UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

COURSE SYLLABUS

Statistics for Insurance

2223-2-F1601M065-F1601M076M

Learning objectives

The aim of the module of Statistics for Insurance is to introduce a coherent set of theoretical/practical competencies with the purpose of

- providing the foundation of the (non-life) insurance risk theory, based on statistical models
- introducing the principal methodologies for its assessment,
- presenting the R software framework, to acquire the ability of implementing theoretical concepts and applying them on real datasets, as required in the actuarial field.

The aim is also to allow students to be in touch with experts from actuarial and insurance firms. To this aim, seminars are organized to meet insurance experts, illustrating and discussing up-to-date issues in the field.

Contents

After a preliminary review, needed in order to consolidate earlier concepts, the course addresses the following statistical issues quite up-to-date for Insurance Companies operating in the Casualty sector:

a) the estimation of the correct assessment of reserves, discussing the various theoretical models for the losses - and their counts- and comparing their results.

b) some elements of ruin theory

c) the evaluation of premiums for customized tariffs, also in view of an expansion of market share.

Detailed program

With reference to the chapters of Wuthrich's book:

1. Introduction
1.1 Nature of non-life insurance
1.2 Probability theory and statistics

2. Collective Risk Modeling
2.1 Compound distributions
2.2 Explicit claims count distributions
2.3 Parameter estimation

3. Individual Claim Size Modeling
3.1 Data analysis and descriptive statistics
3.2 Selected parametric claims size distributions
3.3 Model selection
3.4 Calculating within layers for claim sizes

5. Ruin Theory in Discrete Time
5.1 Net profit condition
5.2 Lundberg bound
5.4 Subexponential claim sizes

7. Tariffication and Generalized Linear Models
7.1 Simple tariffication methods
7.2 Gaussian approximation
7.3 Generalized linear models

9. Claim reserving
9.1 Outstanding loss liabilities
9.2 Claim reserving Algorithms
9.3 Stochastic metods for Claim reserving

The course material also covers the following topics (with lectures and R code available on the e-learning web site)

- The examples, developed in R language for Individual Claim Size Modeling e Collective Risk Modeling
- the development of Pricing Insurance Contracts in R”

Prerequisites

Basic knowledge of probability theory, calculus and Inferential Statistics.

Teaching methods

Frontal lectures, integrated by lab activities developed in R language. Students are solicited to answer to some homework requests, to deepen their comprehension of the lectures.

Assessment methods

Written exam, with four/five opne questions on the topic of the course. Each student will develop a homework on insurance data with the software R, by applying one of the topic of the lectures.

Textbooks and Reading Materials

Non-Life Insurance: Mathematics and Statistics, M.V. Wuthrich, ETH Zurich
Modern Actuarial Risk Theory using R, R.Kaas, M.Goovaerts, J.Daene and M.Denuit, Springer

Semester

First semester

Teaching language

English

Sustainable Development Goals

INDUSTRY, INNOVATION AND INFRASTRUCTURE | SUSTAINABLE CITIES AND COMMUNITIES