Bank Runs, Deposit Insurance, and Liquidity

Diamond and Dybvig (JPE 1983)

Is there something about the demand for liquidity that creates a fragile financial system?

Can sophisticated contracts eliminate the fragility?

Can deposit insurance help?

3 periods:

At time 0, deposits and investment occurs.

At time 1, consumers learn whether they are patient or impatient, and decide whether to make a withdrawal.

Impatient consumers must withdraw in period 1. Patient consumers care about period 2 consumption, but they can decide to withdraw in period 1 and store the money.

The fraction of impatient is t.

Investment Technology: 1 unit (the endowment) invested in period 0 yields

1 unit if harvested in period 1,

$R > 1$ units if harvested in period 2.

Suppose the fraction of impatient consumers is known, but the bank cannot observe an individual's type.

Let c^1 denote consumption received in period 1, and c^2 denote consumption received in period 2

impatient consumer's utility:

$$u(c^1)$$

patient consumer's utility:

$$u(c^1 + c^2)$$

$$\begin{aligned} u'(0) &= \infty \\ u'(\infty) &= 0 \\ -\frac{cu''(c)}{u'(c)} &> 1 \end{aligned}$$

The (full information) ex ante optimal allocation has the impatient receiving c^1 and the patient receiving c^2 in period 2, where $1 < c^{1*} < c^{2*} < R$.

$$
\begin{aligned}
& \max tu(c^1) + (1-t)u(c^2) \\
& \text{subject to} \\
(1-t)c^2 &= (1-c^1 t)R
\end{aligned}
$$

The solution satisfies the constraint and the f.o.c.

$$u'(c^{1*}) = Ru'(c^{2*}).$$

Consider a contract of the form (c^{1*}, c^{2*}).

–If all other patient consumers wait, the first-best is achieved as a Bayes Nash equilibrium, since $c^{1*} < c^{2*}$.

–If all other patient consumers withdraw in period 1, running is a best response, since there is nothing left for the period 2 consumers.

–A run is worse than not trading, because expected consumption is one and there is risk.

–But the deposit contract is a bad one. Partial suspension of convertibility.

Let period 1 payoff depend on the place in line, f_j.

$$\begin{aligned} V_1(f_j) &= c^{1*} \quad \text{if } f_j < t \\ &= 0 \qquad \text{if } f_j > t \end{aligned}$$

Letting f denote the number of positive withdrawals in period 1, this leaves

$$V_2(f) = \frac{R(1 - c^{1*} f)}{1 - f}$$

which is at least c^{2*}.

Now we achieve the first-best as a dominant strategy equilibrium.

–When the fraction of impatient consumers, t, is not known, a *sequential service constraint* makes the full information first best impossible. How much consumption do we give the first consumer? c^{1*} depends on t.

–Unanswered questions: What about the optimal policy? Is it subject to a bank run?

–Diamond and Dybvig claim that we can achieve the first best with deposit insurance. The government taxes the deposits in period 1, so that impatient take home the minimum c^{1*} corresponding to the largest t. When the government sees how many people have withdrawn, the "deposit insurance" pays the impatient enough so they consume $c^{1*}(t)$, and the rest of the tax is handed back to the bank and continues to earn the high return.

–Is this feasible for the government, given the sequential service constraint? If so, why can't the bank do the same thing?

Peck and Shell (JPE 2003) show that sometimes the optimal contract must have a run equilibrium when t is random.

If consumers anticipate a bank run, why would they deposit? Sunspots and a small probability of a run.

Competitive provision of liquidity could undermine efficiency. Suppose that harvested consumption can be traded for unharvested "trees" in period 1, and t is known. Then a small group can do better than the first-best for themselves:

1. Have some of the group deposit and the rest of the group invest privately (in their back yard). The fraction who deposit is determined so that the number of patient depositors equals the number of impatient non-depositors.

2. Impatient depositors withdraw and consume c^{1*}.

3. Patient depositors withdraw, and swap their withdrawal of c^{1*} with an impatient non-depositor for an unharvested tree, receiving $R > c^{2*}$.

4. Those patient who did not deposit receive a return of R, and those impatient who did not deposit receive c^{1*}.