ECON4335 The economics of banking

Lecture 10, 25/10-2011: Bank runs

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*Views and conclusions are those of the lecturer and can not be attributed to Norges Bank

Items on reading list:

- F&R 2.2 (Lectures 1 or 2)
- F&R 7.1, 7.2.1 – 7.2.3 (this lecture)
- Gerdrup (2005)

- Bank *run*: depositors run at one bank

- Bank *panic*: simultaneous bank runs at several banks

- Bank panics happened frequently in advanced economies until establishment of bank regulations in the 1920s or 1930s

  - In the US as many as 21 between 1890 and 1908 and 5 during the great depression (1929–1933).

  - In Norway bank runs for instance in the early 1920s

- More recent episodes:
  - Argentina 2001 (panic)
  - UK, Northern Rock 2007 (run)
  - US, IndyMac 2008 (run)

Problems with bank runs

- Banks only hold a fraction of the value of deposits as liquid reserves.

- Hence, banks subject to a run will be forced to sell their loans at fire sale price, or call back loans, which

  - may cause borrowers' investment projects to be interrupted (the real cost)

  - banks may fail and depositors loose part of their deposits.

- Bank runs driven by expectations, expectations may be self-fulfilling.

- Expectations based on bad news about a bank
  - Fundamental bad news (quality of its assets)
  - Or news about a run already under way. Optimal to run due to first-come first-served. May be based on rumors or misunderstandings only.

- Bank run may, however, be efficient, force a badly run bank to close.

- But even such a bank *run* can spread to other banks and become a bank *panic*, where also good banks are run.

Diamond & Dybvig (1983) model of liquidity insurance (lecture 2)

- Problem, set up of model, equilibria under
  - Autarky
  - Bond market
  - Social first best optimum
  - Banks with fractional reserves

F&R 2.2 (Lectures 1 or 2)

- Two bank equilibria (F&R 7.2.1)
  - efficient (corresponds to first best)
  - bad equilibrium, inefficient run.

- Remedies for bank run (F&R 7.2.3, 7.2.4)
  - Narrow banking
  - Suspension of convertibility
  - Deposit insurance
  - Lender of last resort (LLR)

Diamond & Dybvig (1983) model

- 3 periods $t = 0$, $t = 1$, $t = 2$; consumers endowed with one good $= 1$ at $t = 0$. Two types of agents,
  - type 1: early consumers, fraction π_1, consume only in $t = 1$, $u(C_1)$
  - type 2: patient consumers, fraction π_2, consume only in $t = 2$, $u(C_2)$
  - At $t = 0$ consumers identical, type only revealed in $t = 1$.
  - Ex ante expected utility $U = \pi_1 u(C_1) + \pi_2 u(C_2)$.

- Technology
  - good can be stored between two periods and retain same value.
  - fraction I of good can be invested at $t = 0$, and be worth IR, $R > 1$, at $t = 2$. An illiquid asset, if prematurely liquidated at $t = 1$ worth only $\ell < 1$.
- Autarky
  At $t = 0$ consumers invest I
  - if at $t = 1$ type 1 $C_1 = 1 - I + \ell I$
  - if at $t = 1$ type 2, store $1 - I$ till period 2 and then $C_2 = 1 - I + IR$

- Ex post outcome at $t = 1$, is inefficient. $C_1 < 1$. I.e., impatient consumers get to consume less by investing, no liquidity insurance.

- Bond market, trade between the agent types
  - At $t = 1$ type 1, rather than liquidate his long term investment sells a bond to type 2 at a price p that allows the latter to consume R at $t = 2$.
  - Result: $C_1 = 1$, $C_2 = R$ (For details, see F&R 2.2.4)
  - Pareto dominates autarky,
    but not the best solution.

- Social first best optimum
  A social planner: $\max_{C_1,C_2,I} U = \pi_1 u(C_1) + \pi_2 u(C_2)$
  s.t. $\pi_1 C_1 = 1 - I$ and $\pi_2 C_2 = RI$.

- Solution, when the measure of RRA $-\frac{u''(R)}{u'(R)} R > 1$
  $1 < C_1^* < C_2^* < R$.
  Interpretation: when consumers are sufficiently risk averse (assumed in the whole lecture) the insurance against illiquidity requires a higher consumption for consumers who become impatient at the cost of a lower consumption for patient consumers, compared to the bond market solution.

- Note that neither autarky ($C_1 < 1$) or bond market ($C_1 = 1$) satisfies this solution.

Banks with fractional reserves

- First best solution can be implemented by banks. Banks compete for depositors and thus offer the first best optimal contract. A bank receives one unit of deposits at $t = 0$, invests I of it to yield RI at $t = 2$, stores $1 - I$ as liquid reserves for $t = 1$, and offers depositors to withdraw:
  - at $t = 1$ $\quad C_1 = C_1^*$
  - at $t = 2$ $\quad C_2 = C_2^*$.
  - Thus it stores $\pi_1 C_1^*$ in reserves to be paid out in $t = 1$, and invests $I = 1 - \pi_1 C_1^*$, in order to pay out $\pi_2 C_2^* = R(1 - \pi_1 C_1^*)$ in $t = 2$.

Two Nash Equilibria

- *The good one.* All type 1 consumers – but only type 1 consumers – withdraw $C_1 = C_1^*$ at $t = 1$. All type 2 consumers trust the banks and wait until $t = 2$, when they withdraw $C_2 = C_2^*$. Thus all of I matures till it is worth RI. The first best optimal liquidity insurance is realized.

- *The bad equilibrium, bank run*. Type 2 consumers do not trust the bank, they decide to withdraw $C_1 = C_1^*$ at $t = 1$ rather than wait till $t = 2$. For a single type 2 it is rational to withdraw at $t = 1$ when all other type 2 withdraw at $t = 1$, otherwise he will get nothing at $t = 2$. Result:
  - Bank must liquidate its long term investments, all it can pay in $t = 1$ is
    $\pi_1 C_1^* + (1 - \pi_1 C_1^*)\ell < 1 < C_1^*$. Bank has not sufficient funds to pay all depositors, the bank fails.
  - The social real cost, liquidation of investment $(R - \ell)(1 - \pi_1 C_1^*)$
  - And some consumers get 0, the liquidity insurance has broken down. A distributional issue.

- Notice run *not* based on fundamental news about bank' assets.
- Run occurs only because of a failiure among depositors to coordinate (their expectations).

Remedies against bank run.

- Narrow banking
- Suspension of convertibility
- Deposit insurance
- Interbank market
- Lender of last resort (LLR)

Narrow banking 3 interpretations

1. Enough liquidity to pay all depositors in case of a bank run $\Rightarrow$100 per cent reserve ratio

2. Enough liquidity after liquidation of long term assets that it can meet a run

3. Obtain enough liquidity to meet a run after securitization of its long term assets, i.e., sell them but not as an emergency in $t = 1$.

1. 100 per cent reserve ratio

- $(1 - I) \geq C_1$
- $C_2 \leq IR$
- Bank's problem $\max U = \pi_1 u(C_1) + \pi_2 u(C_2)$
  s.t. $(1 - I) \geq C_1, \quad C_2 \leq IR$
- Result: $C_1 = 1 - I, \quad C_2 = IR$. All depositors can withdraw C_1 at $t = 1$.
- No run! But as liquidity insurance, this is more expensive than autarky.

2. Enough liquidity after liquidation of long term assets to face a run

- $(1 - I) + \ell I \geq C_1$
- $C_2 \leq RI + 1 - I.$
- Result: $C_1 = (1 - I) + \ell I, \quad C_2 = RI + 1 - I.$
- No run! Same as autarky.

3. Securitization

- Same as the bond market: At $t = 1$ the bank sells claims (at $t = 2$) on its long term assets to patient consumers, just enough to finance withdrawals at $t = 1$.

- Essentially the same as the bond market.
  $C_1 = 1$, $C_2 = R$

- No run, but not as good as the good NE in fractional reserve banking.

In general, these guarantees of stability prevent the first best good equilibrium.

Suspension of convertibility

- If the bank knows the proportion of impatient consumers π_1 it declares it will suspend paying out deposits at $t = 1$ when $\pi_1 C_1$ has been withdrawn. Then all type 2 will wait until $t = 2$.

- But, the bank will normally not know the true π_1.
  - If it errs on the low side, a number of truly impatient consumers will be denied liquidity insurance.
  - Because it may err on the high side, type 2 consumers may still have an incentive to run.

Deposit insurance

- Introduce an institution (government) that can levy a tax on banks in $t = 1$ based on the realized π_1.

- Unlike the bank which at $t = 0$ commits to paying C_1 at $t = 1$ and C_2 at $t = 2$, the deposit insurer levies this tax on withdrawals in $t = 1$ when the insurer observes the true value of π_1 denoted $\widehat{\pi}_1$.

- The tax is decided in period 1 when the deposit insurer observes $\widehat{\pi}_1$. Given $\widehat{\pi}_1$, it can then realize the first best after tax consumption solution $C_1^*(\widehat{\pi}_1)$, $C_2^*(\widehat{\pi}_1)$ by setting the right tax rate.

- Proceeds from the tax is channeled back to the bank to make sure the bank has enough liquid assets that all $\widehat{\pi}_1$ who choose to withdraw at $t = 1$ can actually get $C_1^*(\widehat{\pi}_1)$.

- Since all depositors who want to withdraw at $t = 1$ can withdraw, and type 2 now knows that with tax financed deposit insurance they will always get $C_2 > C_1$ by waiting, only the true type 1 choose to withdraw at $t = 1$, and the first best solution is realized.

- But in the real world another problem:
  if a bank through costly effort can influence R, deposit insurance causes moral hazard. Next lecture.

Interbank market

- So far, have abstracted from interbank market where benks can lend and borrow liquidity

- Interbank market $\Rightarrow$ less likely a bank will have to liquidate long run assets to pay depositors $\Rightarrow$ run against the bank less likely.

- But, contagion of a liquidity shock through interbank market is possible. E.g. Allen & Gale (1987).
  - Informational contagion (cf. Lecture 8)

Lender of Last Resort (LLR) or Emergency Liquidity Assistance (ELA) to individual banks.
Outside the Diamond Dybvig model.

- Bagehot (1873): Central banks should lend in an emergency to illiquid but solvent banks. But at penalty rate.

- Goodhart: Clearcut distinction between illiquidity and insolvency is a myth. LLR can in practice be risky, should be approved by Treasury.

- Norges Bank: LLR shall not be solvency assistance to banks. Hence LLR normally against collateral or guarantees when the stability of the financial system as such is at stake. Normally consulting with the Treasury. Look at borrowing bank's solvency. LLR at a penalty rate.