Financial Intermediation

Lecture 1

Reference:

- Diamond, D. and Dybvig, P. (1983). "Bank runs, deposit insurance, and liquidity", *Journal of Political Economy, 91 (3): 401–419*

Some Characteristics of Financial Intermediaries

1. Borrow from one group of economic agents and lend to another. (not covered)
2. Well-diversified with respect to both assets and liabilities. (not covered)
3. Create money (to be covered later)
4. Transform maturity of assets.

The Diamond-Dybvig Banking Model (I)

- Three periods, 0, 1, and 2.
- Two types of consumers: *early* (consume in period 1) and *late* (consume in period 2)
- In period 0 they do not know their type. They learn their type in period 1
- Efficient economic arrangement is for consumers to set up a bank in order to share risk.
- Given the bank's *deposit contract*, the bank is open to a *run*, which is a bad equilibrium.

Assumptions (I)

- Each consumer has 1 unit of the good in period 0.
- Production technology takes 1 unit of good in period 0 and converts into l + r units of the consumption good in period 2.
- However, this production technology can also be interrupted in period l.
- If interruption occurs in period l, then 1 unit of consumption goods can be obtained for each unit of the good invested in period 0.

Assumptions (II)

- In period 0, each consumer knows that he or she has a probability t of being an early consumer and probability $1 - t$ of being a late consumer
- In period 1, tN consumers learn that they are early consumers and $(l - t)N$ consumers learn th
  at they are late consumers. We have $0 < t < 1$, N *large*
- In period 0 consumers maximize:

$$\text{Expected Utility} = tU(c_1) + (1 - t)U(c_2)$$

where c_1 is consumption if the consumer

needs to consume early and c_2 is consumption

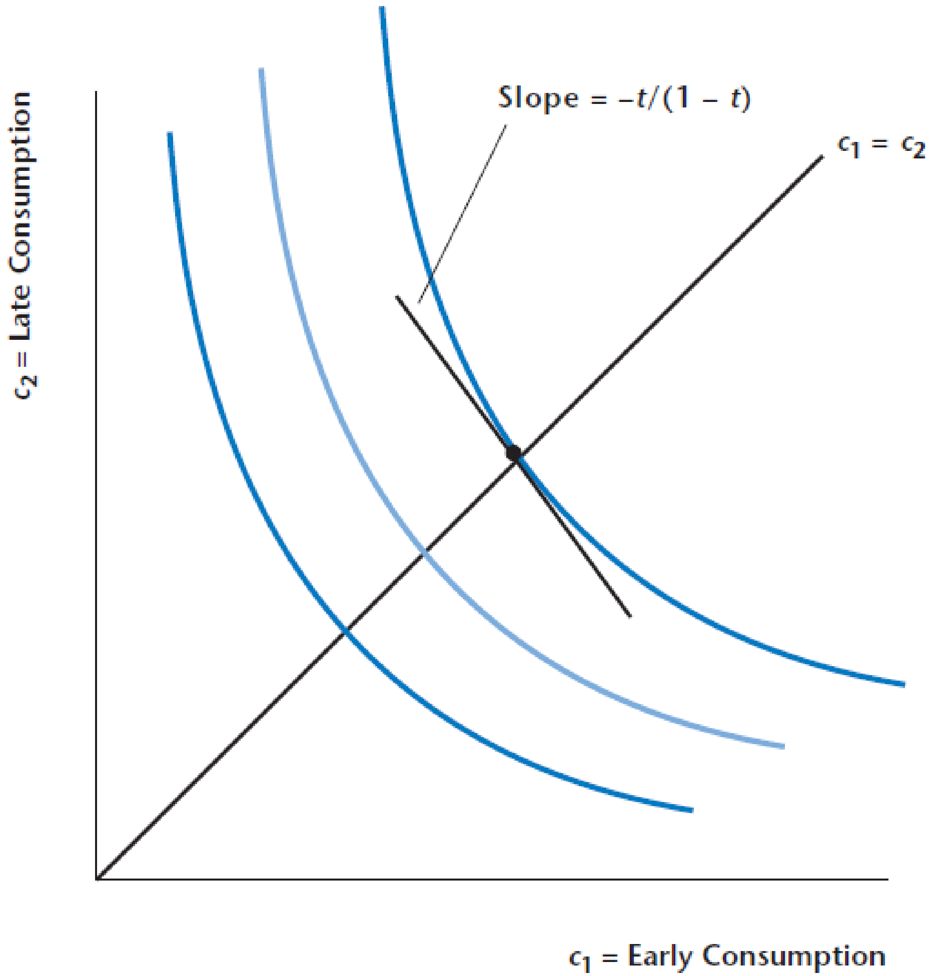
if the consumer is a late consumer

Marginal Rate of Substitution

- The marginal rate of substitution of early consumption for late consumption is

$$MRS_{c_1,c_2} = \frac{tMU_{c_1}}{(1-t)MU_{c_2}},$$

The Preferences of a Diamond–Dybvig Consumer



Autarcy

- Invests all of his or her 1 unit of endowment in the technology in period 0.
- Then, in period 1, if he or she is an early consumer, then he or she interrupts the technology and is able to consume $c_1 = 1$.
- If he or she is a late consumer, then the technology is not interrupted and the consumer gets $c_2 = 1 + r$ in period 2 when the investment matures.
- Want to show that a bank allows all consumers to do better than this.

Constraints on Deposit Contract

Let x be the fraction of the investment to interrupt

$$Ntc_1 = xN$$

$$N(1-t)c_2 = (1-x)N(1+r).$$

Combine the two constraints to get one:

$$tc_1 + \frac{(1-t)c_2}{1+r} = 1,$$

Rewrite the Constraint

$$c_2 = -\frac{t(1+r)}{1-t}c_1 + \frac{1+r}{1-t},$$

$c_1 = 0$ implies $c_2 = \dfrac{1+r}{1-t}$

$c_2 = 0$ implies $c_1 = \dfrac{1}{t}$

Optimality of Banks (I)

Utility function: $\log(c) = \dfrac{c^{1-\sigma}}{1-\sigma}$, with $\sigma > 1$

$$MU_c = c^{-\sigma}$$

$$\frac{MU_{c_1}}{MU_{c_2}} = \left(\frac{c_2}{c_1}\right)^{\sigma}$$

in autarcy the expression above is $(1+r)^{\sigma}$

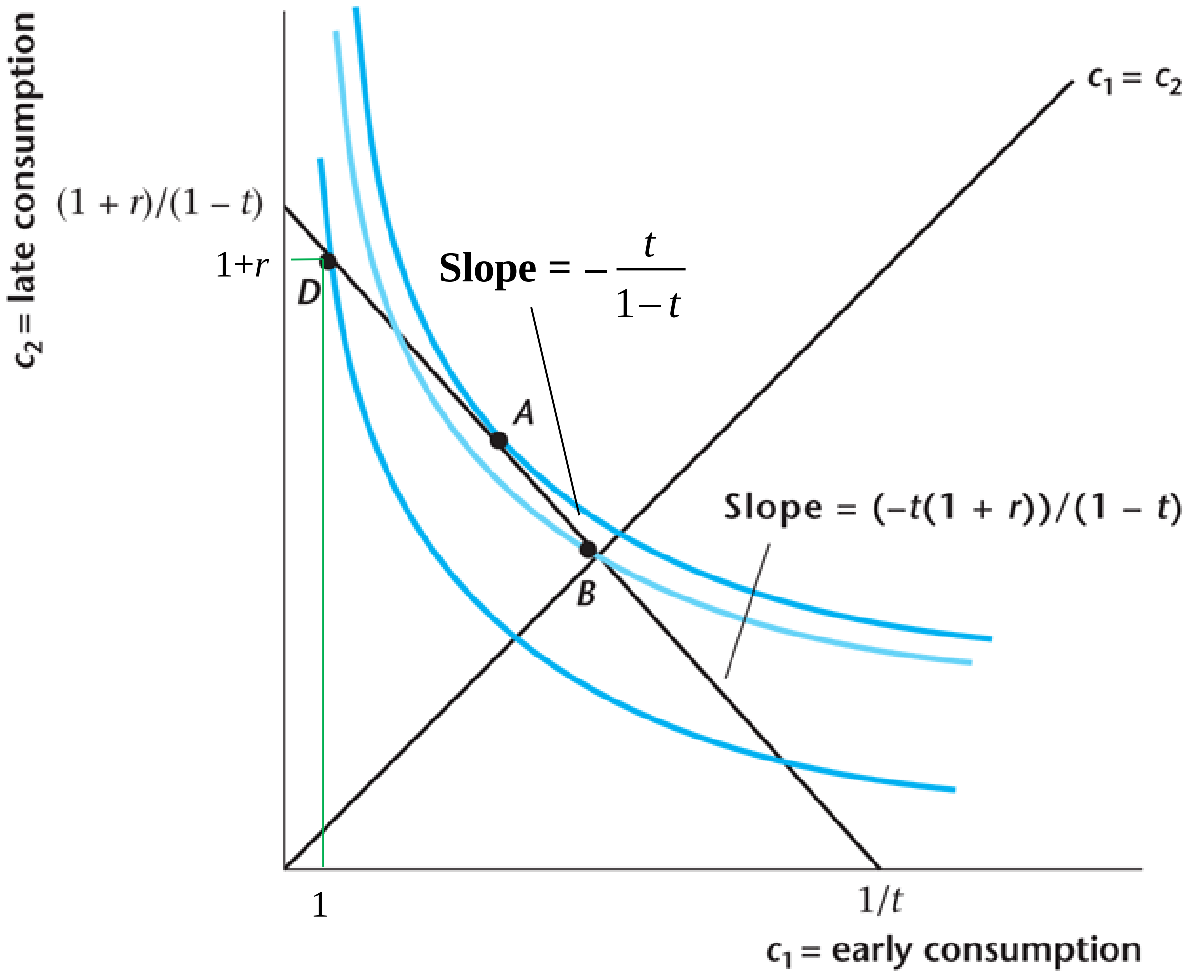
Optimality of Banks (II)

- The indifference curve at *B* has slope $t/(1-t)$
- *A* is the optimal point which lies above point *B*
  - the slope of the indifference curve at *A* is equal to the slope of the constraint: $t(1+r)/(1-t)$
- *D* is autarcy = $(1,1 + r)$
  - the slope of the indifference curve at *D* is $t(1+r)^{\sigma}/(1-t)$
- Thus, *A* lies to the southeast of point *D* since $\sigma>1$

Optimality of Banks (III)

- By accepting the banking contract, the consumer is able to consume more in period 1 at the expense of lower consumption in period 2
- The Diamond-Dybvig bank has some of the properties of financial intermediaries
- The bank holds illiquid assets and is able to convert these assets into liquid deposits

The Equilibrium Deposit Contract Offered by the Diamond–Dybvig Bank



Bank Runs in the Diamond-Dybvig Model

- Suppose that a late consumer believes that all other late consumers will go to the bank to withdraw in period l.
- If all late consumers think that, then there will be a bank run.
- Since $c_1 > 1$ at point *A*, even if the bank liquidates all of its assets in period l, which yields the quantity *N* in consumption goods, it may not satisfy total withdrawal demand if *N is large*, i.e. if $c_1 (N-1)/N > 1$.
- Thus, the individual late consumer chooses to go to the line, hoping that he can get paid, and it becomes a *bank-run*

How to stop a bank run?

- Deposit insurance
  - If the clients are protected the patient clients have no motive to rush to the bank

- Limit the amount of withdraws
  - Might not work perfectly if the amount of impatient is difficult to determine