UNSW Course Outline

ACTL5301 Quantitative Risk Management Techniques - 2024

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General Course Information

Course Code : ACTL5301
Year : 2024
Term : Term 2
Teaching Period : T2
Is a multi-term course? : No
Faculty : UNSW Business School
Academic Unit : School of Risk and Actuarial Studies
Delivery Mode : In Person
Delivery Format : Standard
Delivery Location : Kensington
Campus : Sydney
Study Level : Postgraduate
Units of Credit : 6

Useful Links

Handbook Class Timetable

Course Details & Outcomes

Course Description

Recent occurrences of significant losses in the financial and insurance markets associated with catastrophic events such as heatwaves, floods, cyclones, bushfires, and earthquakes have intensified the need for a systematic approach to modelling, measuring, and managing

catastrophe risks. Culprits behind catastrophe risks include frequency, severity, and dependence. This course introduces students to advanced statistical and actuarial models for a variety of risks in financial institutions such as banks, insurance/reinsurance companies, and superannuation funds. Traditional and newly emerging risks encountered therein will be studied, with a special focus on extreme losses, extreme dependence, and loss aggregation over time. Topics covered include: risk measures; multivariate models; copulas and dependence; financial time series; extreme value theory; market credit and operational risk. Students will be implementing the models using computer software.

Course Aims

This course introduces students to advanced statistical and actuarial models for a variety of risks in insurance and finance with a special focus on extreme losses, extreme dependence, and loss aggregation over time. Applications to financial institutions such as banks, insurance/ reinsurance companies, and superannuation funds will be explored. Students taking this course should be proficient with calculus and linear algebra. This is an advanced course but will be made as self-contained as possible. Moreover, students are expected to have a good understanding of probability, statistics, and stochastic modelling as covered in ACTL5101 and ACTL5103, and have a background of applying probability and statistics to insurance models as covered in ACTL5106. While the course will stress fundamentals and explore topics at a somewhat technical level, it will be made as self-contained as possible so that students with slightly different background described can still follow.

Relationship to Other Courses

Prerequisite: ACTL5103 OR program 4520

Course Learning Outcomes

Course Learning Outcomes	Program learning outcomes
CLO1 : Understand aspects of the theory and practice of quantitative risk modelling for insurance and financial risks as covered in the course aims.	• PLO1 : Business Knowledge • PLO2 : Problem Solving • PLO3 : Business Communication
CLO2 : Assess models used for risk management in practice and their advantages and shortcomings.	• PLO1 : Business Knowledge • PLO2 : Problem Solving • PLO3 : Business Communication • PLO4 : Teamwork
CLO3 : Estimate and apply various models for practical applications.	• PLO1 : Research Excellence • PLO1 : Business Knowledge • PLO2 : Problem Solving • PLO5 : Responsible Business Practice
CLO4 : Review and analyse more advanced risk models.	• PLO2 : Problem Solving • PLO3 : Business Communication
CLO5 : Identify and evaluate relevant research literature on current developments in quantitative risk modelling.	• PLO1 : Research Excellence • PLO1 : Business Knowledge • PLO2 : Problem Solving
CLO6 : Use effective presentation, discussion and report writing skills for explaining risk-modelling concepts used in quantitative risk management.	• PLO1 : Research Excellence • PLO3 : Business Communication

Course Learning Outcomes	Assessment Item
CLO1 : Understand aspects of the theory and practice of quantitative risk modelling for insurance and financial risks as covered in the course aims.	• Assignment • Take-home Formative Quiz 1 • Final examination • Take-home Formative Quiz 2
CLO2 : Assess models used for risk management in practice and their advantages and shortcomings.	• Assignment • Take-home Formative Quiz 1 • Final examination • Take-home Formative Quiz 2
CLO3 : Estimate and apply various models for practical applications.	• Assignment • Take-home Formative Quiz 1 • Final examination • Take-home Formative Quiz 2
CLO4 : Review and analyse more advanced risk models.	
CLO5 : Identify and evaluate relevant research literature on current developments in quantitative risk modelling.	
CLO6 : Use effective presentation, discussion and report writing skills for explaining risk-modelling concepts used in quantitative risk management.	• Assignment

Learning and Teaching Technologies

Moodle - Learning Management System | Echo 360

Learning and Teaching in this 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.

Additional Course Information

Additional information will be released on Moodle course website.

Assessments

Assessment Structure

Assessment Item	Weight	Relevant Dates	Program learning outcomes
Assignment Assessment Format: Individual	20%	Start Date: Week 6, with details to be announced. Due Date: Week 8, with details to be announced.	• PLO2 : Problem Solving • PLO3 : Business Communication • PLO5 : Responsible Business Practice
Take-home Formative Quiz 1 Assessment Format: Individual	10%	Start Date: Weeks 5 and 9, respectively, with details to be announced. Due Date: Weeks 5 and 9, respectively, with details to be announced.	• PLO1 : Business Knowledge • PLO2 : Problem Solving • PLO3 : Business Communication • PLO5 : Responsible Business Practice
Final examination Assessment Format: Individual	60%	Start Date: Not Applicable Due Date: Not Applicable	• PLO1 : Business Knowledge • PLO2 : Problem Solving • PLO3 : Business Communication • PLO5 : Responsible Business Practice
Take-home Formative Quiz 2 Assessment Format: Individual	10%		

Assessment Details

Assignment

Assessment Overview

The assignment aims to develop students' research skills and ability to concisely and coherently present ideas. The assignment will involve the application of course concepts to data analysis and practical risk management decision-making. There will be one major assignment task. Details will be provided on the course website. Students will be awarded marks for accuracy of results, presentation, reasonableness checks applied, and technical details. Dates regarding the assignment are to be announced. While working together on the assignment problems is encouraged, the material submitted for assessment must be their own.

Assesses: PLO2, PLO3 and PLO5.

Course Learning Outcomes

- CLO1 : Understand aspects of the theory and practice of quantitative risk modelling for insurance and financial risks as covered in the course aims.
- CLO2 : Assess models used for risk management in practice and their advantages and shortcomings.
- CLO3 : Estimate and apply various models for practical applications.
- CLO6 : Use effective presentation, discussion and report writing skills for explaining risk-modelling concepts used in quantitative risk management.

Detailed Assessment Description

The assignment aims to develop students' research skills and ability to concisely and coherently present ideas. The assignment will involve the application of course concepts to data analysis and practical risk management decision-making. There will be one major assignment task. Details will be provided on the course website. Students will be awarded marks for accuracy of results, presentation, reasonableness checks applied, and technical details. Dates regarding the assignment are to be announced. While working together on the assignment problems is encouraged, the material submitted for assessment must be their own.

Assessment Length

About two weeks

Submission notes

Assignments must be submitted via the Turnitin submission box, which is available on the course website.

Assessment information

Please note that assignments MUST be submitted prior to the due time and date. The School of Risk and Actuarial Studies has a policy of grading late assignments with a zero mark, so punctual submission of work is required to satisfy the requirements of the course. Turnitin will not accept any late submissions. The assignment may be marked at the discretion of the course coordinator if there is a valid reason for late submission and used in cases where your final overall results are marginal.

Assignment submission Turnitin type

This assignment is submitted through Turnitin and students can see Turnitin similarity reports.

Take-home Formative Quiz 1

Assessment Overview

There will be two written take-home exams in weeks 5 and 9, respectively. Details about the

exams will be announced on the course website. The exam will require written responses, and students will earn marks for correct explanations of the main concepts and issues examined in each question. Marks for calculation questions will be awarded for mathematical working, as well as part marks for incorrect responses with the correct method and reasoning. The exam will test not only the students' knowledge of the material but also the depth of their understanding of it.

Assesses: PLO1, PLO2, PLO3 and PLO5.

Course Learning Outcomes

- CLO1 : Understand aspects of the theory and practice of quantitative risk modelling for insurance and financial risks as covered in the course aims.
- CLO2 : Assess models used for risk management in practice and their advantages and shortcomings.
- CLO3 : Estimate and apply various models for practical applications.

Detailed Assessment Description

There will be two written take-home exams in weeks 5 and 9, respectively. Details about the exams will be announced on the course website. The exam will require written responses, and students will earn marks for correct explanations of the main concepts and issues examined in each question. Marks for calculation questions will be awarded for mathematical working, as well as part marks for incorrect responses with the correct method and reasoning. The exam will test not only the students' knowledge of the material but also the depth of their understanding of it.

Assessment Length

1 hour equivalent each

Submission notes

Details to be announced.

Assessment information

Additional information will be released on the Moodle course website.

Assignment submission Turnitin type

This assignment is submitted through Turnitin and students do not see Turnitin similarity reports.

Final examination

Assessment Overview

The final examination will be a 2-hour written paper that aims to assess the achievement of the learning outcomes of the course. The exam will assess critical analysis, problem-solving skills, and written communication skills. Calculators will be allowed in the final exam, but students must show a clear indication of all the steps involved in their calculations. The exam will require written responses, and students will earn marks for correct explanations of the main concepts and issues examined in each question. Part marks will also be awarded for incorrect responses with the correct method and reasoning. The exam will test not only the students' knowledge of the material but also the depth of their understanding of it.

Assesses: PLO1, PLO2, PLO3 and PLO5.

Course Learning Outcomes

- CLO1 : Understand aspects of the theory and practice of quantitative risk modelling for insurance and financial risks as covered in the course aims.
- CLO2 : Assess models used for risk management in practice and their advantages and shortcomings.
- CLO3 : Estimate and apply various models for practical applications.

Detailed Assessment Description

The final examination will be a 2-hour written paper that aims to assess the achievement of the learning outcomes of the course. The exam will assess critical analysis, problem-solving skills, and written communication skills. Calculators will be allowed in the final exam, but students must show a clear indication of all the steps involved in their calculations. The exam will require written responses, and students will earn marks for correct explanations of the main concepts and issues examined in each question. Part marks will also be awarded for incorrect responses with the correct method and reasoning. The exam will test not only the students' knowledge of the material but also the depth of their understanding of it.

Assessment Length

2 hours

Submission notes

University Examination Period

Assessment information

Additional information will be released on the Moodle course website.

Assignment submission Turnitin type

Not Applicable

Take-home Formative Quiz 2

Assessment Overview

There will be two written take-home exams in weeks 5 and 9, respectively. Details about the exams will be announced on the course website. The exam will require written responses, and students will earn marks for correct explanations of the main concepts and issues examined in each question. Marks for calculation questions will be awarded for mathematical work, as well as part marks for incorrect responses with the correct method and reasoning. The exam will test not only the students' knowledge of the material but also the depth of their understanding of it.

Assesses: PLO1, PLO2, PLO3 and PLO5.

Course Learning Outcomes

- CLO1 : Understand aspects of the theory and practice of quantitative risk modelling for insurance and financial risks as covered in the course aims.
- CLO2 : Assess models used for risk management in practice and their advantages and shortcomings.
- CLO3 : Estimate and apply various models for practical applications.

General Assessment Information

Additional information will be released on Moodle course website.

Grading Basis

Standard

Requirements to pass course

Additional information will be released on Moodle course website.

Course Schedule

Teaching Week/Module	Activity Type	Content
Week 0 : 20 May - 26 May	Reading	Get ready for the beginning of the course.
Week 1 : 27 May - 2 June	Lecture	• Introduction to Quantitative Risk Management • Risk Measures
Week 2 : 3 June - 9 June	Lecture	• Multivariate Models (i)
Week 3 : 10 June - 16 June	Lecture	• Multivariate Models (ii) • Copulas and Dependence (i)
Week 4 : 17 June - 23 June	Lecture	• Copulas and Dependence (ii)
Week 5 : 24 June - 30 June	Lecture	• Financial Time Series (i)
	Assessment	Formative Midterm, Take-home, 1 hour equivalent
Week 6 : 1 July - 7 July	Reading	Flexibility Week, no lecture
Week 7 : 8 July - 14 July	Lecture	• Financial Time Series (ii)
Week 8 : 15 July - 21 July	Lecture	• Financial Time Series (iii) • Extreme Value Theory (i)
	Assessment	Assignment Due, Take-home
Week 9 : 22 July - 28 July	Lecture	• Extreme Value Theory (ii)
	Assessment	Formative Midterm, Take-home, 1 hour equivalent
Week 10 : 29 July - 4 August	Lecture	• Portfolio Credit Risk Management

Attendance Requirements

Students are strongly encouraged to attend all classes and review lecture recordings.

General Schedule Information

Additional information will be released on Moodle course website.

Course Resources

Prescribed Resources

The website for this course is on Moodle, which contains the following information:

- Announcements
- Course outline
- Lecture slides and recording
- Tutorial exercises and solutions
- Online quizzes and assignment information and feedbacks
- Final exam information and instruction

The prescribed textbooks for the course are:

- McNeil, A.J., Frey, R. and Embrechts, P., 2015. Quantitative Risk Management: Concepts, Techniques and Tools (Second Edition). Princeton University Press.
- Chan, N.H., 2010. Time Series: Applications to Finance with R and S-Plus (Second Edition).

John Wiley & Sons.

Recommended Resources

Additional information will be released on the Moodle course website.

Additional Costs

Not applicable.

Course Evaluation and Development

The lecturer in charge (LIC) has taught this course multiple times and has always received very high course evaluations. This time, the LIC will follow the established approach and make further innovations, and is optimistic about achieving another successful collaboration with the students throughout the term.

Staff Details

Position	Name	Email	Location	Phone	Availability	Equitable Learning Services Contact	Primary Contact
Lecturer	Qihe Tang		Room 575, Level 5, East Wing, UNSW Business School Building (E12)	61-2-9065-8256	By appointment	No	Yes

Other Useful Information

Academic Information

COURSE POLICIES AND SUPPORT

The Business School expects that you are familiar with the contents of this course outline and the UNSW and Business School learning expectations, rules, policies and support services as listed below:

- Program Learning Outcomes
- Academic Integrity and Plagiarism
- Student Responsibilities and Conduct
- Special Consideration
- Protocol for Viewing Final Exam Scripts
- Student Learning Support Services

Further information is provided on the key policies and support page.

Students may not circulate or post online any course materials such as handouts, exams, syllabi or similar resources from their courses without the written permission of their instructor.

STUDENT LEARNING OUTCOMES

The Course Learning Outcomes (CLOs) – under the Outcomes tab – are what you should be able to demonstrate by the end of this course, if you participate fully in learning activities and successfully complete the assessment items.

CLOs also contribute to your achievement of the Program Learning Outcomes (PLOs), which are developed across the duration of a program. PLOs are, in turn, directly linked to UNSW graduate capabilities. More information on Coursework PLOs is available on the key policies and support page. For PG Research PLOs, including MPDBS, please refer to the UNSW HDR Learning Outcomes.

Academic Honesty and Plagarism

As a student at UNSW you are expected to display academic integrity in your work and interactions. Where a student breaches the UNSW Student Code with respect to academic integrity, the University may take disciplinary action under the Student Misconduct Procedure. To assure academic integrity, you may be required to demonstrate reasoning, research and the process of constructing work submitted for assessment.

To assist you in understanding what academic integrity means, and how to ensure that you do comply with the UNSW Student Code, it is strongly recommended that you complete the Working with Academic Integrity module before submitting your first assessment task. It is a free, online self-paced Moodle module that should take about one hour to complete.

Submission of Assessment Tasks

SPECIAL CONSIDERATION

You can apply for special consideration when illness or other circumstances beyond your control interfere with your performance in a specific assessment task or tasks, including online exams. Students studying remotely who have exams scheduled between 10pm and 7am local time, are also able to apply for special consideration to sit a supplementary exam at a time outside of these hours.

Special consideration is primarily intended to provide you with an extra opportunity to demonstrate the level of performance of which you are capable. To apply, and for further information, see Special Consideration on the UNSW Current Students page.

Special consideration applications will be assessed centrally by the Case Review Team, who will update the online application with the outcome and add any relevant comments. The change to the status of the application immediately sends an email to the student and to the assessor with the outcome of the application.

Please note the following:

1. Applications can only be made through Online Services in myUNSW (see the UNSW Current Students page). Applications will not be accepted by teaching staff. The lecturer-in-charge/ course coordinator will be automatically notified when your application is processed.
2. Applying for special consideration does not automatically mean that you will be granted a supplementary exam or other concession.
3. If you experience illness or misadventure in the lead up to an exam or assessment, you must submit an application for special consideration, either prior to the examination taking place, or prior to the assessment submission deadline, except where illness or misadventure prevent you from doing so.
4. If your circumstances stop you from applying before your exam or assessment due date, you must apply within 3 working days of the assessment or the period covered by your supporting documentation.
5. Under the UNSW Fit To Sit/Submit rule, if you sit the exam/submit an assignment, you are declaring yourself well enough to do so and are cannot subsequently apply for special consideration.
6. If you become unwell on the day of – or during – an exam, you must stop working on your exam, advise your course coordinator or tutor and provide a medical certificate dated within 24 hours of the exam, with your special consideration application. For online exams, you must contact your course coordinator or tutor immediately via email, Moodle or chat and advise them you are unwell and submit screenshots of your conversation along with your medical certificate and application.
7. Special consideration requests do not allow the awarding of additional marks to students.

Further information on Business School policy and procedure can be found under “Special Consideration” on the key policies and support page.

LATE SUBMISSION PENALTIES

For assessments other than examinations, late submission will incur a penalty of 5% per day or part thereof (including weekends) from the due date and time. An assessment will not be

accepted after 5 days (120 hours) of the original deadline unless special consideration has been approved. An assignment is considered late if the requested format, such as hard copy or electronic copy, has not been submitted on time or where the 'wrong' assignment has been submitted.

For assessments which account for 10% or less of the overall course grade, and where answers are immediately discussed or debriefed, the LIC may stipulate a different penalty. Details of such late penalties will be available on the course Moodle page.

FEEDBACK ON YOUR ASSESSMENT TASK PERFORMANCE

Feedback on student performance from formative and summative assessment tasks will be provided to students in a timely manner. Assessment tasks completed within the teaching period of a course, other than a final assessment, will be assessed and students provided with feedback, with or without a provisional result, within 10 working days of submission, under normal circumstances. Feedback on continuous assessment tasks (e.g. laboratory and studio-based, workplace-based, weekly quizzes) will be provided prior to the midpoint of the course.

Faculty-specific Information

PROTOCOL FOR VIEWING FINAL EXAM SCRIPTS

UNSW students have the right to view their final exam scripts, subject to a small number of very specific exemptions. The UNSW Business School has set a protocol under which students may view their final exam script. Individual schools within the Faculty may also set up additional local processes for viewing final exam scripts, so it is important that you check with your School.

If you are completing courses from the following schools, please note the additional school-specific information:

- Students in the **School of Accounting, Auditing & Taxation** who wish to view their final examination script should also refer to this page.
- Students in the **School of Banking & Finance** should also refer to this page.
- Students in the **School of Information Systems & Technology Management** should also refer to this page.

COURSE EVALUATION AND DEVELOPMENT

Feedback is regularly sought from students and continual improvements are made based on this feedback. At the end of this course, you will be asked to complete the myExperience survey,

which provides a key source of student evaluative feedback. Your input into this quality enhancement process is extremely valuable in assisting us to meet the needs of our students and provide an effective and enriching learning experience. The results of all surveys are carefully considered and do lead to action towards enhancing educational quality.

QUALITY ASSURANCE

The Business School is actively monitoring student learning and quality of the student experience in all its programs. A random selection of completed assessment tasks may be used for quality assurance, such as to determine the extent to which program learning goals are being achieved. The information is required for accreditation purposes, and aggregated findings will be used to inform changes aimed at improving the quality of Business School programs. All material used for such processes will be treated as confidential.

TEACHING TIMES AND LOCATIONS

Please note that teaching times and locations are subject to change. Students are strongly advised to refer to the Class Timetable website for the most up-to-date teaching times and locations.