

ECON4335 The economics of banking

Lecture 10, 6/4-2010: Bank regulation

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

Lecture 10

- Why the particular regulation of banks
- Deposit insurance
- Moral hazard from deposit insurance
- Option value of deposit insurance
- Charter value
- A model of regulation with deposit insurance and charter value

Bank regulation, regulation that is specific to banks

- Solvency or capital regulation, capital requirements
- Liquidity regulation, reserve requirements
- Other portfolio restrictions
- Deposit insurance

Why?

General reason for regulation, market failures: externalities, excessive market power.

In banking some particular issues:

- Fragility of banks, illiquid assets (loans) and liquid liabilities (demandable deposits).
 - Fragility can cause contagion, via interbank exposures or simply informational contagion.
- Bank depositors, unlike creditors of other institutions, not able to monitor bank management. Need to be represented by a monitoring agent. *Representation hypothesis* for bank regulation (Dewatripont & Tirole 1994).

- Banks important for solving asymmetric information. Failure of a bank can thus have negative externalities on its borrowers, costs of being shut off from the bank's credit.

But like a market, regulation also has its imperfections or failures

- Costs, direct (resources spent) and indirect (distortions)
- Regulators may be dependent on politicians and follow political aims rather than regulatory aims.
- Self-interested regulators may be captured by the industry.
- Regulation may necessitate more regulations, (deposit insurance causes need for capital requirements).

Some economists prefer an imperfect unregulated market to an imperfectly regulated market.

Types of regulation covered in this course

- Liquidity regulation (lecture 9 on bank runs)
- Capital or solvency regulation
- Deposit insurance

Solvency arrangements in general (Dewatripont & Rirole, 1994)

- 3 agents (stake holders) in a firm:
 - management: decides the firm's portfolio, dislike direct intervention
 - outside shareholders (convex payoff, favour risky decisions by management)
 - debt holders (concave payoff, risk averse).
- When firm goes well, shareholders and management in control. Shareholders may align managers incentives with their own through e.g. options.

- When solvency is bad, the risk averse debt holders take control. Disliked by managers, provides them incentive to avoid getting towards insolvency.
- In most firms debt holders are banks or agents representing bond holders. All professional. Able to take control the firm in a credible way when solvency is bad.
- Taken care of by agents in the market and ordinary bankruptcy laws
- No need for a specific regulators.

- Most banks, like most large firms, owned by a large amount of outside shareholders.
- In banks, however, debt holders are unprofessional and uninformed depositors.



When solvency is critically low in a bank, *financial regulator* representing unprofessional depositors take control. Disliked by bank managers, provides incentive to avoid insolvency. *Representation hypothesis* for bank regulation.

Entrepreneurial bank

- A bank where the managers and shareholders are the same.
- Due to convex pay off, this bank has incentive to invest risky
- Also here, the same uninformed depositors and need for them to be represented by a financial regulator.
- In the remainder today, assume banks are entrepreneurial.

Deposit insurance

- Can prevent bank run from depositors (Lecture 9).
- Consumer protection, protects uninformed depositors.
- Usually operated by governments, banks have to pay a premium to a fund (ex.ante or ex.post)
- Coverage varies
 - Before crisis: 20,000 €, 100,000 \$, 2 mill kr., co-insurance.
 - During crisis: 20,000 €, 250,000 \$, 2 mill kr., $+\infty$

Distortion from deposit insurance: Moral hazard,

- Basic model setup
- Moral hazard
- Risk related premiums
- Charter value

Basic model setup

$t = 0$		$t = 1$	
Assets	Liabilities	Assets	Liabilities
Loans L	Deposits D	Loan repayment \tilde{L}	Deposits D
Insurance premium P	Invested equity E	Insurance payments \tilde{S}	Net value \tilde{V}

$$L = D + E - P$$

$$\tilde{V} = \tilde{L} - D + \tilde{S}$$

Deposit insurance pays only when $\tilde{L} < D$, $\tilde{S} = \max(0, D - \tilde{L})$

Net value for bank owners $\tilde{V} = E + (\tilde{L} - L) + (\max(0, D - \tilde{L}) - P)$

Whenever $\tilde{L} < D$, $\tilde{V} = 0$.

If $\tilde{L} < L$, but $\tilde{L} > D$, then $\tilde{S} = 0$ and $0 < \tilde{V} = E + (\tilde{L} - L) - P < E$.

I.e., the bank's stock holders the first to shoulder losses.

Moral hazard

- Assume:

- $\tilde{L} = X$ with prob θ , or 0 with prob $1 - \theta$.
- Risk neutral bank determines X and θ , s.t. $E(\tilde{L}) = A$ constant.
- P and D are independent of the bank's choice of X and θ .

- The bank's problem:

$$\max_{\theta} E(\tilde{V}) - E = (\theta X + (1 - \theta)0 - L) - \theta D + (1 - \theta)0 - P + D$$

$$\text{s.t. } \theta X = A. \quad \text{i.e. } \max_{\theta} ((A - L) + (1 - \theta)D - P).$$

Solution: $\theta \rightarrow 0$, $X \rightarrow \infty$. In a mean-preserving spread, as high spread or risk as possible.

- The moral hazard problem of deposit insurance: the bank has incentive to take as high risk as possible, a high gain if success, most of the downside risk shifted to the deposit insurer.
- This distortion occurs because P and D are independent of the risk in the bank's assets.
- In a world with symmetric information without deposit insurance, depositors would require compensation for the bank's risk taking. That would balance the bank's incentive to take risk.
- With deposit insurance risk based insurance premium can do the same under symmetric information.

Risk based deposit insurance premium

- For the bank's owner, the deposit insurance $\tilde{S} = \max(0, D - \tilde{L})$ is equivalent to a put option on the bank's assets \tilde{L} at a strike price D .
- A put option gives the right to sell an underlying asset at a specified time T at a specified price – the strike price. If at T , $D > \tilde{L}$ this put option is in the money, if $D \leq \tilde{L}$ it is out of the money.
- To find the value of a put option before T one can use Black Schole's formula.

Assume \tilde{L} follows the following random walk:

$$\frac{d\tilde{L}}{\tilde{L}} = \mu dt + \sigma dZ, \text{ where } dZ \sim N(0, 1), \sigma \text{ is the volatility of the bank's assets}$$

Assume the bank is liquidated at T , denote the Black and Scholes value of this put option, i.e., the true value of the deposit insurance to the bank with P^* . Then the actuarial rate of deposit insurance

$$\frac{P^*}{D} = p(\sigma, d), \text{ where } d = \frac{D}{L}.$$

I.e., if the bank pays a constant premium P independent of σ and d , the bank can increase the value of the deposit insurance by

- increasing the risk of its assets (σ), risk shifting
- increasing its leverage. This is an argument for a minimum capital ratio for banks with deposit insurance.

Risk based deposit insurance premium

- If a bank pays the premium $\frac{P^*}{D}$ then net value of deposit insurance to the bank is always 0, and the moral hazard problem is solved.
- Possible in practice?
 - Risk based deposit insurance premiums introduced in many countries during 1990s. Typically the premium increases in $\frac{D}{L}$.
 - But asymmetric information problem regarding the true σ .

A problem with the moral hazard theory of deposit insurance:

- When the true σ is not observable in practice banks would take max risk and operate at a minimum capital ratio (bang-bang equilibrium)
- We would observe bank failures as the norm.
- But we do not.
- Why not?
- What is balancing the moral hazard and tendency towards a bang-bang equilibrium?

One answer: The charter value theory.

- Charter value of a bank is the value to the bank's share holders of future discounted net profits that they are entitled to if the bank keeps its charter. Denote the value V .
- If the bank fails, the shareholders lose the charter to operate the bank, i.e., V is lost.
- Hence, by taking high risk, the bank increases the probability of losing V . The cost of risk taking that can balance the moral hazard in deposit insurance.
- But it can also complicate regulation.