Minimum Capital Requirements, Bank Supervision and Special Resolution Schemes

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1. Motivation

- Pre-crisis bank regulatory frameworks provided inadequate safeguards against failures of **S**ystemically **I**mportant **F**inancial **I**nstitutions (SIFIs).
- Without proper bank resolution tools, authorities had two costly alternatives:
  - opening bankruptcy procedures; or
  - bailing out failing banks.
- *Basel Committee on Bank Supervision* and *Financial Stability Board* recommended introducing **Special Bank Resolution Schemes**, which allow authorities
  - to take control over a bank already at an early stage of its financial difficulties; and
  - to take a wide range of actions to deal with the failing institution without prior agreement of shareholders and creditors.

1. Motivation

- *Special Resolution Schemes*
  - were introduced primarily to prevent externalities from bank contagion, but
  - may also have consequences for bank risk-taking.
- Our paper deals with the ex-ante problem of **risk-taking** and asks:
  - Should regulators be able to resolve banks?
  - Should bank resolution tools be used in addition to minimum capital requirements?

1. Motivation

Main results:

- Minimum capital requirements use the bank's information about the project, but deleverage the bank's project.
- Bank-closure policies depend on the quality of supervision.
- In the presence of systemic costs, a capital requirement of even 100 per cent may not be sufficient to thwart the bank's project plan.

1. Motivation

Road Map:

1. Motivation
2. Symmetric information
3. Asymmetric information without signals
4. Asymmetric information with imperfect signals
5. Introducing systemic banks
6. Conclusions

2.1. Symmetric information: Basic model

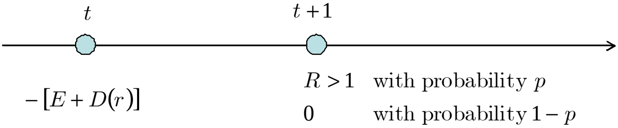
(Risk-neutral) **agents**:

- Bank
  - is endowed with equity $E = 1$,
  - raises deposits D (setting r) and
  - invests funds $E + D$ into a risky project.
- Households demand deposits:

$$D(r) = d(r-1), \; d > 0; \; r \geq 1. \tag{1}$$

- Public agency insures all deposits.
- Regulator cares about social welfare (maximizes expected payments to all agents).

- **Project** payments:



- One-stage-model (at t):
  - The bank learns p and chooses whether to pursue the project or not. If the project is not pursued, the game is over.
  - Otherwise, the bank chooses r and employs equity E and deposits $D(r)$ for the project.

2.1. Symmetric information: Basic model

- Bank's expected profits paid to equity holders:

$$\begin{aligned}\Pi(p,r) &= p\left[R\left(E+D(r)\right)-E-rD(r)\right]+(1-p)(-E)\\ &= Rp-1+p(R-r)\,d\,(r-1)\end{aligned}$$

- Social welfare:

$$\begin{aligned}W(p,r) &= (Rp-1)\,E+p\,(R-r)\,D\,(r)\\ &\quad +(r-1)\,D\,(r)-(1-p)\,rD\,(r)\\ &= (Rp-1)\left[d\,(r-1)+1\right]\end{aligned}$$

2.1. Symmetric information: Basic model

Without prudential regulation

- the bank sets the interest rate at

$$r^B = \frac{1}{2}(R+1).$$

- The bank persues the project if:

$$p > \frac{1}{R + \frac{1}{4}d(R-1)^2} =: p^B$$

- and obtains the payoff:

$$\Pi\left(r^B\right) = Rp - 1 + \frac{1}{4}d(R-1)^2$$

2.1. Symmetric information: Basic model

- The regulator's payoff is:

$$W\left(r^B\right) = (Rp-1)\left[\frac{1}{2}d\left(R-1\right)+1\right]$$

- From the point of view of welfare maximization, the project should be executed whenever:

$$p \geq \frac{1}{R} =: p^W$$

- Because

$$p^B := \frac{1}{R+\frac{1}{4}d(R-1)^2} < \frac{1}{R} =: p^W$$

  the bank may pursue the project even if welfare is negative.

2.2. Symmetric information: Capital requirements vs. bank resolution

Minimum capital requirement:

$$\hat{k} = \frac{E}{E + D} = \frac{1}{1 + D}$$

entails a limit on deposits the bank is allowed to collect:

$$D \leq \frac{1 - \hat{k}}{\hat{k}} E = \frac{1}{\hat{k}} - 1 =: \hat{D}$$

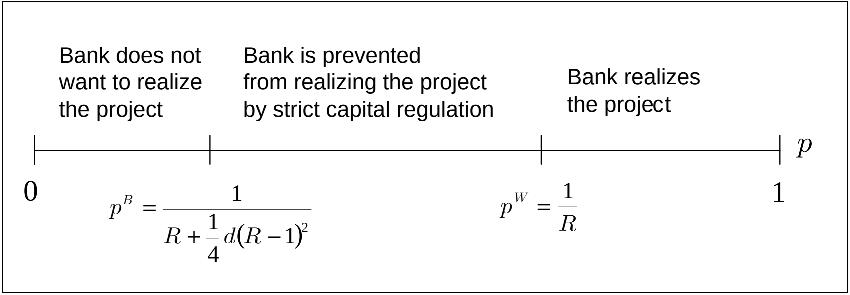
or a limit on the interest offered to the bank's customers:

$$r \leq 1 + \frac{1}{d} \frac{1 - \hat{k}}{\hat{k}} E =: \hat{r}.$$

2.2. Symmetric information: Capital requirements vs. bank resolution

Proposition 1: In the capital-requirement game, the optimal capital ratio is:

$$\hat{k}^* \begin{cases} \in [0,1], & \text{if} \quad p \leq p^B \\ \in \left[\hat{k}_1, 1\right], & \text{if} \quad p^B < p < p^W \\ = 0, & \text{if} \quad p \geq p^W \end{cases}$$



3.1. Asymmetric information without signals

- p has two values: $p \in \{p_l, p_h\}$ with $0 < p_l < p_h \leq 1$ and $prob(l) = prob(h) = 0,5$;
- true probalility (or l or h) is only known by the bank (and not by the regulator).
- Regulator may either
  - set minimum capital requirements, or
  - supervise banks and pursue bank resolution.
- Under asymmetric information bank supervision may take wrong decisions:
  - Leaving a bank open that should be closed ("Type 1 mistake");
  - Closing a bank that should be left open ("Type 2 mistake").

3.2. Asymmetric information: Capital requirements

Two-stages-model (at t):

- **First**, the regulator determines the capital ratio $\hat{k}$
- **Second**, the bank
  - learns whether p_l or p_h, respectively, will apply,
  - chooses to pursue the project or not;
  - if the project is pursued, the bank chooses $1 \leq r \leq \hat{r}$ and employs E and D.

Distinguish

- $\hat{k}_1(p)$ = capital ratio that makes project unattractive for the bank
- $\hat{k}^{bind}$ = capital ratio that restricts the bank's leverage

3.2. Asymmetric information: Capital requirements

If: $p^B < p_l < p^W < p_h$, the regulator has to choose between two actions:

- He sets capital requirement at $\hat{k}_1(p_l)$, so that the bank pursues the project in state h only ("**discrimination**"), or
- sets any capital ratio from the interval $\left[0, \hat{k}^{bind}\right)$, so that the bank pursues the project in both states of the world.

Proposition 2: Discrimination is best for small values $p_l \leq p^{MC}$.

3.3. Asymmetric information: Resolution

Three-stages-model (at t):

- **First**, the bank learns l or h, chooses to pursue the project or not, and proposes the project to the regulating authority.
- **Second**, the regulator allows or prohibits the project.
- **Third**, if the bank's project is accepted, the bank chooses r and employs equity E and D.

3.3. Asymmetric information: Resolution

If $p^B < p_l < p^W < p_h$,

- the bank proposes in both states of the word,
- but the regulator cannot differentiate between l and h
- and will either allow or disallow in both states.

Proposition 3: It is best to allow the project for large values $p_l \geq p^{BR}$.

Proposition 4: Consider $p^B < p_l < p^W < p_h$. Then,

- capital requirements are better than resolution, if p_l is close to p^B $\left(p_l < \min\left(p_l^{MC}, p_l^{BR}\right)\right)$;
- capital requirements yield the same result as resolution, if p_l is close to p^W $\left(p_l \geq \max\left(p_l^{MC}, p_l^{BR}\right)\right)$;
- the capital requirement $\hat{k}_1(p_l)$ is better than resolution, if

$$p_l^{BR} \leq p_l < p_l^{MC}$$

4. Asymmetric information with imperfect signals

- Regulator receives an imperfect signal s_l or s_h about the probabilities p_l and p_h, respectively.
- The signal is symmetric and reveals the true state of the world with probabilities:

$$prob\left(s_l|l\right) = prob\left(s_h|h\right) = q > \frac{1}{2}.$$

4. Asymmetric information with imperfect signals

Four-stage model:

- **First**, the regulator determines the capital ratio.
- **Second**, the bank learns l or h and the probabilities p_l or p_h, respectively.
- **Third**, regulator gets a signal s_l or s_h and decides whether or not to allow the project.
- **Fourth**, if the bank's project proposal is approved, the bank chooses r and employs E and D.

Proposition 5: Assume $p^B < p_l < p^W < p_h$. In case of an informative, but imperfect signal, the capital requirement $\hat{k}_1(p_l)$ tends to be better than a non-binding requirement, if:

- $q < \frac{p^W - p_l}{p_h - p_l}$;
- $q < \frac{2}{d(R-1)+2}$;
- p_l close to p^B.

5. Assuming Systemic Banks

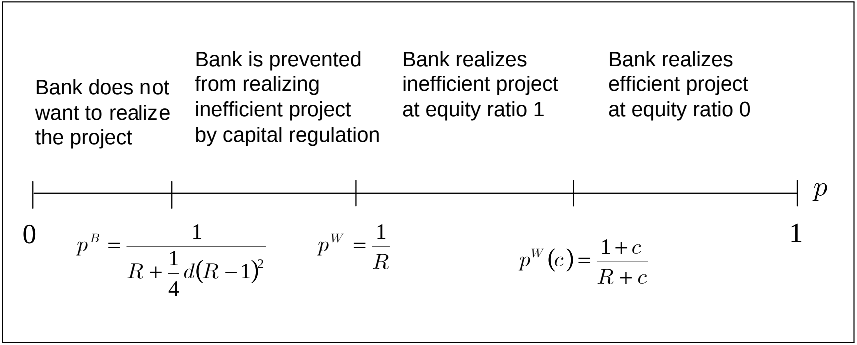
- We return to the basic model but assume that expected systemic costs increase in the size of the bank's balance sheet $(D + E)$:

$$C = (1 - p) \cdot c \cdot [D(r) + E]$$

- From the point of view of welfare maximization, the project should be executed in case of:

$$p \geq \frac{1 + c}{R + c} =: p^W(c).$$

5. Assuming Systemic Banks



5. Assuming Systemic Banks

Proposition 6: In the capital-requirement game with systemic costs, even a capital ratio of 100 per cent may not be sufficient to make the bank refrain from the project.

Then, the regulator should also have the right to close down a bank.

6. Conclusions

- Minimum capital requirements and bank closure policies influence banks' risk-taking behavior through different channels.
- Capital requirements are better from a welfare point of view if
  - the quality of the information gathered by the regulator is relatively bad,
  - the bank has diffculties to attract deposits and / or
  - the bank project's rate of return R is low.
- Even a 100 per cent capital requirement may not be suffcient to abolish excessive bank risk-taking behavior.

Final words...

Thank you for your attention!