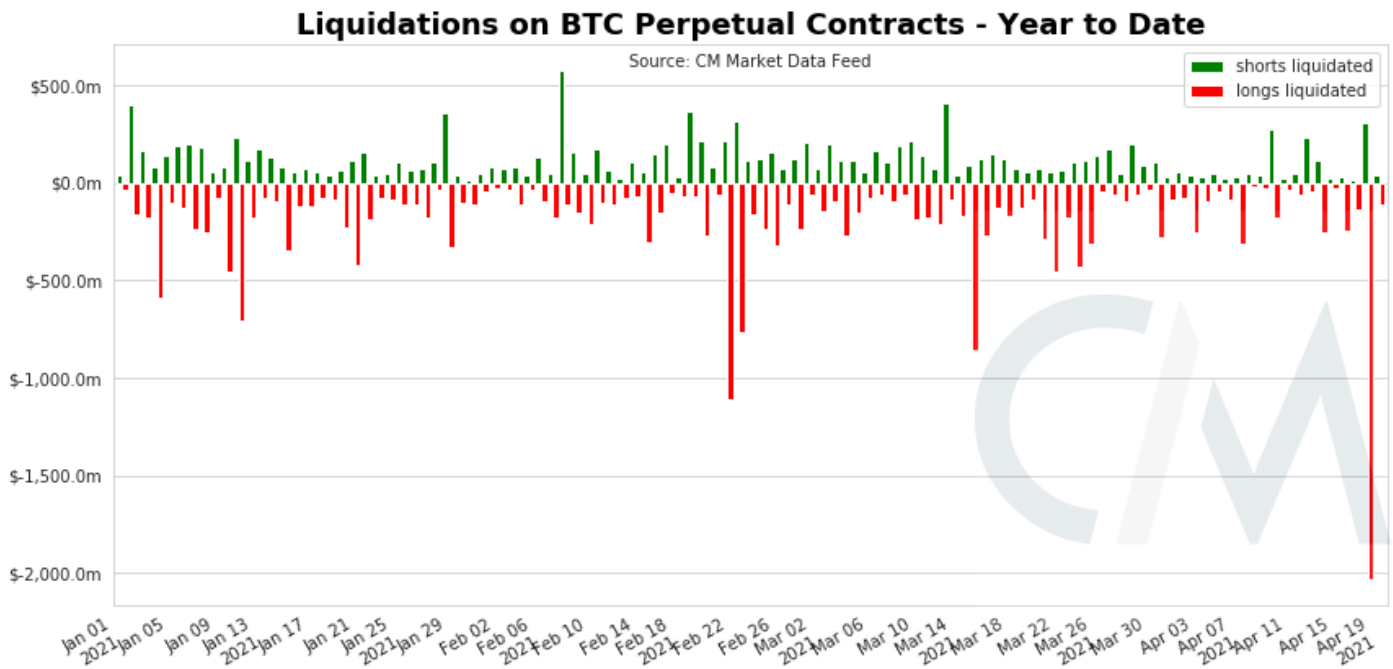
In order to open [leveraged futures contracts](#) traders need to keep a certain amount of capital in their accounts, known as margin. The amount of leverage depends on the ratio of the initial margin to the position size of the contract. If a trader has 0.01 BTC in their account as initial margin they can trade up to 1 BTC with the use of 100x leverage (1% initial margin). A 2% initial margin equals 50x leverage, 5% is 20x leverage, and so on.

After the contract is bought, the trader must keep a certain level of maintenance margin at the risk of being liquidated and losing their investment. The maintenance margin is a separate measurement from the initial margin and represents the amount a trader must keep in their account as a percent of their position size to avoid being liquidated. Changes in the profits and losses of the position will increase or decrease the traders collateral. Price movements can cause a trader to fall below margin requirements and result in liquidation. Highly leveraged trades typically require high levels of maintenance margin, which means relatively small dips in price can lead to getting liquidated.

A simplified example illustrates the process. Suppose a trader deposits \$100 into an exchange and buys \$10,000 worth of Bitcoin perpetual contracts resulting in a leverage of 100x. Also, suppose the current price of Bitcoin is \$10,000. If the price declines to \$9,900 (the “bankruptcy price”), the trader would be bankrupt. Therefore, the exchange sets the liquidation price for this trader’s position at \$9,925 (the “liquidation price”). If the price declines to this liquidation price, the exchange will forcibly initiate a sell liquidation order to attempt to close the trader’s position.

The likelihood of liquidations increases during sudden price movements. If the price of BTC (or whatever underlying asset is being used) suddenly goes up, shorts start to get liquidated, while if price suddenly drops, longs get wiped out.

The following chart shows the amount of daily liquidations for BTC perpetual futures contracts. Large amounts of liquidations tend to occur on days with sudden price movements, like April 18th when BTC suddenly dropped from over \$60K to less than \$54K.

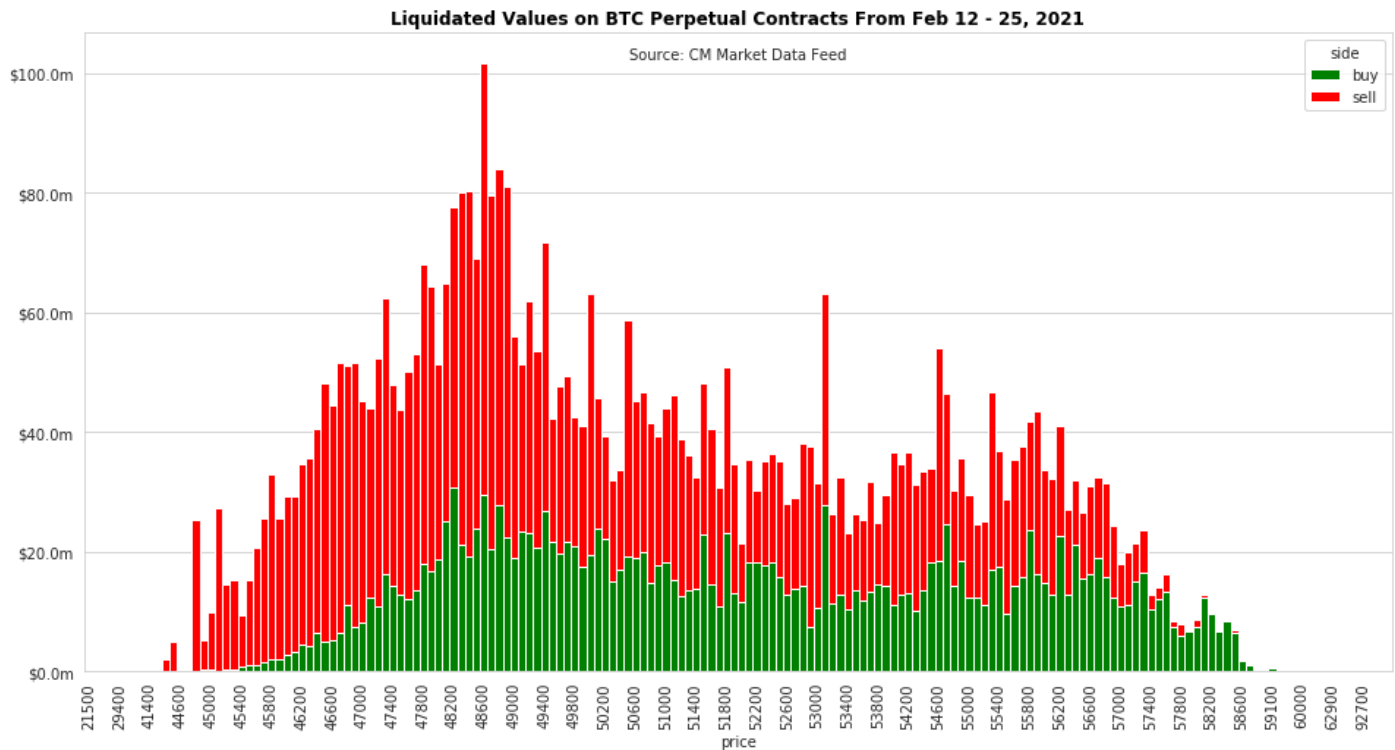


Liquidations can also cause spot price to swing in one direction or the other. As short positions are liquidated exchanges (or arbitrageurs) may be forced to buy the underlying asset to cover. And when longs are liquidated, they may be forced to sell, putting pressure on spot price. Because of this, liquidations tend to be self-reinforcing - liquidations trigger more liquidations. This can lead to liquidation cascades, which can sometimes cause large, sudden movements in spot price.

For example, the below chart shows the value of liquidated BTC perpetual future contracts for February 12th-25th, 2021. The green “buys” represent short sellers that were forced to buy to cover their positions. The red “sells” represent longs that were forced to sell to cover.

Short sellers were liquidated at a relatively steady pace on BTC’s run up towards \$60K. But major pain occurred on the way back down. As BTC dropped below \$50K a large amount of long contracts were liquidated in the \$47-49K range. BTC spot price reached a floor of about \$46K as liquidations dried up.

The large amount of long-liquidations compared to short-liquidations shows that a disproportionate amount of contracts were going long, a sign of the market's bullishness at the time.



OPEN INTEREST

Open interest is a measurement of the total number of active futures contracts. Increasing open interest indicates that more contracts are being opened and additional money is coming into the market.

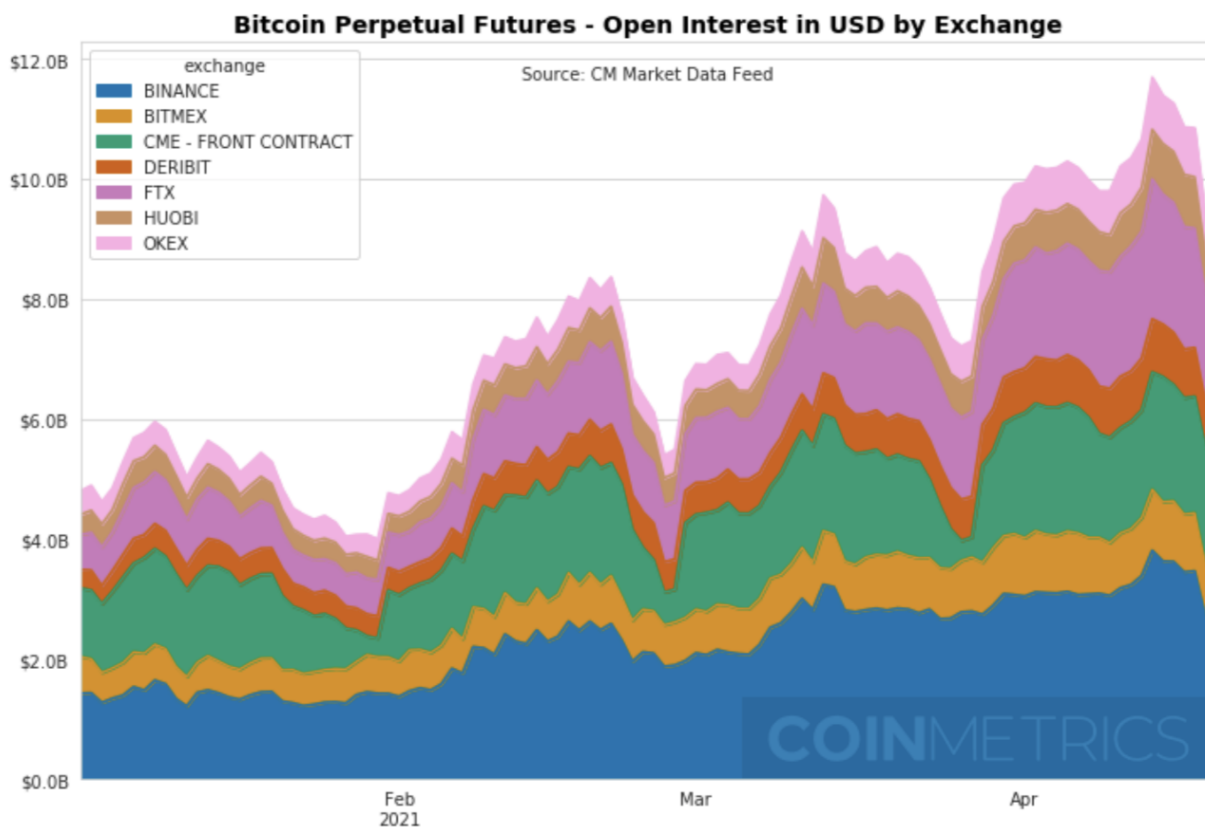
Rising open interest along with rising trading volume implies that the current price trend (either positive or negative) will continue. However if open interest falls it could indicate a price reversal as positions get liquidated.

Open interest is often used in tandem with trading volume but they are two distinct measurements. Open interest measures the amount of open contracts, but not the amount of times contracts change

hands. If a contract is traded between two parties it would get counted as trading volume but not as open interest because no new contracts were created. Open interest increases when new contracts are created, and decreases when contracts are closed or liquidated.

Open interest can also serve as a proxy for measuring leverage. If there's a relatively high amount of open interest there's a good chance there's a high amount of leverage in the futures market, as contracts are often opened using leverage. As large liquidations occur, open interest can quickly start to decrease as the market delverages.

The chart below shows the open interest across multiple exchanges for various Bitcoin perpetual contracts. Open interest has been steadily climbing year to date, with a large jump following the announcement from Tesla regarding the addition of BTC to their balance sheet. There's also been a noticeable trend of steady expansions followed by swift retractions. This pattern is generally due to a strong increase in speculation with the use of leverage and a cascade of liquidations as the price retracts and forces levered traders to sell out of positions.



CONCLUSION

Futures are becoming an increasingly important part of the crypto marketplace. Understanding how to analyze crypto futures data concepts like funding rates, liquidations, and open interest can not only give you a better understanding of how the markets work, but also a better understanding of trends and investor sentiment.

For more information about Coin Metrics' futures coverage, which currently includes pricing, funding rates, open interest, and liquidation data across 11 of the major futures exchanges, see our [Market Data Feed](#) or [contact us here](#).

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