Tokenomics: Designing Token Economies That Last

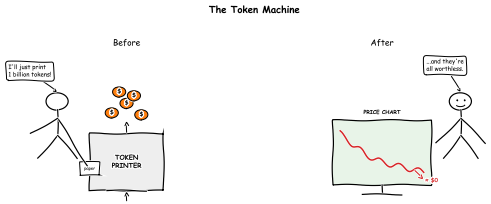
Supply, Value, and the Art of Not Collapsing

Prof. Dr. Jörg Osterrieder

BSc Blockchain, Crypto Economy & NFTs

Spring 2026

[Cartoon] Print Tokens, Get Rich?



Printing tokens is easy. Printing value is hard.

Someone creates 1 billion tokens and lists them on an exchange.

"I'm a billionaire!" they announce.

Nobody buys. The price stays at zero. One billion times zero is still zero.

Why? Because printing tokens is easy. Designing value is hard.

Anyone can deploy a token contract in 10 minutes. Making that token worth holding requires economics, incentives, and trust.

This lecture is about the hard part.

What makes a token worth anything? If you can answer that question, you understand tokenomics.

Learning Objectives

By the end of this lecture, you will be able to:

1. **Describe** the four token types and their economic roles. [Understand]
2. **Explain** how value accrual mechanisms connect token price to protocol success. [Understand]
3. **Calculate** token value using the equation of exchange (MV=PQ). [Apply]
4. **Compare** vesting schedules and their impact on token price stability. [Analyze]
5. **Evaluate** a token project's sustainability using a 6-question framework. [Evaluate]

Prerequisites: Basic blockchain concepts (Blockchain Foundations lecture).

Bloom's levels covered: Understand, Apply, Analyze, Evaluate

These objectives progress from knowledge to judgment — the same path you follow when evaluating any token.

Welcome to Tokenomics

What this lecture covers:

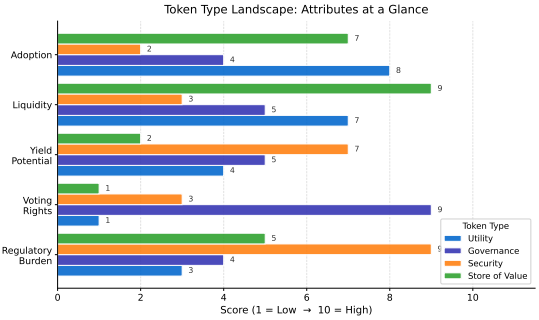
This lecture synthesizes Module D (Lessons 29–31). We cover token types, supply models, value capture, distribution, and classification.

Start: Token fundamentals — what types exist and why they matter.

End: You can evaluate any token project using a structured 6-question framework.

The journey:

- Types → Supply → Value capture
- Distribution → Valuation metrics
- Regulation → Evaluation framework



Core tension: How do you design a token that captures value without collapsing?

The Illusion of Free Money

A Thought Experiment

You receive an airdrop of 10,000 tokens from a new DeFi project. The token is trading at $2 each — you have $20,000!
You check back a month later: the price is $0.02. Your $20,000 is now $200.
What went wrong?

The answer: the project had **no value accrual**. Tokens were printed, distributed, and immediately sold. Nothing locked the value in.
Every recipient had the same thought: "Sell before everyone else does." When everyone sells and no one holds, the price goes to zero.
The tokens had *supply* but no *demand*. Supply without demand is not an asset — it is digital noise.

Think about the last airdrop you heard about. Did anyone hold?

Most airdrops lose 80–90% of value within 90 days. Tokenomics explains why.

What Is Tokenomics?

Definition: Tokenomics

The study of the economic systems governing the creation, distribution, and management of tokens in blockchain ecosystems — including supply schedules, value capture mechanisms, distribution rules, and incentive alignment.

Five core components:

1. **Token purpose and type** — What role does the token play in the ecosystem?
2. **Supply model** — How many tokens exist and how does supply change over time?
3. **Value accrual** — How does the token capture value from protocol activity?
4. **Distribution and vesting** — Who receives tokens and when can they sell?
5. **Governance** — Who controls decisions about the protocol's future?

Each component interacts with the others. Change one, and the entire economic equilibrium shifts.

Tokenomics determines long-term sustainability. 95% of ICO-era tokens failed due to poor economic design.

Token Types: The Four Families

Utility Tokens

- Access to services within an ecosystem
- Examples: BNB (exchange fees), LINK (oracle payments), FIL (storage)
- Value tied to platform usage

Security Tokens

- Represent ownership, dividends, or profit-sharing
- Subject to securities regulation (SEC, MiCA)
- Examples: tokenized stocks, revenue-share tokens

Governance Tokens

- Voting rights on protocol decisions
- Examples: UNI (Uniswap), AAVE (Aave), MKR (MakerDAO)
- Value tied to influence over treasury and parameters

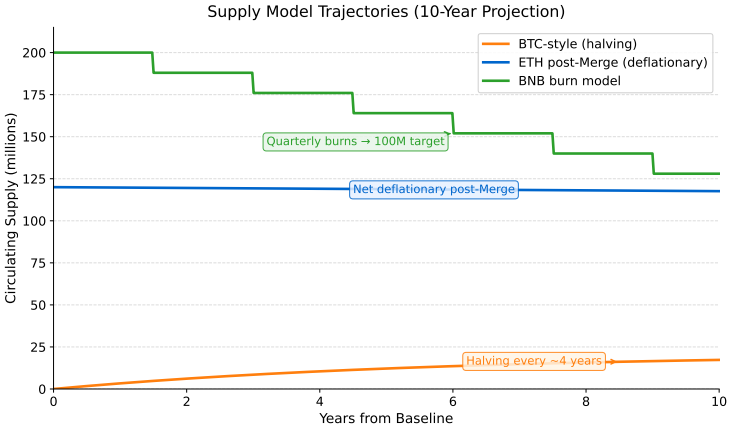
Store of Value Tokens

- "Digital gold" — designed for scarcity
- Example: BTC (21M hard cap, halving schedule)
- Value from limited supply and network effects

Many tokens combine types: ETH is utility (gas) + store of value (deflationary). UNI is governance + utility (fee switches).

Token type determines regulatory treatment, value accrual potential, and investor expectations.

Supply Models: Fixed vs Inflationary vs Deflationary



- **What you see:** Three supply curves — BTC approaching 21M cap, ETH slightly declining post-Merge, BNB stepping down via quarterly burns
- **Key pattern:** BTC's halving creates predictable scarcity; ETH became deflationary after the Merge (Sept 2022)
- **Takeaway:** Supply model is the monetary policy of a token — fixed, inflationary, or deflationary

Bitcoin's supply model is the most predictable monetary policy in human history — every coin until 2140 is already scheduled.

The Token Supply Balancing Act: Sinks and Faucets

Token Faucets (Creation):

- Block rewards (new tokens minted each block)
- Liquidity mining (tokens for providing capital)
- Airdrops (free distribution to bootstrap adoption)
- Developer grants (ecosystem funding)

Effect: Increase supply, incentivize participation, attract new users.

Token Sinks (Removal):

- Transaction fee burns (EIP-1559 base fee)
- Slashing (staked tokens destroyed as penalty)
- Staking locks (tokens held, cannot circulate)
- Governance participation locks (tokens locked to vote)

Effect: Reduce circulating supply, increase scarcity, reward commitment.

Healthy tokenomics requires equilibrium between creation and removal.

Ethereum burns approximately 3,000 ETH per day via EIP-1559 base fee mechanism — roughly $7.5M daily at current prices.

How Does a Token Capture Value?

Definition: Value Accrual

The mechanisms by which a token's price becomes connected to the success of its underlying protocol — ensuring that more usage translates into higher token value.

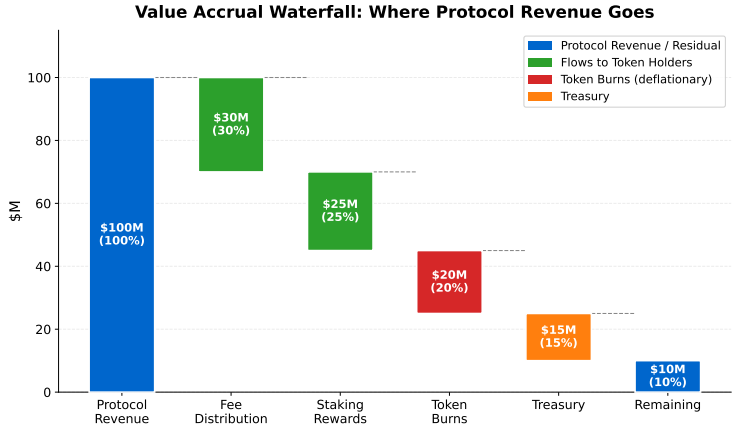
Three primary mechanisms:

1. **Fee Distribution** — the protocol shares revenue directly with token holders.
   Example: GMX distributes 30% of trading fees to staked GMX holders.
2. **Staking Rewards** — lock tokens to earn yield from protocol activity.
   Example: ETH validators earn 3–5% APR (Annual Percentage Rate) for securing the network.
3. **Token Burns** — permanently remove tokens from supply, increasing scarcity.
   Example: BNB quarterly burns; ETH EIP-1559 base fee burns.

The best tokenomics combine multiple mechanisms. Relying on one creates fragility.

Without value accrual, a token is just a number. With it, the token's price tracks protocol success.

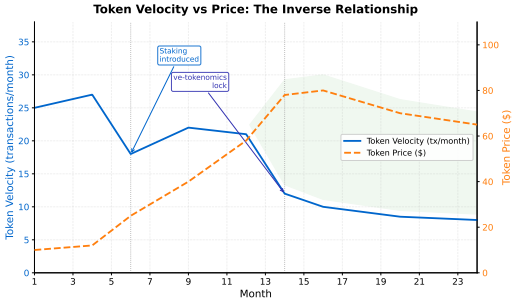
Value Accrual: Where Protocol Revenue Goes



- **What you see:** Waterfall chart showing $100M protocol revenue flowing through fee distribution, staking, burns, and treasury
- **Key pattern:** Combined mechanisms capture 75% of revenue for token holders; treasury retains 25% for development
- **Takeaway:** Best tokenomics combine multiple value accrual mechanisms — no single channel should carry all the weight

Protocols with zero value accrual have tokens that trade on pure speculation — a fragile foundation.

The Velocity Problem: MV = PQ



The Equation of Exchange:

$$\underbrace{M}_{\text{Token Supply}} \times \underbrace{V}_{\text{Velocity}} = \underbrace{P}_{\text{Price Level}} \times \underbrace{Q}_{\text{Tx Volume}}$$

Velocity = how many times each token changes hands per period.

Key insight: High velocity suppresses price. If tokens change hands instantly, no one holds them, creating no scarcity.

Solutions:

- Staking locks (earn yield for holding)
- Governance utility (hold to vote)
- Fee discounts for holders

All reduce velocity by giving reasons to hold.

Velocity is the silent killer of token value. A useful token that nobody holds can still be worthless.

Worked Example: Token Valuation Using MV = PQ

Scenario: A DeFi protocol processes $500M in transactions per year.

Variable	Value	Meaning
Transaction Volume (Q)	$500M/year	Economic activity on the protocol
Token Supply (M)	100M tokens	Total tokens in circulation
Velocity (V)	10	Each token changes hands 10 times/year

Step 1: Rearrange MV = PQ to solve for token price:

$$\text{Token Price} = Q / (M \times V) = \$500M / (100M \times 10) = \mathbf{\$0.50}$$

Worked Example: Token Valuation Using MV = PQ

Scenario: A DeFi protocol processes $500M in transactions per year.

Variable	Value	Meaning
Transaction Volume (Q)	$500M/year	Economic activity on the protocol
Token Supply (M)	100M tokens	Total tokens in circulation
Velocity (V)	10	Each token changes hands 10 times/year

Step 1: Rearrange MV = PQ to solve for token price:

$$\text{Token Price} = Q / (M \times V) = \$500M / (100M \times 10) = \mathbf{\$0.50}$$

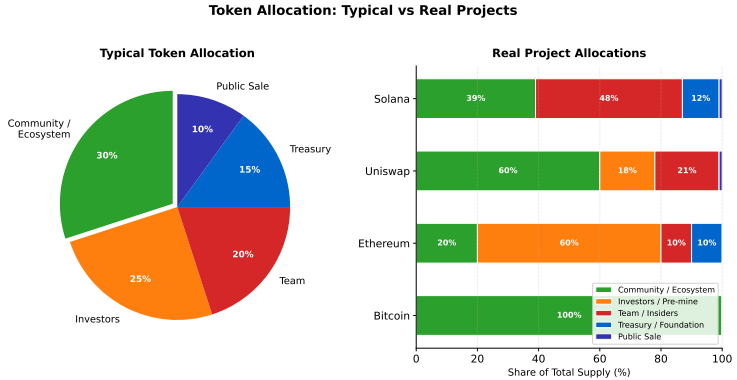
Step 2: Now reduce velocity to 2 (via staking incentives):

$$\text{Token Price} = \$500M / (100M \times 2) = \mathbf{\$2.50} \quad \text{(5x increase!)}$$

Same protocol. Same usage. Same supply. The only change: people hold the token instead of flipping it.

Reducing velocity from 10 to 2 increases token price 5x with NO change in fundamental usage.

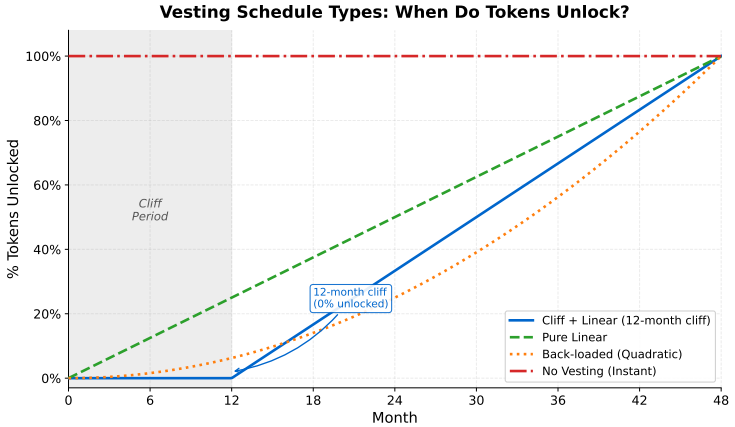
How Are Tokens Distributed?



- **What you see:** Typical allocation pie (Team 20%, Investors 25%, Community 30%, Treasury 15%, Public 10%) with benchmark comparisons across real projects
- **Key pattern:** Bitcoin = 100% community-mined; Solana = 48% insiders — wildly different philosophies
- **Takeaway:** High insider allocation (greater than 30%) is a red flag; community-heavy distribution builds trust

Distribution philosophy reveals project values. Community-first vs insider-first is the single most telling signal.

Vesting Schedules: Cliffs, Linear, and Unlocks



- **What you see:** Four vesting curves over 48 months — cliff+linear, pure linear, back-loaded, and instant unlock
- **Key pattern:** The 12-month cliff creates a sharp unlock event; back-loaded schedules protect against early dumping
- **Takeaway:** Longer vesting = stronger commitment signal. No vesting = immediate sell pressure

Standard best practice: 12-month cliff followed by 24–36 months of linear vesting for team and investor tokens.

The Unlock Shock: When Tokens Flood the Market

What happens when vested tokens unlock:

Large token supply suddenly hits the market → sell pressure → price drops.

Historical examples:

- **Solana (early 2021):** Major unlock events caused 15–20% price dips within days
- **Aptos (Nov 2023):** Massive insider unlock released tokens worth hundreds of millions
- **Arbitrum ARB (2023–2024):** Scheduled unlocks created sell pressure *weeks before* the actual unlock date — anticipation alone moves markets

Key terminology:

- **Cliff unlock** = sudden large release (e.g., 20% of supply on one day)
- **Linear unlock** = gradual daily/weekly release (smoother price impact)

Smart traders track unlock schedules the way bond traders track central bank meetings.

Large unlocks (greater than 5% of circulating supply) reliably suppress price. Tools like TokenUnlocks.app track schedules.

Ethereum's Tokenomics Evolution: A Case Study

Pre-EIP-1559
Before Aug 2021

- Inflation: ∼4.5%/year
- All fees paid to miners
- Unpredictable gas costs
- No burn mechanism
- Supply: growing indefinitely

Monetary policy: like printing money with no cap.

Post-EIP-1559
Aug 2021 – Sept 2022

- Base fee burned automatically
- Tips still go to miners
- Predictable gas pricing
- Partial burn reduces net issuance
- Supply growth: slowed

Monetary policy: inflation with a brake.

Post-Merge
Sept 2022 – present

- Issuance cut by ∼90%
- Net supply: deflationary
- Staking APR: 3–5%
- Validators replace miners
- Supply: slowly shrinking

Monetary policy: like gold, but programmable.

Three upgrades transformed ETH from inflationary (like fiat) to deflationary (like gold).

ETH evolved through three economic regimes. Each upgrade fundamentally changed the token's investment thesis.

How to Spot Bad Tokenomics

Good Tokenomics:

- Clear value accrual mechanism (fees, burns, staking)
- Long vesting: 2–4 years for team tokens
- Low team allocation (less than 20%)
- Transparent, audited distribution
- Real utility beyond speculation
- Multiple velocity-reduction mechanisms

Examples: ETH (post-Merge), MKR, GMX

Bad Tokenomics:

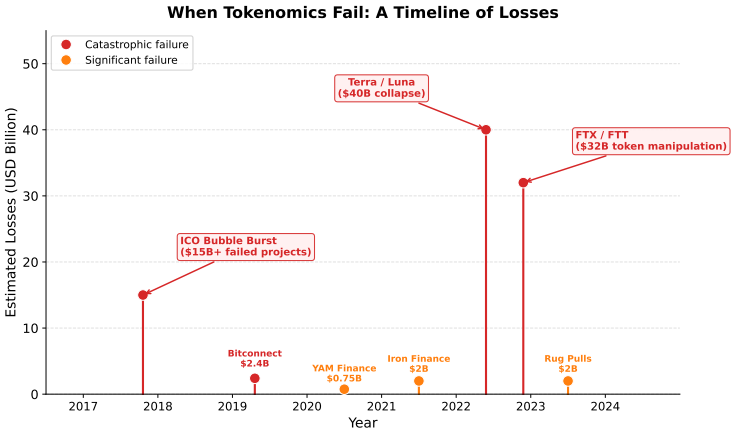
- No value capture (pure speculation)
- Short or no vesting for insiders
- High insider allocation (greater than 30%)
- Opaque or undisclosed distribution
- Unsustainable yield promises (greater than 100% APY)
- Token does nothing except "go up"

Examples: Most ICO tokens (2017–2018), Terra/Luna UST, many meme coins

Red flag test: If you cannot explain how the token captures value in one sentence, the tokenomics are likely bad.

Good tokenomics can be summarized simply. Bad tokenomics hide behind complexity and jargon.

When Tokenomics Fail: Terra/Luna and ICO Collapses



- **What you see:** Timeline of major tokenomics failures from 2017–2024 with estimated loss magnitudes
- **Key pattern:** Terra/Luna (**$**40B) and FTX/FTT (**$**32B) dwarf all others — systemic failures, not just bad projects
- **Takeaway:** Poor tokenomics can cause catastrophic, system-wide losses. Design matters at every scale

Terra/Luna collapsed because the token model created a death spiral: falling price → more minting → lower price.

Red Flags Checklist: 8 Warning Signs

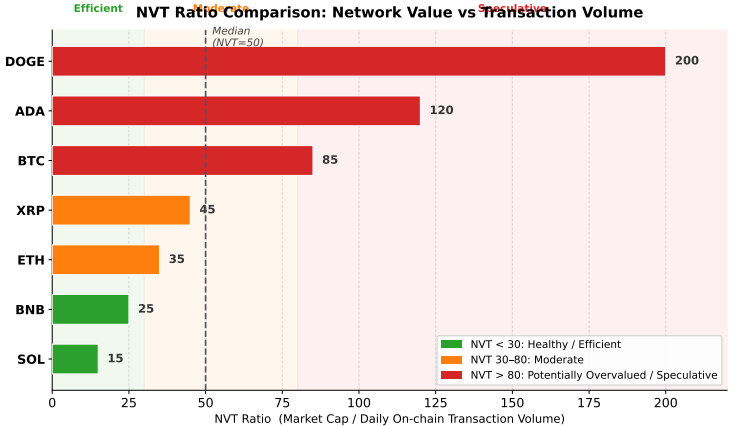
Before investing in any token, check for these warning signs:

1. **Insider allocation exceeds 30%** of total supply — insiders control price
2. **No cliff or vesting period** for team tokens — they can dump immediately
3. **Circulating supply less than 50%** of total supply — massive future dilution ahead
4. **No clear value accrual mechanism** — the token does nothing useful
5. **Yield promises exceeding 100% APY** — where does the yield come from? (Hint: new investors)
6. **Anonymous team with no track record** — no accountability if things go wrong
7. **No audit of smart contracts** — bugs and exploits waiting to happen
8. **Price driven entirely by marketing, not utility** — hype fades, utility persists

Rule of thumb: If a project triggers 3 or more of these red flags, approach with extreme caution. 5 or more? Walk away.

Every major crypto collapse of 2022–2023 triggered at least 4 of these 8 red flags before the crash.

Valuation Metrics: The NVT Ratio

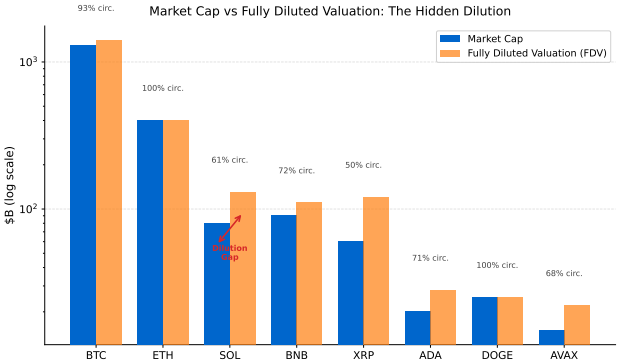


Formula: NVT = Network Value (Market Cap) / Daily Transaction Volume

- **What you see:** NVT ratios for 7 tokens — SOL (∼15, efficient) to DOGE (∼200, speculative)
- **Key pattern:** High-throughput chains (SOL) have low NVT; store-of-value tokens (BTC, DOGE) have high NVT
- **Takeaway:** NVT is like the P/E ratio for crypto — high NVT means paying more per unit of economic activity

A high NVT is not always bad (BTC is designed for store-of-value), but it signals speculative premium over utility.

Market Cap vs Fully Diluted Valuation



Market Cap = price × circulating supply — **FDV** = price × total supply (including locked/unvested)

- **What you see:** Grouped bars showing market cap vs FDV for 8 tokens
- **Key pattern:** XRP and SOL have massive gaps (only 50–61% circulating) — substantial dilution risk
- **Takeaway:** Always check FDV, not just market cap — the gap shows how much your holdings could be diluted

A token can look cheap by market cap but expensive by FDV. Always check both numbers.

The Howey Test: When Is a Token a Security?

The Howey Test (1946)

A transaction is an investment contract (= a security) if it involves:

1. An **investment of money**
2. In a **common enterprise**
3. With an **expectation of profits**
4. Derived primarily from the **efforts of others**

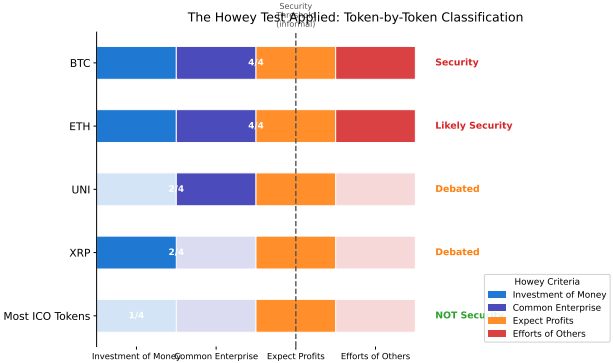
How tokens score:

- **BTC:** Passes 1–2 of 4 criteria → NOT a security (decentralized, no "others" driving profit)
- **XRP:** Passes 4 of 4 → SEC lawsuit (Ripple Labs drives value through development)
- **Most ICO tokens:** 4 of 4 → securities (team raises money, promises returns)

Implications: Securities must register with regulators, limit investor access, and provide disclosures. Non-compliance → massive fines.

SEC vs Ripple (2020–2023) showed the stakes: $125M penalty for misclassifying tokens.

Who Wins, Who Loses in Token Economies?



Stakeholder	Wins When...	Loses When...
Protocol Teams	Tokens vest over time, project succeeds	Short vesting, market crashes early
Early Investors	Long-term value accrual, low velocity	Bad tokenomics, regulatory action
Retail Users	Fair distribution, real utility	High insider allocation, pump & dump
Regulators	Clear classification, investor protection	Ambiguous tokens, cross-border issues

Good tokenomics create positive-sum games. Bad tokenomics are zero-sum or negative-sum.

The Regulatory Landscape: SEC, MiCA, and Beyond

	US (SEC)	EU (MiCA)	Asia-Pacific
Framework	Howey Test (1946)	MiCA Regulation (Dec 2024)	Varies by country
Approach	Enforcement-first (sue, then clarify)	Legislation-first (rules, then enforce)	Mixed: progressive to restrictive
Key Focus	Securities classification	Consumer protection, stablecoin rules	Innovation vs control
Token Categories	Security vs commodity (binary)	E-money, asset-referenced, utility (3 types)	Country-specific
Status	Ongoing enforcement actions	Full implementation Dec 30, 2024	Rapidly evolving

Key development: MiCA provides the first comprehensive crypto regulation framework globally. It classifies tokens into three categories: e-money tokens, asset-referenced tokens, and utility tokens.

The regulatory environment determines whether your token can legally exist. Ignoring it is not a strategy.

MiCA (Markets in Crypto-Assets) reached full EU implementation on December 30, 2024 — the global regulatory benchmark.

The Tokenomics Evaluation Framework: 6 Questions

Apply these 6 questions to evaluate any token project:

1. **What type is this token?**
   Utility, governance, security, store of value — or a combination?
2. **How does it capture value?**
   Fee sharing, staking rewards, token burns — or nothing at all?
3. **What is the supply model?**
   Fixed (BTC), inflationary, deflationary (ETH post-Merge), or hybrid?
4. **Who owns the tokens?**
   Team %, investor %, community %. What is the vesting schedule?
5. **What reduces velocity?**
   Staking locks, governance utility, fee discounts, or nothing?
6. **What are the failure modes?**
   Regulatory risk, death spiral, insider dumping, or smart contract bugs?

If you cannot answer all six, you do not understand the investment.

Apply these 6 questions to any token project. Unanswered questions represent unquantified risk.

Design Principles for Sustainable Tokens

Five principles that separate the 5% that survive from the 95% that don't:

1. **Value must be earned, not printed.**
   Token price should track protocol usage, not marketing spend. Organic demand beats manufactured hype.
2. **Align incentives across all stakeholders.**
   Team, investors, and users should all benefit from protocol growth. Misaligned incentives create adversaries, not advocates.
3. **Design for velocity control.**
   Without staking, governance locks, or utility requirements, tokens become hot potatoes — passed around but never held.
4. **Distribute fairly with commitment.**
   2–4 year vesting, less than 20% team allocation, community-majority distribution. Show you believe in the long term.
5. **Plan for failure modes.**
   Every token design has an Achilles' heel. Identify it before launch, not after the collapse.

These 5 principles separate the tokens that survive from the tokens that become cautionary tales.

What Comes Next: DeFi, RWAs, and Beyond

Where tokenomics is heading:

Module E (DeFi Ecosystem) builds directly on this lecture:

- Automated Market Makers (AMMs) depend on liquidity mining incentives
- Lending protocols use token rewards to attract deposits
- Yield farming is tokenomics in action — and its sustainability depends on everything we covered today

Real-World Assets (RWAs):

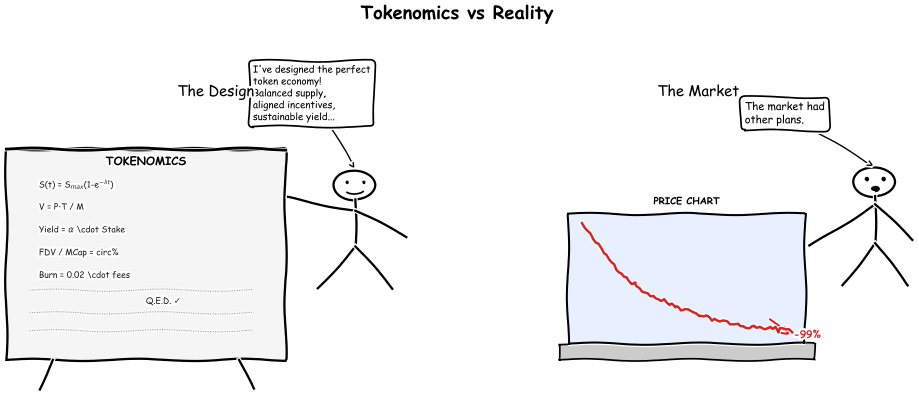
- Tokenized bonds, real estate, and equities bring traditional finance onto blockchains
- New tokenomics challenges: compliance tokens, dividend distribution, regulatory wrappers

Emerging trends:

- **ve-tokenomics** (vote-escrowed locks) — lock tokens longer for more voting power (Curve Finance model)
- **Points systems** — pre-token incentives that convert to tokens at launch (EigenLayer, Blast)
- **Restaking** — reuse staked ETH as security for other protocols (EigenLayer)

Tokenomics is not just crypto — it is the economics of digital coordination. Every future protocol needs it.

One Last Thought...



"In theory, there is no difference between theory and practice. In practice, there is."

In theory, tokenomics is simple. In practice, the market always has other plans.

Key Takeaways

Seven ideas to remember from today:

1. **Token types** determine regulatory treatment and value accrual potential (utility, governance, security, store of value).
2. **Supply models** are the monetary policy of tokens — fixed (BTC), inflationary, or deflationary (ETH post-Merge).
3. **Value accrual** connects token price to protocol success through fee distribution, staking, and burns.
4. **MV = PQ** explains why velocity control matters — reduce V, increase price, without changing fundamentals.
5. **Distribution and vesting** signal commitment — high insider allocation and short vesting are red flags.
6. **Classification** has real consequences — the Howey Test determines if a token faces securities regulation.
7. **The 6-Question Framework** lets you evaluate any token project's long-term sustainability.

Review question: Can you apply the 6-question framework to evaluate Ethereum's tokenomics?

Review question: Can you apply the 6-question framework to evaluate Ethereum's tokenomics? Try it now.

Summary and Next Module Preview

Summary:

Tokenomics is the economic foundation of every blockchain project. Tokens succeed when they combine clear utility, sustainable supply models, robust value accrual, and fair distribution. They fail when any of these pillars is missing.

Key Vocabulary:

1. Tokenomics
2. Utility Token
3. Governance Token
4. Security Token
5. Value Accrual
6. MV = PQ
7. Vesting Schedule
8. Cliff Period
9. NVT Ratio
10. FDV
11. Howey Test
12. Token Burns

Next: Module E — DeFi Ecosystem

How tokenomics powers:

- Automated Market Makers (AMMs)
- Lending and borrowing protocols
- Yield farming and liquidity mining
- Flash loans and composability

Connection: Every DeFi protocol is a tokenomics experiment. The supply models, value capture, and distribution strategies from today determine whether DeFi protocols thrive or collapse.

You now have the framework to evaluate them.

Key vocabulary: Master these 12 terms before moving to DeFi. They form the economic language of the entire ecosystem.