ACTL5109
Financial Economics for Insurance and Superannuation

Course Outline
Semester 2, 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.
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PART A: COURSE-SPECIFIC INFORMATION

1 STAFF CONTACT DETAILS
The Course Coordinator and Lecturer in Charge is Dr Bernard Wong:

<table>
<thead>
<tr>
<th>Staff</th>
<th>E-mail</th>
<th>Room</th>
<th>Telephone</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dr Bernard Wong</td>
<td><a href="mailto:bernard.wong@unsw.edu.au">bernard.wong@unsw.edu.au</a></td>
<td>Business School 641</td>
<td>9385 2827</td>
</tr>
</tbody>
</table>

He is responsible for course administration, final assessment of the course and responsible for the lectures and related teaching and learning. He is available on Tuesdays 4pm-5pm for student consultation during the teaching session.

2 COURSE DETAILS

2.1 Teaching Times and Locations
Face-to-face lectures will be held on Tuesdays from 6pm-9pm at the UNSW Business School Building 130 for all weeks.

Timetables and locations are correct at time of editing. A full timetable of lectures and topics is provided later in this Course Outline. 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.

2.3 Summary of Course
This course introduces the mathematical and economic models of financial economics, and highlights their application to asset-liability management for insurance, superannuation and funds management. Particular focus will be placed on the development of quantitative models to solve practical actuarial problems.

Topics covered include: risk and utility; risk measures; mean-variance models; factor models; asset-liability models; equilibrium and arbitrage-free valuation; valuation of derivatives and embedded guarantees; stochastic interest rate modeling; actuarial stochastic investment models. The topics will be illustrated with applications to the valuation and risk management of insurance and superannuation contracts, especially those with embedded options and financial guarantees.

Students need to be able to use a word processing package (such as WORD) and a spreadsheet package (such as EXCEL).

2.4 Course Aims and Relationship to Other Courses
The aims of this course are to provide students with an understanding of:

- The application of utility theory and quantitative risk measurement as a tool to aid decision-making.
- Mean-variance analysis and its applications to optimal asset-liability management.
- The assumptions, theory and application of the principal asset pricing models – including statistical, arbitrage, and equilibrium approaches.
- Contingent-claims pricing techniques and their actuarial applications.
- Actuarial stochastic investment models, and asset-liability modelling.

Students taking this course are assumed to have mastery over all areas of financial mathematics covered in ACTL5102, and students are required to have either completed or concurrently enrolled in ACTL5103. Concepts covered in this course are useful for advanced quantitative risk management as covered in ACTL5301 and ACTL5302.

This material covered in this course is further continued/complemented in ACTL4303 and ACTL5303, which focuses on the knowledge, skills and judgment necessary to understand investment and asset liability modeling with an emphasis on practical issues.

2.5 Student Learning Outcomes

By the end of the course, you should be able to:

1. Describe and apply methods for quantitative risk measurement and decision-making under uncertainty by effectively combining techniques from financial economics and actuarial science. [LO1]
2. Apply mean-variance criteria to determine the optimal asset allocation for long-term investors, including insurers and superannuation funds. [LO2]
3. Explain and apply the assumptions, theory, and results of the principal asset-pricing models – including statistical, arbitrage, and equilibrium approaches - as well as their applications to actuarial work. [LO3]
4. Apply contingent-claim pricing techniques to value and manage the risks of embedded options and guarantees. [LO4]
5. Describe actuarial stochastic investment models, and their applications to asset-liability management. [LO5]
6. Apply effective communication, discussion and report writing skills. [LO6]

UNSW Business School Program Learning Goals

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.

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’).
Business School 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.

6. Leadership: Our graduates will have an understanding of effective leadership. (MBA and MBT programs only).
   You should be able to reflect on your personal leadership experience, and on the capabilities necessary for leadership.

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

<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 UNSW Business School 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>
<tr>
<td>1 Knowledge</td>
<td>All</td>
<td>Assignment</td>
</tr>
<tr>
<td>2 Critical thinking and problem solving</td>
<td>All</td>
<td>Assignment</td>
</tr>
<tr>
<td>3a Written communication</td>
<td>All</td>
<td>Assignment</td>
</tr>
<tr>
<td>3b Oral</td>
<td>n/a</td>
<td></td>
</tr>
</tbody>
</table>

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CRICOS Code 00098G

UNSW

Business School
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 and associated learning activities, 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 to work through the difficult points. To maximize your learning in each lecture you should read the assigned notes prior to each class. The learning activities provide you with an opportunity to work with your peers and develop both technical, team, and communication skills. The assignment presents you with a practical application of course concepts to an actuarial business problem (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 as each week builds on the weeks prior so it is important that you get your study regime organised quickly.

Students are not permitted to bring into the class any sound or video recording devices.

4 ASSESSMENT

4.1 Formal Requirements
In order to pass this course, you must:
- make a satisfactory attempt at all assessment tasks.

In order to gain an exemption from the Actuaries Institute Course CT8 you must obtain a grade of credit or above in this course.
### 4.2 Assessment Details

<table>
<thead>
<tr>
<th>Assessment Task</th>
<th>Weighting</th>
<th>Learning Outcomes assessed</th>
<th>Business School Program Learning Goals assessed</th>
<th>Length</th>
<th>Due Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mid Session exam</td>
<td>20%</td>
<td>LO1-LO3, LO6</td>
<td>1,2,3,5</td>
<td>1 hour</td>
<td>Week 7</td>
</tr>
<tr>
<td>Assignment</td>
<td>20%</td>
<td>LO1, LO3-LO6</td>
<td>1,2,3,4,5</td>
<td></td>
<td>Week 10</td>
</tr>
<tr>
<td>Final Examination</td>
<td>60%</td>
<td>LO1-LO6</td>
<td>1,2,3,5</td>
<td>2 hours</td>
<td>As advised by UNSW</td>
</tr>
<tr>
<td>TOTAL</td>
<td>100%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Whilst feedback will be provided to students after their assessments have been completed, students should note that the final assessment can involve scaling of overall marks to adjust for varying difficulty across years and to adjust for variations in marking standards of different examiners.

#### 4.2.1 Details of each assessment task:

**4.3.1 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 Learning Outcomes LO1-LO6.

The assignment will allow students the opportunity to develop their understanding of the issues involved in applying/extending the techniques discussed in the course to a practical actuarial business problem, and to develop writing and communication skills.

The assignment will be posted on the course web site on or before 6pm, on the 15th of September, 2015, and are due at 11.59am on 6th of October, 2015. Assignments are to be submitted via the course webpage.

Students are reminded that the work they submit must be based on work by themselves. While we have no problem with students working together (and in fact, it is encouraged to interact with your peers to enhance your learning) 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 using your own code, which you yourself wrote and ran, without reference to any other student’s work.

**4.3.2 Mid Session Exam**
The mid session exam will assess critical analysis and problem solving skills as well as written communication skills, and correspond to Learning Outcomes LO1, LO2, LO3, and LO6. In addition, the mid session exam provides a feedback mechanism for students to gauge their progress in the course.

The date and time of the mid session exam is on **3:30pm Monday, 7th September 2015**. It will be held at a location as indicated on the course website a week prior to the mid session exam date. The mid session exam will be worth 20% of the total assessment for the course. The exam will be closed book.

Normal examination rules apply to the conduct of mid session exams. It is the student’s responsibility to be familiar with the rules governing the conduct of examinations. Calculators will be allowed in the mid session (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.

The mid session exam requires 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 awarded on mathematical working as well as part marks for incorrect responses with correct method and reasoning. The questions will test not only your knowledge of the material, but also the depth of your understanding.

**4.3.3 Final Exam**

The final examination will be a two-hour written paper. The examination will 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 Learning Outcomes LO1-6.

**4.4 Late Submission**

Late submission of any assessment item will not be accepted unless the requirements relating to "Special Consideration" apply (see Part B Course Outline).

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### 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.

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### 5 COURSE RESOURCES

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:

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


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

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 your feedback through both a midsession and end of session CATEI.

As a result of feedback from previous offerings in the course, significant changes and improvements were introduced in recent years with significant positive feedback from students as a result. In 2015 we will improve the course material by incorporating additional illustrative examples to further enhance student understanding. In addition, all lectures will be available via the Echo360 lecture recording system in order to facilitate students flexible learning strategies.
7 COURSE SCHEDULE
This timetable may be altered. Students will be advised of any changes in lectures and via the course web site.

<table>
<thead>
<tr>
<th>Week</th>
<th>Week beginning</th>
<th>Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>27-Jul</td>
<td>Utility Theory; Risk Measures</td>
</tr>
<tr>
<td>2</td>
<td>3-Aug</td>
<td>Mean-Variance Analysis</td>
</tr>
<tr>
<td>3</td>
<td>10-Aug</td>
<td>Capital Asset Pricing Model</td>
</tr>
<tr>
<td>4</td>
<td>17-Aug</td>
<td>Factor Models, Arbitrage Pricing Theory</td>
</tr>
<tr>
<td>5</td>
<td>24-Aug</td>
<td>Data and Statistics; Efficient Markets, Introduction to Derivatives</td>
</tr>
<tr>
<td>6</td>
<td>31-Aug</td>
<td>Contingent Claim Valuation - Discrete Time</td>
</tr>
<tr>
<td>7</td>
<td>7-Sep</td>
<td>Mid Semester Exam, Continuous Time Modelling Techniques</td>
</tr>
<tr>
<td>8</td>
<td>14-Sep</td>
<td>Continuous Time Modelling Techniques</td>
</tr>
<tr>
<td>9</td>
<td>21-Sep</td>
<td>Contingent Claim Valuation - Continuous Time (1)</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Mid Semester Break</strong></td>
</tr>
<tr>
<td>10</td>
<td>5-Oct</td>
<td>Contingent Claim Valuation - Continuous Time (2)</td>
</tr>
<tr>
<td>11</td>
<td>12-Oct</td>
<td>Interest Rate Modelling</td>
</tr>
<tr>
<td>12</td>
<td>19-Oct</td>
<td>Actuarial Stochastic Investment Models; Applications</td>
</tr>
</tbody>
</table>
8 COVERAGE OF ACTUARIES INSTITUTE SYLLABUS

The following table indicates the Actuaries’ Institute Learning Outcomes and the corresponding learning outcomes / lecture in this course:

<table>
<thead>
<tr>
<th>Actuaries Institute CT8 Aim</th>
<th>Learning Outcome(s)</th>
<th>Lecture Topic(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(i) - Utility Theory</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>(ii) - Risk Measures</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>(iii) - Mean-variance Analysis</td>
<td>2</td>
<td>2,12</td>
</tr>
<tr>
<td>(iv) - Factor Models</td>
<td>3</td>
<td>4,5</td>
</tr>
<tr>
<td>(v) - Asset Pricing Models</td>
<td>3</td>
<td>3,5</td>
</tr>
<tr>
<td>(vi) - Efficient Markets</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>(vii) - Stochastic Models</td>
<td>5</td>
<td>5,12</td>
</tr>
<tr>
<td>(viii) - Brownian Motion</td>
<td>4</td>
<td>8,9,10</td>
</tr>
<tr>
<td>(ix) - Option Pricing</td>
<td>4</td>
<td>6,7,8,9,10</td>
</tr>
<tr>
<td>(x) Term Structure</td>
<td>4</td>
<td>11</td>
</tr>
</tbody>
</table>