



Course II:

DeFi Primitives

1. The Mechanics of Modern Decentralized Finance

(ii) Fungible Tokens

Fungible tokens

ERC-20 functionality

- When a token implements the ERC-20 interface, any application that generically handles the defined functionality can instantly and seamlessly integrate with the token.
- Using ERC-20 and similar interfaces, application developers can confidently support tokens that do not yet exist.

Fungible tokens

ERC-20 interface

- **totalSupply()**—read the token’s total supply;
- **balanceOf(address)**—read the balance of the token for a particular user;
- **transferFrom(from address, to address, amount)**—send “amount” tokens from the balance of tokens held at “from address” to “to address”; and
- **approve(owner, spender, amount)**—allows “spender” to spend “amount” tokens of “owner” on behalf of owner.

Fungible tokens

Equity tokens

- An equity token (not traditional stocks) is simply a token that represents ownership of an underlying asset or pool of assets.
- The units must be fungible so that each corresponds to an identical share in the pool. For example, suppose a token, TKN, has a total fixed supply of 10,000, and TKN corresponds to an ETH pool of 100 ETH held in a smart contract.
- The smart contract stipulates that for every unit of TKN it receives, it will return a pro rata amount of ETH, fixing the exchange ratio at 100 TKN/1 ETH.

Fungible tokens

Equity tokens

- We can extend the example so the pool has a variable amount of ETH. Suppose the ETH in the pool increases at 5% per year by some other mechanism.
- Now 100 TKN would represent 1 ETH plus a 5% perpetual cash flow of ETH. The market can use this information to accurately price the value of TKN.

Fungible tokens

Equity tokens

- In actual equity tokens, the pools of assets can contain much more complex mechanics.
 - Variable interest-rate mechanics (Compound)
 - Contract that owns a multi-asset pool with a complex fee structure (Uniswap).
 - A standard interface for creating equity tokens with static or dynamic holdings (Set Protocol).

Fungible tokens

Utility tokens

- Utility tokens are fungible tokens that are required to utilize some functionality of a smart contract system or that have an intrinsic value proposition defined by its respective smart contract system.
- Examples of use cases for utility tokens:
 - To be collateral (e.g., SNX)
 - To represent reputation or stake (e.g., REP, LINK)
 - To maintain stable value relative to underlying or peg (e.g., DAI, Synthetix Synth)
 - To pay application-specific fees (e.g., ZRX, DAI, LINK)

Fungible tokens

Utility tokens

- The last example includes all stablecoins, regardless of whether the stablecoin is fiat collateralized, crypto-collateralized, or algorithmic.
- In the case of USDC, a fiat-collateralized stablecoin, the utility token operates as its own system without any additional smart-contract infrastructure to support its value.
- The value of USDC arises from the promise of redemption for USD by its backing companies, including Coinbase.

Fungible tokens

Governance tokens

- Governance tokens are similar to equity tokens in the sense they represent percentage ownership. Instead of asset ownership, governance token ownership applies to voting rights
- Many smart contracts have embedded clauses stipulating how the system can change; for instance, allowed changes could include adjusting parameters, adding new components, or even altering the functionality of existing components.

Fungible tokens

Governance tokens

- Any platform with admin-controlled functionality is not truly DeFi because of the admins' centralized control.
- A contract without the capacity for change is necessarily rigid, however, and has no way to adapt to bugs in the code or changing economic or technical conditions.
- For this reason, many platforms strive for a decentralized upgrade process, often mediated by a governance token.

Fungible tokens

Governance tokens

- A governance token can be implemented in many ways—with a static supply, an inflationary supply, or even a deflationary supply.
- A static supply is straightforward: purchased shares would correspond directly to a certain percentage control of the vote.
- MKR is an example of a static supply
- COMP is an example of inflationary supply to incentive use of the platform