University of St.Gallen

Course and Examination Fact Sheet: Spring Semester 2025

8,192: Introduction to Life Insurance

ECTS credits: 4

Overview examination/s

(binding regulations see below)
decentral - Written examination, Analog, Individual work individual grade (100%, 90 mins.)
Examination time: Term time

Attached courses

Timetable -- Language -- Lecturer
8,192,1.00 Introduction to Life Insurance -- English -- Rach Manuel

Course information

Course prerequisites

Basic knowledge (Bachelor know-how) in finance, mathematics and stochastics/statistics.

Learning objectives

Upon leaving this course, students will be able to

- Price private life insurance and annuity products, including products with multiple decrements and multiple policyholders
- Apply stochastic mortality models to predict the future development of mortality over time
- Assess risk reduction techniques in life insurance and determine the appropriate risk capital

Course content

This course provides an introduction to life insurance, considering both the policyholders' and the insurers' perspectives. We will particularly focus on the pricing of different life insurance and annuity products as well as mortality models and risk management in life insurance. The course keeps the mathematical depth (derivations and proofs) at a moderate level in order to make room for applications, examples, and exercises.

Course structure and indications of the learning and teaching design

The course consists of lectures which mainly transfer knowledge, in which students are invited to participate actively. Furthermore, there will be regular exercise sheets for the students to solve on a voluntary basis. The solution to (some of) these exercises will then be presented and discussed in the lectures. Solving the exercise sheets during the semester is highly recommended for passing the exam.

Tentative course structure:

Chapter 1: Introduction

- Fundamentals of insurance
- Swiss pension system
- Important life insurance and annuity products

Chapter 2: Premium calculation

- Mortality laws
- Actuarial present values
- Equivalence principle

Chapter 3: Generalization of life insurance contracts to multiple states

- A brief introduction to Markov processes
- Contracts with multiple decrements (such as cancellation and disability)
- Contracts with multiple policyholders (such as modern tontines, annuities for couples and life insurance on the first death)

Chapter 4: Stochastic mortality modeling

- Lee-Carter model and Cairns-Blake-Dowd model
- Projection of future mortality via trend processes
- Modeling multiple populations

Chapter 5: Risk Management in Life Insurance

- Risks in life insurance and risk reduction techniques
- Risk assessment according to the Solvency II standard formula

Course literature

- Lecture notes
- Additional literature (helpful, but not required):
    - Milevsky, M.A. (2006): *The Calculus of Retirement Income: Financial Models for Pension Annuities and Life Insurance.* Cambridge University Press.
    - Milevsky, M. A. (2020). Calibrating Gompertz in reverse: What is your longevity-risk-adjusted global age?. *Insurance: Mathematics and Economics*, 92:147-161.
    - David C.M. Dickson, Mary R. Hardy and Howard R. Waters: *Actuarial Mathematics for Life Contingent Risks*. International Series on Actuarial Science. Cambridge University Press, 2009. Third Edition (2020).
    - Lee, R. D. and Carter, L. R. (1992). Modeling and forecasting US mortality. *Journal of the American statistical association*, 87(419):659–671.
    - Cairns, A. J., Blake, D., and Dowd, K. (2006). A two-factor model for stochastic mortality with parameter uncertainty: theory and calibration. *Journal of Risk and Insurance*, 73(4):687–718.

Additional course information

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Examination information

Examination sub part/s

1. Examination sub part (1/1)

Examination modalities

Examination type	Written examination
Responsible for organisation	decentral
Examination form	Written exam
Examination mode	Analog
Time of examination	Term time
Examination execution	Synchronous
Examination location	On Campus
Grading type	Individual work individual grade
Weighting	100%

Duration 90 mins.

Examination languages
Question language: English
Answer language: English

Remark
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Examination-aid rule
Closed Book

The use of aids is prohibited as a matter of principle, with the exception of pocket calculator models of the Texas Instruments TI-30 series and, in case of non-language exams, bilingual dictionaries without any handwritten notes. Any other aids that are admissible must be explicitly listed by faculty members in the paragraph entitled “Supplementary aids” of the course and examination fact sheet; this list is exhaustive.

Procuring any aids, as well as ensuring their working order, is the exclusive responsibility of students.

Supplementary aids

None, except listed under Examination-aid rule

Examination content

All course contents / topics treated in class

Examination relevant literature

Lecture notes (i.e. slides, additional notes made during lectures and exercise sheets)

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Please note

Please note that only this fact sheet and the examination schedule published at the time of bidding are binding and takes precedence over other information, such as information on StudyNet (Canvas), on lecturers' websites and information in lectures etc.
Any references and links to third-party content within the fact sheet are only of a supplementary, informative nature and lie outside the area of responsibility of the University of St.Gallen.

Documents and materials are only relevant for central examinations if they are available by the end of the lecture period (CW21) at the latest. In the case of centrally organised mid-term examinations, the documents and materials up to CW 13 (Monday, 25 March 2025) are relevant for testing.

Binding nature of the fact sheets:

- Course information as well as examination date (organised centrally/decentrally) and form of examination: from bidding start in CW 04 (Thursday, 23 January 2025);
- Examination information (supplementary aids, examination contents, examination literature) for decentralised examinations: in CW 12 (Monday, 17 March 2025);
- Examination information (supplementary aids, examination contents, examination literature) for centrally organised mid-term examinations: in CW 14 (Monday, 31 March 2025);
- Examination information (regulations on aids, examination contents, examination literature) for centrally organised examinations: two weeks before ending with de-registration period in CW 15 (Monday, 07 April 2025).