Central Bank Digital Currencies (CBDCs)

L03: The Economics of Public Digital Money

Economics of Digital Finance

BSc Course

Lesson Overview

Today's Topics

1. CBDC design choices and trade-offs
2. Monetary policy transmission
3. Bank disintermediation risk
4. Financial inclusion economics
5. International currency competition

Learning Objectives

- Analyze CBDC design trade-offs
- Assess monetary policy implications
- Evaluate disintermediation risks
- Understand global CBDC landscape

CBDCs represent central banks' response to private digital currencies

What is a Central Bank Digital Currency?

Definition
A CBDC is a digital form of central bank money:

- Direct liability of central bank
- Digital (not physical)
- Widely accessible (retail) or restricted (wholesale)

Not a CBDC

- Bank reserves (already digital)
- Commercial bank money
- Stablecoins (private liability)

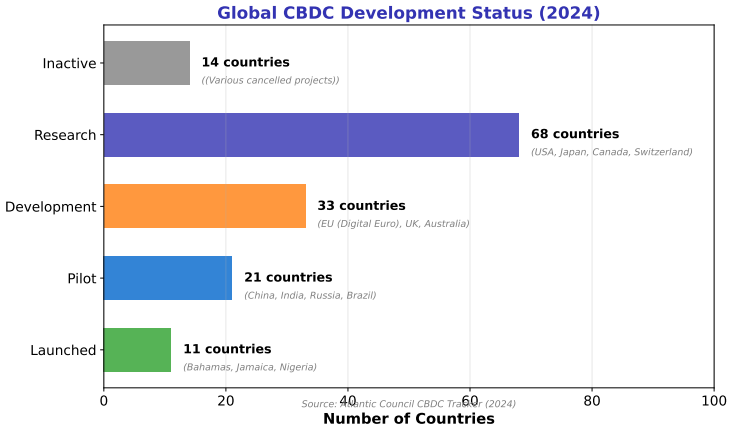
Motivations
Central banks cite multiple goals:

- Maintain monetary sovereignty
- Improve payment efficiency
- Promote financial inclusion
- Counter private digital currencies

Key Economic Question
Does public benefit exceed costs and risks?

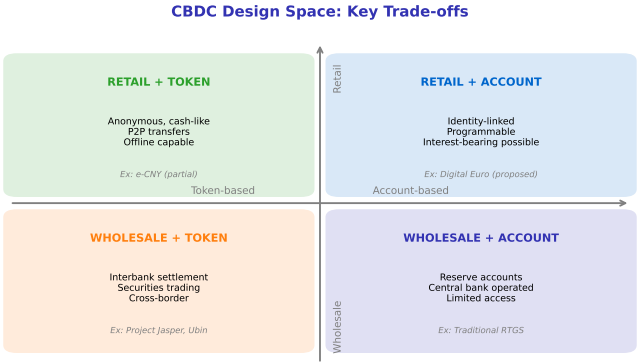
CBDC = digital cash issued by central bank; distinct from existing digital money

Global CBDC Development Status



130+ countries exploring CBDCs; China's e-CNY is most advanced large-economy pilot

CBDC Design Space: Key Choices



Design choices involve trade-offs between privacy, efficiency, and policy goals

Retail vs. Wholesale CBDCs

Retail CBDC

For general public use:

- Replaces/complements cash
- Consumer payment instrument
- Requires distribution network

Economic considerations:

- High operational costs
- Privacy vs. AML trade-off
- Competition with banks

Wholesale CBDC

For financial institutions:

- Interbank settlement
- Securities transactions
- Cross-border payments

Economic considerations:

- Lower operational burden
- Efficiency gains clearer
- Less disruptive to banking

Most advanced economies focus on retail; wholesale offers clearer near-term benefits

Token-Based vs. Account-Based CBDCs

Token-Based

Like digital cash:

- Verify the instrument, not holder
- Can enable anonymity
- Offline transactions possible

Economic implications:

- Lower transaction costs
- Privacy preserving
- Harder to implement AML

Account-Based

Like bank accounts:

- Verify the identity of holder
- Full transaction records
- Programmable features possible

Economic implications:

- Interest-bearing feasible
- Targeted policies possible
- Privacy concerns

Most designs are hybrid: token-like for small values, account-like for large

Monetary Policy Transmission with CBDCs

Traditional Channels
Interest rate channel:

$$i_{\text{policy}} \rightarrow i_{\text{deposit}} \rightarrow C, I$$

- Works through bank intermediation
- Banks pass rate changes to customers
- Time lags in transmission

CBDC Impact
If CBDC is interest-bearing:

$$i_{\text{CBDC}} \rightarrow i_{\text{deposit}}$$

- Direct transmission to public
- Floor on deposit rates

Enhanced Policy Options
Interest-bearing CBDC enables:

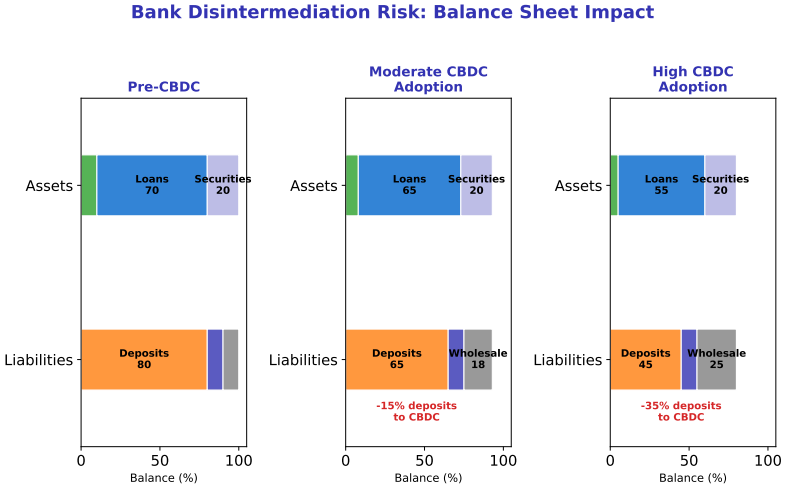
- Negative rates on retail holdings
- Helicopter money (direct transfers)
- Time-limited money (expiring)

Concerns

- Political resistance to negative rates
- Privacy implications of targeting
- Complexity of implementation

CBDC could strengthen monetary policy but raises political economy concerns

Bank Disintermediation Risk



Deposit flight to CBDC could force banks to rely on costlier wholesale funding

Economics of Disintermediation

The Concern
If CBDC is attractive:

- Deposits migrate to CBDC
- Banks lose cheap funding
- Credit supply may contract

Andolfatto (2021) Model

- CBDC as outside option
- Forces competitive deposit rates
- Net welfare effect ambiguous

Mitigation Strategies
Design features to limit migration:

- Holding limits (e.g., 3000 EUR)
- Tiered remuneration (lower for large)
- No interest on CBDC

Financial Stability

- Digital bank runs faster
- Flight to safety amplified
- Requires careful design

Design constraints trade off CBDC usefulness against banking system stability

Financial Inclusion Economics

The Unbanked Problem

Globally 1.4 billion unbanked adults:

- Lack documentation for accounts
- Live far from bank branches
- Cannot afford minimum balances

CBDC Potential

- Lower KYC for small values
- Mobile-based access
- No minimum balance required

Economic Analysis

Benefits:

- Lower transaction costs
- Entry to formal finance
- Government transfer efficiency

Challenges:

- Digital divide persists
- Infrastructure requirements
- Financial literacy needs

Inclusion requires complementary policies; technology alone is insufficient

International Currency Competition

Currency Competition
CBDCs could intensify:

- Cross-border CBDC use
- Challenge to dollar dominance
- Regional currency blocs

China's Strategy

- e-CNY for domestic use
- mBridge for wholesale cross-border
- Reduce SWIFT dependence

US Response Dilemma

- Digital dollar slower to develop
- Privacy concerns prominent
- Risk of losing first-mover advantage

Economic Implications

- Seigniorage redistribution
- Sanctions effectiveness
- Monetary policy spillovers

CBDCs add new dimension to international monetary system competition

Cross-Border CBDC Applications

Current Pain Points

- High costs (average 6%)
- Slow settlement (2-5 days)
- Limited transparency
- Correspondent banking dependencies

Wholesale CBDC Solution

- Direct central bank settlement
- Atomic swap mechanisms
- 24/7 operation possible

Multi-CBDC Projects

- mBridge (China, UAE, HK, Thailand)
- Project Dunbar (Singapore, Australia)
- Project Icebreaker (Nordic countries)

Economic Benefits

- Reduced FX settlement risk
- Lower remittance costs
- Faster trade finance

Wholesale CBDCs show clearer efficiency gains for cross-border payments

Privacy vs. Policy Control Trade-off

Privacy Concerns

- Government surveillance potential
- Transaction tracking
- Political control over spending

Design Options

- Tiered privacy (small = anonymous)
- Zero-knowledge proofs
- Third-party anonymity services

Policy Control Benefits

- AML/CFT compliance
- Tax enforcement
- Targeted stimulus

Economic Framework
Trade-off function:

$$U = f(\text{Privacy}, \text{Policy Effectiveness})$$

- Social preferences vary by country
- No one-size-fits-all design

Privacy preferences differ: Europeans prioritize privacy; China accepts surveillance

Case Study: The Digital Euro

ECB Design Principles

- Complement to cash, not replacement
- Privacy by design (small payments)
- Holding limits (~3000 EUR proposed)
- No interest initially

Timeline

- Investigation phase: 2021-2023
- Preparation phase: 2023-2025
- Potential launch: 2027-2028

Economic Rationale

- Strategic autonomy (vs. US big tech)
- Payment system resilience
- Declining cash usage

Criticisms

- Banks lobby against disintermediation
- Privacy advocates concerned
- Unclear consumer demand

Digital Euro reflects European values: privacy, strategic autonomy, bank coexistence

Key Takeaways

Main Conclusions

1. CBDC design involves fundamental trade-offs
2. Disintermediation risk requires mitigation
3. Monetary policy transmission could improve
4. International competition is intensifying

Economic Framework

- Retail vs. wholesale scope
- Token vs. account architecture
- Privacy vs. policy control
- Inclusion vs. stability

Core Insight

CBDCs are not simply "digital cash"—they require careful economic analysis of trade-offs between competing objectives. No design satisfies all goals simultaneously.

Next lesson: Payment Systems Economics

Further Reading

Academic Papers

- Andolfatto (2021): "Assessing the Impact of CBDC on Private Banks"
- Brunnermeier & Landau (2022): "The Digital Euro"
- Auer et al. (2022): "CBDCs Beyond Borders"

Central Bank Publications

- ECB (2023): "A Stocktake on the Digital Euro"
- BIS (2021): "CBDCs: An Opportunity for the Monetary System"
- Fed (2022): "Money and Payments"

All readings available on course platform