## 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.

# **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

To explain above suppose price of eth is 100$.

I want to trade eth and I have 100$ so I can trade with 1 eth but instead with the amount I have I use leverage.

Now suppose I use 2x leverage, which means at 100$ , I am buying the perp future contract of 2 eth. Now suppose price of eth starts falling. No if the price reaches to 80$ so I am in loss of

2 \* 20 = 40$ (because I have 2 units of eth and 20 is difference between my bet price and current price.)

So now if the price comes falling and reaches 50 $ now ,my loss will be 2 \* 50 =100$ (50 because bet price = 100$ , current price 50$ so loss = 100$)

Now at this my point my initial margin or we can say my collateral which is deposited would be completely exhausted if price goes down further so I will start getting calls to maintain margin and if I do am not able to maintain it then my account will be liquidated (closed). If I deposit the maintenance margin then I can continue with my trade. And if the price keeps falling this process will continue.

Now suppose if I use 10X leverage with 100$ dollars for eth at price of 100$. Now if price falls to 90$ so I would be in loss of

10 \* 10$ = 100$(1o units of eth because I used 10X leverage and 10$ loss per unit because bet price = 100$ and current price 90$)

So I would start getting call at 90$ where as when I used 2X leverage I would have got call at 50$ of eth price.

So in simple words the more use of leverage the higher the risk and low margin window.

## **2 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)

**One more thing happens in between these two process which is called Funding payment. This is process to converge the price of asset in contract and market price of the asset.**

# The Current Limitations of AMMs: Leverage, Shorts, and Impermanent Loss (IL)

Despite the sheer amount of innovation happening in this space, all of the improvements mentioned above are focused on serving token swaps, meaning that every new approach only applies to swaps and can’t be applied to derivatives, such as perpetual contracts.

Perpetual contracts are the most popular product for crypto traders. Because derivative products usually involve leverage of some kind, it’s hard to make them compatible with the current designs for AMMs; however, there are a few ways. For instance, one way to enable leverage and short selling with an AMM are to encourage liquidity providers to provide tokens in the AMM pool (= 1x leverage) and allow traders to borrow assets at the leverage they want. You can learn more about this approach [here](https://medium.com/bandprotocol/short-selling-without-counterparty-using-bonding-curve-c499e35c3dc2). However, the shortcomings of this approach are that 1) liquidity providers suffer from high impermanent loss, and 2) open interest is bound by the pool size.

# Perpetual Protocol’s Solution: Virtualizing the AMM

Working to solve the current limitations of AMMs, Perpetual Protocol introduces an entirely new approach known as a “virtual AMM,” which radically expands the application space of AMMs and enables perpetual contracts for the first time

Perpetual Protocol’s vAMM uses the same x\*y=k constant product formula as Uniswap. As the “virtual” part of vAMM implies, there is no real asset pool (k) stored inside the vAMM itself. Instead, the real asset is stored in a smart contract vault that manages all of the collateral backing the vAMM. In contrast to traditional AMMs, Perpetual Protocol uses a vAMM as a price discovery mechanism, but not for spot trading.

Here is an example showing how a *vAMM* works under the hood:

1. Before a *vAMM* is created on the blockchain, the creator sets the number of virtual assets stored inside the *vAMM*. Suppose the price of ETH is traded at 400 DAI, the creator can set an initial amount of ETH and DAI on *vAMM* with a ratio of 1-to-400. For simplicity, we assume the creator sets the initial state on that *vAMM* as 100 vETH and 40000 vDAI.

2. Trader Alice wants to go 10x long ETH with 100 DAI as collateral:

* Alice deposits 100 DAI into Perpetual Protocol’s vault, which, as mentioned above, is a smart contract on Perpetual Protocol.
* Perpetual Protocol credits 1,000 vDAI (10x leverage on 100 DAI) from Alice to the *vAMM*, which, in return, calculates the amount of the vETH that Alice receives according to a constant function (x\*y = k).
* Perpetual Protocol records that Alice now has 2.4390244 vETH and the state inside this *vAMM* becomes 97.5609756 vETH and 41000 vDAI.

3. Trader Bob then goes 10x short ETH with 100 DAI as collateral, meaning that:

* Bob deposits 100 DAI into the same vault.
* Perpetual Protocol credits -1,000 vDAI from Bob to the *vAMM*, which, in return, calculates the amount of the negative vETH that Bob receives according to a constant function (x\*y = k).
* Perpetual Protocol records that Bob has now shorted 2.4390244 vETH and the state inside this *vAMM*now becomes 100 vETH and 40000 vDAI.

# The Unique Properties of vAMMs

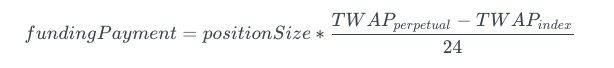
## No liquidity providers needed

Because of path independence, vaults will always have enough collateral to pay back all the traders trading against vAMMs (assuming all the under-collateralized assets are successfully liquidated before going bankrupt). In contrast to conventional AMMs whose liquidity comes from liquidity providers contributing assets to facilitate trades, the liquidity for vAMMs comes directly from the vault sitting outside of the vAMM. In other words, there is no need for the existence of liquidity providers to bring liquidity for a vAMM to work: the traders provide liquidity to each order.

Since no liquidity provider is required in a vAMM, there is no impermanent loss, to begin with.

## Periodic price alignment

The vAMM itself acts as an independent cash-settlement market. If we want to make the vAMM market price close to an underlying index, we need to add a funding rate, similar to funding payments for perpetual contracts on central limit order book (CLOB) exchanges. For example, below is the funding payment formula from FTX:



The funding payments incentivize arbitrageurs to bring the market price back as close as possible to the underlying index and make the vAMM market track the underlying index.  
Perpetual Protocol leverages a similar funding rate formula to that of FTX and therefore allows new derivative markets to trade with leverage while closely tracking an underlying index.

## Managing slippage

For vAMMs, similar to conventional AMMs, traders suffer less slippage when the value of K is higher — but the similarity ends there.  
For conventional AMMs, the only ways to increase the value of K are 1) encouraging more liquidity providers to provide more liquidity, or 2) increasing the transaction fee, and recycling trading profits to provide more liquidity.

In contrast, in vAMMs, since the value of K is set manually by the vAMM operator at launch, it can be increased or decreased at will at any time, even after the vAMM is created, which helps the market respond to the latest conditions. That being said, despite the vAMM operator having this kind of power, he/she cannot move the funds saved inside the Vault. The vAMM operator will be the Perpetual Protocol team in the first version and transit to a DAO structure after. While the first version of Perpetual Protocol will set K manually, over time we expect K to be set algorithmically. For example, K could be set as a function of volumes, open interest, funding payments, volatility, and other variables.  
Setting the value of K is a delicate balance. If K is too low, then organic users of the protocol will incur too much slippage and will not want to trade in the system. However, if K is too high, then arbitrageurs won’t have enough capital to keep the vAMM price in line with the underlying index price.  
As we learn more about how users use the system in production, we will move Perpetual Protocol away from manually selecting K to algorithmic selection.