Deposits

5 Key Questions

1. What are deposits?

In [ ]:

```
```

2. Why do we need deposits?

In [ ]:

```

```

3. What is the risk of offering deposits?

```
In [ ]:
```

4. How can we prevent such risk?

```
In [ ]:
```

5. What are shadow banks?

```
In [ ]:
```

Map

1. Value of Deposits
2. A Model of Deposits
3. The Fragility of Deposits
4. Policy Implications
5. Shadow Banks
6. Information and Runs

1. The Value of Deposits

What is a Deposit?

- Funds placed by customers at a bank
- Bank liability, withdrawable **on demand**
- Earns an **interest rate** for the depositor
- Forms part of the **money supply** (means of payment)

Functions and Implications

- **Liquidity creation**: Banks hold **illiquid loans/assets** but issue **liquid deposits**.
  - **Shortest-maturity liability** in the system
  - **Only banks** (and bank-like entities) issue them at scale → *unique service*.
- **Payment function**: Deposits are directly usable for transfers and settlements.
- **Fragility**: Most **runnable** liability → central to **banking crises**.
  - **Regulatory core**: Special protections (deposit insurance, prudential rules).

Deposits are the **defining liability of banks**

Importance of Deposits

Deposits are not just cheap funding — they are the **core of money, payments, and stability** in modern economies.

For Banks

- **Main funding source**:
  - In most banking systems, **50–70% of bank liabilities are deposits**.
  - Example: euro area banks in 2022 relied on **~55% deposits** for total funding (ECB, 2023).
- **Lower cost of funds**: Deposit rates typically below wholesale funding rates → key driver of net interest margin (BIS, 2022).
- **Stability**: Retail deposits are more "sticky" than wholesale markets, providing resilience in crises (Gatev & Strahan, 2006).
- **Crisis evidence**: Banks with larger deposit bases were more stable in 2008 vs. wholesale-funded banks (Huang & Ratnovski, 2011).

For the Economy

- **Money supply backbone**: Deposits are the dominant form of broad money.
    - In the euro area, about **85% of the total stock of money** in the economy consists of bank deposits (ECB, Statistical Data Warehouse, 2023)
- **Payment system**: Deposits are the medium of most electronic payments and transfers.
- **Monetary policy transmission**: Deposit and lending rates are the key channels for central bank rate changes (Bernanke & Blinder, 1992).
- **Financial stability**: Deposit runs have repeatedly triggered systemic crises (Calomiris & Gorton, 1991; Shin, 2009; Federal Reserve Board, 2023 on SVB).

2. A Model of Deposits

Diamond and Dybvig (1983) introduced a simple model of deposit contracts.

> *10k citations; foundation for* ***Nobel Prize (2022)*** *in part (Diamond, Dybvig, Bernanke).*

The model explains **why banks exist** and **why they are fragile**.

Key insight

- `incomplete information`: Because depositors don't know when they'll need money, banks provide an insurance: anyone can withdraw on demand.
- Drawback: if depositors expect others to withdraw, they will rush to withdraw too → a **self-fulfilling bank run**.
- Bank runs cause real economic damage because banks are forced to sell assets early at a loss.

Paper impact

- It gave economists and policymakers a formal model showing that bank runs are not just random accidents, but a natural outcome of how banks work.
- It explained the importance of **deposit insurance** and **lenders of last resort**
- It shaped modern banking regulation and is one of the main reasons almost all countries insure deposits today.

Economic Intuition

- Investors face **idiosyncratic, privately observed** timing shocks (early vs late consumption).
- Markets alone can’t insure this (information is private).
- **Banks pool liquidity** and offer a simple contract (demand deposits) that beats autarky/exchange.
- Downside: **multiple equilibria** including self-fulfilling runs.

The Environment

Three dates: $T = 0, 1, 2.$

One **illiquid asset**:

- **Invest** 1 unit at $T = 0.$
  - If **liquidated** early at $T = 1$: gross return $1.$
  - If **held to maturity** at $T = 2$: gross return $R > 1.$
- Alternative **storage technology** (perfectly liquid):
  - Returns **1** at both dates.

Preferences & Types

Investors are **risk-averse**:

- Utility function $U(c)$ with $U''(c) < 0 \quad \text{for all } c$ (concave).
  - Example: $U(c) = 1 - \frac{1}{c}$

There are **two types** of investors.

- `Type 1` are **early** consumers: need to liquidate asset at $T = 1$
- `Type 2` are **late** consumers: can liquidate asset at $T = 2$

Expected utility:

Let t be the prob. of `Type 1`; $1 - t$ be the prob. of `Type 2`.

At $T = 0$, investors do not know their types (→ `incomplete information`):

$$\mathbb{E}[U] = t\,U(c_1) + (1 - t)\,U(c_2).$$

Investment Strategies

<u>Without banks</u> (Pure market allocation)

Two "pure" investments:

- **Storage**: $(1, 1)$ `autarky`
- **Illiquid asset**: $(1, R)$ (if not liquidated) `market`

<u>With banks</u>

Deposit contract: promise depositors (r_1, r_2) with $r_1 < r_2$, where:

- `Type 1` withdraws at $T = 1$ → r_1
- `Type 2` waits to $T = 2$ → r_2

__**Goal**__: show that **bank deposits** offer superior option to **autarky** and **market**

→ Implement (r_1, r_2) that **Pareto-dominates** market alternatives when $1 < r_1 < r_2 < R$.

- **Risk-aversion**: investors prefer (r_1, r_2) over $(1, R)$ and $(1, 1)$

Manufacturing Deposits

Let N investors deposit 1 each in the bank at $T = 0$ → Bank invests N into the illiquid asset.

At $T = 1$: fraction t withdraw; bank must repay $r_1 N t$.

- Liquidates fraction to raise **1** per unit.
- Remaining position: $N - r_1 N t = N(1 - r_1 t)$.

At $T = 2$: remaining assets return R.

- Resources: $R\,N(1 - r_1 t)$.
- Must repay late withdrawals: $r_2 N(1 - t)$.

Feasibility:

$$r_2 N(1-t) \leq R\,(N - r_1 N t)$$
$$\leftrightarrow$$
$$r_2 \leq \frac{R\,(1 - r_1 t)}{1 - t}, \quad \text{with } 1 < r_1 < r_2 < R.$$

Optimal Policy for the Bank

Find the optimal risk sharing across dates:

$$\max_{r_1, r_2} \; tU(r_1) + (1-t)U(r_2)$$

Subject to <u>feasibility constrain</u>: $0 \leq \; 1 - tr_1 - \frac{1-t}{R} r_2$

Analysis

- Set up the Lagrangian:

$$\mathcal{L} = tU(r_1) + (1-t)U(r_2) + \lambda\left(1 - tr_1 - \frac{1-t}{R}r_2\right)$$

- Differentiate w.r.t. r_1:

$$\frac{\partial \mathcal{L}}{\partial r_1} = tU'(r_1) - \lambda t = 0 \quad \Rightarrow \quad U'(r_1) = \lambda.$$

- Differentiate w.r.t. r_2:

$$\frac{\partial \mathcal{L}}{\partial r_2} = (1-t)U'(r_2) - \lambda\frac{1-t}{R} = 0 \quad \Rightarrow \quad U'(r_2) = \frac{\lambda}{R}.$$

Result

Optimal policy → chose (r_1, r_2) such that:

$$\boxed{U'(r_1) \;=\; RU'(r_2)}$$

Intuition

A marginal unit consumed early costs R units late → equate **marginal utilities** adjusted by **opportunity cost**.

Implication

If the bank offers such (r_1^*, r_2^*), then offer superior to the market and all investors chose the bank

→**Liquidity creation through pooling and insurance!**

3. From Value to Fragility

Value Created

The model shows that

- Deposit contracts optimally **share risk** between early and late consumers.
- They provide **liquidity insurance** and improve welfare compared to market allocations.
- **Why banks exist**: they create value by transforming illiquid assets into liquid deposits.

... But fragility emerges

- This solution relies on **beliefs about withdrawals**.
- If everyone withdraws as expected (only true early types), the contract works perfectly.
- But if depositors **fear others may run**, they may rush to withdraw too (**self-fulfilling prophecies**)

Key: The very feature that makes deposits valuable (liquidity on demand) also makes them **fragile**.

Runs and Self-fulfilling Prophecies

Expectations

Let f be the **actual fraction withdrawing** at $T = 1$.
Let $\hat{f}$ be the **depositors' expectation** of f.

- If everyone expects only `Type 1` withdraw $(\hat{f} = t)$, the **good equilibrium** is feasible.
- If $\hat{f}$ is high, `Type 2` may fear there won't be enough left at $T = 2$ and **withdraw early**, making f rise → **self-fulfilling run**.

When Do Late Types Run?

`Type 2` compares:

- **Wait**: receive $r_2(f)$ at $T = 2$ (declines with f).
- **Run**: receive r_1 at $T = 1$.

Run condition:

$$r_2(\hat{f}) < r_1.$$

Run threshold: $\hat{f}^*$

If $\hat{f} > \hat{f}^*$ → **run equilibrium.**

1. Use the feasibility relation: $r_2(f) = \frac{R\,(1-r_1 f)}{1-f}$
2. Set $r_2(\hat{f}^*) = r_1$ and solve for $\hat{f}^*$:

$$r_1 = \frac{R(1 - r_1\hat{f}^*)}{1 - \hat{f}^*}$$

3. Multiply both sides by $1 - \hat{f}^*$:

$$r_1(1 - \hat{f}^*) = R(1 - r_1\hat{f}^*)$$

4. Isolate $\hat{f}^*$:

$$\boxed{\hat{f}^* = \frac{R - r_1}{r_1\,(R-1)}}$$

Interpretation

If depositors expect more than $\hat{f}^*$ of investors to withdraw early, late types will prefer to withdraw too. This is an **expectations-driven fragility** threshold.

From Runs to Default

Bank fails at $T = 1$ if cash demand exceeds what can be raised by early liquidation:

$$r_1 \, f \, N \; > \; N \qquad \Longleftrightarrow \qquad f > \frac{1}{r_1}.$$

Interpretation

If the actual fraction of withdrawals f exceeds $1/r_1$, the bank literally runs out of cash (**defaults**). This is a **mechanical solvency threshold**.

Overview

Threshold Comparison	Condition	Outcome
Run threshold $\hat{f}^*$	$\hat{f} \leq \hat{f}^*$	Only true early types withdraw → **Good equilibrium**
	$\hat{f} > \hat{f}^*$	Late types also withdraw → **Bad equilibrium (run)**
Insolvency threshold $1/r_1$	$f \leq 1/r_1$	Bank can still meet obligations (but inefficient liquidation)
	$f > 1/r_1$	Bank becomes **insolvent and fails**

Cases

- If $f = t$: no problem, bank works as intended.
- If $\hat{f}^* < f < 1/r_1$: bank is still able to meet withdrawals, but value is destroyed by early liquidation → **inefficient run**.
- If $f \geq 1/r_1$: bank defaults because late types run, pushing withdrawals beyond what can be funded.

4. Policy Implications

“Feature, Not a Bug”

- **Value**: deposits **insure** private liquidity shocks and improve risk sharing.
- **Cost**: admit a **bad equilibrium** (run) due to **information frictions** (private types) and **coordination**.

How to mitigate the cost while enabling the value proprosition?

Instruments

1. **Public Commitment/Disclosure**
2. **Suspension of convertibility**
3. **Lender of last resort (LOLR)**
4. **Deposit insurance**

1. Public Commitment / Disclosure

- **Idea**: Use information policy to anchor beliefs $\hat{f}$ on the good equilibrium.
- **Mechanism**: Transparent disclosure of solvency, liquidity, and guarantees.
- **Upside**: Low-cost if credible; can prevent panic without direct intervention.
- **Downside**: Credibility is fragile — if information is delayed, partial, or mistrusted, it may backfire.
- **Example**: Central bank announcements during 2008 and 2023 crises (e.g., Fed's joint statement on SVB deposit guarantees).

2. Suspension of Convertibility

- **Idea**: Temporarily freeze withdrawals, forcing all depositors to wait.
- **Mechanism**: Breaks the run dynamic since f is fixed regardless of beliefs $\hat{f}$.
- **Upside**: Stops panic instantly.
- **Downside**: Very costly → disrupts payments, destroys trust, can trigger broader panic.
- **Historical use**: 19th century U.S. banks and Argentina's "corralito" in 2001.

3. Lender of Last Resort (LOLR)

- **Idea**: Central bank provides emergency liquidity when banks face sudden outflows.
- **Mechanism**: By lending against **good collateral**, the central bank substitutes for deposits that run away.
- **Upside**: Stabilizes funding without guaranteeing all deposits.
- **Downside**: Risk of lending to insolvent banks ("bailouts"); stigma can deter use.
- **Example**: Bank of England in 19th century ("Bagehot's rule" — lend freely, against good collateral, at a penalty rate).

4. Deposit Insurance

- **Idea**: Government (or guarantee scheme) promises to repay depositors even if the bank fails.
    - Eligibility for such insurance is the definition of banking
- **Mechanism**: Eliminates the late-type incentive to withdraw early → removes the bad equilibrium.
- **Upside**: Restores depositor confidence; cornerstone of modern banking systems.
- **Downside**: Creates **moral hazard** — banks and depositors may take more risk knowing deposits are guaranteed.
- **Example**: FDIC created in the U.S. in 1933 after widespread bank runs.

5. Beyond Banks: Shadow Banking and Runs

Why Bank Regulation Exists

- Classic banks issue **demand deposits**: short-term, liquid, withdrawable at par.
- Because these liabilities are **runnable**, regulation is needed:
  - **Deposit insurance**
  - **Prudential oversight**
  - **Central bank support (LOLR)**

Shadow Banks

- Financial institutions outside traditional banking system.
- Examples: money market funds, structured investment vehicles (SIVs), repo dealers, stablecoin issuers.
- Issue **short-term liabilities** (shares, repo contracts, tokens) that function like deposits:
    - **Redeemable on demand**
    - Promise a stable value
    - Backed by longer-term or opaque assets

Vulnerability

- Same liquidity mismatch: short-term liabilities vs long-term assets.
- **Runnable** just like deposits.
- **Key difference**: no **deposit insurance** or direct central bank guarantee.
- Policy gap: when runs occur, systemic risk can spread through the financial system.

Systemic Risk Link

- Shadow banks are often **interconnected with regulated banks**:
    - Banks fund them (e.g., repo, credit lines).
    - Banks hold their liabilities (e.g., money market fund shares).
- Runs in shadow banking can therefore destabilize banks.
- **2008 evidence**:
    - Run on money market funds (Reserve Primary Fund “broke the buck”).
    - Repo market freeze amplified bank funding crisis.

> ***Insight:*** *Deposit services are the reason banks are regulated. Shadow banks perform bank-like functions without protections → systemic vulnerability.*

6. Information & Runs

Silent Runs

- **Idea**: large outflows without visible queues (institutional/wholesale/online).
- **Implication**: absence of lines ≠ stability; need **real-time flow** monitoring.

Social-Media Amplification

- Expectations $\hat{f}$ form **faster**; common knowledge spreads **virally**.
- **Result**: intervention window collapses; communications policy is pivotal.

Digital Assets & Stablecoins

- Stablecoins mimic deposit contracts: **liquid redemption** vs **opaque/illiquid reserves**.
- Same logic: liquidity mismatch + unverifiable backing → **redemption runs**.

Currency & Cross-Border Deposits

- FX expectations interact with run risk (e.g., fear of devaluation).
- Policy levers include convertibility limits and capital controls (costly).

Regulators vs Depositors: Info Gaps

- **Depositors** act on noisy/partial info; **regulators** have better data but communicate with **lags**.
- Credible, timely disclosure can anchor $\hat{f}$ to t.