Bank Profitability and Risk-Taking

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Financial institutions after the crisis: facing new challenges and new regulatory frameworks

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Motivation

• Banks are leveraged $\rightarrow$ incentives for risk-shifting

• Shareholder value reduces risk-shifting
  
  – Profitability
  – Franchise value, Net worth
  – Capital
Motivation (cont’d)

• Experience from the crisis seems to contradict this

• Risk-taking in FIs with large and stable core business
  – Exposures to risky financial instruments
  – Massive loss of shareholder value

• Examples
  – UBS: wealth management return on allocated capital >30%
  – AIG: profitable insurer, AAA-rated
  – WaMu: dominant in consumer and small business operations

• Why FIs with substantial shareholder value took that much risk?
Mechanism

- “Usual” risk-shifting models: choose risk of a portfolio of a given size
- In practice: risky investments *alongside* stable, profitable core business

- Larger scale may offset lower incentives to take risk of a given size:
  - When easier to lever up (weaker regulation, better creditor rights)
  - With senior funding for risky investments (e.g. repos)
Model: Setup

- One bank with no initial capital, borrows to invest
- Three dates (0,1,2), no discounting, risk neutrality
Model: Investments

- **Core** project (soft information / relationships-based)
  - safe, profitable, limited scale
  
  \[ 1 \text{ at date 0 } \rightarrow R \text{ at date 2} \quad R-1>0 \text{ core profitability} \]

- **Market-based** investments (hard information)
  - scalable but less profitable
  
  **Safe** (e.g. treasury securities)
  
  \[ X \text{ at date 1 } \rightarrow (1+\varepsilon)X \text{ at date 2} \quad (\varepsilon>0) \]

  **Risky** (e.g. asset-backed securities)
  
  \[ X \text{ at date 1 } \rightarrow (1+\alpha)X \text{ w.p. } p \quad (\alpha>\varepsilon) \text{ or } 0 \text{ w.p. } 1-p \quad \text{ at date 2} \]

- **Abscond** (leverage constraint): after date 1, get \( b(1+X) \)
Model: Investments (cont’d)

- Risky market-based has negative NPV: \( p(1+\alpha) - 1 < 0 \)
  - but once funding is attracted, the expected return to shareholders is larger than from the safe: \( pa > \varepsilon \)

- Core project is not credit-constrained: \( R-1 \geq b \)

- Market-based investments are credit-constrained: \( pa < b \)

- The banker chooses whether to engage in risky market-based, and at which scale \( X \)
Model: Funding

- Two types of creditors
  - date 0: finance core project and charge \( r_0 \) (till date 2)
  - date 1: finance market-based investments and charge \( r_1 \)

- When risky market-based investment produces 0, bank is insolvent

  Assets’ liquidation value \( R \) (the value of the core project)
  \[
  \theta X \quad \text{goes to date 1 creditors}
  \]
  \[
  R - \theta X \quad \text{goes to date 0 creditors}
  \]

- Parameter \( \theta \) : relative seniority
  - high \( \theta \) means high seniority of date 1 creditors
    - bank “dilutes” pre-existing date 0 debt through higher seniority of date 1 debt
    - bank cannot commit not to issue senior debt or not to invest in markets
  - exogenous parameter = feasibility of senior debt
  - if endogenous, bank chooses highest possible \( \theta \)
Timeline

**Date 0**
- A bank attracts $l$ unit of funds at the interest rate $r_0$ to invest in the core project.

**Date 1**
- A bank attracts $X$ units of funds at the interest rate $r_1$ to undertake a market-based investment
- A bank can convert its assets into private benefits $b(l + X)$.

**Date 2**
- Projects returns are realized and distributed.
Risk-shifting

Requires that debt is not priced at the margin

• Date 0 funding:
  – Exogenous $r_0 = 0$ : deposit insurance
  – Endogenous $r_0$ : interest rate on date 0 debt is set before the bank makes the investment decision at date 1

• Date 1 funding:
  – Endogenous $r_1$ (e.g. credit provided by informed wholesale markets) and determined by break-even condition (i.e. no friction here)
Solving the model \((r_0 = 0)\)

- For \(X \leq R-1\): Bank never takes risk  
  (shareholders fully internalize the downside)

- For \(X > R-1\): Incentives to take risk 
  \[ p \left[ R-1 + (\alpha - r_1)X \right] > R-1 + \varepsilon X \]

  with 
  \[ r_1 = \frac{(1-p)(1-\theta)}{p} \]

Banker undertakes risky market-based investment only when 

1. its scale is large enough:  
   \[ X > X_{\text{min}} = \frac{(1-p)(R-1)}{p\alpha - \varepsilon - (1-p)(1-\theta)} \]

2. date 1 debt is sufficiently senior:  
   \[ \theta > \theta^* = 1 - \frac{p\alpha - \varepsilon}{1-p} \]
Solving the model (cont’d)

• Leverage constraint

\[ p \left[ R-1 + (\alpha - r_1)x \right] \geq b(1 + x) \]

with

\[ r_1 = \frac{(1-p)(1-\theta)}{p} \]

• Maximum scale of risky market-based investment

\[ X \leq X_{\text{max}} = \frac{p(R-1) - b}{b - p\alpha + (1-p)(1-\theta)} \]
Investment choice

• Exists $b^*$ small enough and $\theta^*$ high enough: for any $b < b^*$ and $\theta > \theta^* \rightarrow X_{\text{max}} > X_{\text{min}}$, so that the bank undertakes the risky market-based investment at scale $X_{\text{max}}$

$$b < b^* = \frac{(p(\alpha - \varepsilon) - (1 - p)(1 - \theta))(R - 1)}{(1 - p)(R - 1) + p\alpha - \varepsilon - (1 - p)(1 - \theta)}$$

• The bank takes risk when its ability to lever up is high (due to lax leverage constraint) and the market-based investment can be funded with cheap senior debt
Investment choice (cont’d)
Bank profitability and risk-taking

**Proposition**

Higher core profitability $\rightarrow$ bank more likely to undertake risky investment and at a larger scale ($\frac{\partial b^*}{\partial R} > 0$, $\frac{\partial X_{\max}}{\partial R} > 0$)
Debt seniority and risk-taking

Result

Risk taking increases when new debt is more senior:

\[ X(b) \]

\[ X_{\text{max}}(b, \theta) \]

\[ X_{\text{min}}(b, \theta) \]
Solving the model (endogenous $r_0$)

- Traditional risk-shifting model:
  \[ \uparrow r_0 \rightarrow \downarrow \text{core business profitability} \rightarrow \uparrow \text{risk-taking} \]

- Our model:
  \[ \uparrow r_0 \rightarrow \downarrow \text{core business profitability} \rightarrow \downarrow \text{bank’s borrowing capacity} \rightarrow \downarrow \text{incentives for risk-taking} \]

- Risk-mitigating $r_0$ VS. Endogenous $r_0$ (determined by date 0 depositors break-even condition)

- Date 0 creditors set the minimal interest rate such that they at least break even under correctly anticipated bank risk choices
Summary

• When a bank takes risk by leveraging up
  – Higher core profitability can increase risk-taking because allows the bank to borrow more
  – Environments where easier to lever up more affected (advanced economies / “better” creditor protection)
  – Senior funding (repos) drives risk-taking

• Consistent with evidence from the crisis

• Policy implications
Extensions

• Robust to explicit capital
  – equivalent to the effect of bank profitability

• Non-deterministic core project $\rightarrow$ bank exerts effort
  – access to a risky market-based investment increases bank’s incentives to exert effort in the core project

• Impact of monetary policy (via funding costs)
  – more accommodative monetary policy may have heterogeneous effects on overall bank risk-taking depending on the bank’s mix of activities
    • increases bank margins from fixed scale investments
      $\rightarrow$ higher effort in core business
    • increases the scale of potential market-based investments
      $\rightarrow$ higher incentives for risk-shifting
- Left panel shows the evolution of the interest rate required by date 0 creditors depending on $b$, for the following set of parameter values: $R=1.07$; $\varepsilon=0.02$; $\alpha=0.03$; $p=0.97$; $\theta=0.75$.
  - For $b^{**} \leq b \leq b^*$, $r_0^{{\text{Risk-Mitigating}}} < r_0^{{\text{Risky}}}$; date 0 creditors set $r_0=r_0^{{\text{Risk-Mitigating}}}$ and the bank chooses the safe market-based investment.
  - For $b < b^{**}$, $r_0^{{\text{Risky}}} < r_0^{{\text{Risk-Mitigating}}}$; date 0 creditors set $r_0=r_0^{{\text{Risky}}}$ and the bank chooses the risky market-based investment.

- Right panel shows the evolution of threshold $b^{**}$ depending on core profitability, $R$, and the feasible date 1 debt seniority, $\theta$, for the following set of parameter values: $\varepsilon=0.02$; $\alpha=0.03$; $p=0.97$. Higher $R$, as well as higher $\theta$, lead to a higher $b^{**}$, indicating a wider range of parameter values for which a bank undertakes the risky market-based investment.