ST348-15 Risk Theory

25/26

Department
Statistics
Level
Undergraduate Level 3
Module leader
Larbi Alili
Credit value
15
Module duration
10 weeks
Assessment
Multiple
Study location
University of Warwick main campus, Coventry

Description

Introductory description

This module is available for students on a course where it is a listed option. It is **not** available as an Unusual Option to students with their home department outside Statistics.

Prerequisites

Statistics Students: Completion of Year 1 and Year 2 core modules.

Non-Statistics Students: ST120 Introduction to Probability and ST227 Stochastic Processes and ST232/ST233 Introduction to Mathematical Statistics.

Useful background. Students taking this module may benefit from taking ST350 Measure Theory for Probability or MA359 Measure Theory since it may help students comprehend or learn the material more effectively but is not required to study this module.

Results from this module may be partly used to determine exemption eligibility in the Institute and Faculty of Actuaries modules CM2, CS1, and CS2. (Independent application with the IFoA may be required to receive the exemption.)

Module web page

Module aims

To cover the parts of the syllabus for CM2 Financial Engineering and Loss Reserving, CS1 Actuarial Statistics 1, and CS2 Risk Modelling and Survival Analysis.

Outline syllabus

This is an indicative module outline only to give an indication of the sort of topics that may be covered. Actual sessions held may differ.

Decision theory and Bayesian estimation.
Loss distributions and resinsurance contracts.
Aggregate claims distributions.
Introduction to copulas.
Ruin theory.
Run-off triangles.
Generalized linear models.
Time series.
Simulation of a stochastic process.
Credibility Theory

Learning outcomes

By the end of the module, students should be able to:

- Know how probability models are used in general insurance.
- Understand the concept of methods of re-insurance to hedge against risk.
- develop the mathematical skills and statistical techniques of particular relevance to general financial work and insurance.
- calculate central moments of claim distributions (with limits and risk sharing arrangements).
- calculate insurance premiums and reserves, as well as derive Bayesian estimators and credibility premiums.
- study other professional actuarial subjects in the Core Application and Specialist Technical areas.

Indicative reading list

Reading lists can be found in Talis

Specific reading list for the module

Subject specific skills

- Evaluate mathematical and/or statistical techniques.
- Create structured and coherent arguments communicating them in written form.
- Construct and develop logical mathematical arguments with clear identification of assumptions and conclusions.
- Communicate subject-specific information effectively and coherently.
- Evaluate data/problems, including potentially conflicting or incomplete information, abstract

essential information and formulate an appropriate analysis/solution strategy using appropriate mathematical language and pursue these strategies through a complete solution cycle.

Transferable skills

- Critical thinking: extracting patterns from incomplete data and using them to form evidence-based conclusions.
- Problem solving: use of logical reasoning to build arguments grounded in evidence and with explicit underlying assumptions.
- Self-awareness: monitoring of your own learning and seeking feedback.
- Communication: verbal discussion of ideas in seminars and among peers; written communication in assignments and the final project.
- Information literacy: evaluation of data and uncertainty in a model-based way.
- Digital literacy: use of computational tools to understand and visualise data, and to produce reports. - Professionalism: self-motivation, taking charge of your own learning, and prioritising effectively.
- Ethics: reflect on professional responsibilities as a statistician in conjunction with the generation and dissemination of information.

Study

Study time

Type	Required	Optional
Lectures	30 sessions of 1 hour (20%)	2 sessions of 1 hour
Tutorials	9 sessions of 1 hour (6%)	
Private study	81 hours (54%)	
Assessment	30 hours (20%)	
Total	150 hours	

Private study description

Weekly revision of lecture notes and materials, wider reading, practice exercises and preparing for class tests and the examination.

Costs

No further costs have been identified for this module.

Assessment

You do not need to pass all assessment components to pass the module.

Assessment group D1

	Weighting	Study time	Eligible for self-certification
Class Test	10%	15 hours	No
A class test taken during the term covering a range of material from the module.			
Computer-based class test	10%	15 hours	No
A computer-based class test taken during the term covering a range of material from the module.			
Centrally-timetabled examination (On-campus)	80%		No
Answer ALL questions.			

- Answerbook Pink (12 page)
- Students may use a calculator
- Cambridge Statistical Tables (blue)

Assessment group R1

	Weighting	Study time	Eligible for self-certification
On-campus Examination	100%		No
Answer ALL questions.			

- Answerbook Pink (12 page)
- Students may use a calculator
- Graph paper
- Cambridge Statistical Tables (blue)

Feedback on assessment

Feedback on Class Test 1 will be returned after 2 weeks, and feedback on Class Test 2 will be returned after 3 weeks, following each test.

Solutions and cohort level feedback will be provided for the examination.

Past exam papers for ST348

Availability

Anti-requisite modules

If you take this module, you cannot also take:

- ST402-15 Risk Theory

Courses

This module is Optional for:

- USTA-G300 Undergraduate Master of Mathematics,Operational Research,Statistics and Economics
    - Year 3 of G300 Mathematics, Operational Research, Statistics and Economics
    - Year 4 of G300 Mathematics, Operational Research, Statistics and Economics

This module is Option list A for:

- Year 3 of USTA-G300 Undergraduate Master of Mathematics,Operational Research,Statistics and Economics
- Year 4 of USTA-G1G3 Undergraduate Mathematics and Statistics (BSc MMathStat)
- Year 3 of USTA-GG14 Undergraduate Mathematics and Statistics (BSc)
- Year 4 of USTA-GG17 Undergraduate Mathematics and Statistics (with Intercalated Year)
- Year 3 of USTA-Y602 Undergraduate Mathematics,Operational Research,Statistics and Economics
- Year 4 of USTA-Y603 Undergraduate Mathematics,Operational Research,Statistics,Economics (with Intercalated Year)

This module is Option list B for:

- UMAA-G105 Undergraduate Master of Mathematics (with Intercalated Year)
    - Year 4 of G105 Mathematics (MMath) with Intercalated Year
    - Year 5 of G105 Mathematics (MMath) with Intercalated Year
- Year 3 of USTA-G300 Undergraduate Master of Mathematics,Operational Research,Statistics and Economics
- Year 3 of UMAA-G100 Undergraduate Mathematics (BSc)
- UMAA-G103 Undergraduate Mathematics (MMath)
    - Year 3 of G100 Mathematics
    - Year 3 of G103 Mathematics (MMath)
    - Year 4 of G103 Mathematics (MMath)
- Year 4 of UMAA-G107 Undergraduate Mathematics (MMath) with Study Abroad
- Year 3 of USTA-G1G3 Undergraduate Mathematics and Statistics (BSc MMathStat)
- Year 4 of USTA-G1G4 Undergraduate Mathematics and Statistics (BSc MMathStat) (with Intercalated Year)

- Year 4 of UMAA-G101 Undergraduate Mathematics with Intercalated Year

This module is Option list F for:

- Year 4 of USTA-G300 Undergraduate Master of Mathematics,Operational Research,Statistics and Economics