ACTL5301
Models for Risk Management

Course Outline
Semester 1, 2015

Part A: Course-Specific Information

Please consult Part B for key information on Business School policies (including those on plagiarism and special consideration), student responsibilities and student support services.
# Table of Contents

**PART A: COURSE-SPECIFIC INFORMATION**

1 STAFF CONTACT DETAILS ........................................ 1

2 COURSE DETAILS ................................................... 1

2.1 Teaching Times and Locations ................................ 1

2.2 Units of Credit .................................................... 1

2.3 Summary of Course .............................................. 1

2.4 Course Aims and Relationship to Other Courses .......... 1

2.5 Student Learning Outcomes .................................... 2

3 LEARNING AND TEACHING ACTIVITIES ......................... 4

3.1 Approach to Learning and Teaching in the Course ........ 4

3.2 Learning Activities and Teaching Strategies ............... 4

4 ASSESSMENT .......................................................... 4

4.1 Formal Requirements ............................................. 4

4.2 Assessment Details ............................................... 4

5 COURSE RESOURCES ................................................. 6

6 COURSE EVALUATION AND DEVELOPMENT .................. 7

7 COURSE SCHEDULE .................................................. 8
PART A: COURSE-SPECIFIC INFORMATION

1 STAFF CONTACT DETAILS
Lecturer-in-charge: Dr Ramona Meyricke
Email: ramona.meyricke@unsw.edu.au

Consultation times and location will be posted (and updated) on the course website during the semester.

2 COURSE DETAILS

2.1 Teaching Times and Locations
Lectures start in Week 1 (to Week 12). Lectures will be held on Wednesdays from 6pm to 9pm in MechEng102 from week 1 to week 12 (excluding public holidays).

Timetables and locations are correct at time of editing. 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 website.

2.2 Units of Credit
The course is worth 6 units of credit. There is no parallel teaching in this course.

2.3 Summary of Course
This course explores quantitative methods of risk measurement and modelling in financial institutions, including insurers, reinsurers, superannuation funds, and banks, and the major types of risks encountered therein.

Topics covered include: risk measures; multivariate models for risks; copulas and dependence models; extreme value theory and tails of losses; time series techniques. The links between the different modelling tools are explored, and are further illustrated with models used in different risk types. Together with ACTL5302 it is designed to cover the course topics for the professional actuarial Enterprise Risk Management/CERA qualification.

As of 2014, students completing the courses ACTL5301 and ACTL5302 at a Distinction average will be recommended for exemption for the Actuaries Institute Part III Examination C7A on Enterprise Risk Management.

2.4 Course Aims and Relationship to Other Courses
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.
- 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.
• Current research issues in quantitative risk models and their practical applications.

This course is offered as an elective in the postgraduate program (Master of Actuarial Studies, Master of Risk Management) in the school of risk and actuarial studies. 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 the formal prerequisites for ACTL5301. In addition, students will also benefit from having been exposed to topics in financial economics such as discussed in ACTL5109 Financial Economics for Insurance and Superannuation.

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 R which can be used to implement many of the models discussed in this course.

2.5 Student Learning Outcomes

The Course Learning Outcomes are what you should be able to DO by the end of this course if you participate fully in learning activities and successfully complete the assessment items.

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

The Learning Outcomes in this course also help you to achieve some of the overall Program Learning Goals and Outcomes for all postgraduate coursework students in the Business School. Program Learning Goals are what we want you to BE or HAVE by the time you successfully complete your degree (e.g. ‘be an effective team player’). You demonstrate this by achieving specific Program Learning Outcomes - what you are able to DO by the end of your degree (e.g. ‘participate collaboratively and responsibly in teams’).

For more information on the Postgraduate Coursework Program Learning Goals and Outcomes, see Part B of the course outline.

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Business Postgraduate Coursework Program Learning Goals and Outcomes

1. Knowledge: Our graduates will have current disciplinary or interdisciplinary knowledge applicable in local and global contexts.

You should be able to identify and apply current knowledge of disciplinary or interdisciplinary theory and professional practice to business in local and global environments.
2. Critical thinking and problem solving: Our graduates will have critical thinking and problem solving skills applicable to business and management practice or issues. You should be able to identify, research and analyse complex issues and problems in business and/or management, and propose appropriate and well-justified solutions.

3. Communication: Our graduates will be effective communicators in professional contexts. You should be able to:
   a. Produce written documents that communicate complex disciplinary ideas and information effectively for the intended audience and purpose, and
   b. Produce oral presentations that communicate complex disciplinary ideas and information effectively for the intended audience and purpose.

4. Teamwork: Our graduates will be effective team participants. You should be able to participate collaboratively and responsibly in teams, and reflect on your own teamwork, and on the team’s processes and ability to achieve outcomes.

5. Ethical, social and environmental responsibility: Our graduates will have a sound awareness of ethical, social, cultural and environmental implications of business issues and practice. You should be able to:
   a. Identify and assess ethical, environmental and/or sustainability considerations in business decision-making and practice, and
   b. Consider social and cultural implications of business and/or management practice.

The following table shows how your Course Learning Outcomes relate to the overall Program Learning Goals and Outcomes, and indicates where these are assessed (they may also be developed in tutorials and other activities):

<table>
<thead>
<tr>
<th>Program Learning Goals and Outcomes</th>
<th>Course Learning Outcomes</th>
<th>Course Assessment Item</th>
</tr>
</thead>
<tbody>
<tr>
<td>This course helps you to achieve the following learning goals for all Business postgraduate coursework students:</td>
<td>On successful completion of the course, you should be able to:</td>
<td>This learning outcome will be assessed in the following items:</td>
</tr>
</tbody>
</table>
| 1 Knowledge | LO1-LO5 | • Assignment  
• Mid-Semester Exam  
• Exam |
| 2 Critical thinking and problem solving | LO1-LO5 | • Assignment  
• Mid-Semester Exam  
• Exam |
| 3a Written communication | LO6 | • Assignment  
• Mid-Semester Exam  
• Exam |
| 3b Oral communication | Not specifically addressed in this course. | |
| 4 Teamwork | Not specifically addressed in this course. | |
3 LEARNING AND TEACHING ACTIVITIES

3.1 Approach 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 this course, you must:
- achieve a composite mark of at least 50; and
- make a satisfactory attempt at all assessment tasks (see below).

4.2 Assessment Details
Assessment of your performance in the course will be done through the following tasks:

<table>
<thead>
<tr>
<th>Assessment Task</th>
<th>Weighting</th>
<th>Due Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mid Semester Exam</td>
<td>15%</td>
<td>15 April, 2015</td>
</tr>
<tr>
<td>Assignment</td>
<td>25%</td>
<td>16 May, 2015</td>
</tr>
<tr>
<td>Final Exam</td>
<td>60%</td>
<td>University Exam Period</td>
</tr>
<tr>
<td>Total</td>
<td>100%</td>
<td></td>
</tr>
</tbody>
</table>
4.2.1 Assignment
The Assignment is intended to develop your skills in research and your ability to concisely and coherently present your ideas. It is intended to be part of achieving course learning outcomes 1-6, and postgraduate program learning goals 1-3.
There will be one major assignment task involving application of course concepts to data analysis and practical risk management decision-making. Details will be provided through the course blackboard web site. The assignment will allow students the opportunity to develop their understanding of the issues involved in estimating and applying models for various risks 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 assignment questions will be posted on the course moodle website on or before 6pm, 16th April, 2015. It will be due (submitted via TURNITIN on the course website) by 11pm, 16th May, 2015.

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.

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.

4.2.2 Mid Session Exam
The mid session exam will assess critical analysis and problem solving skills as well as written communication skills, and correspond to course learning outcomes 1-6, and postgraduate program learning goals 1-3. In addition, the class test provides a feedback mechanism for students to gauge their progress in the course.

The date and time for the test is 15th April, 2015, and will be at the scheduled location as indicated on the course website before 6pm, 8th April, 2015. The test will be administered at 6:00pm, and will be worth 15% of the total assessment for the course. The test will be closed book.

Normal examination rules apply to the conduct of class tests. Calculators will be allowed in the class tests and the final examination but a clear indication of all of the steps involved in your calculations must be shown. The University will not supply calculators to students for use in examinations where the provision of calculators has not been requested by the course examiner. It is the student's responsibility to be familiar with the rules governing the conduct of examinations.
The mid session exam require written responses, with students earning marks for correct explanations of the main concepts and issues examined in each question. Marks for calculation questions will be granted on mathematical working as well as part marks for incorrect responses with correct method and reasoning. They test not only your knowledge of the material, but also the depth of your understanding of it.

4.2.3 Final Exam
The final examination will be a two 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 course learning outcomes 1-6, and postgraduate program learning goals 1-3.

4.3 Assignment submission procedure
Assignments must be submitted via the Turnitin submission box that is available on the course moodle website. Turnitin reports on any similarities between their own cohort’s assignments, and also with regard to other sources (such as the internet or all assignments submitted all around the world via Turnitin). More information is available at: https://student.unsw.edu.au/turnitin

Please read this page, as we will assume that its content is familiar to you. You will be able to make multiple submissions, with only the final (on time) submission being used for grading.

Please note that it is 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. Punctual submission of work is required in order to satisfy the requirements of the course. Turnitin will not accept any late submission. 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.

You need to check your document once it is submitted (check it on-screen). We will not mark assignments that cannot be read on screen.

Students are reminded of the risk that technical issues may delay or even prevent their submission (such as internet connection and/or computer breakdowns). Students should then consider either submitting their assignment from the university computer rooms or allow enough time (at least 24 hours is recommended) between their submission and the due time. The Turnitin module will not let you submit a late report. No paper copy will be either accepted or graded.

In case of a technical problem, the full document must be submitted to the course coordinator before the due time by e-mail, with explanations about why the student was not able to submit on time. In principle, this assignment will not be marked. It is only in exceptional circumstances where the assignment was submitted before the due time by e-mail that it may be marked—and this only if a valid reason is established.

5 COURSE RESOURCES
The main reference text for the course (MFE text) is:
Other texts that are useful references for the course coverage are:


**Course website**
The course moodle website is available from the UNSW TELT platform:
http://elearning.unsw.edu.au/

To access the online support site for students, follow the links from that website to Support for Students. Additional technical support can be obtained from itservicecentre@unsw.edu.au (02 9385 1333).

All course contents will be available from the course website. **It is essential that you visit the site regularly to see any notices posted there by the course coordinator, as it will be assumed that they are known to you within a reasonable time.**

**Actuaries Institute**
The Actuaries Institute allows students to become University Subscribers free of charge. Full time undergraduates studying at an Institute accredited university who are members of a university student actuarial society are eligible.
To sign up, go to http://www.actuaries.asn.au/Membership/MembershipoftheInstitute/Subscriber.aspx

### 6 COURSE EVALUATION AND DEVELOPMENT

Each year feedback is sought from students and other stakeholders about the courses offered in the School and continual improvements are made based on this feedback. UNSW's Course and Teaching Evaluation and Improvement (CATEI) Process is one of the ways in which student evaluative feedback is gathered. In this course we will seek feedback at least at the end of the session.

Partly as a result of feedback from previous offerings of this course, in 2014 we will continue to refine and update the course, and continue to include opportunities for students to apply course concepts to practical problems utilizing more advanced software tools.
## 7 COURSE SCHEDULE

### Lecture Schedule

Lectures start in Week 1 and finish in Week 12.

<table>
<thead>
<tr>
<th>Week</th>
<th>Topic</th>
<th>Reference (from MFE text)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Week 1 2 March</td>
<td>Intro to Quantitative Risk Management</td>
<td>Ch 1, Sect 2.1-2.2</td>
</tr>
<tr>
<td>Week 2 9 March</td>
<td>Risk Measures; Multivariate Models.</td>
<td>Sect. 6.1.1, 6.1.2 (up to but excluding Theorem 6.8), Sect. 6.1.5 (Example 6.12)</td>
</tr>
<tr>
<td>Week 3 16 March</td>
<td>Multivariate Models (ii)</td>
<td>Sect. 3.1, 3.2.1-3.2.4, Appendix A.2 and A.3</td>
</tr>
<tr>
<td>Week 4 23 March</td>
<td>Multivariate Models (iii)</td>
<td>Sect. 3.3.1-3.3.4; 3.4.1 (not Theorem 3.22 or Corollary 3.23).</td>
</tr>
<tr>
<td>Week 5 30 March</td>
<td>Extreme Value Theory</td>
<td>Sect. 7.1, 7.2.1-7.2.4</td>
</tr>
<tr>
<td></td>
<td>Mid-semester break: Good Friday 3(^{rd}) April -Sunday 12(^{th}) April</td>
<td></td>
</tr>
<tr>
<td>Week 6 13 April</td>
<td>Mid-Semester Exam</td>
<td></td>
</tr>
<tr>
<td>Week 7 20 April</td>
<td>Copulas and Dependence (i)</td>
<td>Sect. 5.1 (up to 5.1.1)</td>
</tr>
<tr>
<td>Week 8 27 April</td>
<td>Copulas and Dependence (ii)</td>
<td>Sect. 5.1 (up to 5.1.3)</td>
</tr>
<tr>
<td>Week 9 4 May</td>
<td>Copulas and Dependence (iii)</td>
<td>Sect. 5.3.1-5.3.31, 5.2, 5.3.1-5.3.3, 5.4.1-5.4.2, 5.5</td>
</tr>
<tr>
<td>Week 10 11 May</td>
<td>Financial Time Series</td>
<td>Sect. 4.1, 4.4.3, 4.4.1 (Revision: 4.2.1, 4.2.2, 4.6.1-4.6.2)</td>
</tr>
<tr>
<td>Week 11 18 May</td>
<td>Market. Credit, and Operational Risk Analytics (i)</td>
<td>Sect. 8.1, 8.2, 8.3.1, 8.3.3, 8.4.1, 8.4.2</td>
</tr>
<tr>
<td>Week 12 25 May</td>
<td>Market. Credit, and Operational Risk Analytics (ii)</td>
<td>Sect. 10.1, 10.2</td>
</tr>
<tr>
<td>Week 13 1 June</td>
<td>NO LECTURES</td>
<td></td>
</tr>
</tbody>
</table>