L12: Controversies & Future

Extended Slides – BSc Blockchain Course

Digital Finance

Outline

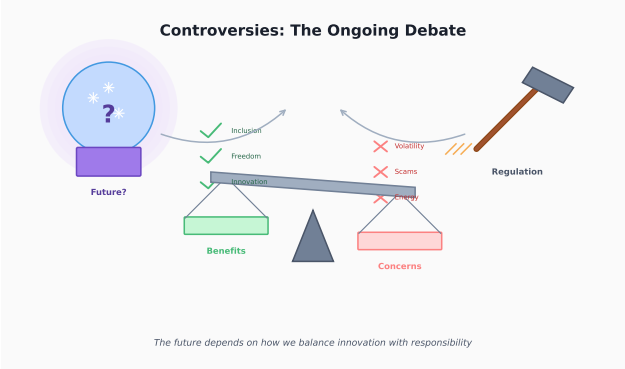
Learning Objectives

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

1. Evaluate blockchain energy consumption debates
2. Understand global regulatory landscape
3. Analyze technology adoption patterns
4. Consider future scenarios for blockchain
5. Form evidence-based opinions on controversies

Critical thinking is essential for emerging technologies.

The Road Ahead



Purpose: Blockchain faces legitimate criticisms: energy use, scams, volatility, regulatory uncertainty. Evaluating these objectively is essential for informed participation.

Separating hype from substance to understand blockchain's real potential.

The Energy Debate

Critics Argue:

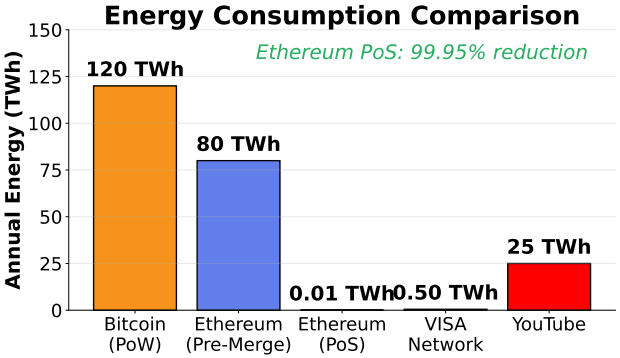
- Bitcoin uses more energy than many countries
- Environmental impact is unsustainable
- Energy could be used for better purposes

Defenders Counter:

- Much mining uses renewable/stranded energy
- Banking system also uses significant energy
- Security requires real-world cost

The debate is more nuanced than headlines suggest.

Energy Consumption



PoS reduces energy use by 99.95% compared to PoW.

The Merge Impact

Ethereum's Transition to PoS (Sept 2022):

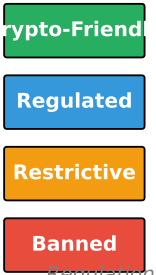
- Energy reduction: 99.95%
- No more GPU mining
- Validators stake ETH instead of computing hashes

Implications:

- Proves PoS can secure large networks
- Removes major environmental criticism
- Sets precedent for other chains

Bitcoin remains committed to PoW for security.

Global Crypto Regulatory Landscape



Regulation evolving rapidly - status as of 2024

Regulation varies dramatically by jurisdiction.

Key Regulatory Frameworks

Major Approaches:

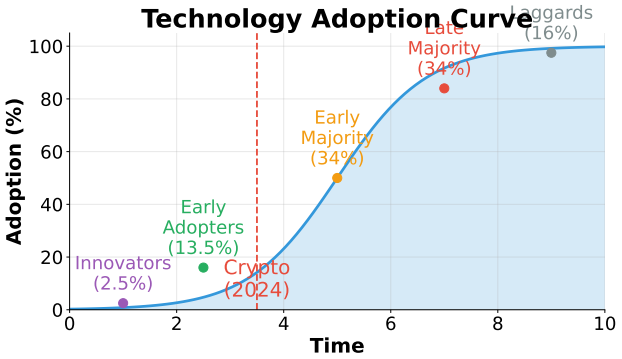
- **MiCA (EU):** Comprehensive crypto regulation
- **SEC (USA):** Securities law enforcement
- **China:** Complete ban on trading and mining
- **UAE/Singapore:** Friendly regulatory sandboxes

Key Issues:

- Is crypto a security or commodity?
- How to regulate DeFi without entities?

Regulatory clarity is improving but still evolving.

Adoption Curve



Crypto adoption is between early adopters and early majority.

Adoption Metrics

Signs of Growth:

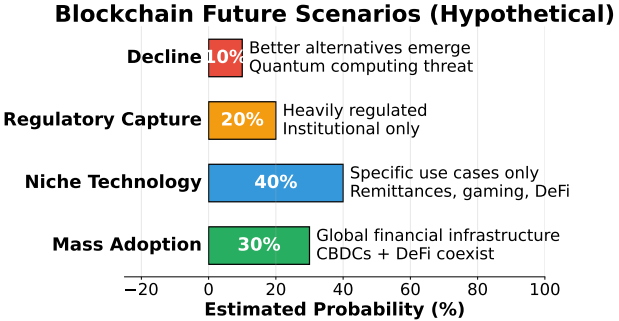
- 600M+ global crypto users (estimated)
- Bitcoin ETFs approved (2024)
- Major banks offering custody services

Barriers to Mass Adoption:

- User experience complexity
- Regulatory uncertainty
- Volatility concerns
- Security risks (hacks, scams)

User experience must improve for mainstream adoption.

Future Scenarios



Multiple futures are possible depending on regulation and adoption.

CBDCs and Blockchain

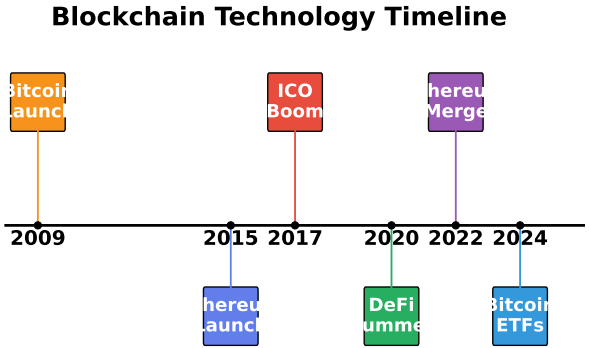
Central Bank Digital Currencies:

- Majority of central banks exploring or piloting CBDCs
- China's digital yuan in active deployment
- Potential complement or competitor to crypto

Key Differences from Crypto:

- Centrally controlled
- Not permissionless
- Privacy concerns

CBDCs may legitimize digital money but differ from crypto values.



Blockchain has evolved significantly since Bitcoin's 2009 launch.

Emerging Technologies

Near-Term Developments:

- Account abstraction (better UX)
- Zero-knowledge rollups (scaling + privacy)
- Restaking and liquid staking

Long-Term Possibilities:

- Post-quantum cryptography
- AI + blockchain integrations
- Fully on-chain governance

Innovation continues across the stack.

Forming Your Own View

Critical Thinking Framework:

- Seek primary sources (whitepapers, code)
- Question both hype AND FUD
- Understand incentives of information sources
- Separate technology from speculation

Key Questions:

- What problem does this solve?
- Does it need a blockchain?
- Who benefits and who pays?

Independent thinking is your most valuable skill.

CBDC Design Tradeoffs

Architectural Models:

- **Direct CBDC:** Central bank holds all retail accounts; maximum control
- **Indirect CBDC:** Intermediated by commercial banks; preserves existing structure
- **Hybrid CBDC:** Banks handle onboarding; central bank holds ultimate liability

Policy Tensions:

- Programmable money: can restrict spending (e.g., only food purchases)
- Negative interest rates: enforceable at wallet level
- Financial inclusion: no bank account required for access
- Bank run risk: people flee commercial banks to CBDC in crises

The Bahamas (Sand Dollar), Jamaica (JAM-DEX), and Nigeria (eNaira) have launched live CBDCs.

Stablecoin Reserve Transparency

Case Studies:

- **Tether (USDT):** 2021 CFTC fine of $41M for false reserve claims; now primarily T-bills
- **UST/LUNA:** Algorithmic design with no hard collateral; $40B wiped in 72 hours (May 2022)
- **USDC:** Monthly attestations from Grant Thornton; fully cash and T-bills
- **DAI:** Over-collateralized crypto + real-world assets; all collateral publicly visible on-chain

MiCA Requirements:

- E-money tokens must have 1:1 fiat reserves
- Monthly reserve disclosures mandatory
- Redemption at par within 1 business day

Reserve quality matters as much as reserve quantity — counterparty and liquidity risk remain.

Mining Centralization Metrics

Bitcoin Pool Concentration:

- Top 3 pools routinely exceed 50% of hashrate
- Foundry USA, AntPool, ViaBTC dominate (2023–2024)
- Pools themselves comprise thousands of independent miners

Geographic Concentration:

- Post-China ban (2021): USA leads ($\sim$38%), Kazakhstan, Russia follow
- Cheap electricity drives geographic clustering
- ASIC manufacturing concentrated in one supplier (Bitmain)

51% Attack Threshold: Pool coordination (not individual miners) is the real risk — economic incentives generally deter attack.

Hash rate centralization is a concern for censorship resistance, not necessarily double-spend risk.

Key Takeaways

Remember These Points

1. PoW energy use is real but PoS offers solutions
2. Regulation ranges from friendly to complete bans
3. Adoption follows typical technology S-curves
4. CBDCs may complement or compete with crypto
5. Evidence-based thinking beats hype and FUD
6. The future is uncertain but innovation continues

Course Complete! Good luck with your projects.