Optimal Risk Weights

FIN 971B - Project

Alex von Hafften

UW-Madison

March 7, 2022

Motivation

- Banks create short-term, safe, and liquid liabilities (e.g. deposits) from long-term, risky, and illiquid assets (e.g. loans).

- Moral hazard (Kareken and Wallace 1978):

  - **Distorted incentives** from deposit insurance (i.e. limited liability) and expectations of ex-post bailout (e.g. too big to fail).

  - **Asymmetric information:** Regulators and depositors have less information about the riskiness of bank assets.

- Moral hazard leads banks to take on excessive credit risk resulting in bank failures hampering credit availability, financial stability, and economic activity (Romer and Romer 2017).

- **Broad research question:** How should bank regulation address moral hazard?

Risk-Weighted Capital Requirements

- To address moral hazard, banks are subject to risk-weighted capital requirements:

$$E \geq \mathbf{A} \cdot \mathbf{w}$$

  - E is shareholder equity (i.e. "capital") in the bank.
  - $\mathbf{A}$ is a vector of bank assets.
  - $\mathbf{w}$ is a vector of risk weights.

- The higher credit risk of asset A_i, the higher w_i.
  - e.g. $w_{\text{Treasury}} = 0$, $w_{\text{residential mortgage}} \approx 0.5$, and $w_{\text{corporate debt}} \approx 1.0$.

- A bank invested in Treasuries and mortgages has lower risk weighted assets and needs to hold less capital than a comparable bank invested in corporate debt.

- Risk-weighted capital requirements aim to address moral hazard by forcing banks to have 'skin in the game' and internalize the social costs of bank failures.

How to Calculate Risk Weights?

- Under Basel I (1988), "less informed" regulators set $\mathbf{w}^R$. (More)
  - ▶ **Benefit:** Simple and transparency.
  - ▶ **Cost:** Coarse risk weights led to distortions in credit allocation within bucket (Jones 2000).

- Under Basel II (2006), "more informed" banks could determine $\mathbf{w}^B$ using in-house models. (More)
  - ▶ **Benefit:** Banks have better information about their riskiness.
  - ▶ **Cost:** Bank have an incentive to under-report risk.
  - ▶ Behn, Haselmann, and Vig (forthcoming) find evidence of banks gaming risk weights. (More)

- Under Basel III (2011), banks use $\max\{\mathbf{A} \cdot \mathbf{w}^R, \mathbf{A} \cdot \mathbf{w}^B\}$.
  - ▶ Possibly a blunt way to address gaming by banks?

Research Question

- **Key tradeoff:** Banks have better information about their riskiness, but they have an incentive to under-report risk.

- **Specific research questions:**

  Given this trade-off between information and incentives,

  - How to design optimal risk weights (i.e. the risk weights that extract information about risks from the bank via its reporting)?

  - How far are Basel III risk weights from optimal risk weights?

Next Steps

Develop a two-period model in the spirit of Allen and Gale (2000) and Boyd and De Nicolo (2005):

- A bank maximizes shareholder return.

- The bank is funded by insured deposited and shareholder equity.

- The bank can invest the risky technology where the riskiness is unobservable to a regulator.

- Regulator impose risk-weighted capital requirements to achieve information-constrained planner solution.

- Extend to dynamic setting to incorporate reputation effects (in the spirit of Dovis and Kirpalani 2020).

Basel I Risk Weights

Risk Weight (%)	Asset types
0	Cash, bullion, Treasuries
20	MBS with AAA rating
50	Municipal bonds, residential mortgages
100	Corporate debt

The framework of weights has been kept as simple as possible and only five weights are used.

Basel (1988)

Back

Basel II Risk Weights

- The primary motivation for Basel II was to achieve greater sensitivity to credit risk across assets (Gordy and Heitfield 2012) using a "standardized approach" and an "internal-ratings based approach"

- "Standardized approach"
  - Similar to Basel I but with finer risk weight buckets.

- "Internal-ratings based approach"
  - Under the "internal-ratings based approach", banks estimate borrow-specific default probabilities and loans to borrowers with higher default probabilities receive higher risk weights (Behn, Haselmann, and Vig forthcoming).

  - Risk weights are computed using a variety of credit risk models (e.g. some banks run over 100 different models).

  - These models are designed and calibrated by banks and then the estimates are approved by the bank supervisor.

Back

Behn, Haselmann, and Vig (forthcoming)

- Use loan-level data from Germany to study the introduction of capital requirements using internal-rating based (IRB) risk weights.

- They find that banks systematically underreported risk.

- Banks with higher gains from under-reporting risks under-report risks more.

- Larger banks benefit from IRB more than smaller banks.

Back

References

Allen, Franklin and Douglas Gale (2000) "Comparing Financial Systems," Cambridge, MA: The MIT Press, Chapter 8.

Basel Committee on Banking Supervision (1988). "International Convergence of Capital Measurement and Capital Standards." https://www.bis.org/publ/bcbs04a.pdf

Basel Committee on Banking Supervision (2006). "Basel II: International Convergence of Capital Measurement and Capital Standards: A Revised Framework." https://www.bis.org/publ/bcbs128.htm

Basel Committee on Banking Supervision (2011). "Basel III: A global regulatory framework for more resilient banks and banking systems." https://www.bis.org/publ/bcbs189.htm

Behn, Markus, Rainer Haselmann, and Vikrant Vig (forthcoming). "The Limits of Model-Based Regulation." Journal of Finance.

Boyd, John H. and Gianni De De Nicolo (2005) "The Theory of Bank Risk-Taking and Competition Revisited", Journal of Finance, 60, p. 1329-43.

Gordy, Michael and Eric Heitfield (2012). "Risk-Based Regulatory Capital and Basel II," The Oxford Handbook of Banking (1 ed.) Edited by Allen N. Berger, Philip Molyneux, and John O. S. Wilson.

Romer, Christina, and David Romer "New Evidence on the Aftermath of Financial Crisis is Advanced Countries." American Economic Review 107 (10).