Risk Analysis and Valuation of Life Insurance Contracts
Combining Actuarial and Financial Approaches

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Agenda

- Traditional life insurance products
- Model and Methodology
- Conclusion
Traditional life insurance products

• Often equipped with minimum interest rate guarantees

• Types of guarantee
  – point-to-point guarantee → only relevant at maturity
  – cliquet guarantee → relevant on a year-by-year basis

• Plus some additional surplus participation
  – regular and terminal surplus participation
The paper’s title

• Valuation:
  – use risk-neutral valuation

• Risk Analysis:
  – investigate the (real-world-) risk exposure

• Combination:
  – [Barbarin and Devolder, 2005] propose a methodology of combining above paradigms
What’s new?

• Extension to cliquet guarantees

• Discuss methodology proposed by [Barbarin and Devolder, 2005]
  – when does it work in practice?

• Derivation of risk-minimizing asset allocations
  – what is a ‘good’ risk-measure?
Agenda

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Model and Methodology

• Financial market:
  – Gaussian framework modeling stochastic interest rate and stock markets

• Insurer’s assets:
  – Stocks, bonds and cash
Model and Methodology

• Liabilities:
  – point-to-point guarantee
  – cliquet guarantee
  • minimum surplus participation according to German regulatory framework
  • model mirroring actually applied surplus policy
Model and Methodology

• Proposed methodology works fine in arbitrage-free market

• Yields following pricing approach:
  – Determine risk-minimizing asset allocation
  – Adjust terminal bonus participation rate to ensure fair contract
Model and Methodology

• Determine risk-minimizing asset allocation
  
  – using a heuristic search algorithm based on Evolution Strategies
Pitfalls

• Which risk measure to choose?
Pitfalls

- Which risk measure to choose?
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Conclusion

• Proposed methodology allows for extension to cliquet guarantees and works fine given absence of arbitrage

• Optimal asset allocations vary dramatically using different risk measure
  – wrong incentives applying inappropriate risk-measure?
Thanks for your attention

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