Automated Market Makers

The Protocols Behind Decentralized Exchanges

Market Makers vs. Automated Market Makers

Typical market makers are entities that provide liquidity to the market by keeping a central order book in which they match bids and asks. Market makers charge a fee to buyers and sellers for maintaining the book.

On the other hand, Automated Market Makers (AMMs) are protocols and do not maintain an order book. As a replacement for a central order book, AMMs use mathematical equations to determine the exchange rates of assets that are provided to them to use as a source of liquidity. Some notable AMMs are Uniswap, Bancor, Curve, and Balancer.

The Mechanics of AMMs

Constant Product Formula

Rather than using an order book like traditional market makers, AMMs use the constant product method, which relies on the following formula:

$$x * y = k$$

Pools

AMMs are made of groups of pools, places where users can swap between the pair of assets deposited into the pool.

But where do pools come from in the first place? When a user deposits equal values of two assets to the AMM, a pool is created.

Ex. A user can deposit $100 DAI and $100 of USD Coin (USDC) to create a DAI / USDC pool.

DAI / USDC

Applying the Math

DAI / USDC Pool Example

Now, our example pool can be used to swap DAI and USDC. The exchange rate will automatically update based on the constant product formula, where:
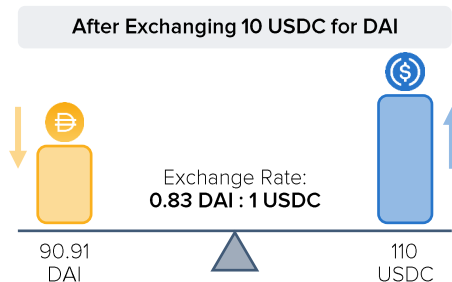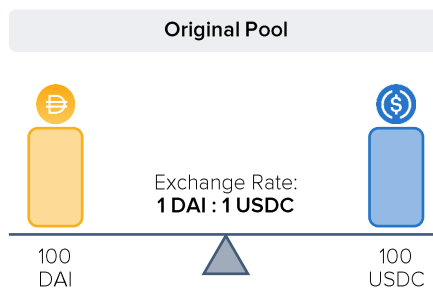
x = DAI

y = USDC

k = the constant product.

If you trade your USDC for DAI, there is more of x and less of y, putting the pool out of balance. In order to compensate for this, the exchange rate changes, so that you need to add more USDC now if you wanted the same number of DAI that you just received.

The protocol uses the equation to calculate the new exchange rate between x (DAI) and y (USDC) while ensuring that their product, k, stays constant.

Original Pool

Exchange Rate:
1 DAI : 1 USDC

100 DAI   100 USDC

After Exchanging 10 USDC for DAI

Exchange Rate:
0.83 DAI : 1 USDC

90.91 DAI   110 USDC

Send 10 USDC

1. x * y = k

2. 100 * 100 = 10,000

3. x * (100 + 10) = 10,000

4. x * 110 = 10,000

5. x = 90.91

6. 100 DAI – 90.91 DAI = 9.09 DAI

Receive 9.09 DAI