L29: Token Economics Fundamentals

Module D: Tokenomics

Blockchain & Cryptocurrency

December 2025

Learning Objectives

- Understand different token types and their purposes
- Analyze value accrual mechanisms in token economies
- Evaluate token supply models and their implications
- Apply tokenomics principles to real-world projects

What is Tokenomics?

Definition: The study of the economic systems governing the creation, distribution, and management of tokens in blockchain ecosystems.

Key Components:

- Token design and purpose
- Supply and distribution mechanics
- Incentive structures
- Value capture mechanisms
- Governance and utility

Why It Matters: Tokenomics determines the long-term sustainability and success of crypto projects.

Token Types: Overview

1. **Utility Tokens**
   - Access to platform services
   - Payment for network fees
   - Examples: BNB, LINK, FIL
2. **Security Tokens**
   - Represent ownership/dividends
   - Subject to securities laws
   - Examples: tokenized stocks, bonds
3. **Governance Tokens**
   - Voting rights on protocol changes
   - DAO participation
   - Examples: UNI, AAVE, MKR
4. **Store of Value Tokens**
   - Digital gold analogy
   - Limited supply
   - Example: BTC

Utility Tokens: Deep Dive

Purpose: Grant access to specific products or services within an ecosystem.

Characteristics:

- Not designed as investments
- Required for platform interaction
- Value linked to platform usage
- May offer fee discounts

Example: Binance Coin (BNB)

- Trading fee discounts on Binance exchange
- Gas fees on BNB Chain
- Participation in token sales (Launchpad)
- Quarterly token burns based on trading volume

Security Tokens

Definition: Tokens that represent investment contracts and are subject to securities regulations.

Howey Test Criteria:

1. Investment of money
2. In a common enterprise
3. With expectation of profits
4. Derived from efforts of others

Implications:

- Must comply with SEC regulations (in US)
- Require registration or exemption
- Investor protections apply
- Limited to accredited investors (often)

Governance Tokens

Purpose: Enable decentralized decision-making in protocols.

Voting Rights:

- Protocol parameter changes
- Treasury allocation
- Fee structure modifications
- Smart contract upgrades

Example: Uniswap (UNI)

- Governance over protocol fee switch
- Treasury management (billions in assets)
- Grant program decisions
- 1 UNI = 1 vote (with delegation)

Value Accrual Mechanisms

How do tokens capture value from protocol success?

1. **Fee Distribution**
   - Protocol fees shared with token holders
   - Example: GMX distributes 30% of trading fees
2. **Staking Rewards**
   - Lock tokens to earn yield
   - Example: Ethereum validators earn ETH rewards
3. **Token Burns**
   - Reduce circulating supply
   - Example: BNB quarterly burns, ETH EIP-1559
4. **Buybacks**
   - Protocol buys tokens from market
   - Example: MakerDAO buying back MKR

Supply Models: Fixed Supply

Characteristics:

- Predetermined maximum supply
- No new tokens created after cap
- Deflationary if tokens are burned

Bitcoin Example:

- Maximum supply: 21 million BTC
- Current supply: 19.5 million (as of 2024)
- Halving every 210,000 blocks (4 years)
- Final BTC mined around year 2140

Advantages:

- Scarcity creates potential value appreciation
- Predictable monetary policy
- Protection against inflation

Supply Models: Inflationary

Characteristics:

- New tokens continuously created
- Inflation rate may be fixed or decreasing
- Incentivizes staking/participation

Ethereum Example (Post-Merge):

- New ETH issued to validators: 0.5% annually
- ETH burned via EIP-1559: 0.5-2% annually
- Net effect: slightly deflationary to neutral

Advantages:

- Ongoing incentives for network security
- Flexibility to adjust issuance
- Can fund ecosystem development

Supply Models: Deflationary

Characteristics:

- Circulating supply decreases over time
- Tokens removed through burns
- Creates scarcity pressure

BNB Burn Mechanism:

- Auto-Burn: based on BNB Chain gas fees
- Real-Time Burn: 10% of gas fees immediately burned
- Target: burn until 100M BNB remains (from 200M initial)
- Current supply: 144M BNB (Dec 2024)

Risks:

- Excessive deflation may discourage spending
- Burns must be backed by genuine demand
- Can be manipulated if not transparent

Emission Schedules

How tokens enter circulation over time:

1. **Linear Emission**
   - Constant rate of new tokens
   - Predictable but perpetual inflation
2. **Decreasing Emission**
   - Halving events (Bitcoin model)
   - Gradually reducing inflation
3. **Exponential Decay**
   - Rapid initial distribution
   - Asymptotically approaches max supply
4. **Algorithmic Adjustment**
   - Based on network metrics
   - Example: Ethereum's variable issuance

Token Velocity Problem

Problem: High token velocity (frequent buying/selling) can suppress token price.

Equation of Exchange:

$$MV = PQ$$

where:

- M = Money supply (token supply)
- V = Velocity (transaction frequency)
- P = Price level
- Q = Quantity of goods/services

Implication: If V increases while PQ (network activity) stays constant, M (token value) must decrease.

Solutions:

- Staking mechanisms (reduce velocity)
- Vesting periods
- Utility that requires holding (governance, fee discounts)

Incentive Alignment

Goal: Align interests of all participants (users, developers, investors, validators).

Stakeholders:

- **Users:** Want low fees, good UX, reliable service
- **Developers:** Need funding, want protocol adoption
- **Token Holders:** Seek value appreciation
- **Validators/Miners:** Require adequate compensation

Mechanisms:

1. **Fee Sharing:** Users pay fees, validators/holders earn
2. **Governance:** All stakeholders can propose changes
3. **Vesting:** Long-term alignment for team/investors
4. **Liquidity Mining:** Bootstrap network effects

Token Sinks vs. Faucets

Token Sinks (Removal)

- Transaction fee burns
- Protocol penalties (slashing)
- Staking locks
- Governance participation locks
- NFT minting costs

Effect: Reduce circulating supply, increase scarcity.

Token Faucets (Creation)

- Block rewards
- Liquidity mining rewards
- Airdrops
- Developer grants
- User incentives

Effect: Increase supply, incentivize participation.

Balance: Healthy tokenomics requires equilibrium between sinks and faucets.

Case Study: ETH Tokenomics Evolution

Pre-EIP-1559 (Before Aug 2021):

- Inflationary: 4.5% annual issuance
- All fees go to miners
- Unpredictable fee market

Post-EIP-1559:

- Base fee burned (deflationary mechanism)
- Priority tips to miners
- More predictable fees

Post-Merge (Sept 2022):

- Issuance reduced 90% (from 4.5% to 0.5%)
- Net deflationary during high activity
- Staking yields: 3-5% APR

Result: ETH became an ultrasound money meme due to net deflation.

Good vs. Bad Tokenomics

Good Tokenomics

- Clear value accrual
- Sustainable incentives
- Low initial team/VC allocation
- Long vesting periods
- Transparent distribution
- Product-market fit
- Real utility beyond speculation

Bad Tokenomics

- No clear value capture
- Ponzi-like dynamics
- High team/insider allocation
- Short/no vesting
- Opaque distribution
- No real product
- Pure speculation

Red Flags:

- Excessive token supply to insiders (¿30%)
- No burns or deflationary mechanisms
- Unsustainable yield promises (¿100% APY)
- Complex mechanisms to hide inflation

Key Metrics to Evaluate

1. **Circulating Supply vs. Total Supply**
   - Large difference indicates future dilution
2. **Token Distribution**
   - Top holder concentration
   - Team/VC percentage
3. **Inflation Rate**
   - Current and projected annual inflation
4. **Value Accrual Mechanisms**
   - Fee sharing, burns, staking rewards
5. **Unlock Schedule**
   - When do vested tokens enter circulation?

Summary

Key Takeaways:

- Token type determines purpose and regulatory treatment
- Value accrual mechanisms connect token price to protocol success
- Supply models (fixed, inflationary, deflationary) have trade-offs
- Good tokenomics aligns incentives across all stakeholders
- Token velocity must be managed to maintain value
- Transparent distribution and vesting are crucial

Next Lecture: Distribution and Vesting - How tokens are allocated and released over time.

Questions for Reflection

1. How does Bitcoin's fixed supply model compare to Ethereum's flexible issuance?
2. What are the trade-offs between utility tokens and governance tokens?
3. How can a protocol reduce token velocity without harming liquidity?
4. Why might high team/VC allocations be problematic?
5. What role do token burns play in value accrual?