A Positive Analysis of Bank Behaviour under Capital Requirements

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The views expressed are those of the presenter and not necessarily those of the Bank of England, the MPC, the FPC or PRA Board.
A bank faces an increase in capital requirement
   - Will it raise capital or cut lending?

Theoretical framework
   - Risk-shifting and debt overhang

Main takeaway: it depends
   - Lending response typically U-shaped
   - Economic conditions matters

Test predictions using UK data
   - Find that main margin of adjustment is
   - Lending in bad times but capital in good times
The environment

- Three dates: 0, 1, and 2, random variable $A \in [A_L, A_H]$
- A bank and risk-neutral households

<table>
<thead>
<tr>
<th>Assets</th>
<th>Liabilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>X (new loans)</td>
<td>e (capital)</td>
</tr>
<tr>
<td>x (legacy loans)</td>
<td>d (deposits)</td>
</tr>
</tbody>
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- Payoff $X$
- Concave in $x$
- Payoff $Z(A)$
- $Z < z$ in some states
- Source of overhang
- Insured
- No premium
- Elastic supply

- Some initial level
- Can pay dividend
- Can issue seasoned capital
- No information asymmetry

- Capital requirement: $e \geq \gamma(x + z)$
- Three choice variable, but
  - Focus on binding capital requirement: $e = \gamma(x + z)$
  - Balance sheet identity: $d = z + x - e$
The problem of the bank

- Economic surplus: \( E [X + Z(A) - (x + z)] \)
- Private surplus: \( E [X + Z(A) - (1 - \gamma)(x + z)]^+ - \gamma(x + z) \)

**FOC:** \[
\int_{A_0}^{A_H} (X_x - (1 - \gamma)) f(A) dA - \gamma = 0
\]

where \( A_0 \) is the default threshold

- Define \( \pi(x, \gamma) \equiv \int_{A_0(x, \gamma)}^{A_H} f(A) dA \)

\[
X_x - \left(1 - \gamma + \frac{\gamma}{\pi(x, \gamma)}\right) = 0
\]
The overhang problem

\[ \int_{A_0}^{A_H} (X_x - (1 - \gamma)) f(A) dA - \gamma = 0 \Rightarrow X_x - 1 + \int_{A_L}^{A_0} ((1 - \gamma) - X_x) f(A) dA = 0 \]

- The wedge is negative
  - Positive NPV loans are not issued
  - Reflects an overhang problem

• How does \( \gamma \) affect wedge?
• Comparative statics with respect to \( \gamma \) based on the FOC
Conditional reasoning

\[ X_{x \text{ mr}} - \left( 1 - \gamma + \frac{\gamma}{\pi(x, \gamma)} \right)_{\text{mc}} = 0 \]

- The sign of \( \frac{dx^*}{d\gamma} \) hinges on conditional marginal cost

\[ \frac{dmc}{d\gamma} = \frac{1}{\pi} - 1 + \gamma \frac{\partial \pi}{\partial \gamma} \left( \frac{-1}{\pi^2} \right) \]

composition effect > 0

price effect < 0

As \( \pi \to 1 \), price effect dominates!
The U-shape

- Equilibrium lending as a function of $\gamma$

![Graph showing the U-shape relationship between $x$ and $\gamma$.]

- Changes in economic conditions, for instance $E[A]$, shift the relationship
• Assume $X$ also depends on $A$

• Either can dominate

• $\frac{d\text{mr}}{d\gamma} < 0 \rightarrow \text{internalisation effect}$

• Reinforces the composition effect; but price effect can still dominate
Empirics

- We use regulatory UK data (Basel I)
  - Changes to individual capital requirements
  - Test the interaction with economic conditions
  - We can control for what other banks do

- Find that the main margin of adjustment is
  - Lending in bad times
  - Capital in good times

- Consistent with prediction on
  - how economic conditions “shift” the U-shape
Conclusion

- Capital requirement under Basel III
  - Overall increase
  - Time varying adjustments
- Intellectual debate
  - Costs and benefits
  - Normative and general equilibrium questions
- Tractable general equilibrium analysis
  - Requires stark assumptions on bank individual behavior
- Understanding the determinants of such behavior is essential
Thank you
Overhang and risk-shifting

\[ \text{beta}_x = 1, \text{beta}_z = 2, z = 2.5, \mu_z = -2, \mu_x = 1, \sigma = 0.3, b = 0.20 \]
Lending response

Figure 3: Lending and lending response in the general case

\( \beta_x = 1, \beta_z = 2, z = 2.5, \mu_z = -2, \mu_x = 1, \sigma = 0.3, b = 0.20 \)