Bank Runs, Deposit Insurance, and Liquidity

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Motivation

How/why can banks attract demand deposits if the probability of a bank run is never 0?

- What is a *bank run*?
- Depositors rushing to withdraw their deposits because they expect the bank to fail. Sudden withdrawals can cause the bank to liquidate many of its assets at a loss and to fail.

- *Explicit economic role for banks*:Transformation of illiquid assets into liquid liabilities.

- 3 important points in the model.
- 1) Bank deposit contracts can provide allocations superior to those of exchange markets
- 2) The demand deposit contract providing this improvement has an undesirable equilbrium (a bank run)
- 3) Bank runs cause real economic problems, causing the recall of loans and the termination of productive investment

Banks role in Providing Liquidity

asymmetric info lies at the root of liquidity demand

- 3 periods. 1 good. Productive technology yields R>1 units of output in period 2 for each unit of input in period 0.
- So the productive technology is:
  (where the choice (0,R) and (1,0) is made in period 1)

$T = 0$	$T = 1$	$T = 2$
-1	$\begin{cases} 0 \\ 1 \end{cases}$	$\begin{matrix} R \\ 0, \end{matrix}$

- All consumers are identical as of period 0. Private risk of being type 1 or type 2. Learn type in period 1. Everybody can store consumption free but storage is not publicly observable.
- A fraction $t \in (0,1)$ of the continuum of agents are of type 1 and conditional on t, each agent has an equal and independent chance of being of type 1. For now, t is constant.
- We give each consumer an endowment of 1 unit in period 0 (and none at other times)

Competitive Solution

Agents hold the assets directly

- In each period there is a competitive market in claims on future goods.
- Agents can only write uncontingent contracts as there is no public information on which to condition. Contracting in period T=0, all agents(who are then identical) will establish the same trades and each will invest his endowment in the production technology. Therefore there is never any trade and agents can do no better or worse than in autarky.
- If types were publicly observable it would be possible to write optimal insurance contracts that give the ex ante optimal sharing of output between type 1 and 2 agents.
- It is potentially possible to achieve the optimal insurance contract, since the optimal contract satisfies the self selection constraints (noboby wants to mimic the other type)
- Banks can provide this insurance: by providing liquidity, banks guarantee a reasonable return when the investor chashes in before maturity

The model

Demand deposit contract gives each agent withdrawing in period 1 a fixed claim or r1 per unit deposited at time 0.

Withdrawal tenders are served sequentially in random order until the bank runs out of assets. So the bank's payoff to any agent depends only on his place in the line.

$$V_1(f_j, r_1) = \begin{cases} r_1 & \text{if } f_j < r_1^{-1} \\ 0 & \text{if } f_j \geqslant r_1^{-1} \end{cases}$$

Period 1 payoff per unit deposit withdrawn which depends on one's place in line at T=1

Period 2 payoff per unit deposit **NOT** withdrawn at T=2 which depends on total withdrawals at T=1.

$$V_2(f, r_1) = \max\{R(1 - r_1 f)/(1 - f), 0\},$$

fj:# of withdrawers' deposits serviced before agent j as a fraction of total demand deposits.

f: total # of demand deposits withdrawn.

wj: fraction of agent j's deposits that attempts to withdraw at T=1.

So comsumption for deposits proceeds are given by

$$w_j V_1(f_j, r_1) \quad \text{for type 1, and}$$

$$w_j V_1(f_j, r_1) + (1 - w_j) V_2(f, r_1) \quad \text{for type 2}$$

Equilibrium Decisions

Good equilibrium or Bank runs

- *The demand deposit contract can achieve the full info optimal risk sharing as an equilibrium.*

- This occurs when $r_1 = c_1^{1*}$

(that is the fixed payment per dollar of deposits withdrawn at T=1 is equal to the optimal consumption of a type 1 agent given full info)

- Then type 1 withdraw at T=1 and type 2 wait (precisely because the IC holds).

- Panic! Everybody tries to withdraw at T=1.

(this is because the face value of deposits is larger than the liquidation value of the bank's assets)

- ***It is precisely the "transformation" of illiquid assets into liquid assets that is responsible for the liquidity service provided by banks and for their susceptibility to runs.***

- For r1>1 runs are an equlibrium. If r1=1 there will not be bank runs but there is also no improvement on simple competitive claims.
- A demand deposit contract which is not subject to runs provides no liquidity services.

The Bank Run equilibrium

- The *bank run equilibrium* provides allocations that are *worse for all agents* than they would have obtained without the bank (trading in the competitive claims market).
- In the bank run equilibrium everybody receives a risky return that has mean 1.
- Holding assets directly provides a riskless return that is at least 1.
  (and equal to R>1 if an agent becomes type 2)
- Bank runs ruin the risk sharing between agents and take a tol on the efficiency of production because all production is interrupted at T=1 when it is optimal for some to continue until T=2.
- **What cause runs?** It need not be anything fundamental about the bank's condition.
- The problem is that once agents have deposited, anything that causes them to anticipate a run, WILL LEAD TO A RUN.

Improving on demand deposits:
suspension of Convertibility with t known

- This gives banks a defense against runs: suspension of allowing withdrawal of deposits.
- If banks can suspend convertibility when withdrawls are too numerous at T=1, ***anticipation*** of this policy prevents runs by removing the incentive of type 2 agents to withdraw early.
- There is a ***unique*** Nash equilibrium with f=t, and it is a dominant strategy equilibrium, thus a "stable" contract.
- Type 1: will withdraw at T=1 because consumption in T=2 is worthless for them.
- Type 2: no matter what others do, they receive higher proceeds by waiting until T=2 to withdraw.
- Optimal risk sharing is achieved because suspension never occurs in equilibrium and the bank can follow the optimal asset liquidation policy.

Suspension of Convertibility with stochastic withdrawals (t)

- The fraction of type 1 is an unobservable random variable.
- At the optimum, consumption is equal for all agents of a given type and depends on the realization of t. This implies a unique optimal asset liquidation policy give t.
- **Proposition 1:** Bank contracts which much obey the sequential service constrain cannot achieve optimal risk sharing when ***t*** is stochastic and has a nondegenerate distribution. (two part proof by contradiction)
- However, suspension can generally improve on the uninsured demand deposit contract by preventing runs.
- ***Problem:***
- When suspension occurs less than the largest possible realization of t, some type 1 agents cannot withdraw, which is inefficient ex post.
- This can be desirable ex ante, however, because the threat of suspension prevents runs and allows a relatively high value of r1.

Government deposit insurance

- Deposit insurance guarantees that the promised return will be paid to **all** who withdraw.
- Private insurance company is constrained by its reserves to offer unconditional garantees.
- Government can impose tax to every agent in the economy. In particular, it can tax those agents who withdrew “early” in the period T=1. How much tax must be raised depend on how many deposits are withdrawn at T=1 and what amount of r1 was promised to them. (Exemple…)
- The government can impose a tax on an agent ***after*** he or she has withdrawn, while a bank which must provide sequential service and cannot reduce the amount of a withdrawal after it has been made.
- ***Proposition 2:*** Demand deposit contracts with government deposit insurance achieve the unconstrained optimum as a ***unique*** Nash equilibrium (f=t) if the government imposes an optimal tax to finance the deposit insurance.
- As long as the government can impose some tax to finance the insurance, there will be no runs and the tax need never be imposed. Thus, the role of government policy is to provide an institution to prevent a bad equlibrium rather than a policy to move an existing equilibrium.

Conclusions and implications

- The riskless technology abstracts from the choise of bank loan portfolio risk. If the risk of bank portfolios could be selected by a bank manager, then, there is a trade-off between optimal risk sharing and proper incentives for portfolio choise, and introducing deposit insurance can influence the portfolio choise.

- The Federal Reserve discount windown can, as a lender of last resort, provide a service similar to deposit insurance. (buy bank assets for prices greater than their liquidating value)

- If the technology is risky and the lender of last resort were ***always*** required to bail out banks with liquidity problems, there would be perverse incentives for banks to take on risk, even if bailouts occurred only when many banks fail together. For instance, all banks have an incentive to take more risk, because the will all be bailed out together.