RISK-BASED CAPITAL FOR INSURANCE: AN ECONOMIC BASIS

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Background

- Analytical approach to RBC requires a risk measure
  - Examples are VaR, EPD, TVaR
  - Each is a measure of tail risk
- A risk measure must be calibrated
  - Example is Solvency II, with VaR = 99.5%
- For a given tail risk, calibrated RM provides the required capital amount
- However, both the choice of RM and its calibration in current practice are largely arbitrary, with no underlying economic foundation
- Can we do better than this?

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Yes We Can!

- Underlying economic basis for insurance establishes policyholder welfare approach to RBC
  - Developed while on AAA RBC Committee in 2008-2012
  - CAS RBC Dependency and Correlation Working Party
- Result is two papers, which serve as project reports:
- *An Economic Basis for Property-Casualty Insurance Risk-Based Capital Measures*
  - One-period model
  - Implications for regulation, corporate governance, pricing
- *Insurance Risk-Based Capital with a Multi-Period Time Horizon*
  - Extends results to multiple periods
  - Examines period length and other time-related factors

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A Basic Economic Tradeoff

- More capital is better for policyholders
  - But capital is costly, so insurer can't hold too much of it
  - Thus, in principle, there must be an optimal capital amount
- How do we find the optimal amount?
  - Do we need to specify a risk measure?
  - Or is the risk measure determined by the underlying economic assumptions?
- The key notion is how we value insurance
  - We can value complete protection from loss
  - Use same method to determine value the unprotected loss from insurer default

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The Value of Insurance

- Fundamental basis of insurance: policyholders are risk-averse
  - Therefore, they will pay more than expected value for coverage
  - The difference is the consumer value (consumer surplus)
- Risk-aversion can be quantified by an adjusted probability distribution
  - This formulation is the dual process for expected utility
  - The expected loss under the APD is called the certainty-equivalent loss ($L^\wedge$)
  - The CEL is the maximum the PH will pay for coverage
  - If the insurer charges the expected loss (L), the CV is $L^\wedge - L$

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Optimal Capital Amount

- One-period model with no expenses, inv. income, etc.
- Value of insurance contract is
  V = CEL – premium – CE value of default
- Premium = $L + zC$, where z is frictional capital cost rate
  - The premium compensates owners fairly
  - Both policyholders and insurer's owners are satisfied
- As C increases, premium goes up, but CED goes down
- So, there is an optimum value for C, obtained by the derivative of the insurance value V
- Example next

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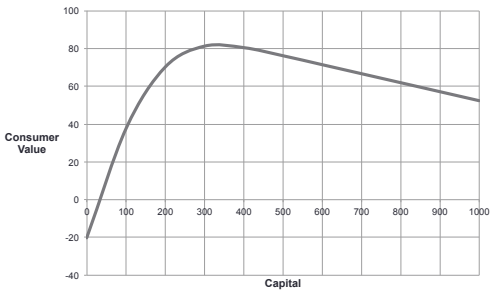
Optimal Capital Example



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The Proper Risk Measure

- Optimum occurs when the adjusted ruin (default) probability $Q^$ equals z
- $Q^$ is the proper risk measure
  - It is not arbitrary – it follows directly from the economic basis for insurance
  - The calibration is not arbitrary; it equals z
  - The FCC rate is essentially the cost of double taxation
- The proper risk measure is *none* of the conventional RMs
  - These RMs (VaR, EPD) give too little weight to extreme tail loss amounts
  - They do not consider the PH risk aversion to these events
- The subadditivity constraint (a coherent RM property) for RMs is unnecessary

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Implications for RBC

- Regulatory RBC will depend on optimal capital, but will be a lesser amount
- Several factors/variables not currently considered are important:
  - Individual behavior: risk aversion
  - Economic : interest rate
  - Government: guaranty fund participation, income tax rate
- Asset risk is modeled in same way as losses
  - Consumer value for asset risk is negative
  - Adjusted asset return is the risk-free rate

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RBC for Multiple Periods

- Debate over basis for multi-period RBC
  - Runoff approach uses ultimate loss volatility
  - Annual approach uses current year loss volatility
- Extend one-period model to more periods by incorporating
  - Stochastic loss development process
  - Dynamic capital funding strategy
  - Effect of technical insolvency and conservatorship
  - Cost of raising external capital
- Backward induction method extends model beyond two periods

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Results for Multi-period Model

- Optimal capital for multiple periods depends on *both* annual and ultimate time horizons
  - Losses develop to ultimate under conservatorship
- Thus, optimal capital amount is greater than under annual method
  - Optimal capital increases with horizon length
  - Capital-raising costs also increase initial optimal capital
- A shorter period length (capitalization interval) reduces optimal capital amount
  - Ability to raise and withdraw capital quickly reduces need for it
  - Access to capital markets is an important factor in determining optimal capital for an insurer

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Concluding Remarks

- Main purpose is to further our understanding of how to establish risk-based capital for insurance losses and assets
- Lots of work ahead to implement this analysis
  - Need research on risk preferences
  - Simulation models ideally suited
- Nevertheless, qualitative results can be used; examples
  - Compared to conventional risk measures:
    more capital is needed for high-risk losses
    less capital is needed for low-risk losses
  - Lines of business with more guaranty fund coverage require less capital
  - Insurers with limited ability to raise capital (e.g., small mutuals) need more RBC than large stock insurers