

Automated Market Makers and Decentralized Exchanges Explained

The Marketplace Technology Powering the New Financial System

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In every functioning economy, there is a marketplace. In the new financial system being built on blockchain, that marketplace is the decentralized exchange — and the engine that powers it is called an automated market maker.

Understanding AMMs and DEXs is not optional for anyone who wants to understand where crypto is going. These are not peripheral features of the ecosystem. They are the foundation of decentralized finance — the infrastructure through which trillions of dollars of value will eventually flow.

CEX	DEX	AMM	LP
Centralized Exchange Order book matching	Decentralized Exchange AMM liquidity pools	Automated Market Maker $x \times y = k$ formula	Liquidity Provider Earns trading fees

What Is a Centralized Exchange and Why Does It Have Limits?

A centralized exchange like Binance, Coinbase, or Kraken operates through an order book — a live list of all buy and sell orders at various prices. This system works, but it has fundamental limitations:

Centralization risk. The exchange controls your assets. If the exchange is hacked or goes bankrupt — as happened with FTX in November 2022 — users lose access to their funds.

Access restrictions. Centralized exchanges require identity verification, are subject to government regulation, and can restrict access based on geography or regulatory pressure.

Custody. When your assets sit on a centralized exchange, you do not hold the private keys. You hold an IOU from the exchange — a promise that has not always been kept.

What Is a Decentralized Exchange?

A decentralized exchange — DEX — is a protocol that allows users to trade cryptocurrencies directly with each other, peer to peer, without a central authority controlling the process. There is no company holding your funds. There is no account registration required. You connect your wallet, execute a trade, and the smart contract handles everything automatically.

Major decentralized exchanges include Uniswap on Ethereum, Aerodrome on Base, Raydium on Solana, and PancakeSwap on BNB Chain. Each operates on a different blockchain but shares the same fundamental architecture — the automated market maker.

What Is an Automated Market Maker?

An AMM allows a decentralized exchange to function without a traditional order book — using liquidity pools and a mathematical formula instead. Here is how it works in three steps:

Step 1 — Liquidity Providers deposit assets. Participants deposit pairs of tokens into a smart contract — for example, \$10,000 worth of ETH and \$10,000 worth of USDC — creating a pool that anyone can trade against. In return, they earn a share of all trading fees generated by the pool.

Step 2 — The mathematical formula sets the price. The most common AMM formula is the constant product formula: $x \times y = k$. Where x is the quantity of one token, y is the quantity of the other, and k is a constant that never changes. When a trader buys ETH, the ratio of ETH to USDC in the pool changes — automatically adjusting the price.

Step 3 — The trade executes automatically. The smart contract calculates the output based on the current pool ratio, deducts a small fee — typically 0.3% — and executes the swap instantly. No counterparty needed. No matching required.

$$x \times y = k$$

x = Token A quantity | y = Token B quantity | k = Constant product (never changes)

Liquidity Pools — The Engine of the DEX

Without liquidity, there is no market. In traditional markets, liquidity is provided by large financial institutions and professional trading firms. In decentralized exchanges, anyone can be a market maker — any user who deposits assets into a liquidity pool becomes a liquidity provider, earning a proportional share of every trading fee generated by the pool.

This democratization of market making is one of the most significant innovations in the history of finance. A retail investor anywhere in the world can provide liquidity to a global trading pair and earn fees from every trade executed against that pool — something structurally impossible in the traditional financial system.

Impermanent Loss — The Risk Liquidity Providers Take

Impermanent loss occurs when the price of the assets in a liquidity pool changes relative to each other after deposit. If a liquidity provider deposits 1 ETH and \$2,000 USDC when ETH is priced at \$2,000, then ETH rises to \$4,000 — arbitrage traders will rebalance the pool, leaving the provider with less ETH and more USDC than they deposited.

The difference between what they would have had by simply holding versus their current pool position is the impermanent loss. It is called impermanent because if prices return to the original ratio, the loss disappears. But if the provider withdraws while the price divergence persists, the loss becomes permanent.

AMM Generations — How the Technology Has Evolved

Uniswap V1 and V2 — The Original Model. The constant product AMM provided a simple solution to decentralized trading, distributing liquidity evenly across all possible prices. Most deposited liquidity sat idle at price ranges the asset never traded in.

Uniswap V3 — Concentrated Liquidity. Liquidity providers can now specify a price range within which their liquidity is active — focusing capital where most trading occurs and dramatically improving capital efficiency and fee earnings.

Curve Finance — Stable Asset AMMs. A specialized AMM formula optimized for stable asset pairs — stablecoins trading against each other — dramatically reducing slippage for large stable trades and becoming the dominant DEX for stablecoin liquidity.

Balancer — Multi-Asset Pools. Extended the AMM concept to pools of up to eight different assets at customizable weightings — enabling automated portfolio management products that rebalance themselves as prices move.

How to Evaluate a DEX as an Investment

Total Value Locked — TVL. The total assets deposited in the protocol's liquidity pools. Higher TVL indicates greater market confidence and more liquidity depth.

Trading Volume. The daily and weekly trading volume processed by the protocol. Volume drives fee revenue, and fee revenue drives the economic value of the governance token.

Fee Revenue. The actual fees generated and how they are distributed — to liquidity providers, token holders, or the protocol treasury. Fee revenue is the fundamental driver of long-term protocol value.

Token Utility. What the governance token actually does — whether it captures fee revenue, grants governance rights, or provides staking yields. Tokens with direct fee capture have stronger fundamental value.

Chain and Ecosystem Position. Which blockchain the DEX operates on, how dominant it is within that ecosystem, and whether the underlying chain is attracting growing developer activity and user adoption.

Why AMMs Matter Beyond DeFi

As traditional financial institutions begin tokenizing real-world assets — stocks, bonds, real estate, commodities — they will need liquid markets for those tokenized assets to be traded. The most likely infrastructure for those markets is some version of the AMM model, operating on institutional-grade blockchain infrastructure.

The OCC's recent moves toward permitting national banks to engage with crypto infrastructure, combined with tokenized stock initiatives being developed by major financial institutions, point directly toward a future where AMM technology processes a significant portion of global financial market activity. The rails are being built. The AMM is one of the most important rails.

Key Takeaway

The automated market maker is the marketplace of the new financial system — the first institution built in every new blockchain settlement, and the infrastructure through which the entire DeFi economy flows. Understanding how AMMs work, how liquidity pools function, and what drives protocol value gives you a fundamental edge in evaluating every DeFi project, every Layer 2 ecosystem, and every institutional crypto initiative that references on-chain liquidity.