

THE UNIVERSITY OF
NEW SOUTH WALES



Australian School of Business
School of Actuarial Studies

ACTL 5301

MODELS FOR RISK MANAGEMENT

**COURSE OUTLINE
SEMESTER 1, 2009**

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Sydney 2052 Australia

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Dear Students

Welcome to ACTL5301, Models for Risk Management. This course is one of four options in the Master of Actuarial Studies covering advanced topics in quantitative risk management. Modelling risk is an important aspect of risk management for financial service providers particularly banks, insurers and reinsurers. I hope you find the course challenging and interesting.

This course outline has details of the course requirements, course aims and learning outcomes, content, teaching methods, assessment tasks, texts and readings, and expectations. Please read it carefully and thoroughly, as it will be assumed that you are familiar with the contents.

If you have any questions about the course at any time then please contact me.

I look forward to guiding your learning through the duration of the course.

Bernard Wong

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1. COURSE STAFF

The Course Coordinator of this course is Dr Bernard Wong:

Staff	E-mail	Room	Telephone
Dr Bernard Wong	bernard.wong@unsw.edu.au	Quad 2076	9385 2827

He is responsible for course administration, teaching and final assessment of the course.

Other teaching Staff for this course are:

Staff	E-mail	Room	Telephone
Dr Benjamin Avanzi	b.avanzi@unsw.edu.au	Quad 2071	9385 9844

He will be delivering the lecture on copulas (Week 5) of the course.

Dr Greg Taylor, Professorial Visiting Fellow in the School of Actuarial Studies, Australian School of Business, and Taylor Fry Consulting Actuaries, will also teach in the course.

1.1 Communication with Staff

If students have questions about the material covered in lectures and other problems in assignments then consult the Course Coordinator. Bernard will normally be available for consultation on Mondays and Thursdays during teaching session from 5 p.m. to 6 p.m. in Quad 2076.

For administrative matters related to the course including enrolment, assessment, special consideration, and the course web site, students should consult the Course Coordinator or the School Administrator (Bindya Subba).

Bindya Subba
Actuarial Studies Office (Room 2058, 2nd Floor Quadrangle Building)
Telephone: 9385 1886
Fax: 9385 1883
E-mail: b.subba@unsw.edu.au

2. COURSE DETAILS

2.1 Teaching Times and Locations

This course will consist of 3 hours of lectures per week.

Lecture times and locations are as follows:

Monday 6:00 p.m. – 9:00 p.m. ASB 232

Timetables and locations are correct at time of printing. A full timetable of lectures and topics is provided later in this Course study guide. Any alterations to the lecture times or locations will be advised in lectures and via the Course WebCT Vista site.

Students should consult the WebCT Vista site on a regular basis, since assignment questions and other Course materials will be placed there. The web address is: <http://vista.elearning.unsw.edu.au>

2.2 Units of Credit

Each course is 6 UOC.

2.3 Summary of Course, Aims & Relationship to other Courses

This course is one of four options in the Master of Actuarial Studies covering advanced topics in quantitative risk management. These courses are: ACTL5301 Models for Risk Management (S1), ACTL5302 Risk and Capital Management (S1), ACTL5303 Asset-Liability Management (S2) and ACTL5304 Risk Management Strategies (S2). The courses are normally completed by students as advanced options in the Master of Actuarial Studies or as a normal part of the program for students entering the Master of Actuarial Studies with an undergraduate major in actuarial studies. They develop more advanced topics related to the actuarial professional syllabus. They also provide a valuable background for graduates who are aiming to enter the risk management area in insurance, banking or funds management.

Students are assumed to have a good mathematics background and a solid understanding of the concepts of probability and statistics and risk models as covered in ACTL5101 Probability and Statistics for Actuaries and ACTL5106 Insurance Risk Models. These courses are prerequisites for ACTL5301. Students need to be able to use a word processing package (such as WORD) and a spreadsheet (such as EXCEL). They should also be familiar with a statistical software package such as MINITAB, SAS or the MATLAB (Statistics Toolbox).

The aims of this course are to provide students with an understanding of:

- The main techniques used to develop and estimate distributions used in risk management for insurance, market, credit and operational risk.
- The main features of distributions that may be used in risk management for loss frequencies and severities and their practical application.
- Risk models for individual risks and aggregate risks in a portfolio.
- The main features of market, credit and operational risk models and their links to insurance risk modelling.
- Alternative approaches to modelling dependencies in risk management, the main features of copulas and applications of copulas to model a portfolio of dependent risks.
- The main features and risk management applications of extreme value distributions.
- The basic concepts of a generalised linear model (GLM) and how they may be applied in risk modelling.
- Probabilistic models for insurer loss provisions and implications for risk management.
- Current research issues in quantitative risk models and their practical applications.

2.4 Student Learning Outcomes

At the end of the course the student will have be able to:

- 1 Understand aspects of the theory and practice of quantitative risk modelling for insurance and financial risks as covered in the course aims. [LO1]
- 2 Assess models used for risk management in practice and their advantages and shortcomings. [LO2]
- 3 Estimate and apply various models for practical applications. [LO3]
- 4 Review and analyse more advanced risk models. [LO4]
- 5 Identify and evaluate relevant research literature on current developments in quantitative risk modelling. [LO5]
- 6 Use effective presentation, discussion and report writing skills for explaining risk-modelling concepts used in quantitative risk management. [LO6]

Graduate Attributes

The Australian School of Business has as its core graduate attributes the development throughout a program of an awareness of and ability to:

1. Think critically [GA1]
2. Communicate [GA2]
3. Work in teams [GA3]
4. Have an appreciation of relevant social and global issues [GA4]
5. In-depth engagement with relevant disciplinary knowledge [GA5]
6. Professional skills [GA6]

This course contributes to your development of the following Australian School of Business Graduate Attributes, which are the qualities, skills and understanding we want you to have by the completion of your degree. Learning Outcomes 1–3 aim to enhance your capacity for critical thinking and problem solving (GA 1, 5). Learning Outcomes 4 and 5 develop your skills in evaluating new developments in the field of risk management (GA 1, 4, and 6). Learning Outcome 6 aims to develop your written communication skills (Graduate Attribute 2) in the context of a practical task in risk management (GA 5, 6).

3. LEARNING AND TEACHING ACTIVITIES

3.1 Approaches to Learning and Teaching in the Course

The course textbooks, lectures and assessment tasks are designed to provide a framework for your learning. Every student has a different approach to learning. How much time you spend on reading in preparation for lectures, completing assessment tasks, reviewing course objectives, deepening your understanding and preparing for final examinations will depend on your learning approach. Lectures will generally cover the main concepts and issues and will not necessarily cover all the details of the course readings or texts. It is expected that you have read the reading material for the lecture in advance. Students who are successful in this course take an active approach to learning.

3.2 Learning Activities and Teaching Strategies

The learning activities of this course involve three key components – the lecture, the assignments, and your private study. Each lecture will provide a short overview of topic at hand and will then focus on explaining the difficult concepts and issues. The role of the lecture is to help you understand the context of the topic as well as work through the difficult points. To maximize your achievements in each lecture you should read the assigned notes prior to each class. The assignments present you with a practical application of course concepts to a problem in risk management (see also assessments section, below). Your private study is the most important component of this course. Weekly readings, solving problems, and your own topic summaries form the basis of an excellent private study regime. Keeping up to date is very important and each week builds on the prior weeks so it is important that you get your study regime organised quickly.

4. ASSESSMENT

4.1 Formal Requirements

In order to pass the course students must complete and submit all components of assessment at or before the due times. Late assessment submissions will not be marked. It is important that students be punctual and reliable when submitting assessments. This is an important workplace requirement and students need to ensure they meet deadlines.

4.2 Assessment Details

The summary table below provides an overview of the assessment tasks and relative weighting:

Assessment Task	Weighting	Learning Outcomes assessed	Due Date
Assignment 1	12.5%	LO1-LO6	21 Apr
Assignment 2	12.5%	LO1-LO6	19 May
Final Examination	75%	LO1-LO5	TBA
TOTAL	100%		

4.2.1 Assignments

Assignments are intended to develop your skills in research and your ability to concisely and coherently present your ideas. They are intended to be part of achieving LO1-LO6, and GA1, GA2, GA4, GA5 and GA6.

There will be two assignment tasks involving application of course concepts to data analysis and practical risk management decision-making. Details will be provided through the course WebCT web site. These assignments will allow students the opportunity to develop their understanding of the issues involved in estimating and applying models for various risks including insurance portfolios and broaden their knowledge of course topics. They will also provide students with an opportunity to develop research skills in learning how to locate and evaluate the research literature on quantitative risk modelling. Marks will be awarded for

- Accuracy of results
- Presentation
- Reasonableness checks applied
- Technical details

The assignments availability and due dates are:

Assignment	Available Date	Due Date
1	31 March	21 April
2	28 April	19 May

Assignments will be posted on the course WebCT vista site on the above "Available Date", Assignments are due at 5:00pm on the due date.

Students are reminded that the work they submit must be their own. While we have no problem (and in fact, it is encouraged to interact with your peers to enhance your learning) with students working together on the assignment problems, the material students submit for assessment must be their own. This means that: (i) the mathematical solutions you present are written up by you, without reference to any other student's work; (ii) Any analysis and program you use and present is done by your own code, which you yourself wrote and ran, without reference to any other student's work.

4.2.2 Final exam

The final examination will be a three-hour written paper. The examination will aim to assess the achievement of the learning outcomes of the course including the course aims. The examination will assess critical analysis and problem solving skills as well as written communication skills, and correspond to LO1-5 and GA 1, 2, 4, 5, and 6.

4.3 Assignment Submission Procedure

Assignments must be placed in the box provided outside Quad 2059, Level 2 Quadrangle Building, near the Actuarial Studies. A cover sheet must accompany these assignments. A copy of the cover sheet is available from the course web site on WebCT Vista. Additional copies of the cover sheet can be obtained outside Quad 2059.

*** Please note that it is School policy that late assignments will **not** be marked.***

Remember to keep a copy of all work submitted for assessment and to keep returned marked assignments.

4.4 Late Submission

The School of Actuarial Studies has a policy of grading late assignments with a zero mark. We believe this policy fosters development of ASB Graduate Attribute 6. Punctual submission of work is required in order to satisfy the requirements of the course. The assignment may be marked at the discretion of the course co-ordinator if there is a valid reason for late submission and used in cases where your final overall results are marginal.

5. ACADEMIC HONESTY AND PLAGIARISM

The University regards plagiarism as a form of academic misconduct, and has very strict rules regarding plagiarism. For UNSW policies, penalties and information to help you avoid plagiarism see:

<http://www.lc.unsw.edu.au/plagiarism/index.html>

As well as the guidelines in the online ELISE tutorial for all new UNSW students:

<http://info.library.unsw.edu.au/skills/tutorials/InfoSkills/index.htm>.

To see if you understand plagiarism, do this short quiz:

<http://www.lc.unsw.edu.au/plagiarism/plagquiz.html>

For information on how to acknowledge your sources and reference correctly, see:

<http://www.lc.unsw.edu.au/onlib/ref.html>

For the ASB Harvard Referencing Guide, see:

http://wwwdocs.fce.unsw.edu.au/fce/EDU/harvard_ref_guide.pdf

School of Actuarial Studies Policy on Plagiarism

The School of Actuarial Studies views any form of plagiarism as unacceptable. The School follows University Procedures in the event of any student plagiarism. In cases of plagiarism for in session assessment the minimum penalty all students involved can expect is to receive a mark of zero for the particular assessment item. The Head of School will be informed, and the School will also keep a record of student Plagiarism cases. Students should familiarise themselves with the University Policy and Procedures and ensure they have consulted The Learning Centre web site so that they are aware of and understand the concepts and practices of academic honesty and plagiarism.

6. COURSE RESOURCES

Textbooks

There are many books of relevance to the course topics. The following books will be the main text references for a substantial part of the course:

- McNeil, A.J., R. Frey, and P. Embrechts, Quantitative Risk Management: Concepts, Techniques and Tools, Princeton Series in Finance, 2005. (Note: this is at a more advanced level than the coverage of the course. Lecture notes will provide the required knowledge for the course.)
- Klugman, S. A., H H Panjer and G E Willmot, Loss Models: From Data to Decisions, Wiley, 3rd Edition, 2008.

Other References

Other texts that are useful references for the course coverage are:

- Denuit, M., J. Dhaene, M. Goovaerts and R. Kaas, Actuarial Theory for Dependent Risks, Wiley, 2005.
- Kaas, R., M. Goovaerts, J. Dhaene, and M. Denuit, Modern Actuarial Risk Theory, Kluwer, 2001.
- Taylor, Greg, Loss Reserving: An Actuarial Perspective, Kluwer, 2000.
- Nelsen, R B, An Introduction to Copulas, Springer, 1998.
- Kotz, S and S Nadarajah, Extreme Value Distributions, Imperial College Press, 2000.
- Bluhm, C., L. Overbeck, and C. Wagner, An Introduction to Credit Risk Modelling, Chapman and Hall, 2002.

Internet sites

The following web sites provide valuable additional information to support your learning in the course:

http://www.riskglossary.com/link/value_at_risk.htm/

<http://www.gloriamundi.org/>

<http://www.defaultrisk.com/>

<http://www.csfb.com/creditrisk/>

<http://www.kmv.com/insight>

Course WebCT Vista

This course will use WebCT Vista for communication with students. The WebCT Vista site for this course will contain the course outline, lecture notes, assessment information, and any notices relevant to this course. It is important that you visit the site regularly to see any notices posted there by the course coordinator. The site can be accessed from the WebCT Vista log-in page at: <http://vista.elearning.unsw.edu.au/>.

7. COURSE EVALUATION AND DEVELOPMENT

Each year feedback is sought from students about the courses offered in the School and continual improvements are made based on this feedback. In this course, we will seek your feedback through the Catei forms and you are welcome to pass comments to the Course Coordinator at any time. As a result of student feedback in the 2008 offering of this course, in 2009 we will place additional weighting and emphasis of the assignments, and also to deliver the course in a traditional 12 week format (as opposed to intensive sessions)

8. STUDENT RESPONSIBILITIES AND CONDUCT

Students are expected to be familiar with and adhere to university policies in relation to class attendance and general conduct and behaviour, including maintaining a safe, respectful environment; and to understand their obligations in relation to workload, assessment and keeping informed.

Information and policies on these topics can be found in the 'A-Z Student Guide': <https://my.unsw.edu.au/student/atoz/ABC.html>.

See, especially, information on 'Attendance and Absence', 'Academic Misconduct', 'Assessment Information', 'Examinations', 'Special Consideration', 'Student Responsibilities', 'Workload' and policies such as 'Occupational Health and Safety'.

Special Consideration and Supplementary Examinations

You must submit all assignments and attend all examinations scheduled for your course. You should seek assistance early if you suffer illness or misadventure which affects your course progress.

UNSW policy and process for Special Consideration applies (see <https://my.unsw.edu.au/student/atoz/SpecialConsideration.html>). Specifically:

- Applications for special consideration (including supplementary examinations) must go through UNSW Central administration (within 3 working days of the assessment to which it refers) – applications will not be accepted by teaching staff;
- Applying for special consideration does not automatically mean that you will be granted additional assessment or that you will be awarded an amended result;
- If you are making an application for special consideration (through UNSW Central Administration) please notify your Course Coordinator or Lecturer in Charge;
- Please note: a register of applications for Special Consideration is maintained. History of previous applications for Special Consideration is taken into account when considering each case.

Students may be required to sit for an oral or written supplementary examination. Any supplementary examination date will be advised to students after the final examination. In general, a supplementary examination will only be offered to a student who has been prevented from taking the Final Examination, who has been placed at a serious disadvantage during the examination, and whose circumstances have improved considerably in the period since the relevant examination was held. Failure to attend a supplementary examination, if you have been granted one, will result in forfeiture of any additional assessment granted to you. Satisfactory performance in any course assessment is required in order to be granted a supplementary examination.

STUDENTS SHOULD NOTE THAT SPECIAL CONSIDERATION WILL NOT BE GRANTED UNLESS PERFORMANCE AND ATTENDANCE AT LECTURES IS SATISFACTORY. THIS WILL USUALLY MEAN THAT YOU WILL HAVE TO PASS ALL ASSESMENT TASKS IN ORDER FOR ANY SPECIAL CONSIDERATION TO BE GIVEN.

Consideration for Missed Assessments (other than final examination)

If you miss a test or are unable to submit your assignment by the due time & date, and you have a valid reason, you need to inform the Actuarial Studies office as soon as

possible. You must provide written documentation requesting consideration to the Actuarial Studies office, in the form of a letter explaining your reasons with evidence attached, i.e. medical certificate, police report etc. You should note the course details, your student ID and contact details in your letter as well. As per University rules these considerations must be submitted within 3 working days of the assessment date. If no request is received or it is received after 3 working days you will be awarded a zero mark for that assessment.

Review of Results of Assessments (other than final examination)

As per University rules, if you wish a piece of course assessment to be re-checked, for addition error or incorrect marking, you need to contact the Actuarial Studies office within 15 working days of the assessment being available for collection. You will need to bring in the assessment and provide a note as to the error or reason for review to the Actuarial Studies office. The assessment will be passed onto the relevant academic for review. Students will be able to collect back the assessment from the Actuarial Studies office.

9. ADDITIONAL STUDENT RESOURCES AND SUPPORT

The University and the ASB provide a wide range of support services for students, including:

1. **ASB Education Development Unit (EDU)** (www.business.unsw.edu.au/edu)
Academic writing, study skills and maths support specifically for ASB students. Services include workshops, online and printed resources, and individual consultations. EDU Office: Room GO7, Ground Floor, ASB Building (opposite Student Centre); Ph: 9385 5584; Email: edu@unsw.edu.au
2. **UNSW Learning Centre** (www.lc.unsw.edu.au)
Academic skills support services, including workshops and resources, for all UNSW students. See website for details.
3. **Library training and search support services:** <http://info.library.unsw.edu.au>
4. **UNSW IT Service Desk:** Technical support for problems logging in to websites, downloading documents etc. Library, Level 2; Ph: 9385 1333. Website: www.its.unsw.edu.au/support/support_home.html.
5. **UNSW Counselling Service** (<http://www.counselling.unsw.edu.au>)
Free, confidential service for problems of a personal or academic nature; and workshops on study issues such as 'Coping With Stress' and 'Procrastination'. Office: Level 2, Quadrangle East Wing; Ph: 9385 5418.
6. **Student Equity & Disabilities Unit** (<http://www.studentequity.unsw.edu.au>)
Advice regarding equity and diversity issues, and support for students who have a disability or disadvantage that interferes with their learning. Office: Ground Floor, John Goodsell Building; Ph: 9385 4734.

10. COURSE SCHEDULE

This timetable is tentative and may change. Revisions will be advised as they occur through the course web site.

Week	Day	Lecturer	Topic	Text Reference
1	9-Mar	BW	Course Introduction; Review of Background, Risk Modelling Concepts	MFE: 1,2
2	16-Mar	BW	Risk Management Models: Multivariate Models	MFE: 3
3	23-Mar	GT	Loss Distributions; Parametric, Mixture, Discrete Distribution; Compound Poisson Model	KPW: 4, 5, 6
4	30-Mar	GT	Aggregate Loss Models, Compound Models, Recursion, Approximation	KPW: 9
5	6-Apr	BA	Modelling Dependency, Copulas	MFE: 5; KPW: 7
Mid Semester Break				
6	20-Apr	GT	Extreme Value Theory	MFE: 7
7	27-Apr	GT	Generalized Linear Models, Exponential Family	KGDD: 8; KPW: 17.3
8	4-May	BW	Market Risk Models	MFE: 3, 6
9	11-May	BW	Credit Risk Models - Structural Models	MFE: 8
10	18-May	BW	Credit Risk Models - Intensity Models	MFE: 9
11	25-May	GT	Probabilistic Loss Reserve Modelling in Insurance	TG
12	1-Jun	BW	Operational Risk Models; Review	MFE: 10

Text Reference Key:

MFE: McNeil, Frey, Embrechts. Quantitative Risk Management

KPW: Loss Models: From Data to Decisions, 3rd Ed

KGDD: Kass, Goovaerts, Dhaene, Denuit. Modern Actuarial Risk Theory

TG: Taylor, G and G. McGuire, Loss Reserving with GLM's: A Case Study, CAS, 2004

<http://www.casact.org/pubs/dpp/dpp04/04dpp327.pdf>