Introduction to the Economics of Digital Finance

L01: Setting the Economic Framework

Understanding the trillion-dollar shift from cash to code

Economics of Digital Finance

BSc Course

Lesson Overview

Today's Topics

1. What is digital finance? (Economic definition)
2. Historical evolution of money and payments
3. The four economic lenses framework
4. Why economists should care

Learning Objectives

- Define digital finance from an economic perspective
- Distinguish economic from technical questions
- Apply four structured ways of thinking (economic frameworks) to digital finance

This course examines digital finance through economic theory, not technical implementation

What is Digital Finance?

Economic Definition

Digital finance encompasses financial services and instruments that:

- Rely on digital infrastructure for value transfer
- Create new forms of money and payment systems
- Enable disintermediation (removing middlemen) or re-intermediation (replacing old middlemen with new digital ones like crypto exchanges)

Scope of Digital Finance

- Cryptocurrencies (digital assets secured by cryptography—the mathematical science of encoding information to prevent tampering) and stablecoins (cryptocurrencies pegged to stable assets like USD)
- Central Bank Digital Currencies (CBDCs)—official digital money issued by central banks
- Digital payment systems
- Decentralized Finance (DeFi)—financial services on blockchain without banks
- Tokenized assets (traditional assets represented as digital tokens on blockchain)

Economics analyzes incentives, efficiency, and welfare—not code or protocols

What is Digital Finance? (cont.)

Key Economic Questions

- Who captures value?
- What are the welfare effects (overall impact on society's well-being)?
- How does regulation affect outcomes?

Key Distinction

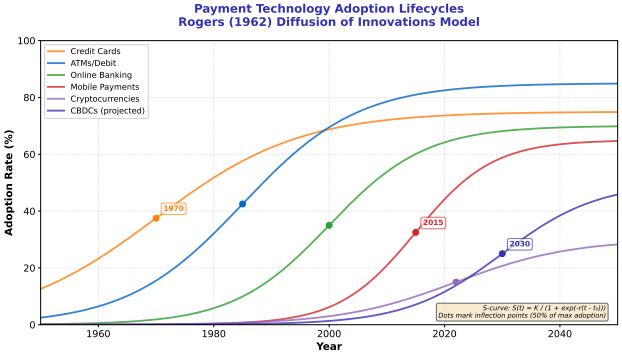
- Technical: *How does it work?*
- Economic: *What incentives drive adoption?*

Why This Matters

- Digital finance is not just a technology story—it rewires *who* earns, *who* pays, and *who* bears risk
- Every topic in this course returns to these three questions

This course focuses on economic incentives and outcomes, not on coding or protocols

Payment Technology Adoption Over Time



- Each S-curve shows how a payment technology starts slow, accelerates, then levels off
- Notice how newer technologies (cards, digital) adopt *faster* than older ones (checks)
- The inflection point (steepest part of curve) marks the moment adoption accelerates rapidly

Each transition was driven by economic forces: reducing transaction costs (time, fees, and difficulty in exchanges), enabling trade at scale

The Economics of Money: Three Functions

Classical Functions of Money

1. Medium of Exchange

- Solves double coincidence of wants (without money, you'd need to find someone who wants exactly what you have and has exactly what you want—highly inefficient)
- Reduces transaction costs
- Requires acceptability

2. Unit of Account

- Simplifies price comparisons (imagine comparing prices when bread costs 3 chickens, milk costs 2 eggs, and eggs cost 0.5 chickens—money provides one common yardstick)
- Enables economic calculation
- Reduces cognitive costs

3. Store of Value

- Preserves purchasing power
- Enables intertemporal trade (saving now to spend later—trading value across time)
- Requires stability

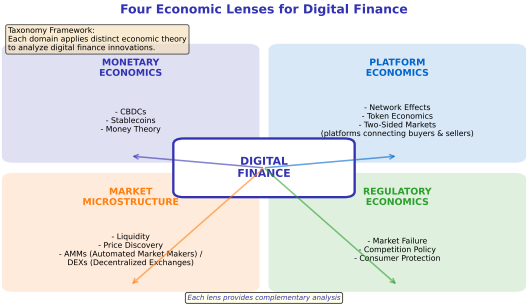
Digital Finance Challenge

Do cryptocurrencies fulfill these functions?

- Bitcoin: Limited as medium (volatility—rapid, unpredictable price swings)
- Stablecoins: Better but trust issues (are reserves really there? Who audits them?)
- CBDCs: Designed to fulfill all three

Jevons (1875), a foundational economist: "Money is what money does"—evaluate money by how well it performs these three functions

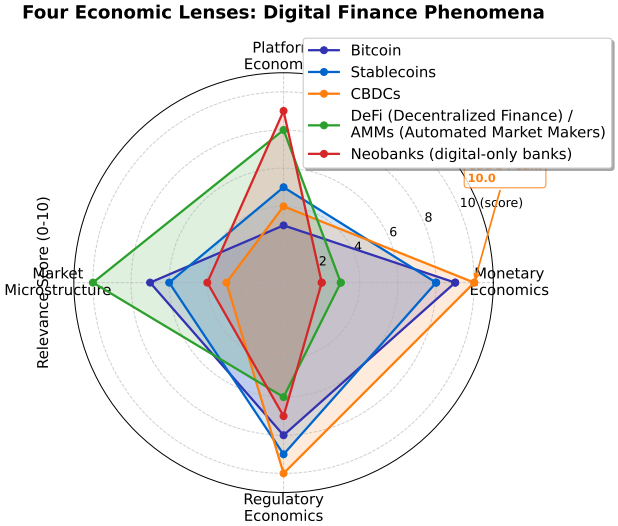
Four Economic Lenses for Digital Finance



- This course examines digital finance from four complementary perspectives (lenses)
- Do not worry about unfamiliar terms (AMMs, DEXs, etc.)—each lens is explained in detail on the next slides
- Every digital finance topic can be analyzed through multiple lenses simultaneously

This course applies all four lenses to understand digital finance comprehensively

How the Four Lenses Apply to Each Topic



Lens 1: Monetary Economics

Key Questions

- How do digital currencies affect money supply?
- What happens to monetary policy transmission (how central bank decisions affect the real economy)?
- Can cryptocurrencies replace fiat money (government-issued currency like dollars)?

Theoretical Tools

- Quantity theory of money (relationship between money supply, prices, and output)
- Money demand functions (models of how much money people want to hold)
- Currency substitution models (when people switch from one currency to another)

Key Concepts

- Seigniorage (profit from issuing currency) and its distribution
- Velocity of money (how fast money circulates in the economy) in digital systems
- Gresham's Law (bad money drives out good)

Applications

- CBDC design trade-offs
- Stablecoin stability mechanisms (how stablecoins maintain their peg through reserves, arbitrage, or algorithms)
- Dollarization (adopting USD) vs. crypto-ization (adopting crypto instead of local currency)

Lessons 2-3 focus on monetary economics of digital currencies and CBDCs

Lens 2: Platform Economics

Key Questions

- Why do some cryptocurrencies dominate?
- How do network effects shape adoption?
- What determines token value?

Theoretical Tools

- Network effects models
- Two-sided market theory (how platforms like Visa connect merchants and cardholders, creating value for both sides)
- Mechanism design (designing rules/incentives to achieve desired outcomes)

Key Concepts

- Critical mass (minimum users needed for viability) and tipping points (moments when adoption accelerates rapidly)
- Winner-take-all dynamics (markets where one player captures nearly all users, like Google in search)
- Platform governance

Applications

- Token economics (design of digital token value and incentives) design
- Blockchain adoption dynamics
- DeFi protocol competition

Lessons 4-5 apply platform economics to payments and token systems

Lens 3: Market Microstructure

Key Questions

- How do crypto markets discover prices?
- Why are spreads (gaps between buy and sell prices) wider in crypto?
- How do Automated Market Makers (AMMs) differ from order books (lists of pending buy and sell orders)?

Theoretical Tools

- Bid-ask spread (difference between buy and sell prices) models
- Liquidity provision theory (how market makers supply tradability)
- Information asymmetry (when one party knows more than another) models

Key Concepts

- Market making (providing buy/sell offers) and inventory risk (risk from holding assets)
- Price impact (how trades move prices) and slippage (difference between expected and actual price)
- Impermanent loss (temporary value loss from providing liquidity) in AMMs

Applications

- Decentralized Exchange (DEX—blockchain-based) vs. Centralized Exchange (CEX—company-run) efficiency
- MEV (Maximal Extractable Value—profit from reordering transactions)
- Market manipulation detection

Lesson 6 provides deep dive into market microstructure of digital finance

Lens 4: Regulatory Economics

Key Questions

- What market failures (situations where free markets produce harmful outcomes) justify regulation?
- How should crypto be classified legally?
- What are costs of regulatory arbitrage (exploiting differences in rules across jurisdictions)?

Theoretical Tools

- Market failure analysis
- Public interest (regulation benefits society) vs. capture theory (special interests control regulation)
- Cost-benefit analysis

Key Concepts

- Asymmetric information
- Systemic risk (risk of entire system failing) externalities (spillover costs to third parties)
- Consumer protection rationale

Applications

- Principles vs. rules-based regulation
- Regulatory sandbox (safe testing environment for new products) design
- Regulatory arbitrage (exploiting differences across jurisdictions)

Lesson 7 applies regulatory economics; Lesson 8 synthesizes all four lenses

Why Economists Should Study Digital Finance

Disruption Potential

- $15+ trillion digital payments by 2027
- 130+ countries exploring CBDCs
- DeFi challenging traditional finance

Policy Relevance

- Central banks need economic analysis
- Regulators need welfare frameworks (tools for measuring impact on society's well-being)
- Governments need tax policy guidance

Theoretical Innovation

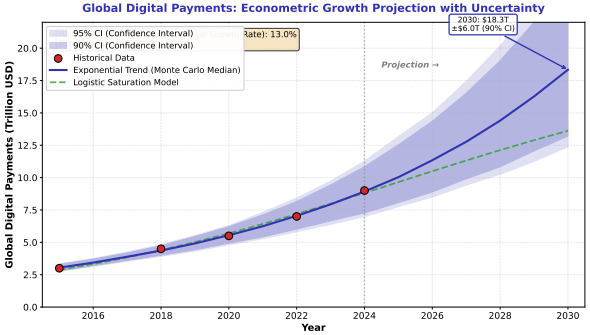
- New forms of money creation
- Novel market mechanisms (AMMs)
- Programmable financial contracts (agreements that automatically execute when conditions are met)

Research Opportunities

- High-frequency blockchain data (transaction-level records updated every few seconds)
- Natural experiments (real-world policy changes that create before/after comparisons) in adoption
- Cross-country regulatory variation

Digital finance is a laboratory for testing economic theories with real-world data

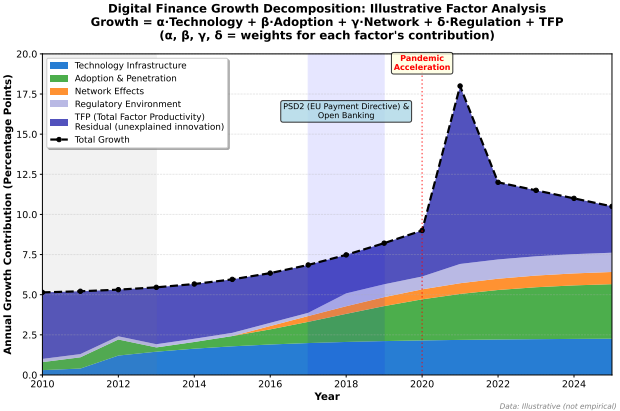
The Scale of Digital Finance Transformation



- The shaded bands show uncertainty: the model runs many random scenarios (Monte Carlo simulation) to estimate a range of possible futures
- CAGR (Compound Annual Growth Rate) measures average yearly growth—e.g., 15% CAGR means the market grows roughly 15% each year, compounding
- Key takeaway: digital payments are growing rapidly regardless of model assumptions

COVID-19 accelerated digital payment adoption; economists must understand these trends

What Drives Digital Finance Growth?



- Growth is decomposed (broken into parts) to show which factors contribute most: technology, adoption, network effects, or regulation
- Early growth was technology-driven (smartphones, cloud); recent growth is adoption- and network-driven
- Data is illustrative (not measured)—the pattern shows how economists think about growth accounting

Growth accounting: total growth = technology contribution + adoption contribution + network effects + other factors

Economic Questions vs. Technical Questions

Technical Questions

- How does proof-of-work function?
- What is a smart contract?
- How do hash functions secure data?
- What programming languages are used?

Focus: Mechanisms and implementation

Economic Questions

- Why do miners invest in PoW systems?
- How do smart contracts reduce costs?
- What incentives secure the network?
- Who benefits from decentralization (distributing control away from central authorities)?

Focus: Incentives and welfare

This course focuses on economic analysis, not technical implementation

You don't need to understand HOW proof-of-work or hash functions work—just know they exist so you can see what economists focus on instead

Key Takeaways

What We Covered

1. Digital finance defined economically
2. Historical context of money evolution
3. Four economic lenses framework
4. Why economic analysis matters

Looking Ahead

- L02: Monetary economics of crypto
- L03: CBDCs and monetary policy
- L04: Payment systems economics
- L05-L08: Further applications

Core Message

Digital finance raises fundamental economic questions about money, markets, platforms, and regulation. This course provides the analytical tools to address them.

Next lesson: Monetary Economics of Digital Currencies

Key Terms (1/2)

Blockchain Distributed digital ledger recording transactions across many computers.

CBDC Central Bank Digital Currency; digital form of official currency.

Cryptocurrency Digital asset using cryptography, not issued by government.

Decentralization Distribution of power away from single authority to many participants.

DeFi Decentralized Finance; blockchain financial services without intermediaries.

Digital Finance Financial services relying on digital infrastructure for value transfer.

Disintermediation Removal of intermediaries like banks from transactions.

Externality Cost or benefit affecting parties outside a transaction.

Fiat Money Government-issued currency not backed by physical commodity.

Liquidity How easily an asset trades without affecting its price.

Terms continued on next slide

Key Terms (2/2)

Market Failure When free markets fail to allocate resources efficiently.

Market Microstructure How trading mechanisms affect price formation and efficiency.

Network Effects Value of a service increases as more users join.

Seigniorage Profit from issuing currency above production cost.

Stablecoin Cryptocurrency designed to maintain stable value, pegged to fiat.

Token Digital unit of value representing assets, rights, or access.

Transaction Costs All exchange costs: time, fees, search, and difficulty.

Two-Sided Market Platform connecting distinct groups providing mutual network benefits.

Volatility Degree of price fluctuation; high volatility means rapid changes.

Welfare Total societal well-being; measures efficiency plus fairness.

Master these terms before proceeding to subsequent lessons

Further Reading

Foundational Papers

- Brunnermeier & Niepelt (2019): "On the Equivalence of Private and Public Money"
- Catalini & Gans (2020): "Some Simple Economics of the Blockchain"

Policy Reports

- BIS (Bank for International Settlements) Annual Economic Report (2022), Chapter III
- IMF (International Monetary Fund) Global Financial Stability Report (2023)
- FSB (Financial Stability Board) Crypto-asset Reports (2022-2023)

All readings available on course platform