Minimum Capital Requirements, Bank Supervision and Special Resolution Schemes

Harald Wiese    Uwe Vollmer

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1. Motivation

- Pre-crisis bank regulatory frameworks provided inadequate safeguards against failures of **Systemically Important Financial Institutions** (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?
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:

  $$D(r) = d(r - 1), \quad d > 0; \quad r \geq 1.$$  \hfill (1)

- Public agency insures all deposits.

- Regulator cares about social welfare (maximizes expected payments to all agents).
2.1. Symmetric information: Basic model

- **Project payments:**

  \[-[E + D(r)]\]

  \[R > 1 \text{ with probability } p\]

  \[0 \text{ with probability } 1 - p\]

- **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:

\[ \Pi (p, r) = p [R (E + D(r)) - E - rD(r)] + (1 - p) (-E) \]
\[ = Rp - 1 + p (R - r) d (r - 1) \]

- Social welfare:

\[ W (p, r) = (Rp - 1) E + p (R - r) D (r) \]
\[ + (r - 1) D (r) - (1 - p) rD (r) \]
\[ = (Rp - 1) [d (r - 1) + 1] \]
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 pursues 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:

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

- 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:

\[ r \leq 1 + \frac{1}{d} \frac{1 - \hat{k}}{\hat{k}} E =: \hat{r}. \]
Proposition 1: In the capital-requirement game, the optimal capital ratio is:

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

Bank does not want to realize the project
Bank is prevented from realizing the project by strict capital regulation
Bank realizes the project

\[
p^B = \frac{1}{R + \frac{1}{4}d(R - 1)^2}
\]

\[
p^W = \frac{1}{R}
\]

\[0 \quad \quad p^B = \frac{1}{R + \frac{1}{4}d(R - 1)^2} \quad \quad p^W = \frac{1}{R} \quad \quad 1\]
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 $\text{prob}(l) = \text{prob}(h) = 0.5$;
- true probability (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
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 $[0, \hat{k}^{bind})$, 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 $p^B < p_I < p^W < p_h$. Then,

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

$$\text{prob}(s_l|l) = \text{prob}(s_h|h) = q > \frac{1}{2}.$$
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 \( D \).
4. Asymmetric information with imperfect signals

**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

<table>
<thead>
<tr>
<th>Bank does not want to realize the project</th>
<th>Bank is prevented from realizing inefficient project by capital regulation</th>
<th>Bank realizes inefficient project at equity ratio 1</th>
<th>Bank realizes efficient project at equity ratio 0</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>$p_B = \frac{1}{R + \frac{1}{4}d(R - 1)^2}$</td>
<td>$p_W = \frac{1}{R}$</td>
<td>$p_W(c) = \frac{1 + c}{R + c}$</td>
</tr>
</tbody>
</table>

| $p$ | 1
|-----|---
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 difficulties 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 sufficient to abolish excessive bank risk-taking behavior.
Final words...

Thank you for your attention!