Global Financial Systems
Chapter 5-a
The Central Bank

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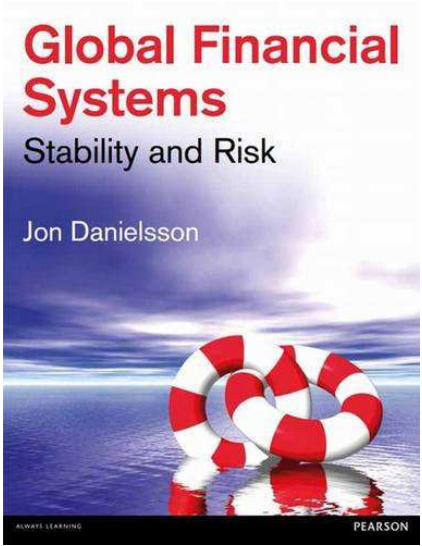
Book and slides



- Updated versions of the slides can be downloaded from the book web page `www.globalfinancialsystems.org`

illusionofcontrol.org

The central bank (CB)

- The most important institution in the financial system
- Has monopoly on *printing money*
- Common functions — differs by countries
  1. Price stability
  2. Macroeconomy
  3. Financial stability
  4. Supervision
  5. Stimulating the economy
  6. Funding governments
  7. Environment/climate
  8. Equality (income and wealth)
- Over time, the relative importance of those changes frequently

Background

- Often was a private bank
- Perhaps established to help in war financing
- And may retain some private ownership or connections (like in Switzerland)
- But generally is under the control of the government
- In some countries, private banks may issue money under a full reserve arrangement
  - Danske Bank in Northern Ireland, Scotland, HSBC in Hong Kong, etc.
- May have other names such as *monetary authority* or *reserve bank* or *federal reserve system* or *people's bank* or *bank of*
- We use the term *central bank* to encompass all these

Some central banks

- First: Swedish Riksbank (1668)
- Second: Bank of England (BoE) (1694)
- Bank of Japan (BoJ) (1882)
- Federal Reserve System (Fed) in the US (1913)
- People's Bank of China (PBoC) (1948)
- European Central Bank (ECB) (1998)

Money

- We have used many things for money
- Sea shells, cigarettes and pearls etc.
- Over time, we converged to using metals, copper, but especially precious metals like silver and gold
- We now use fiat money
- Will we move to digital currencies?

Gold standard

- Gold is money
  - either we use gold to trade
  - or central bank issues paper money that is transferable to gold with 100% certainty
  - BoE issued paper money 40% backed by gold
    - explains the "To stop the Duke, go for gold" in the Runs chapter
  - brings stability (1873–1914)
  - but supply cannot be adjusted to suit the economy, like when it is growing or in crisis
- Gold supply concentrated control over monetary conditions
  1. Did not work so well for Spain
  2. UK invasion of South Africa

Fiat money

- Money created by governments
- No asset, like gold, guarantees money keeps its value
- We have to trust the government
- Printed by central banks
  - either physically on paper
  - or virtually by increasing the reserve accounts at the central bank
- First example in China in the 12^{th} century — led to high inflation
- Often ends up in too much money being printed, inflation and failure of the issuing bank

Digital currencies

Discussed later

Base money (M0)

- Base money is comprised of two things
  - commercial banks have special accounts with CBs called *reserve accounts*
  - physical money, like coins and notes
- When we say "print money" it refers to increasing base money

Reserve Accounts

- Commercial banks have special accounts with CBs called reserve accounts
- They can be required to have some amount in it (required reserves)
- Usually prefer to hold more
- Creating money
  - CB buys a bond from a bank worth X
  - increases the amount in the bank's reserve account by X — base money (M0) increases by X
  - the CB does *not* transfer X in
  - simply increases the amount on deposit by X
  - which becomes a liability of the CB

Who creates money?

- Central banks create base money
- Money in circulation is mostly created by commercial banks
- More broadly, money is created by the interaction of economic agents
- For example, if people lend and borrow from each other and use the debt obligations (IOU) to transact with, then
- They have created more money
- A feature of the Japanese economy and many others

Monetary aggregates

M0 Monetary base — sum of currency in circulation and reserves

M1 Narrow money, monetary base plus checkable accounts

M2 M1 plus saving accounts

M3 Broadest formal measure of money — M2 + large time deposits, institutional money market funds, short-term repurchase and other larger liquid assets

- M2 and M3 are a good indication of inflation and credit expansion.
- They increase in booms and fall in recessions
- Money is other things. We often can use debt promises — IOU — as money
- The central bank only fully controls M0 (why it is so hard to control inflation)

Fractional reserve banking

This is an oversimplified textbook version

1. Person X deposits \$100 (M0) into bank A
2. Bank A keeps 10% (δ) which is the *reserve requirement*
3. Lends \$90 to Person Y who deposits \$90 at bank B
4. Which keeps δ and lends out \$81 and so on

In the limit, M1$= 100 + 90 + 81 + ... = \frac{100}{\delta} = 1000$

$$M1 = \gamma \times M0$$

5. Hence δ can be used to control credit

Fragilities of the fractional reserve banking system

- A Bank lends deposits out at *long maturities*
- But deposits are payable *on demand*
- If a sufficient number of depositors want money, the bank can't pay — *bank run*
- Bank runs are contagious

Monetary policy

Monetary policy

- The core day-to-day function of the central bank
- Used to meet (political) objectives like
  - level of aggregate output
  - employment
  - inflation
- By controlling
  - the supply of money
  - availability of money
  - cost of money or rate of interest

Relationship between money and output

- Money $\times$ velocity of money = prices $\times$ output

$$M \times V = P \times Q$$

- Monetarism focused on controlling M, ignoring V
  - Modern use of that term, referring to the past, is often very historically inaccurate
- We have only a vague idea of the magnitude of these variables
- So long as we expect P to be stable (inflation very low) V is also usually stable, because M and Q change only slowly
- But if we expect inflation to rise, we use money faster — $V \uparrow$
- Which in turn fuels yet more inflation
- So management of inflationary expectations is particularly important

Money supply and objectives

- Money is M (recall M0, M1, M2 and M3)
- *Expansionary monetary policy* — M↑ to combat unemployment, stimulate the economy or prevent *deflation*
- *Contractionary monetary policy* — M↓ to reduce *inflation* and stop economy from overheating

Interest rates

- The central banks control the shortest interest rates
- Why? Because they control bank reserves and overnight lending
- There are many different names and mechanisms
- CBs do not directly control rates for longer maturities
  - Twist operations can be used on longer maturities
- Often they use *inflation targeting*
- Inflation targeting is where the government tells the central bank what inflation should be, perhaps 2%
- And the central bank uses its tools to achieve that inflation

Central bank lending

- Effectively a *ceiling* for market (risk-free) rates
- In some countries also a *floor* by setting a slightly lower rate on reserves held by banks
- Also used to provide emergency liquidity in crises

Open market operations

- Most common procedure — trading government bonds on the open market
- Buying M0↑ — increase the reserve account of seller's bank
- Increases the total volume of reserves in the system
- If there are aggregate excess reserves, market rates are competed down
- Hence expansionary open market operations do $r \downarrow$
- And vice versa
- Most common in developed economies

Reserve requirements: Traditional tool

- Reserve requirement — the minimum reserve a bank must hold at the CB
- Lowering reserve requirements reduces the demand for reserves
- Contrast with expansionary open market operations, which increase the supply of reserves
- But roughly the same effect — $r \downarrow$

$$M1 = \gamma \times M0 = \frac{1}{\delta}$$

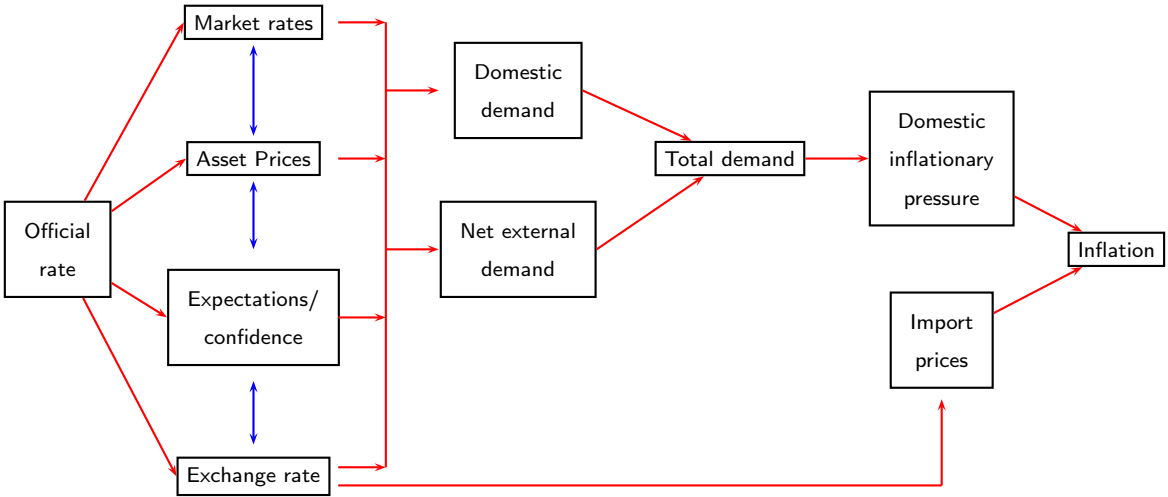
Changing the reserve requirements, δ, changes the money multiplier, γ, and hence the volume of M1 given an amount of M0

- Most common in emerging markets (e.g. China)

Zero lower bound

- Typically, the central banks can exercise control by changing short-term interest rates
  - increase them if the economy is heating up and inflation is high
  - lower them if economy is slowing down and inflation is low
- What if inflation is low, the economy is slowing down and interest rates are close to zero?
- It is not possible to make interest rates very negative. They can be slightly below zero
- That is the *zero lower bound*
- In that case, we may do quantitative easing

Transmission mechanism



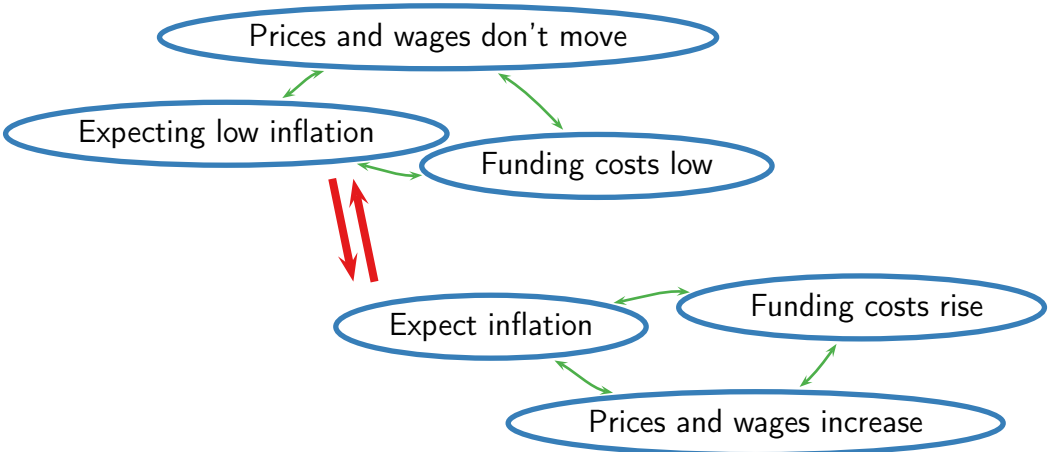
Costs of inflation and deflation

- Inflation
  - erodes purchasing power, especially for those on fixed incomes
  - cost of constantly updating prices
  - holding cash expensive, so people hold less cash, more transactions
  - distorts price signals and investment decisions
  - redistributes wealth from savers to borrowers
- Deflation
  - increases real debt burdens
  - postponing consumption — why buy today if cheaper tomorrow?
  - can trigger deflationary spiral — Japan 1990s
  - makes monetary policy ineffective (zero lower bound)
  - raises real wages, increasing unemployment
- Most central banks aim for 2% inflation

Drivers of inflation

- Strong aggregate demand and/or weak aggregate supply drive up prices
- For some developing countries, fluctuations in global commodity prices significantly affect inflation
- Some countries deliberately create money to fund themselves
- Expectations — if we expect prices to rise in the future when making contracts today (salaries, goods) we build in price rises
- *Anchoring* — long-run inflation expectations remain anchored to some level — ideally the central bank target
- If we expect high inflation it remains high, and if we expect low inflation it remains low

Self-reinforcing stable regimes of low and high inflation



Classical inflation fighting playbook

- Slow down the economy to reduce aggregate demand
- Assumes aggregate demand is artificially high because of inflation
- Do that by raising the cost of money — policy rate
- Deliberately creating a recession to fight inflation — difficult cost-benefit analysis

Effectiveness

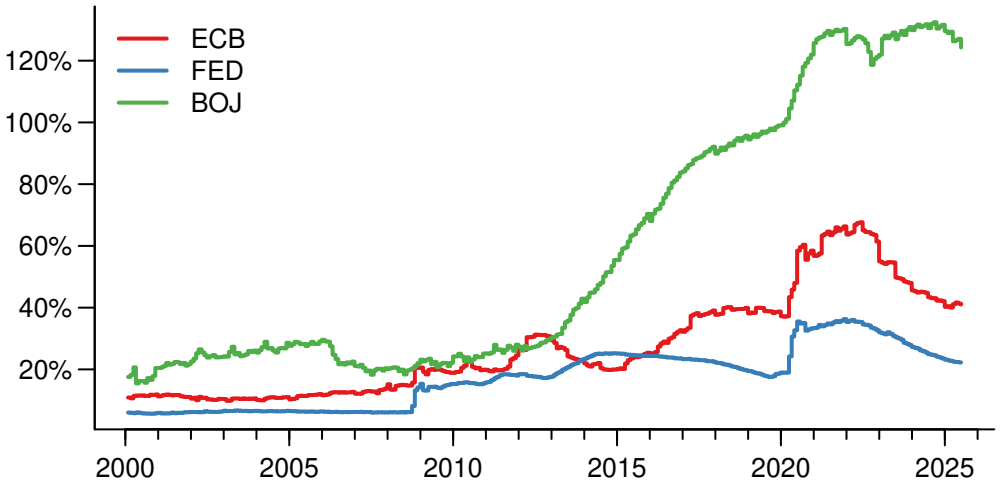
- If expectations shift — i.e. the central bank is credible — then hopefully inflation gets anchored to the central bank target
- High interest rates signal that the government is committed to fighting inflation
- Politically difficult — US and UK in 1982
- The political leadership needs to be firmly and visibly in support
- Turkey is an example of what happens when government has a different view

Bailing out governments

Bailing out governments

- Not typically listed as a core central bank function
- But always has been a core function
- Even a founding function
  - BoE was founded to help with war funding
- Usually viewed as dirty or unseemly
- However, under the right conditions, it is appropriate
- Can create significant economic dangers
- Japan and ECB have been especially enthusiastic

Central-bank assets to GDP



Pros and cons

- Only recommended in exceptional circumstances
- When done routinely, it locks in inflationary expectations — very costly to eventually fight
- If the economy is in deep recession (way below output potential) and inflation is negligible
- Justified for two reasons
  1. relieves pressure on the government
  2. reverses contracting money supply

Case of one CB — one nation state

- Most of the time, the CB belongs to a single nation-state
- In that case, using the CB to bail out the state is effectively a *tax*
- And like any other tax, it has distributional effects
  - Disproportionately falling on pensioners and savers (who often can't do much about it)
  - And benefiting borrowers
- Most of the cost falls on domestic residents

Europe's central bank

- Belongs to 20 governments
- By using the ECB to bail out (private or public entities) it is a tax on all residents of the eurozone for the benefit of some countries only
- Turns the EU into a *transfer union* — fiscal transfers between member states
- This limits the legitimacy of the ECB to fulfil its core functions
- Two contradictory dynamics:
  - ECB lacks clear political ownership — vulnerable to abuse
  - Compensating with excessive rules and restrictions — limiting operational flexibility

Digital currencies

Competition from digital money

- Traditional money faces competition from digital currencies
- Private stablecoins
- Central-bank digital currencies (CBDCs)

Settlement and clearing

- Clearing means calculating who owes what to whom
  - Banks exchange payment instructions
  - Net positions calculated (offsetting payments)
- Settlement is actually moving the money
- Reconciliation is matching records to ensure they agree
  - Each bank verifies its records match counterparties
  - Errors must be investigated and resolved
  - Can add days to the process
- Risk between clearing and settlement
  - Money appears gone from sender but not yet at receiver
  - Counterparty could fail before settlement
  - This is why we need complex financial infrastructure

Accounts

- Imagine a credit card transaction
  1. Money goes from your account to your bank
  2. to payment system account
  3. to merchants' bank account
  4. to the merchant's account
- Transactions/transfers typically involve money taken out of and put into multiple accounts
- Money moves via debits and credits to ledgers at each institution — no actual transfer
- We need verification at each stage
- Plenty of scope for mistakes
- Settlement can take days, especially for international transfers
- Each intermediary takes fees and adds counterparty risk

Tokens

- Information/record is a *token*, representing some asset
- Can be on a blockchain, but increasingly in other databases
- Could be anything, but suppose it is fiat money (say \$20)
- When we change the owner of the token — I give the token to you — we change the ownership of the \$20
- Single step: direct transfer from owner A to owner B
- No intermediary accounts or settlement layers needed
- Instant finality — no clearing or reconciliation required

All that is not old school fiat or cryptocurrencies

- Cryptocurrencies are based on money as tokens on a blockchain where the blockchain is public and mining underpins trust
- If we do away with either or both public and mining
- But keep tokens (next slide)
- We are left with digital currencies
  - Corporate: like Facebook's Libra (then Diem, now cancelled) or JPM's coin
  - Public, like central bank digital currencies (CBDC)

Replacing accounts with tokens

- If money is tokens
- All we have to do is to swap tokens
- Perhaps add transfer of ownership as a block to the blockchain
- Much more robust, quick, fewer errors and cheap
- Clients of the bank can transfer money by swapping tokens
- Hard to see any benefit from blockchain compared to other database technologies

Stablecoins

- A type of cryptocurrency that promises that its price in fiat money, typically USD, remains constant — stable
- The advantage to crypto investors is that they can trade crypto using a stablecoin as a temporary store of value — much cheaper and more efficient than using fiat
- They are also seen as underpinning the envisioned decentralised financial system (DeFi — decentralised finance and Web3) — Crypto banks
- They are therefore competitors to CBDCs and the incumbent banking system

Types

Fiat-collateralised Full USD reserves (Treasury bills, reverse repos, bank deposits) — Tether, USDC

Crypto-collateralised Over-collateralised with volatile cryptocurrencies — DAI (150%+ collateral ratio)

Algorithmic No backing assets, mint/burn mechanisms — TerraUSD collapsed in 2022

- The market has shifted decisively to fully-backed models
- Notable failures: Iron Finance, Basis, TerraUSD — all algorithmic designs
- Regulatory pressure pushing towards 1:1 cash and cash-equivalent backing

Benefits and advocacy arguments

Financial inclusion providing banking services to the unbanked globally

Cross-border efficiency faster, cheaper international transfers than correspondent banking

24/7 availability unlike traditional banking systems that close

Programmable money enabling smart contracts and automated payments

Reduced intermediation costs cutting out traditional banking fees

Monetary sovereignty especially for countries with unstable currencies

Dollarisation in high-inflation economies (Turkey, Argentina)

Circumventing capital controls and sanctions

Market scale

- Total stablecoin market capitalisation: US$140–150 billion (Q1 2025)
  - Tether (USDT): approximately 70% market share
  - USD Coin (USDC): approximately 20% market share
- The top two issuers control 90% of market
- Daily trading volumes exceed $70 billion, primarily in crypto-to-stablecoin pairs
- Critical infrastructure for DeFi protocols, accounting for majority of transaction volume

Comparison with money market funds

- Similar asset backing: short-term government securities and commercial paper
- Key difference is the 24/7 instant redemption vs business-day settlement
- Regulatory gap: money market funds subject to oversight and stress testing
- Operational risk: stablecoins lack traditional banking infrastructure safeguards

Systemic implications

- Too small and fragmented to be systemic

Monetary policy implications

- Potential disintermediation of traditional banking and payment systems
- Challenges central bank control over money supply and monetary transmission
- Dollar dominance reinforcement through USD-backed stablecoins
- Challenges to capital controls and monetary sovereignty in developing economies

Regulatory landscape — Non-US

- EU: Markets in Crypto-Assets (MiCA) rules applying to stablecoin issuers from 2024–2025
- Singapore: MAS framework for single-currency stablecoins went live in 2024
- Regulatory arbitrage: issuers continue to incorporate in crypto-friendly jurisdictions
- Key focus: reserve requirements, audit standards and operational resilience

Trump administration

- Pro-crypto stance: pledged to make US "crypto capital of the world"
- Regulatory clarity: support for comprehensive stablecoin legislation
- Industry-friendly appointments to Treasury and regulatory agencies
- Focus on dollar-backed stablecoins reinforcing USD dominance

Central-bank digital currencies — CBDCs

- The central bank introduces a digital currency in parallel with the current set-up
- Main motivation is competition from private payment systems
- Especially foreign systems threatening monetary sovereignty
  - PayPal's 2010s attempt to bypass banking regulations raised concerns
  - Current fears: foreign payment system dominance (Alipay, Meta Pay, Apple Pay, stablecoins)
- Governments face a dilemma — CBDCs risk disrupting banking but inaction cedes control

Central-bank digital currencies — Obvious implementation

- Central bank creates a blockchain with tokens on its own fiat money
- CB controls blockchain (no mining, trust from CB)
- People can then swap their old-school fiat money for tokens and use those for regular transactions
- Transactions then involve swapping tokens on the central bank blockchain
- Countries divided between enthusiasm and strong opposition
- Very disruptive, we are essentially replacing big parts of the financial system infrastructure

Issues for governments from the obvious implementation

- All financial transactions are visible to the central bank — enables comprehensive monitoring and control
- Gives private sector financial institutions a much-diminished role — more power to government
- Fine-tuning the money supply is easy because the central bank can simply increase/decrease the number of tokens
- Swapping over the technology on such a massive scale carries with it significant risks and enormous costs

Privacy paradox

- Democratic societies demand transaction privacy from government surveillance
- Authoritarian states see complete transaction visibility as a feature
- Tokens on central bank ledger are fully traceable by design
  - Block *ac32b3aa* tracks from employer to you to merchant
  - Every transaction creates permanent audit trail
- Attempted solutions include zero-knowledge proofs, transaction limits, tiered anonymity
- Fundamental tension between anonymous digital cash and anti-money-laundering requirements
- Most CBDCs sacrifice privacy for compliance

Banking sector disruption

- Direct CBDC accounts at central bank would eliminate commercial bank deposits
- Banks currently create 90%+ of money supply through lending
- Key questions remain unresolved
  - Who provides loans if deposits flee to central bank?
  - Does central bank become retail lender?
  - How do we maintain credit creation in economy?
- This disruption risk drives preference for intermediated models

Hybrid model — Synthetic CBDC

- Direct retail CBDC considered too disruptive — threatens bank deposits
- Instead, most countries exploring hybrid models
- Perhaps private banks face clients and use tokenised central bank money
- Clients access central bank tokens/coins by proxy
- Not compatible with existing infrastructure
- So it will take a long time to implement

Hybrid model — Intermediated CBDC

- Banks remain customer-facing, using existing infrastructure
- CBDC operates as wholesale settlement layer between institutions
- Central bank blockchain serves as efficient interbank payment system
- Preserves current banking relationships while modernising backend
- Lower implementation costs and risks than full replacement

Adoption reality check (2025)

- Live retail CBDCs with minimal uptake
  - Nigeria's eNaira: less than 1% active users after 3 years
  - Bahamas Sand Dollar, Jamaica Jam-Dex, DCash: similarly low adoption
- Large pilots struggling with organic adoption
  - China's e-CNY: widespread pilots but limited regular use
  - India's digital rupee, Sweden's e-krona: pilot phase only
- Wholesale CBDCs showing more promise: BIS mBridge project moving to production

Why CBDCs struggle with adoption

- Existing payment systems work well in developed countries
- Privacy concerns outweigh perceived benefits for users
- Technical complexity compared to familiar payment methods
- Banks resisting disintermediation of their role
- No compelling use case for consumers over current options
- Government surveillance fears in democratic societies
- Network effects favour established payment platforms
- Implementation costs vs marginal improvements