Comments by Rafael Repullo on

Financing Choices of Banks: The Role of Non-Binding Capital Requirements

by

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Introduction

• Empirical observation
  
  Banks hold more capital than required by regulation

• Question
  
  Why banks hold excess capital?

• Relevance
  
  Discussion of Basel II focused on minimum requirements

  Perhaps more important is what will happen with total capital
Introduction

• Existing explanations
  • Supervisory interference: Prompt corrective action
  • Market discipline: Keep good ratings
  • Preservation of future rents

• Gan’s explanation
  • Limited profitable investment opportunities
The model

• Bank’s balance sheet
  • Fixed capital $c > 0$
  • Endogenous (insured) deposits $d \geq 0 \rightarrow$ deposit rate = 0
  • Endogenous assets $a = c + d \rightarrow$ gross return = $R$

• Assumptions
  
  A1 Lognormal returns
  \[
  \log R = \mu - \frac{\sigma^2}{2} + \sigma z, \quad \text{with } z \sim N(0,1) \rightarrow E(R) = e^\mu
  \]

  A2 Shareholders are risk neutral and have zero discount rate

  A3 Capital requirement: $c \geq ka \iff a \leq c / k = \bar{a}$
Bank’s objective function

\[ \max V(a) = E[\max(\langle aR - (a - c), 0 \rangle)] + \pi \Pr[aR - (a - c) \geq 0] \]

profits  future rents

By the properties of the normal distribution

\[ V(a) = ae^\mu N(x) - (a - c)N(x - \sigma) + \pi N(x - \sigma) \]

\[ \rightarrow x = \frac{1}{\sigma} \log \frac{ae^\mu}{a - c} + \frac{\sigma}{2} \]
Three cases

- Investment in securities: $\mu = 0$
- Investment in loans: $\mu(a) > 0$, with $\mu'(a) < 0$
- Investment in both loans and securities

- Functional forms and parameter values
  
  $\mu(a) = 1 - \frac{a}{20}$ and $\sigma = 0.35$
Investment in securities

\[ \pi = 0 \quad \text{and} \quad \pi = 4 \]
Investment in loans

\[ V \]

\[ \pi = 4 \]

\[ \pi = 0 \]
Investment in loans and securities

- Return of a portfolio invested in loans ($\lambda$) and securities ($1-\lambda$)

\[ R = \lambda R_l + (1-\lambda) R_s \]

- Problem: sum of two lognormal variables is not lognormal

- Solution: assume

\[ \log R_l = \mu_l - \frac{\sigma^2}{2} + \sigma z \quad \text{and} \quad \log R_s = -\frac{\sigma^2}{2} + \sigma z \]

with the same $\sigma$ and the same $z \sim N(0,1)$ for both returns

- Then \[ \log R = \mu - \frac{\sigma^2}{2} + \sigma z \quad \text{with} \quad \mu = \log[\lambda e^{\mu_l} + (1-\lambda)] \]
Investment in loans and securities

\[
\begin{align*}
\max V(a, \lambda) &= ae^{\mu} N(x) - (a - c)N(x - \sigma) + \pi N(x - \sigma) \\
\rightarrow x &= \frac{1}{\sigma} \log \frac{ae^{\mu}}{a - c} + \frac{\sigma}{2} \\
\rightarrow \mu &= \log[\lambda e^{\mu(\lambda a)} + (1 - \lambda)]
\end{align*}
\]
Investment in loans and securities

\[ \pi = 12 \]

Interior solution

\[ \pi = 0 \]

Corner solution
Main comment

• If $c > ka$ shareholders may prefer to pay excess capital

• For $\pi = 0$ we have corner solution (i.e. binding requirements)

$$V(a, d) = ae^\mu N(x) - [a - (c - d)]N(x - \sigma) + d$$

$$\rightarrow \frac{\partial V}{\partial d} = 1 - N(x - \sigma) > 0$$

• For $\pi > 0$ we may have interior solution
Other comments

• For low $a$ shareholders would like to short-sell securities ($\lambda > 1$)
  → Intuition: same risk factor for both loans and securities

• Future rents should be endogenized
  → Bellman equation

$$V^* = \max_a [ae^{\mu N(x)} - (a - c)N(x - \sigma) + V^*N(x - \sigma)]$$
Concluding remarks

• Explanation of non-binding requirements is not convincing
  → Requires special distributional assumptions
  → Requires to rule out dividend payments

• Fall back to existing explanations

• Need to understand costs of raising (and reducing) bank equity