Actuarial Mathematics II
MTH5125

Introduction

Dr. Melania Nica

Spring Term

Administrative Issues

- Lecturer
  - Dr. Melania Nica
  - E-mail: m.nica@qmul.ac.uk
  - Office: 226, Maths Building

Administrative Issues

- Textbooks
  - Dickson, D., Hardy, M. and H. Waters: Actuarial Mathematics for Life Contingent Risks, 3rd edition, Cambridge University Press
  - Solution Manual for Actuarial Mathematics for Life Contingent Risks
- Lecture Slides, Exercises, Case Studies posted on QMPlus

Administrative Issues

- 70%: Examination in May/June
- 30%: Two Assessments
  - set in Week 6 and Week 9
  - analytical and Excel questions

What will we study?

- Actuarial mathematics that underlies the operation of a life assurance company.
- For a range of different types of insurance policy:
  - How premiums are calculated
  - What reserves the insurance company should hold
  - How profits can be measured
- More complicated policies that depend on the mortality/survival of two lives
- Introduction to actuarial mathematics used in pensions and in health insurance
- Policies where amount assured depends on investment returns.

Topics

- Some revision from Actuarial Maths 1
- Premiums and Reserves
- Multiple Transitions
- Multiple Decrements

Topics

- Two Lives Functions
- Projected Future Cashflow Techniques
- Unit Linked Reserves

Preliminaries

An *insurance contract* is an agreement between two parties:

- the insurer agrees to pay for insurance benefits;
- in exchange for insurance premiums to be paid by the insured.

Preliminaries

An insurance policy is funded by contract premiums:

- once (single premium) made usually at time of policy issue, or
- a series of payments (usually contingent on survival of policyholder) with first payment made at policy issue

Premiums need to to cover:

- the benefits,
- expenses associated with initiating/maintaining contract,
- profit margins, and
- deviations due to adverse experience.

Preliminaries

Net premiums (called also benefit premiums)

- considers only the benefits provided
- nothing allocated to pay for expenses, profit or contingency margins

Gross premiums (called also expense-loaded premiums)

- cover the benefits and includes expenses, profit or contingency margins

Preliminaries

Peter Drucker, The Economist, 1999

By providing financial protection against the major 18th and 19th century risk of dying too soon, life assurance became the biggest financial industry [...] Providing financial protection against the new risk of not dying soon enough may well become the next century's major and most profitable financial industry.

How to set up premiums?

Principle of equivalence:

- Zero net random future loss for the insurer

PV at time of issue, of future benefits to be paid by the insurer = PV at time of issue, of future premiums to be paid by the insured.