

Pricing for Insurance Risk

Module A: Introduction

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Created 2021-01-03 13:52:03



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A.01. Course Overview

Understand different approaches to pricing risk

- **Understand...**
 - Predict and explain behavior
- **... different approaches...**
 - Stand-alone vs. diversified
 - Traditional vs. distortion-based
- **... to pricing...**
 - Loading loss cost for risk
 - No expenses
- **... risk**
 - Thick-tailed vs. thin-tailed, cat vs. non-cat
 - Tail vs. volatility risk
 - One-year duration

Methodology

1. Construct realistic model portfolio
2. Calibrate variety of pricing methods
 - i. Traditional and distortion-based methods
 - ii. Calibrations derived from cat bond prices
 - iii. All methods calibrated to consistent returns
3. Compare results
 - i. Stand-alone vs. customary market pricing
 - ii. Gross vs. net
 - iii. Stand-alone vs. diversified, allocated multiline pricing

Questions

Pricing and Return Related

1. How does price vary with risk? With volatility vs. tail risk?
2. Can reasonable risk loads for non-cat lines be estimated from cat bond price data?
3. Are negative risk loads ever appropriate? Why? When?

Capital Structure and Reinsurance Related

4. Should all lines target the same return on capital (ROE)?
5. Should target ROE be calibrated to gross or net returns? Are the two the same?
6. Can the same distortion be used to price gross and net? All lines?
7. Is pricing in one line independent of reinsurance on other lines?

Findings

Pricing

1. Pricing across all methods aligns well with CV and tail risk measures
2. Pricing is sensitive to tail risk
3. By line pricing varies materially by method
4. Pricing calibrated to cat bond spreads is realistic
5. ROE of distortion-based pricing varies with risk, even on a stand-alone basis

Pooling and reinsurance

6. Relative pricing is consistent with effects of pooling by line
7. Cat risk leads to ineffective diversification in gross risk pool: cat lines benefits disproportionately from high-layer capital
8. Net pool exhibits effective diversification and more balanced returns

Applications

Methodology has many applications

- Optimal portfolio mix
- Optimal capital structure
- Optimal retention
- Optimal reinsurance
- By line or policy profit targets
- Strategy and business planning

Appendix A.I. About the Author

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About the Author: Stephen Mildenhall has worked in the insurance industry since 1992. Most recently, he was an Assistant Professor at St. John's University, New York. Between 2003 and 2016 he worked at Aon, including roles as Global CEO of Analytics for Aon plc and head of Aon Benfield Analytics. Previously, he was Vice President of Actuarial Pricing for Kemper Insurance. He began his career in 1992 at CNA, holding positions in CNA Re and CNA Personal Lines.

Steve is an FCAS, ASA, CERA, CSPA, and CCRMP. He earned his Masters and PhD degrees in Mathematics from the University of Chicago and a BSc in Mathematics from the University of Warwick in England.

Steve is a Board of the Casualty Actuarial Society and Chair of the CAS Audit Committee. He is a frequent speaker at professional meetings and industry events and is the author of several published papers in risk theory, the intersection of insurance and finance, and probability and statistics applications to reserving and rate-making problems.