Program of the course "Life Insurance"

Mark Kelbert

Approved by

the academic council of the program

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Author	Mark Kelbert
Credits	3
Contact hours	40
Self-study hours	74
Course	1

1 Introduction

Apart from the introduction into the standard actuarial theory, this course handles various methods of solving popular problems of life insurance that are relevant for actuarial practice, for instance, the Tiele equations in Markovian environment, CLT for order statistics in Demography, analysis of mortgate-link or index-linked insurance policies. All methods, considered in this course, require only few assumptions about the probabilistic properties of the model, from which the data is obtained. The course reflects the state-of-the-art in actuarial risk theory. In addition to basic topics which are compatible with official material of actuarial education in UK and other parts of the world, the course contains important material on topics that are relevant for recent insurance and actuarial developments including the credibility theory, reserving, ranking of risks in life-insurance, modelling dependencies and the use of generalized linear models, as well as $PH-$type distributions with an eye on applications to the life insurance. The mathematical background assumed is on a level such as acquired in the bachelors programs in quantitative economics or mathematical statistics: Calculus, Probablity Theory and Mathematical Statistics.

2 Content

-1. Survival functions and Mortality Rate
-2. Principles of construction of Life Tables
-3. Deterministic and stochastic population models
-4. Order statistics in Demography
-5. CLT for order statistics
-6. Endowment, Pure Endowment and Term Assurances
-7. Reserves and Tiele equations
-8. Tiele equations in Markovian environment

-9. Mortgage linked, index-linked policies and other financial instruments
-10. Phase type distributions in Life Insurance
-11. Combined models of Life-Health-Pension Insurance
-12. Elements of Credibility Theory

3 Recommended literature

Main list.
1. M.Kelbert, Insurance Mathematics by Problems and Examples, MCCME. 2019 (in press)
2. R. Kaas, H. Goovaerts, J. Dhaeue, M. Denuit. Modern Actuarial Risk Theory, Springer 2002
https://link.springer.com/book/10.1007/b109818

Additional literature
1. A.Gupta, T.Varga, An Introduction to Actuarial Mathematics, Springer, 2002
https://link.springer.com/book/10.1007/978-94-017-0711-4
2.S. Klugman, Bayesian Statistics in Actuarial Science with Emphasis on Credibility, Springer
https://link.springer.com/book/10.1007/978-94-017-0845-6

4 Student evaluation

The final evaluation grade of the students is calculated according to the formula:

$$\begin{aligned}&[\text{Final mark}] = 0.3 \times [\text{cumulative mark for the work during the modulus}]\\ &+0.3 \times [\text{mark for the intermidiate written test }]\\ &+0.4 \times [\text{mark for the final test}].\end{aligned}$$

The cumulative mark for the work during the modulus is based on the mark for the home tasks and on the activity during the seminars.