- Douglas Diamond and Philip Dybvig. 1983. "Bank Runs, Deposit Insurance, and Liquidity." *Journal of Political Economy* 91: 401-19.

Douglas Diamond

Philip Dybvig

- three periods: $T = 0, 1, 2$
- a single good
- a continuum of agents with measure 1
- Each agent is endowed with 1 unit of the good in period 0.

The Model: Asset Return

$$\begin{array}{ccc} T = 0 & T = 1 & T = 2 \\ -1 & \begin{cases} 0 \\ 1 \end{cases} & \begin{array}{c} R \\ 0 \end{array} \end{array}$$

The Model: Preferences

- In period 0, all agents are identical.
- In period 1, some agents become "patient" and others become "impatient". (private information)
- $$\begin{cases} u(c_1) & \text{if impatient} \\ \\ u(c_2) & \text{if patient} \end{cases}$$
- The probability of being impatient is λ for each agent in period 0.

Autarky

- autarky:
  - utility of the impatient in period 1: $u(1)$
  - utility of the patient in period 2: $u(R)$
  - expected utility in period 0: $\lambda u(1) + (1 - \lambda) u(R)$
- $1 < R$
  - "insurance" against the liquidity shock is desirable.

Banking Economy

- Banks offers demand deposit contract (d_1, d_2).
- Agents
  - make deposits in period 0.
  - withdraw d_1 in period 1.
  - or withdraw d_2 in period 2.
- free-entry banking sector: (d_1, d_2) maximizes the depositor's expected utility.

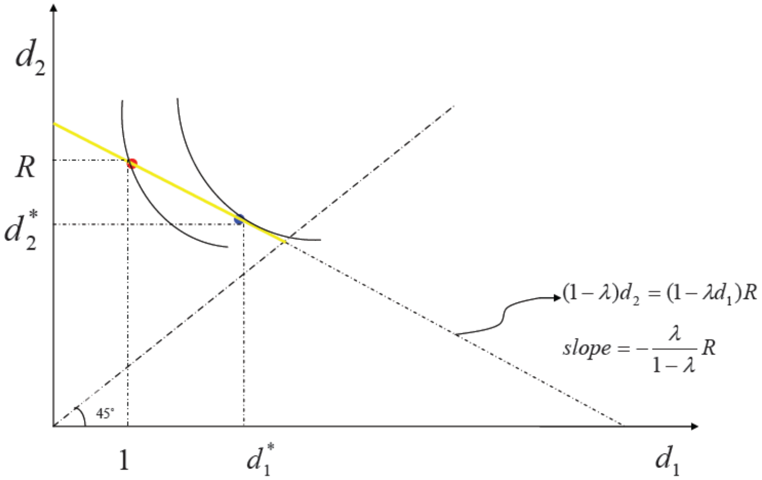
Optimal Deposit Contract

$$\max_{d_1, d_2} \ \lambda u(d_1) + (1-\lambda) u(d_2)$$

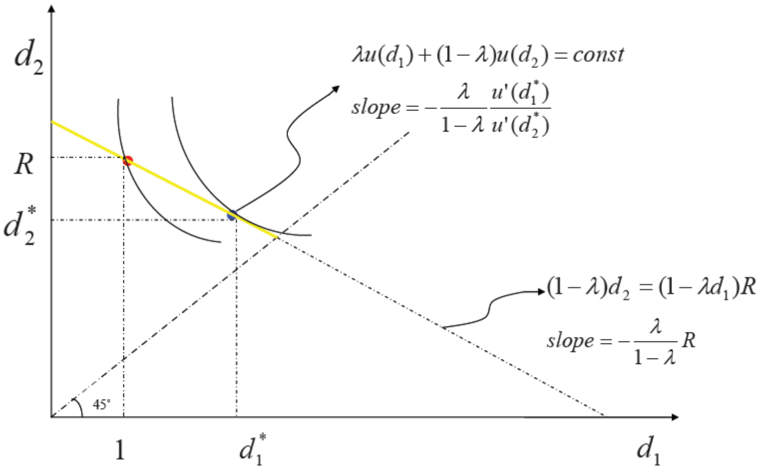
$$s.t. \quad \underbrace{(1-\lambda) d_2}_{\text{withdrawals in period 2}} \quad \leq \quad \underbrace{(1-\lambda d_1) R}_{\text{resources in period 2}} \qquad (RC)$$

$$d_1 \leq d_2 \quad (IC)$$

Optimal Deposit Contract:



Optimal Deposit Contract:



$$\underbrace{\frac{\lambda}{1-\lambda}\frac{u'(d_1^*)}{u'(d_2^*)}}_{MRS} = \underbrace{\frac{\lambda}{1-\lambda}R}_{MRT}$$

What do banks do?

- $u'(d_1^*)/u'(d_2^*) = R$
- $u'' < 0 \Rightarrow d_1^* < d_2^*$
- CRRA: $u(c) = \frac{c^{1-\gamma}}{1-\gamma}$
  - $u'(c) = c^{-\gamma} \implies u'(d_1)/u'(d_2) = (d_2/d_1)^\gamma$
  - if $\gamma = 1 \implies d_1^* = 1, d_2^* = R$
  - if $\gamma > 1 \implies 1 < d_1^* < d_2^* < R$

Why do bank runs occur?

- $\gamma > 1 \Longrightarrow 1 < d_1^* < d_2^* < R$
- IC: $d_1 \leq d_2$
- Expectation: Only the impatient depositors withdraw in period 1.
- A patient depositor can $\begin{cases} \text{get } d_2^* & \text{if he withdraws in period 2} \\ \\ \text{get } d_1^* & \text{if he withdraws in period 1} \end{cases}$

Why do bank runs occur?

- $\gamma > 1 \Longrightarrow 1 < d_1^* < d_2^* < R$
- Expectation: All other depositors demand withdraw in period 1.
- A patient depositor can

$$\begin{cases} \text{get } \textit{nothing} & \text{if he withdraws in period 2} \\ \\ \text{get } d_1^* \text{ w.p. } (1/d_1^*) & \text{if he withdraws in period 1} \end{cases}$$