**Perpetual Contracts**

The perpetual contract is a derivative that enables traders to speculate on an asset’s price movements without the need to hold the asset itself. Nowadays, it has become the most-traded derivative in the crypto space due to its flexibility, liquidity, and ease of understanding.

# ****Why do we need perpetual contracts?****

Imagine a scenario where your friends tell you about a new asset called Bitcoin and its price is surging. What are the choices we have to speculate on the price of this asset?

## **Choice #1: Spot Market**

The most apparent option should be going to a cryptocurrency exchange that supports fiat currency deposits, depositing your local fiat currency, and buying the amount of BTC you want on the spot market.

**Pros**

1. Easy to do:  
   Generally speaking, there is one dominant cryptocurrency exchange in each country that provides a fiat on-ramp, so this approach should be the easiest to do.

**Cons:**

1. No leverage:  
   If you use all of your deposited fiat currency to buy BTC, it effectively means that you’re speculating on BTC with 1x leverage.
2. Custodian risk (CEX):  
   The BTC you buy will be stored by the exchange and is effectively under their control. As such, you can lose your asset if the exchange gets hacked or encounters a problem.
3. High gas fees (DEX):  
   Due to the nature of handling an orderbook via Ethereum smart contract, using an on-chain DEX can come with significant gas fees.

As a side note, traders on the spot market can use something called margin trading to increase their buy/selling power. The way it works is that traders can use their assets as the collateral to borrow another asset from lenders to trade with.

## **Choice #2: Options Market**

A more advanced approach to speculate on the price movements of an asset is the option contract. For those who aren’t familiar with this financial instrument, an option contract is a derivative that gives the option holder **the right, but not the obligation**, to buy or sell an asset with a specific price at a predetermined date.

**Pros**

1. Limited loss:  
   As an option buyer, what you need to pay upfront is called “the premium,” which will be the maximum amount of money you can lose if you don’t exercise your right in the future.
2. Non-custody of the underlying:  
   Since what you buy is a right in the future rather than the asset itself, and the right is just data stored on the exchange’s server, there is no custodial risk for the underlying asset (but you still need to post some assets as the margin, which is still under the custodial risk).

**Cons:**

1. Contract roll-over  
   Because there is an expiration date for each option contract, if you want to speculate on the price movement after the contract expires, you need to open a new one.
2. (European options) Not so flexible  
   There are two styles of options — American and European. For the former, the holder can exercise the right before the expiration date; as for the latter, it can only be exercised at the expiration date.

## **Choice #3: Futures Market**

The last option for price speculation is to purchase a futures contract, which gives you the **obligation** to either

1. (physical delivery) buy or sell a certain amount of an asset at a specific price at the contract expiration date, or
2. (cash settlement) receive or pay the net cash difference between the spot price and the pre-determined price on the contract at the expiration date.

Unlike options contracts, futures contracts are tradable before the expiration date. However, holders of a futures contract still need to open a new contract if they want to continue speculating on the underlying asset after the settlement. Improving upon this drawback, BitMEX invented a new financial instrument called the perpetual contract, which is similar to a futures contract but without the expiration date, meaning that traders can now hold this futures-like contract indefinitely (or perpetually) without the need to roll-over the contract.

**Pros**

1. All of the pros from options contracts:  
   As a derivative, perpetual contracts also have the same pros as options contracts, such as limited loss (you can only lose up to the amount of your margin) and non-custody issues (you don’t hold any assets when holding the contract)
2. Ease of understanding:  
   Comparing to options and futures contract where there is an expiration date and you have to buy a specific dated future (i.e. Oct20 BTCUSD or Nov20 BTCUSD, which all have different prices), it’s much easier to buy a perpetual contract — one price and it goes up or down in real-time.
3. Higher leverage & better liquidity:  
   In general, traders can use more leverage when trading perpetual contracts (sometimes up to over 100x) than trading options contracts, which results in better liquidity for traders on the perpetual market.

**Cons:**

1. Scheduled payment:  
   Perpetual contracts rely on a scheduled payment between buyers and sellers known as the “funding payment” to converge the price of the contract with the price of the underlying asset. More on this in the next section.

Even though there are more pros for the perpetual contracts than the options contracts, it doesn’t mean that the invention of the former makes the latter obsolete. On the contrary, options contracts and traditional futures contracts still play a vital role in the cryptocurrency industry, especially for institutional traders. As an example, for Bitcoin miners may expect they’ll get X amount of BTC over the next three months, what they can do to lock in the future exchange rate (BTC/USDC) is to

1. sell X amount of the Bitcoin futures contract, or
2. buy put options contracts (“put” means to the right to sell) that expires at the end of the quarter.

On the other hand, if Bitcoin miners use a perpetual contract for the same purpose, they need to factor in the consistent funding payment, which is more troublesome than merely using a futures contract or an options contract.

# ****How does a perpetual contract work?****

## **1️⃣ Opening a position**

When we decide to speculate on an asset on the perpetual market, we need to ask ourselves three questions:

* Which direction do I expect the price of the asset will go?
* How much capital to speculate on?
* How much risk do I want to take?

Let’s say the market price (or the spot price) of one BTC is 10,000 USDC on FTX, and trader Alice thinks the BTC price will go up, this is what she can do:

First, she needs to deposit some assets such as BTC, stable coins, or fiat currencies into her account on FTX as collateral for the perpetual contract that she will open in the following steps. In our example here, Alice deposits 2,000 USDC into her account.

Second, Alice needs to decide how many BTC-PERP (the ticker for BTC perpetual contract on FTX) she wants to speculate on. If she ends up deciding to go long on 1 BTC (1 BTC here is known as the position size) with 2K USDC in her account as the margin, then she effectively uses 5x leverage.

Leverage = Notional Value of the Position / Margin

And since the notional value of the newly-opened position is 10,000 USDC (1 BTC’s market price), Alice needs to pay 7 USDC as the transaction fee (on FTX, the fee for a taker is 0.07%).

*Transaction Fee = Notional Value of the Position \* Transaction Fee (%)*

One thing to be mindful of in this step is that, with the same amount of balance in an account, the bigger the size of the positions you open, the riskier it’ll get. But why is that?

Derivative exchanges allow traders to trade perpetual contracts with leverage by posting their assets as the margin, which means traders can go long or short with more assets than they own. The higher the leverage that a derivative exchange offers for a pair, the less time it has to close (or “*liquidate*”) positions during volatile market conditions. If the exchange fails to liquidate a position in time, it will result in a loss for the exchange. To avoid this, derivative exchanges always require traders to maintain a healthy ratio between the value of the margin that a trader uses to open the position and the notional value of their position — this ratio is called “margin ratio,” and that healthy ratio is known as the “maintenance margin.” If a trader fails to keep the margin ratio of a position above the maintenance margin, her position will be liquidated by the exchange, and this trader will lose all or part of her margin depending on which exchange this trader is on.

Margin Ratio: (Margin + Unrealized PnL)/Notional Value of the Position

Put differently, the higher the leverage that a trader uses, the easier it is to get her position liquidated because the margin ratio might quickly fall below the maintenance margin during tumultuous market conditions.

As we mentioned above, traders can use leverage to increase their buying/selling power for both margin trading and perpetual contracts trading. However, unlike margin trading, where under the hood traders borrow assets from lenders to trade with leverage, the leverage for perpetual contracts is set by the exchange operator based on its risk tolerance. That’s the reason why for margin trading, you need to repay the principal and the interest even if your position is liquidated (the trade is fully funded); whereas for perpetual contract trading, you don’t need to repay anything if your position is liquidated because the exchange provides your leverage (the leverage is baked into the contract).

## **2️⃣ Holding a position**

Now, it’s the end of the hour when Alice got her 1 BTC-PERP. Assuming the BTC-PERP market price at the moment on FTX is 10,500 USDC and the average price of BTC on other major exchanges is 10,600 USDC (this price is known as the ‘index price’).

As we briefly mentioned before, derivative exchanges use a scheduled payment between buyers and sellers called a “funding payment” to converge the market price of a perpetual contract and the index price of an underlying asset. The interval of such payment can be once per hour (FTX), once per eight hours (BitMEX and Binance), or continuously (Deribit). In our example, because the market price of the perpetual contract on FTX is lower than the index price, what FTX will do is automatically deduct the funding payment from the margin of shorts and add that to the margin of longs, as shown in the formula below.

Funding Payment = Position Size \* (TWAP of the Market Price — TWAP of the Index Price)/24  
TWAP = Time-weighted average price

By introducing the funding payment, derivative exchanges can incentivize arbitrageurs to come in to correct the contract’s price by taking the less popular side, which creates a better trading environment for all of the participants.

## **3️⃣ Closing a position**

Now, the price of the BTC-PERP on FTX becomes 11,000, and Alice wants to close her position and realize the profit. What she can do is either

* open a position in the opposite direction with the same position size, and pay the transaction fee for the new position to settle the existing one, or
* clicking the close button on the UI and the exchange will do the aforementioned things for you.

In Alice’s case, her profit for this trade will be approximately 1,000 USDC.

Realized Profit = Position Size \* (Closing Price — Average Entry Price)

# ****🌏 Types of perpetual contract exchanges****

And there are two main types of perpetual contract exchanges — the orderbook type and the automated market maker (AMM) type.

## **Orderbook-Based (Peer-to-peer)**

Nearly all of the centralized players belong to this category, including FTX, Binance, BitMEX, and Deribit. The way an orderbook-style exchange works is that each trader can place orders on a centralized orderbook, and the exchange’s matching engine will match the buy and the sell orders from different traders.

**Pros:**

1. Faster matching speed (CEX)
2. Diverse order types (market order, limit order, stop-loss order, etc)
3. Easier to use

**Cons:**

1. Requires identity verification (KYC)
2. Not transparent

## **AMM-Based (Peer-to-pool)**

New entrants from the DeFi world such as Perpetual Protocol (we’re the author of this piece if you weren’t already aware 🙋‍♂️) and MCDEX are adopting this model where the counterparty on each trade is a pool of assets, known as an automated market maker (AMM). Unlike orderbook-based exchanges where the price of a perpetual contract is determined by one sell order and one buy order, prices on an AMM type exchange are determined by a predefined formula.

**Pros:**

1. No need for identity verification
2. Easier to bootstrap new markets
3. Transparent mechanism

**Cons:**

1. Market orders only
2. Harder to use (you need to have a token wallet; exchange mechanism may feel unintuitive at first)

## What is the initial margin?

Initial margin is the minimum value you must pay to open a leveraged position. For example, you can buy 1,000 BNB with an initial margin of 100 BNB (at 10x leverage). So your initial margin would be 10% of the total order. The initial margin is what backs your leveraged position, acting as [collateral](https://academy.binance.com/en/glossary/collateral).

## What is the maintenance margin?

Maintenance margin is the minimum amount of collateral you must hold to keep trading positions open. If your margin balance drops below this level, you will either receive a margin call (asking you to add more funds to your account) or be liquidated. Most cryptocurrency exchanges will do the latter.

In other words, the initial margin is the value you commit when opening a position, and the maintenance margin refers to the minimum balance you need to keep the positions open. The maintenance margin is a dynamic value that changes according to market price and to your account balance (collateral).

## What is liquidation?

If the value of your collateral falls below the maintenance margin, your futures account may be subject to liquidation. Depending on the exchange you use, the liquidation occurs in different ways. In general, the liquidation price changes according to the risk and leverage of each user (based on their collateral and net exposure). The larger the total position, the higher the required margin.

To avoid liquidation, you can either close your positions before the liquidation price is reached or add more funds to your collateral balance - causing the liquidation price to move further away from the current market price.

## What is the funding rate?

Funding consists of regular payments between buyers and sellers, according to the current funding rate. When the funding rate is above zero (positive), traders that are long (contract buyers) have to pay the ones that are short (contract sellers). In contrast, a negative funding rate means that short positions pay longs.

The funding rate is based on two components: the interest rate and the premium. The interest rate may change from one exchange to another, and the premium varies according to the price difference between futures and spot markets.

In general, when a perpetual futures contract is trading on a premium (higher than the spot markets), long positions have to pay shorts due to a positive funding rate. Such a situation is expected to drive the price down, as longs close their positions and new shorts are opened.

In case of a positive funding interest which means funding rate above zero, Longers (Buyers holding the Long position) pay the Shorts (Sellers with Short position). On the other hand, if the funding rate is below zero i.e. a negative funding interest, then the Shorts pay the Long.

## What is the mark price?

The mark price is an estimate of the true value of a contract (fair price) when compared to its actual trading price (last price). The mark price calculation prevents unfair liquidations that may happen when the market is highly volatile. So while the Index Price is related to the price of spot markets, the mark price represents the fair value of a perpetual futures contract. Typically, the mark price is based on the Index Price and the funding rate - and is also an essential part of the “unrealized PnL” calculation.

## What is PnL?

PnL stands for profit and loss, and it can be either realized or unrealized. When you have open positions on a perpetual futures market, your PnL is unrealized, meaning it’s still changing in response to market moves. When you close your positions, the unrealized PnL becomes realized PnL (either partially or entirely).

Because the realized PnL refers to the profit or loss that originates from closed positions, it has no direct relation to the mark price, but only to the executed price of the orders. The unrealized PnL, on the other hand, is constantly changing and is the primary driver for liquidations. Thus, the mark price is used to ensure that the unrealized PnL calculation is accurate and just.

## What is the Insurance Fund?

Simply put, the Insurance Fund is what prevents the balance of losing traders to drop below zero, while also ensuring that winning traders get their profits.

To illustrate, let’s suppose that Alice has $2,000 in her futures account, which is used to open a 10x BNB long position at $20 per coin. Note that Alice is buying contracts from another trader and not from the exchange. So on the other side of the trade, we have Bob, with a short position of the same size.

Because of the 10x leverage, Alice now holds a 1,000 BNB position (worth $20,000), with a $2,000 collateral. However, if the BNB price drops from $20 to $18, Alice could have her position automatically closed. This means that her assets would be liquidated and her $2,000 collateral entirely lost.

If for whatever reason, the system is not able to close her positions on time and the market price drops more, the Insurance Fund will be activated to cover those losses until the position is closed. This wouldn’t change much for Alice, as she was liquidated and her balance is zero, but it ensures that Bob is able to get his profit. Without the Insurance Fund, Alice’s balance would not only drop from $2,000 to zero but could also become negative.

In practice, however, her long position would probably be closed before that because her maintenance margin would be lower than the minimum required. The liquidation fees go directly to the Insurance Fund, and any remaining funds are returned to the users. So, the Insurance Fund is a mechanism designed to use the collateral taken from liquidated traders to cover losses of bankrupt accounts. In normal market conditions, the Insurance Fund is expected to grow continually as users are liquidated.

Summing up, the Insurance Fund gets bigger when users are liquidated before their positions reach a [break-even](https://academy.binance.com/en/glossary/break-even-point) or negative value. But in more extreme cases, the system may be unable to close all positions, and the Insurance Fund will be used to cover potential losses. Although uncommon, this could happen during periods of high [volatility](https://academy.binance.com/en/glossary/volatility) or low market [liquidity](https://academy.binance.com/en/glossary/liquidity).

