Topics in Bank Management: Lecture 9

Ronaldo Carpio

May 11, 2015

7.2.4: Equity vs. Deposits

- We continue our exploration of the Diamond-Dybvig model and its extensions.
- Last week, we saw that a demand deposit economy (where the bank takes deposits and invests in the long-term technology) achieves better risk sharing than a market economy (where there is a riskless bond traded at $t = 1$).
- The market economy can still result in inefficient liquidation of the long-term technology, while in the good (non-bank run) NE outcome, no liquidation takes place.
- Is it possible to achieve the same efficient allocation using a different contract, without bank runs?

7.2.4: Equity vs. Deposits

- The model of Jacklin (1987) shows that an *equity* contract can sometimes do as well as deposit contracts.
- An equity contract is one where an investor agrees to pay some initial amount of money, in exchange for ownership of a fraction of the firm.
- They are entitled to receive the same fraction of the future profits generated by the firm.

- The bank in the DD model could be called a "mutual" bank; that is, the funds used to pay out in case of liquidity shocks of depositors, come from the other depositors.
- Instead, consider a bank that is entirely financed by *equity* (i.e. paid-in cash by shareholders, who will receive the profits of the firm).
- The firm announces it will pay a dividend d at $t = 1$ to the shareholders, who were the depositors in the previous model.
- It keeps a cash reserve of d and invests the rest, $1 - d$, in the long-run technology.
- The shares of the bank are traded during $t = 1$, after agents realize their types and after d has been paid.
- Each share gives a right to $R(1 - d)$ consumption units at $t = 2$ (the firm will pay out the returns of the long-run technology as dividends).

- The endogenously determined equilibrium price p will depend on d; a larger d paid out at $t = 1$ implies a lower market price, since there will be less paid out in the future.
- Changing the value of d will allow varying levels of trade-off between the utilities of early and late consumers.
- Type 1 agents (early consumers) will be able to consume $C_1 = d + p$ (dividends plus sale price of the stock)
- Type 2 agents (late consumers) will use their dividends to buy d/p new shares, giving them:

$$C_2 = (1 + \frac{d}{p})R(1 - d)$$

- Price p is determined by supply and demand:

$$\pi_1 = \pi_2 \frac{d}{p} \Rightarrow p = \frac{\pi_2 d}{\pi_1}$$

$$C_1 = \frac{d}{\pi_1}, C_2 = \frac{R(1-d)}{\pi_2}$$

- The level of d is determined by the shareholders at $t = 0$, who choose d to maximize expected utility.
- This gives the same constraint as the deposit contracts

$$\pi_1 C_1 + \pi_2 \frac{C_2}{R} = 1$$

- This achieves the same efficient allocation using equity contracts.
- The advantage of equity contracts is that they do not experience bank runs.
- In order for models like this to work in the real world, we have to assume that the financial market for securities reaches equilibrium, in between the start of $t = 1$ and the start of $t = 2$, which may not hold in practice.

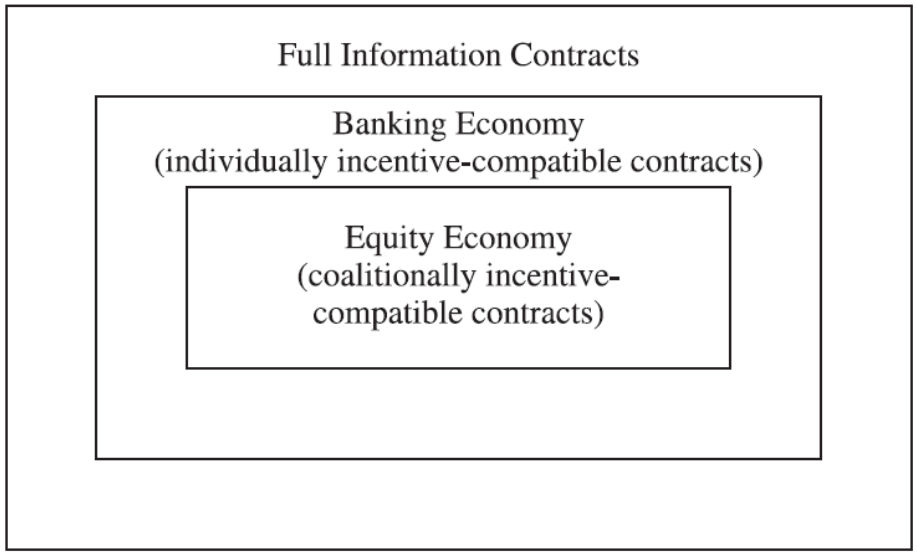

Figure 7.1
Different sets of contracts.

- In general, Jacklin finds that deposit contracts can be more efficient than equity contracts, but at the risk of bank runs.
- Equity contracts are *coalitionally incentive-compatible*, while deposit contracts are only *individually incentive-compatible*.
- If agents are allowed to trade their deposit contracts on a financial market, these become equivalent to equity contracts.

Efficient Bank Runs

- In order for models with financial markets (like Jacklin's model and the financial markets model of Diamond-Dybvig) to work in the real world, the price of market securities is assumed to reach equilibrium during $t = 1$.
- In the real world, it takes time for prices to reach equilibrium, and during bank runs and other times of crisis, market prices could be far from equilibrium.
- In general, this is a problem for any dynamic model that assumes equilibrium prices are reached within a single time period.

Efficient Bank Runs

- In the Diamond-Dybvig model, bank runs are *inefficient* (i.e. not Pareto-optimal) because they lead to inefficient liquidations.
- Recall that an outcome is not Pareto-optimal if it is possible to make some agent better off without making the other agents worse off.
- The bank run Nash equilibrium is not Pareto-optimal, since in the non-bank run NE, all agents are at least as well off, and the late consumers are strictly better off (since there is no liquidation).
- The only difference between the two NE are the beliefs of the late consumers.

Efficient Bank Runs

- There is no "fundamental" reason for late consumers to believe the bank might fail; so any policy to change the beliefs of depositors to support the non-bank run NE is welfare-improving.
- However, there may be a "fundamental" reason to believe that the bank may fail, e.g. if the depositors receive a signal that the bank's assets will perform poorly.
- In this case, even if all late consumers do not withdraw early, some may be unable to withdraw their money.
- This late consumer could be better off even if there is a bank run.
- In this situation, there is only one Nash equilibrium outcome; the one with a bank run.
- Fundamental bank runs can provide an efficient mechanism for closing down inefficient banks.

Systemic Risk and Contagion

- Systemic risk is a risk that may affect the financial system as a whole.
- In general, a crisis that affects the entire financial system arises from:
  - a *macroeconomic shock* which affects all banks at the same time;
  - *contagion*, which spreads from an initial set of banks to the rest of the system.
- The existence of contagion effects is one justification for regulation of the banking industry.

Macroeconomic Shocks

- Aggregate *liquidity shock*: withdrawals across many banks, such that the interbank lending market cannot buffer these withdrawals.
- Example: the Great Depression in the USA
- Aggregate *productivity shock*: if many banks invest in the same type of assets, which causes poor returns for all of the banks.
- Example: investment into real estate and related securities in the financial crisis of 2008, post-bubble crash in Japan during 1990s
- *Exchange rate shock*: if banks' debts are denominated in a foreign currency, which suddenly becomes more expensive to repay
- Example: the Asian Financial Crisis of 1998

Contagion

- Contagion is where problems that originate in one bank, may spread to other banks.
- Channels of contagion:
  - Information, or changes in expectations by investors
  - Interbank liabilities
  - Macroeconomic effects

Information/Expectations of Investors

- The problems affecting one bank contains information about the situations facing other banks.
- For example, during the financial crisis of 2008, as the problems at one bank caused by mortgage-backed securities came to light, other banks holding similar assets fell in value.
- This could be thought of as a delayed macroeconomic shock.

Information/Expectations of Investors

- Chen (1999), "Banking Panics: The Role of the First-Come, First-Served Rule and Information Externalities", Journal of Political Economics
- In this model, there are risky project returns and depositors with different information about bank returns
- If the returns of different banks are correlated, the failure of one bank gives information about the probability of failure of other banks
- Uninformed depositors will withdraw early if they see a problem at one bank
- Informed depositors will withdraw even if they know bank returns are high

Interbank Liabilities

- Several ways in which one bank can owe another bank money:
- Payment systems (money transfers, clearing)
- Over-the-counter (OTC) derivatives: for example, one bank writes CDS insurance (promises to pay another bank if a certain firm defaults).
- If the probability of default was underestimated, then it may owe large amounts to many other banks.
- Interbank markets (short-term lending between banks)
- One bank failing may lead to a cash shortfall for other banks that depended on repayments from the first bank.
- Allen & Gale (2000), "Financial contagion", Journal of Political Economy
- Freixas, Parigi, & Rochet (2000), "Systemic risk, interbank relations, and liquidity provision by the central bank", Journal of Money, Credit and Banking

Macroeconomic Effects

- So far, we've assumed that the costs of liquidation are given exogenously.
- In reality, the value recovered from liquidation or early sales are greatly affected by current market conditions.
- If many banks have to sell assets simultaneously (a "fire sale"), market prices may fall below fundamental value
- Market prices may depend on the liquidity available in the market (which dries up in times of crisis)
- *Mark-to-market accounting* regulations imply that the balance sheet, and hence insolvency, of a bank will depend on current market prices

Debt Deflation

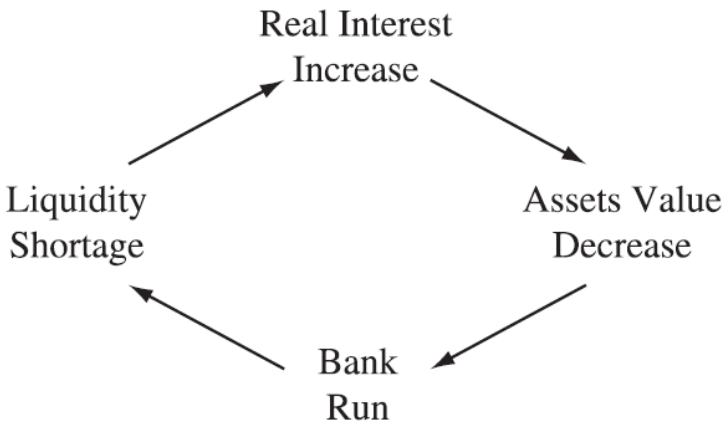

Figure 7.2
Debt deflation.

- Debt deflation, first proposed by Irving Fisher (1933), is a mechanism by which an ongoing financial crisis can have real effects on the macroeconomy, resulting in poor a poor business environment, which puts more pressure on the financial system in a vicious cycle.

Debt Deflation

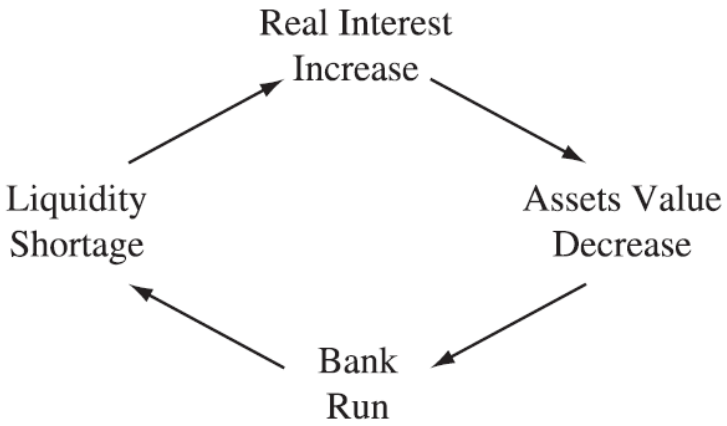

Figure 7.2
Debt deflation.

- A decrease in the value of assets on the balance sheet causes depositors to believe it may not survive, causing withdrawals and bank runs.
- This leads to a decrease in the overall credit supply and a liquidity shortage.
- Next, this leads to an increase in real interest rates and a worse business environment, which further decreases asset values.

Debt Deflation

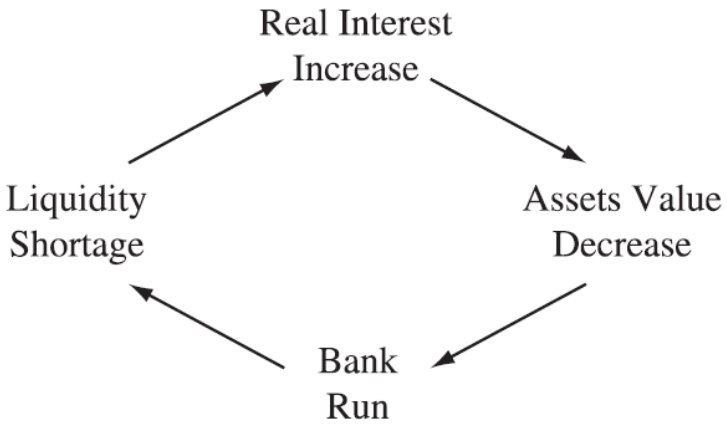

Figure 7.2
Debt deflation.

- The key transmission mechanism here is the market value of assets, which can decrease very quickly in a market downturn.
- The financial system also affects the "real" economy, through the supply of credit.

Empirical Evidence for Contagion

- Is there empirical evidence for contagion as a major factor in financial crises?
- Evidence for the information channel seems to be weak: depositors seem to be able to distinguish between good and bad banks
- There is evidence for contagion through interbank liabilities, but the effects are small
- The effects of macroeconomic shocks are potentially large, but as with any macroeconomic phenomenon, difficult to prove causality.

The Financial Crisis of 2008

- Which of these channels affected the financial crisis of 2008?
- Macroeconomic shock: the earliest trigger of the crisis was the sharp fall in the value of real estate and mortgage-related securities.
- Contagion through information: discovery of "toxic assets" at one bank led to a fall in the value of other banks with similar assets.
- Contagion through interbank liabilities: primarily through OTC derivatives (e.g. AIG had provided default insurance based on pre-crisis probabilities)
- Contagion through macroeconomic effects: the credit crunch prevented nearly illiquid firms from operating (e.g. General Motors and Chrysler had to be bailed out by the government), leveraged firms had to lay off workers, consumers in general cut back on consumption due to uncertainty

Lender of Last Resort (LLR)

- In most countries, the central bank is also the lender of last resort (LLR).
- Under certain conditions, commerical banks facing liquidity problems can get short-term loans from the central bank.
- Possbile strategies by the central bank:
- Provision of liquidity to the market on a *regular basis*. Lending (anonymously) against good collateral. For example, the TARP program of the Federal Reserve.
- Lend to a specific group of solvent (but illiquid) institutions. (emergency lending assistance)
- Lend to a specific insolvent institution. This can be seen as essentially an injection of capital by the central bank. (for example: AIG)

Lender of Last Resort (LLR)

- Instead of directly intervening, the central bank can also organize the merging of weaker banks with strong ones. (For example: getting JP Morgan Chase to buy Bear Stearns; getting Bank of America to buy Merrill Lynch).

Bagehot's observations

- Central bank practice traditionally follows the rules described by Walter Bagehot (!873), a British journalist and businessman who had observed how the Bank of England dealt with financial crises.
- "First. That these loans should only be made at a *very high rate of interest*. This will operate as a heavy fine on unreasonable timidity, and will prevent the greatest number of applications by persons who do not require it. The rate should be raised early in the panic, so that the fine may be paid early; that no one may borrow out of idle precaution without paying well for it; that the Banking reserve may be protected as far as possible."

Bagehot's observations

- "Secondly. That at this rate these advances should be made on *all good banking securities*, and as largely *as the public ask for them*."
- "The reason is plain. The object is to stay alarm, and nothing therefore should be done to cause alarm. But the way to cause alarm is to refuse some one who has good security to offer... "
- "No advances indeed need be made by which the Bank will ultimately lose. The amount of bad business in commercial countries is an infinitesimally small fraction of the whole business... The great majority, the majority to be protected, are the 'sound' people, the people who have good security to offer."
- "If it is known that the Bank of England is freely advancing on what in ordinary times is reckoned a good securityon what is then commonly pledged and easily convertiblethe alarm of the solvent merchants and bankers will be stayed. But if securities, really good and usually convertible, are refused by the Bank, the alarm will not abate, the other loans made will fail in obtaining their end, and the panic will become worse and worse."

- Lend freely (to ensure that depositors have no doubt that the bank will survive)
- At a high rate of interest (so that banks cannot use the central bank to fund ordinary operations)
- Against good collateral
- LLR is required because there is a market failure to insure against liquidity shocks.
- "Every banker knows that if he has to prove that he is worthy of credit, however good may be his argument, in fact his credit is gone" - this is an asymmetric information problem.

Issues with LLR

- Why can't the interbank market provide sufficient liquidity to buffer a liquidity shock?
- If there is an aggregate liquidity shock (e.g. if there are withdrawals at all banks), then only the central bank has the power to produce additional liquidity (possibly by "printing money").
- Loans from the central bank should be anonymous, since if depositors learn that a specific institution is receiving emergency loans, they may stat a run on that bank
- Also, in times of crisis, banks themselves want to hoard their own liquidity, and are reluctant to lend to others on the interbank market
- "Liquidity is there until you need it"

Issues with LLR

- Bagehot's view is that the rules governing LLR behavior should be clearly stated in advance.
- Most of the time, this is opposed by central banks.
- Instead, they prefer a policy of "constructive ambiguity", i.e. if there is some uncertainty to whether the central bank will intervene, then this will help bring market discipline.
- However, this creates incentives for banks to become "too big to fail", i.e. so large and interconnected that the central bank has no choice but to assist them.

Issues with LLR

- LLR should lend to banks that are illiquid, but not insolvent.
- In practice, not easy to distinguish between the two.
- If there is a possibility of contagion (for example, an insolvent bank will sell its assets, leading to a fire sale and depressed market valuations for other banks), then there is an incentive to support some insolvent banks as well
- LLR leads to moral hazard on the part of banks: if they anticipate support during crisis times, they may take more risk during normal times

Empirical Evidence

- Empirical evidence suggests that a LLR policy has helped to avoid and mitigate bank panics.
- Miron (1986), "Financial panics, the seasonality of the nominal interest rate, and the founding of the Fed.", AER
- Bordo (1990), "Financial crises, banking crises, stock market crashes and the money supply: Some international evidence, 1887-1933"
- Eichengreen & Portes (1987), "The anatomy of financial crises."

Next Week

- I will post the readings for next week on the web site.
- If you have a vague idea for a paper topic, feel free to email me - perhaps I can suggest ways to improve it.