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Building 26C
refer to the ANU Campus Map
(map GH32, reference G3)

Course Outline

STAT3035/STAT8035 Risk Theory

Semester 1, 2012

STUDENTS: Course details change from semester to semester. ***Please check*** *that you are reading the Course Outline for the correct semester.*

Course Description

This course introduces the theory of compound Poisson processes, with an emphasis on application to insurance portfolios (though their applicability in other areas is also noted)

Topics include: Modelling loss distributions; Skewed parametric distribution families; Method of moments, method of percentiles and maximum likelihood estimation; Pearson goodness-of-fit testing for distribution assessment; Truncated and censored data, including applications to reinsurance and policy excess schemes; Random sums, convolutions and compound distributions, particularly for modelling aggregate claim distributions; Normal and gamma approximations to compound distributions; Compound Poisson process theory, including applications to insurance portfolio surplus processes; Ultimate and finite-time ruin probabilities; Adjustment coefficients and optimal reinsurance contracts.

Graduate Studies Select Classification: Advanced and Specialist.

Contacts

Role	Office	Email	Telephone	Consultation Times
Course Convenor / Authority and Lecturer *Steven Stern*	Room 3.65 CBE Building	Steven.Stern@anu.edu.au	6125-3370	Any time, except lunch, and lecture times
Tutor/s *Xu Shi*	TBA	TBA	TBA	TBA
FAS School Manager *Tracy Skinner*	Room 4.48 CBE Building	Tracy.Skinner@anu.edu.au	6125-0487	NA

Communication

Email

If necessary, the lecturers and tutors for this course will contact students on their official ANU student email address. Information about your enrolment and fees from the Registrar and Student Services' office will also be sent to this email address.

Announcements

Students are expected to check the Wattle site for announcements about this course, e.g. changes to timetables or notifications of cancellations. Notifications of emergency cancellations of lectures or tutorials will be posted on the door of the relevant room.

Course URLs

More information about this course may be found on:

- Study @ ANU,
- the College of Business and Economics website, and
- Wattle, the University's online learning environment. Log on to Wattle using your student number and your ISIS password.

Course Information

Basic Outline of Course Topic Areas

The primary subject of Risk Theory (STAT3035/8035) is the development and study of mathematical models to describe and predict the behaviour of insurance portfolios, which are generally modelled using random sums and compound jump processes, ideas which are introduced in any introductory course on Stochastic Processes (such as STAT3004/STAT7018). These portfolios are considered as collections of stochastic entities, generally termed policies in the context of actuarial science, which are in turn modelled as stochastic processes that generate deterministic financial income in the form of premiums and financial costs in the form of claims, which are random in both amount and timing. It should be noted, however, that the techniques developed in relation to insurance concepts are quite generally applicable to many other areas of scientific endeavour. Indeed, any phenomenon which is characterised by the accumulation of random quantities generated by randomly timed events can effectively be modelled using the ideas developed in this course.

The course consists of three sections. First, we will investigate the random amount of individual claims, in the process introducing some new statistical distributions and learning how to choose which of these distributions best describes a set of observations on a portfolio. Second, we will examine the total cost of all claims made on a portfolio over a fixed period of time, which means that we will have to develop techniques for dealing with sums of random amounts where the number of terms in the sum is itself random (since the random timing of claims means that the number which occur in any fixed period is a random variable). Finally, we shall discuss the long-term behaviour of insurance portfolios by modelling the overall income and cost structure through time.

Tutorial Information

Tutorials commence in Week 2 of the semester. Tutorial problem sets (as well as solutions) are available on the class Wattle page. Selected exercises from these tutorial problem sets generally will be discussed during tutorials. In particular, Tutorial 0 consists of a collection of review problems designed to help students refresh (and extend) their memories regarding prerequisite materials.

Learning Outcomes

To achieve an understanding of and facility in applying and communicating the following topics:

1. Estimating using skewed distributions with and without the presence of censoring and truncation
2. Aggregation of random quantities through compound distribution theory
3. Compound Poisson process theory including approximation of boundary crossing probabilities as applied to calculating risk for insurance portfolios

Workload

Students taking this course are expected to commit at least 9 hours a week to completing the work.

This will include:

- 2 hour a week: Lectures*
- 1 hour a week: Tutorial problem discussion
- 6 hours a week: reading and tutorial problem preparation

*NOTE: The Tuesday lecture time listed on the ANU Timetable will not be used for this course. It is scheduled for the possibility that no tutorials can be arranged.

Course Delivery

Lectures and tutorial problem discussion sessions.

Attendance Requirements

None

Tutorial Registration

Enrolment in tutorials will be completed online using the Electronic Teaching Assistant (ETA). To enrol, follow these instructions:

1. Go to http://eta.fec.anu.edu.au.
2. You will see the Student Login page. To log into the system, enter your University ID (your student number) and password (your ISIS password) in the appropriate fields and hit the **Login** button.
3. Read any news items or announcements.
4. Select "Sign Up!" from the left-hand navigation bar.
5. Select your courses from the list. To select multiple courses, hold down the control key. On PCs, this is the **Ctrl** key; on Macs, it is the key. Hold this key down while selecting courses with the mouse. Once courses are selected, hit the **SUBMIT** button.
6. A confirmation of class enrolments will be displayed. In addition, an email confirmation of class enrolments will be sent to your student account.
7. For security purposes, please ensure that you click the **LOGOUT** link on the confirmation page, or close the browser window when you have finished your selections.
8. If you experience any difficulties, please contact the School Office (see page 1 for contact details).

Study Schedule

Lectures will be held each week of the Semester on Wednesdays from 1-2pm and Thursdays from Noon to 1pm in the Manning Clark Centre, Lecture Theatre 2.

Tutorials will be held once a week beginning in Week 2 of Semester. Students should prepare answers to Tutorial Questions each week prior to attending their assigned tutorial.

Assessment

Proposed Assessment Schedule

Details about assessment may change during the first two weeks of semester. Please ensure that you check with your lecturer or tutor about any changes. Changes to the assessment schedule will be posted to the Wattle site.

Assessment item	Description assignment	Dates	Weighting (%)
Assignment	Take-home problem set	*Available*: Monday, 2 April *Due*: Friday, 27 April	20%
Final Examination	15 minute reading time; 3 hour writing time; No restrictions on permitted materials	To be determined (Centrally timetabled)	80%

Learning Outcomes-Assessment

How well have you achieved the learning outcomes for this course? Your lecturer makes this judgement based on your assignments and examination papers. This table illustrates how each assessment item provides evidence about your achievements against each learning outcome.

Course Learning Outcomes To achieve an understanding of and facility in applying and communicating the following topics:	**Assignment**	**Final Examination**
Estimating using skewed distributions with and without the presence of censoring and truncation	☑	☑
Aggregation of random quantities through compound distribution theory		☑
Compound Poisson process theory including approximation of boundary crossing probabilities as applied to calculating risk for insurance portfolios		☑

Assignment Details

Due Date	Friday, 27 April 2012
Value or Weighting (%)	20%
Marks	50
Suggested Length	NA
Instructions	Answer all problems, showing appropriate mathematical working and discussing results where appropriate.
Purpose	Give students an indicator as to their progress in understanding course

	concepts in first half of course.
Marking Criteria	Correctness of answers and appropriateness of discussion
Submission / Presentation Details	Assignments are to be submitted no later than 4pm on the due date by dropping completed assignments in the marked boxes outside the School of Finance, Actuarial Studies and Applied Statistics main office on Level 4 of the CBE Building, Building 26C.

It is important that you do all work on the assignment by yourself. Collaboration on assignment work is not permitted.

Return of Assignments

Assignments will be made available as soon as possible and distributed in tutorial sessions.

Scaling

Your final mark for the course will be based on the **raw** marks allocated for each assignment or examination. However, your final mark may not be the same number as produced by that formula, as marks may be **scaled**. Any scaling applied will preserve the rank order of raw marks (i.e. if your raw mark exceeds that of another student, then your scaled mark will exceed the scaled mark of that student), and may be either up or down.

Extensions

The four-week period allotted for completion of the assignment should be long enough to allow all students sufficient time to complete their assignment even taking into account normal circumstances such as illness and other time commitments. As such, no extensions on submission of the assignment will be granted. In extreme cases, students may be allowed to substitute completion of the assignment with an increased weighting on the final examination to 100%.

Penalties

NA

Examinations

Final examination will be 3 hours in duration with 15 minutes reading time. There will be no restrictions on the permitted materials. Examination date to be set by ANU Exam Section.

Texts and Other Reading

Prescribed Texts

None

Technology, Software, Equipment

There is no formal computing requirement for this course. However, interested students may contact the lecturer regarding the use of computing in relation to the course.

Recommended Reading

D.C.M. Dickson (2005)
Insurance Risk and Ruin
Cambridge University Press

H.H. Paujer & G.E. Willmot (1992)
Insurance Risk Models
Society of Actuaries

Hossack, Polland and Zehnwirth (1983)
Introductory Statistics with Applications in General Insurance
Cambridge University Press

Hogg and Klugman (1984)
Loss Distributions

John Wiley & Sons

Course-related Matters

Requisites

STAT3004 Stochastic Modelling

Co-teaching

Undergraduate (STAT3035) and Graduate (STAT8035) taught together.

General Information for all Students

CBE Student Office

http://www.cbe.anu.edu.au/

The CBE Student Office provides assistance with program and course selection, enrolment, change of program, variation to enrolment, status and other general matters. It is located on Level 2 of CBE Building 26c, contact details:

- T: (61) 02 6125 3807
- E: info.cbe@anu.edu.au

Main Administrative Dates 2012

http://www.anu.edu.au/sas/SEAP_guide/

The main administrative dates regarding teaching sessions, course census dates, examination period, graduation and enrolment variations (i.e. add and drop courses) are available from the ANU SEAP Guide 2012.

Associate Dean (Education)

Dr Royston Gustavson is the Associate Dean (Education) in the ANU College of Business & Economics.

ANU Student Support

Academic Skills and Learning Centre

http://www.anu.edu.au/academicskills/

The Academic Skills and Learning Centre, in the Pauline Griffin Building, offers services to students regarding a range of academic issues including essay writing, note-taking, referencing, reading, examination preparation, and plagiarism.

ANU College

http://www.anucollege.com.au/

ANU College offers the following introductory and extended programs:

- maths bridging courses; and
- English language support for students from non-English-speaking backgrounds.

Information Literacy Program

http://ilp.anu.edu.au/index.html

Workshops are available to undergraduate and graduate students to develop skills in handling information and communication technologies.

Policies, Procedures and Rules

ANU SEAP Guide 2010

http://www.anu.edu.au/sas/SEAP_guide/

The Student Enrolment and Administrative Procedures Guide (SEAP) supplements the ANU Undergraduate Handbook information available on Study@ANU (http://info.anu.edu.au/studyat/), the ANU Rules (http://www.anu.edu.au/cabs/rules/), and the Graduate Research website (http://www.anu.edu.au/graduate/).

Information for Enrolled Students

http://cbe.anu.edu.au/Current_Students/general_info/

Students are expected to be familiar with the ANU College of Business & Economics and university-wide policies and procedures on the following:

- Code of Practice for Student Academic Honesty
- Assessment Arrangements for Students from Language Backgrounds Other Than English
- Academic Progress Rules and Procedures
- Special examinations/consideration
- Supplementary examinations
- Review of assessment procedures

Special Examinations

http://cbe.anu.edu.au/Current_Students/general_info/specexam.asp

You must contact the College Office for guidance on the procedure for special examinations for final examination. Do not approach your lecturer for this information.

Students who are unable to attend an examination for reasons outlined in the policies above, may ***apply*** to sit a special examination by lodging an application with the College Student Administration Office no later than 72 hours after the scheduled examination. It is important to emphasise that ***travel arrangements and minor illnesses are not normally acceptable grounds for special examinations*** (Section 2, College 'Special Examination Policy').

Section 7.7 of the 'Student Enrolment and Procedures Guide 2009' states:

> ***Students must make themselves available for the duration of the examination period in order to attend any special examination that may be required.***

If you know in advance of circumstances whereby you will be unable to sit the examination, you should lodge an application for a special examination as soon as possible.

The dates on which Special Examinations will be held will be published on the School website when the final timetable is published.

Applications for special examinations must be correctly completed with all original supporting documentation attached. Where an application is made on the grounds of sickness, Section B of the application **must be completed by a medical practitioner** and a detailed medical certificate stating the effect on your capacity to sit the examination is required.

The medical certificate must carry the stamp from the medical practice, and will not always be sufficient evidence.

Special examinations are ***not*** automatically granted. If approved, successful candidates are required to contact the relevant School Office to obtain details of the special exam. If you do not sit the examination, or your application for a special examination is declined, then you will fail the course as incomplete.

It is not grounds for a further special examination if students are not contactable and miss the scheduled examination date.

Special Consideration

If illness or other disruptive events have affected your preparation for, or performance during, an examination, you can bring this to the attention of the examiners by making a request for special consideration using the Application for Special Consideration form.

Requests for special consideration must be lodged with the relevant **School Office** before the scheduled date of the examination. However, if it relates to a problem that arose during the examination, it should be submitted immediately after the examination (see the invigilator).

Requests for special consideration must be accompanied by documentation of the illness and/or a letter setting out the reasons for the difficulties in studying for or sitting an examination. The examiners will take this into account in awarding the final grade.

Special Arrangements

If you have a disability or disorder (permanent or temporary) which makes undertaking a formal sit-down examination difficult, then ***you are responsible for requesting special arrangements to be made for your examination***. In the past these arrangements have included the use of special equipment, additional time, writing breaks, a scribe (someone to write for you), etc.

Please contact the Examinations and Graduations Office early in the semester and **at least 10 days prior to the examination period**.

Failure to make appropriate arrangements for an examination may result in a subsequent application for a special examination/special consideration being declined.

Disabilities

If you have any queries about special arrangements with respect to disabilities, please refer to the Disabilities Officer. The ANU Disability Services Centre's website is at http://www.anu.edu.au/disabilities/.

Supplementary Examinations

http://www.anu.edu.au/cabs/rules/ExamsRules.pdf

In accordance with the University Examinations Rules 2009 (No. 3), you may be provided with a supplementary examination.

If you have qualified for a supplementary examination, your grade will be recorded as a PX on your Notification of Results. ***You must notify the School Office, in writing (email is satisfactory), within 7 days of the official publication date of examination results to indicate your acceptance or otherwise to sit the supplementary examination***.

If you pass the supplementary examination you will receive the grade of PS (pass at supplementary examination) and a mark of 50. If you are unsuccessful, or you decide not to sit the supplementary examination, your grade will be recorded as N (fail) and your original mark will stand.

Supplementary examinations will be held early in the next semester on dates to be advised. For information regarding the timing and venues for supplementary examinations please refer to the school websites in week 2 of the current semester:

ABIS: http://www.cbe.anu.edu.au/schools/abis/

ECONOMICS: http://www.cbe.anu.edu.au/schools/eco/

FAS: http://www.cbe.anu.edu.au/schools/fas/

MMIB: http://www.cbe.anu.edu.au/schools/mmib/

Travel plans should be made accordingly as travel plans are not an acceptable reason to miss a supplementary examination.

Results and Examinations

In accordance with the University Assessment Grades/Codes, CBE applies the following scale when awarding grades:

Final Pass Grades	
HD – High Distinction	80–100
D – Distinction	70–79
CR – Credit	60–69
P – Pass	50–59
PS – Pass at supplementary examination	50
Final Fail Grades	
N – Fail	00–49
NCN – Not Completed/Fail	
WN – Withdrawn with failure	
Interim Codes (used when a result for a course has not yet been finalised)	
DA – Deferred assessment	
PX – Offered supplementary assessment	
RP – Result pending	
WA – Withheld for administrative reasons	

Results Notification

To access results students should check their ISIS accounts on the advertised date for release of examination results. After publication, students enquiring about results must provide an ANU student card as proof of identification to the Examinations, Graduations, Prizes and Timetabling Office (Building 12). For privacy reasons students should not make enquiries regarding the results of other students.

Examination Timetable – Final Examination Period

http://timetable.anu.edu.au/

Details of the final examination timetable are available on the ANU Timetabling website. The onus is upon students to acquire their own scheduling details.

Examination Timetable – Mid-Semester Examinations

When a mid-semester exam is scheduled, timetable information will be posted by the relevant School.

Misconduct

http://www.anu.edu.au/cabs/rules/DisciplineRules.pdf

In relation to an examination, misconduct on the part of a student includes:

- cheating;
- plagiarism (including the reproducing in, or submitting for assessment for, any examination, by way of copying, paraphrasing or summarising, without acknowledgement and with the intention to deceive, any work of another person as the student's own work, with or without the knowledge or consent of that other person);
- submitting for an examination any work previously submitted for examination (except with the approval of the prescribed authority);
- failing to comply with the University's instructions to students at, or in relation to, an examination;
- acting, or assisting another person to act dishonestly, in or in connection with an examination; and/or
- taking a prohibited document into an examination venue.

The administrative procedures regarding misconduct are incorporated in the ANU Discipline Rules.

Plagiarism

http://academichonesty.anu.edu.au/

The College regards plagiarism as any appropriation of the ideas or expressions of another without relevant and appropriate acknowledgment. This includes un-attributed appropriation of text or content and may extend to improper referencing. Plagiarism will not be tolerated in any course and all discovered instances would be pursued to the full extent allowable under the rules.

Where students have doubts as to how to deal with or acknowledge source materials in course assignments they should consult the lecturer or tutor.

The penalties and administrative procedures regarding plagiarism are incorporated in the ANU Policy on Academic Honesty.

On-line material discussing plagiarism and referencing styles is available from the Academic Skills and Learning Centre Web page (http://www.anu.edu.au/academicskills/).