

Stochastic Processes and Modeling in Financial Reporting and Capital Assessment

Agenda

- What is it?
- How has it been developed?
- Why?
- Target?
- The book!

Stochastic Processes and Modeling in Financial Reporting and Capital Assessment

- Provide a foundation of concepts
- General Methodology
 - Risk Neutral vs Real World
 - Techniques
 - Distributions and Fitting
 - Random Number Generation
 - Risk Measures
- Case Studies



How developed?

- Co-ordination by the IAA Insurance Accounting Committee and Actuarial Standards Subcommittee
- Sponsored by international Actuarial Groups
- Overseen by the Adhoc Project Oversight Group
- Authored by Milliman

How developed?

- Written by an international team
- Broad reviewed including
 - Adhoc Project Oversight Group
 - Universities
 - Practicing actuaries
 - Milliman internal processes

The IAA

- wants to present a professional international body whose members can provide stochastic modelling expertise to such organizations like the IASB on an internationally consistent manner.

Sponsorship

- The Actuarial Foundation (United States)
- Canadian Institute of Actuaries
- Casualty Actuarial Society
- Financial Reporting Section of the Society of Actuaries
- Het Actuarieel Genootschap (Dutch Actuarial Association)
- Institute of Actuaries of Australia

Ad hoc project oversight Group

- Representing Sponsors
 - David Finnis
 - Curtis Huntington
 - Ad Kok
 - Kerry Krantz
 - Scott McGaire
 - Susan Witcraft
- Accounting and Standards
 - David Congram
 - Francis Ruijgt
 - Sam Gutterman
- IAA
 - Katy Martin

Milliman Inc

Principle authors

- James G. Stoltzfus, FSA, MAAA
- Andrew Dalton, FSA, MAAA
- Mark R. Shapland, FCAS, ASA, MAAA
- Stephen A. Finch, FCAS, MAAA.

With a team of international consultants from
Asia, Europe and North America

Contributing Authors

Contributing authors have credentials from the following actuarial societies worldwide:

- Society of Actuaries (North America)
- Casualty Actuarial Society (North America)
- Institute of Actuaries (United Kingdom)
- Institute of Actuaries of Australia (Australia)
- Institute of Actuaries of Japan (Japan)
- Actuarieel Genootschap (Dutch Society of Actuaries)
- Schweizerische Aktuarvereinigung (Swiss Association of Actuaries)

Contributing Authors

Contributing authors hold the following advanced degrees or other professional credentials:

- PhD in Chemical Physics
- PhD in Financial Mathematics
- Master of Business Administration (MBA)
- Chartered Financial Analyst Charterholder (CFA)
- Global Association of Risk Professionals (FRM)
- Chartered Enterprise Risk Analyst (CERA)

Why?

- Needed for financial reporting.
- Development of new solvency techniques, like Solvency II, calling for this approach.
- Use in stress testing of financial institutions after the financial crisis.
- Demand for a consistent professional international approach.

Targetted?

- At students and practicing actuaries CPD.
- Practical guide
- Case studies have been the differentiator

The Book – General Outline

Divided into Five Sections:

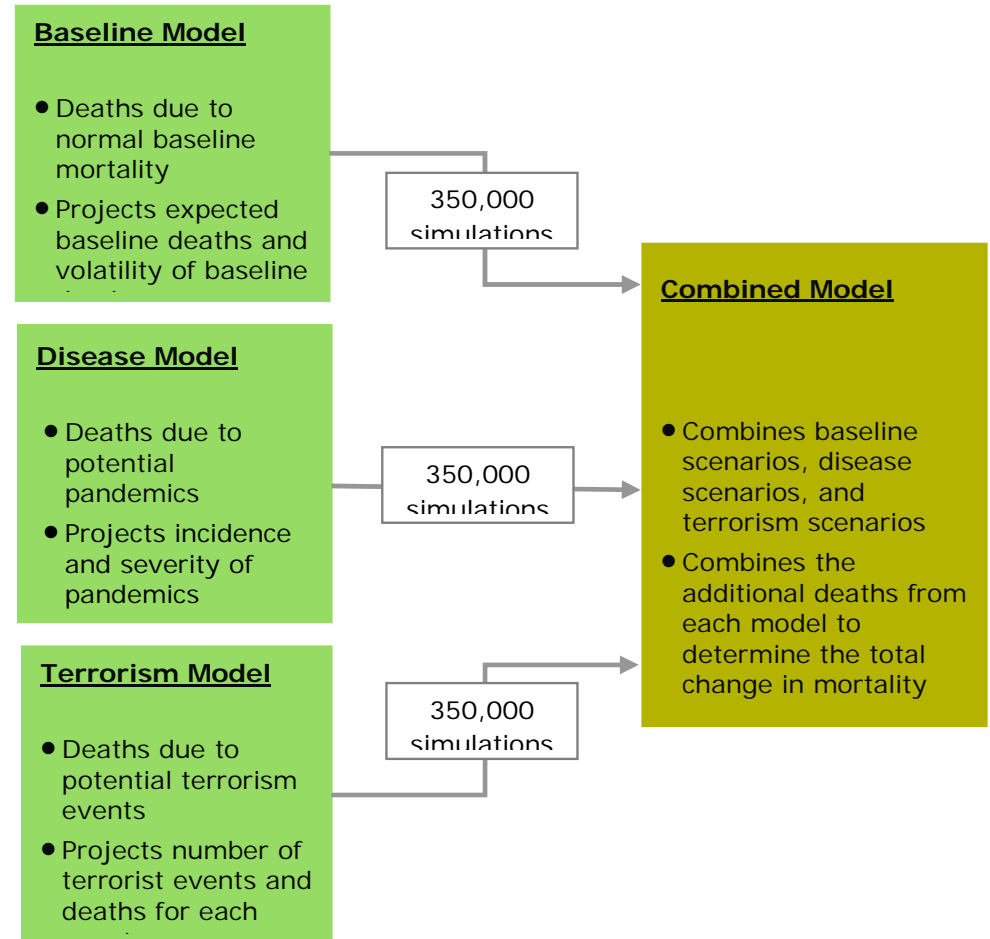
1. General Methodology & Techniques
2. Applications of Stochastic Modeling
3. Evaluation and Communication of Stochastic Results
4. Case Studies
5. Technical Appendix & References

The Book - Structure

- Each section builds on the previous one
 - Section I provides fundamental technical background material
 - Section II applies the technical material developed in Section I to insurance models
 - Section III discusses practical considerations related to the models presented in Section II
 - Section IV:
 - Illustrates the real-world application of models developed in Sections I - III
 - Brings the entire book together
 - Serves as capstone learning experience
 - Provides a link between purely academic material and how actuarial science is practiced

The Book - Structure

- The case studies illustrate concepts from Sections I – III and rely heavily on the theoretical material developed in the earlier sections of the book.
- For example, a detailed mortality model is presented in Section II:



The Book - Structure

- The same mortality model is used in the case study regarding Economic Capital development for a life insurance company:

IV.B.5.c Mortality

The mortality scenarios were developed using the mortality model described earlier in the monograph. Interested readers can find the full details in Section II.D.1.

In the present case study, we generated 30,000 random numbers to create 1,000 scenarios, each with a 30-year projection horizon. The results of the analysis generated mortality scaling factors that were applied to actual mortality. This process was used for all lines of business in which stochastic mortality was reflected.

The Book – Details on Section I

Section I (General Methodology & Techniques):

- Risk-Neutral vs. Real World Scenarios
- Modeling Techniques
 - Stochastic vs. Non-Stochastic Methods
 - Monte Carlo Simulation
 - Lattice Models
 - Regime Switching Models
- Distributions and Fitting
- Random Number Generation
- Risk Measures

The Book – Details on Section II

Section II (Applications):

- Economic scenario generation
- Capital testing
- Deflators
- Life/Health models
- Non-Life Claim/Financial models
- Country/Region Specific Issues

The Book - Applications

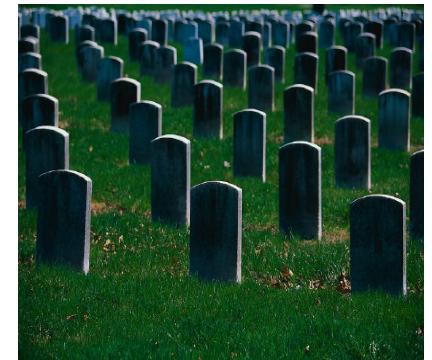
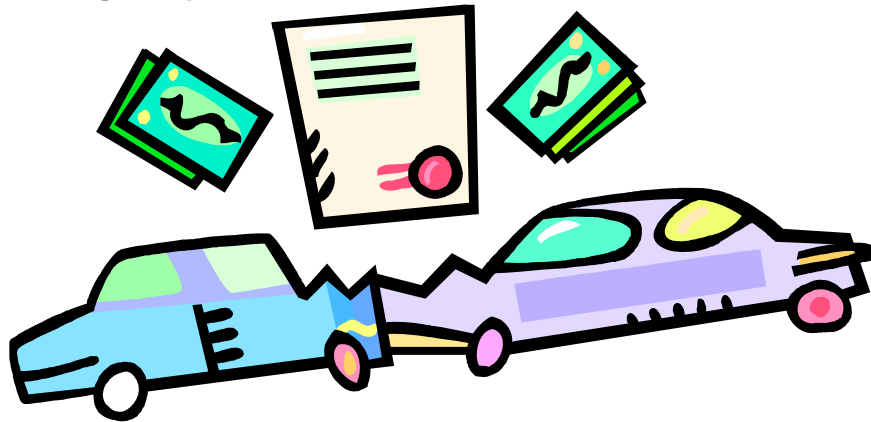
- Economic Scenarios
 - Interest Rates
 - Focus on Methods with Sample Parameterizations
 - Exchange Rates
 - Equity Returns
 - Credit Risks
 - Inflation
 - Other



The Book - Applications

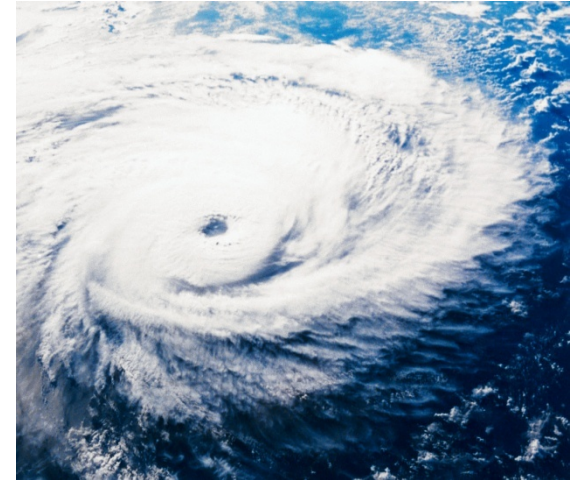
- Policyholder Behavior

- Mortality
- Lapse
- Morbidity
- Claims Experience
- Other



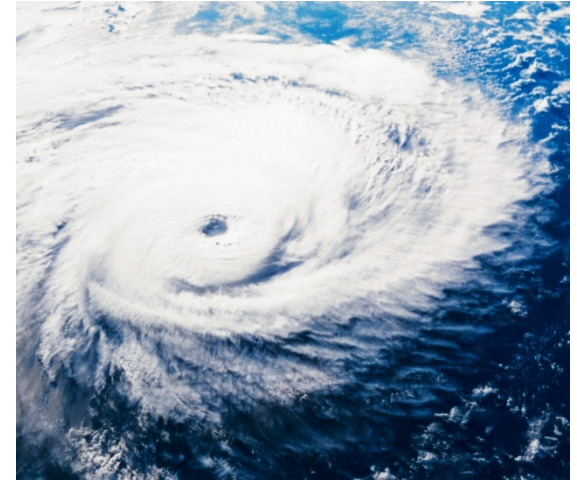
The Book - Applications

- Casualty Models
 - Aggregate
 - Intermediate
 - Individual
 - Retrospective vs Prospective Risk
 - Reinsurance



The Book - Applications

- Casualty Financial Models
 - Capital Adequacy
 - Reinsurance
 - Product Management
 - ALM
 - Unemployment/GDP/Inflation



The Book - Applications

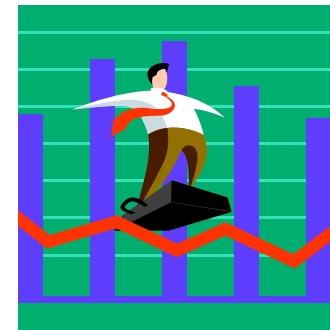
- Accounting Frameworks
- Capital Testing including Nested Stochastics
- Deflators
- Country and Region Specific Issues
- Other Issues – Health and Trends



The Book – Details on Section III

Section III (Evaluation and Communication):

- Calibration
- Validation
- Auditing results
- Peer reviewing results
- Methods to communicate results



The Book – Details on Section IV

Section IV (Case Studies):

- Development and management of a variable-annuity product
- Economic capital for a multi-line life insurance company
- Development of Embedded Value for a multi-line life insurance company
- Unpaid claim variability for a multi-line non-life insurance company
- Economic Capital for a multi-line non-life insurance company
- Combining Economic Capital results for life and non-life companies
- Stochastic reserve and capital calculations

The Book – The Case Studies

- Case studies presented in Section IV:
 - Touch on a wide variety of actuarial specialties:
 - Life insurance and financial services
 - Health insurance
 - Non-Life insurance
 - Address most of the risk factors developed in Sections I – III:
 - Economic scenarios
 - Claims scenarios
 - Lapse/mortality scenarios
 - Illustrate use of the risk measures developed in Sections I – III
 - VaR
 - CTE
 - Greatest Present Value of Accumulated Deficiency

The Book – The Case Studies

- Essential Component of Monograph
- Development of Simple Illustrative Spreadsheet Tools to Assist Readers (available on a website with limitations)
- Many of the processes/techniques are applicable for multiple purposes
- For example, interest rate generators would be used for regulatory filings, development of economic capital,



The Book – The Case Studies

- Discuss Scenario Generation
- Aggregation of Risks
- Policyholder Behavior
- Financial Reporting
- Validation of Results
- Review
- Communication



The Book – References

- List of Sources available for further study
- Websites and Printed Material

