ACST306
Quantitative Asset and Liability Modelling 1
S1 Day 2016
Dept of Applied Finance and Actuarial Studies

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General Information

Unit convenor and teaching staff

Unit Convenor
Jiwook Jang
jiwook.jang@mq.edu.au
Contact via jiwook.jang@mq.edu.au
E4A 613
Weekly Discussion Board

Angela Chow
angela.chow@mq.edu.au

Credit points
3

Prerequisites
ACST202 and STAT272

Corequisites

Co-badged status

Unit description
This unit examines: utility theory and simple asset allocation; mean-variance portfolio theory; the capital asset pricing model; measures of investment risk; single and multifactor models; arbitrage pricing theory; and the efficient market hypothesis. With the introduction of options, the binomial option pricing models are covered for European, American and exotic options. Stochastic interest rates and moments of the accumulation of annuities are also studied. Students gaining a grade of credit or higher in both ACST306 and ACST307 are eligible for exemption from subject CT8 of the professional exams of the Institute of Actuaries of Australia.

Important Academic Dates
Information about important academic dates including deadlines for withdrawing from units are available at https://www.mq.edu.au/study/calendar-of-dates

Learning Outcomes
On successful completion of this unit, you will be able to:

- Decision making via utility functions.
- Asset pricing using Capital Asset Pricing Model (CAPM), single/multi index models and
Arbitrage Pricing Theory (APT) Model.
Measuring investment risk using various risk measures.
Detecting three forms of market efficiency.
A stochastic approach to the theory of interest - the mean and variance of the accumulation of a string of payments.
Understanding option and single to multi-period Binomial option pricing models (discrete time model).

General Assessment Information

Assessment Tasks

<table>
<thead>
<tr>
<th>Name</th>
<th>Weighting</th>
<th>Due</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class Test</td>
<td>10%</td>
<td>Monday 30 May 10:00am</td>
</tr>
<tr>
<td>Assignment</td>
<td>20%</td>
<td>Tuesday 26 April 12:00noon</td>
</tr>
<tr>
<td>Final Examination</td>
<td>70%</td>
<td>University Examination Period</td>
</tr>
</tbody>
</table>

Class Test

Due: **Monday 30 May 10:00am**
Weighting: **10%**

You are permitted ONE A4 page of paper containing reference material printed on both sides. The material may be handwritten or typed. The page will not be returned at the end of the class test. Non-programmable calculators with no textretrievalcapacity are allowed. Dictionaries are not permitted.

No extensions will be granted. Students who have not submitted the task prior to the deadline will be awarded a mark of 0 for the task, except for cases in which an application for special consideration is made and approved.

On successful completion you will be able to:
• Measuring investment risk using various risk measures.
• A stochastic approach to the theory of interest - the mean and variance of the accumulation of a string of payments.
• Understanding option and single to multi-period Binomial option pricing models (discrete time model).

Assignment
Due: **Tuesday 26 April 12:00noon**
Weighting: **20%**

Assignment has to be submitted to ACST306/816 Assignment Box in BESS.

No extensions will be granted. There will be a deduction of 10% of the total available marks made from the total awarded mark for each 24 hour period or part thereof that the submission is late (for example, 25 hours late in submission - 20% penalty). This penalty does not apply for cases in which an application for disruption of studies is made and approved. No submission will be accepted after solutions have been posted.

On successful completion you will be able to:
• Decision making via utility functions.
• Asset pricing using Capital Asset Pricing Model (CAPM), single/multi index models and Arbitrage Pricing Theory (APT) Model.

Final Examination
Due: **University Examination Period**
Weighting: **70%**

You are permitted ONE A4 page of paper containing reference material printed on both sides. The material may be handwritten or typed. The page will not be returned at the end of the final examination. Non-programmable calculators with no textretrieval capacity are allowed. Dictionaries are not permitted.

On successful completion you will be able to:
• Decision making via utility functions.
• Asset pricing using Capital Asset Pricing Model (CAPM), single/multi index models and Arbitrage Pricing Theory (APT) Model.
• Measuring investment risk using various risk measures.
• Detecting three forms of market efficiency.
• A stochastic approach to the theory of interest - the mean and variance of the accumulation of a string of payments.
Understanding option and single to multi-period Binomial option pricing models (discrete time model).

**Delivery and Resources**

**CLASSES**

This unit consist of 2 hours of lectures and 1 hour tutorial per week, Lectures are held at the following times: Monday 10:00-12:00noon E7B T5.

ACST306 Tutorials are held on Monday, commencing in **Week 2**:

You must attend the tutorial class in which you are enrolled. The tutorial is an opportunity for you to attempt the section exercises given at the end of each section of work, and to discuss problems with the tutor.

Any alterations to the class times or locations will be advised in lectures and via the website.

**REQUIRED and RECOMMENDED TEXTS and/or Materials**

**Required texts**

Lecture materials are available for downloading from ACST306/816 teaching website.

**Recommended textbooks**

Lecture materials are available for downloading from ACST306/816 teaching website.

- Investment Science; David Luenberger
- Modern Portfolio Theory and Investment Analysis; Edwin J. Elton, Martin J. Gruber, Stephen J. Brown and William N. Goetzmann
- Investment Mathematics and Statistics; Andrew Adams, Della Bloomfield, Philip Booth and Peter England
- Options, Futures and Other Derivatives; John Hull

Each copy of these books is available in the Reserve section of the Library and can be purchased from the Macquarie University Co-op bookshops.

**Optional ActEd material**

- The ActEd CT8, that can be purchased directly from ActEd.

**TECHNOLOGY USED and REQUIRED**

Students need to be able to use a computer to analyse financial problems. You should be able to use a word processing package (such as WORD), a spreadsheet (such as EXCEL), a statistical package (such as MINITAB) and a programming languages (such as Visual Basics or Matlab). Although the unit does not aim to teach students how to use computers, as this is covered in prerequisite units, you are encouraged to make use of spreadsheets and other software packages for the assignment.

**Unit Web Page**

[https://unitguides.mq.edu.au/unit_offerings/68667/unit_guide/print](https://unitguides.mq.edu.au/unit_offerings/68667/unit_guide/print)
To access the website, go to http://ilearn.mq.edu.au and login using your usual login and password.

**TEACHING and LEARNING STRATEGY**

The unit is taught using two-hour lecture and one-hour tutorial each week. You are expected to read lecture materials in advance of the lectures. The tutorial is an opportunity for you to attempt questions for each section of work, or to ask questions. It is highly recommended to try to solve questions in advance of the tutorials. In addition to the tutorial, you should use the Discussion Board to ask questions or discuss concepts covered in the unit.

**CHANGES since LAST OFFERING**

Nil.

**Unit Schedule**

<table>
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<tr>
<th>Week</th>
<th>Lecture Topics</th>
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<tbody>
<tr>
<td>1.</td>
<td>Utility Theory</td>
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<td>2.</td>
<td>Decision making via utility functions</td>
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<tr>
<td>3.</td>
<td>Mean-Variance portfolio theory</td>
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<td>4.</td>
<td>The CAPM</td>
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<td>5.</td>
<td>Easter Monday</td>
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<td>6.</td>
<td>Single/Multi index models and Arbitrage pricing theory (APT)</td>
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<td></td>
<td>Semester Break</td>
</tr>
<tr>
<td>7.</td>
<td>ANZAC Day</td>
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<tr>
<td></td>
<td>(Assignment due - Tuesday 26th April at 12noon)</td>
</tr>
<tr>
<td>8.</td>
<td>Measurements of investment risk / Options</td>
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<tr>
<td>9.</td>
<td>Single/Multi period Binomial option pricing model</td>
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<tr>
<td>10.</td>
<td>American and Exotic option pricing via Binomial model</td>
</tr>
<tr>
<td>11.</td>
<td>Stochastic interest rate models / Efficient market hypothesis</td>
</tr>
<tr>
<td>12.</td>
<td>Class Test (Monday 30 May 10:00-12:00noon)</td>
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<tr>
<td>13.</td>
<td>Revision</td>
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</tbody>
</table>

**Policies and Procedures**

Macquarie University policies and procedures are accessible from [Policy Central](http://mq.edu.au/policy/docs/academic_honesty/policy.html). Students should be aware of the following policies in particular with regard to Learning and Teaching:


Student Support

For more information visit [http://students.mq.edu.au/events/2016/07/19/new_assessment_policy_in_place_from_session_2/](http://students.mq.edu.au/events/2016/07/19/new_assessment_policy_in_place_from_session_2/)


In addition, a number of other policies can be found in the [Learning and Teaching Category](http://www.mq.edu.au/policy/docs/) of Policy Central.

**Student Code of Conduct**

Macquarie University students have a responsibility to be familiar with the Student Code of Conduct: [https://students.mq.edu.au/support/student_conduct/](https://students.mq.edu.au/support/student_conduct/)

**Results**

Results shown in iLearn, or released directly by your Unit Convenor, are not confirmed as they are subject to final approval by the University. Once approved, final results will be sent to your student email address and will be made available in eStudent. For more information visit [ask.mq.edu.au](http://ask.mq.edu.au).

Supplementary Exams

Further information regarding supplementary exams, including dates, is available here [http://www.businessandeconomics.mq.edu.au/current_students/undergraduate/how_do_i/disruption_to_studies](http://www.businessandeconomics.mq.edu.au/current_students/undergraduate/how_do_i/disruption_to_studies)

**Student Support**

Macquarie University provides a range of support services for students. For details, visit [http://students.mq.edu.au/support/](http://students.mq.edu.au/support/)

**Learning Skills**

Learning Skills ([mq.edu.au/learningskills](http://mq.edu.au/learningskills)) provides academic writing resources and study strategies to improve your marks and take control of your study.

- **Workshops**
- **StudyWise**
- **Academic Integrity Module for Students**
- **Ask a Learning Adviser**
Student Services and Support
Students with a disability are encouraged to contact the Disability Service who can provide appropriate help with any issues that arise during their studies.

Student Enquiries
For all student enquiries, visit Student Connect at ask.mq.edu.au

IT Help
For help with University computer systems and technology, visit http://www.mq.edu.au/about_us/offices_and_units/information_technology/help/.

When using the University's IT, you must adhere to the Acceptable Use of IT Resources Policy. The policy applies to all who connect to the MQ network including students.

Graduate Capabilities
Creative and Innovative
Our graduates will also be capable of creative thinking and of creating knowledge. They will be imaginative and open to experience and capable of innovation at work and in the community. We want them to be engaged in applying their critical, creative thinking.

This graduate capability is supported by:

Learning outcomes
• Decision making via utility functions.
• Asset pricing using Capital Asset Pricing Model (CAPM), single/multi index models and Arbitrage Pricing Theory (APT) Model.
• Measuring investment risk using various risk measures.
• Detecting three forms of market efficiency.
• A stochastic approach to the theory of interest - the mean and variance of the accumulation of a string of payments.
• Understanding option and single to multi-period Binomial option pricing models (discrete time model).

Assessment tasks
• Class Test
• Assignment
• Final Examination

Discipline Specific Knowledge and Skills
Our graduates will take with them the intellectual development, depth and breadth of knowledge,
scholarly understanding, and specific subject content in their chosen fields to make them competent and confident in their subject or profession. They will be able to demonstrate, where relevant, professional technical competence and meet professional standards. They will be able to articulate the structure of knowledge of their discipline, be able to adapt discipline-specific knowledge to novel situations, and be able to contribute from their discipline to inter-disciplinary solutions to problems.

This graduate capability is supported by:

**Learning outcomes**

- Decision making via utility functions.
- Asset pricing using Capital Asset Pricing Model (CAPM), single/multi index models and Arbitrage Pricing Theory (APT) Model.
- Measuring investment risk using various risk measures.
- Detecting three forms of market efficiency.
- A stochastic approach to the theory of interest - the mean and variance of the accumulation of a string of payments.
- Understanding option and single to multi-period Binomial option pricing models (discrete time model).

**Assessment tasks**

- Class Test
- Assignment
- Final Examination

**Critical, Analytical and Integrative Thinking**

We want our graduates to be capable of reasoning, questioning and analysing, and to integrate and synthesise learning and knowledge from a range of sources and environments; to be able to critique constraints, assumptions and limitations; to be able to think independently and systemically in relation to scholarly activity, in the workplace, and in the world. We want them to have a level of scientific and information technology literacy.

This graduate capability is supported by:

**Learning outcomes**

- Decision making via utility functions.
- Asset pricing using Capital Asset Pricing Model (CAPM), single/multi index models and Arbitrage Pricing Theory (APT) Model.
- Measuring investment risk using various risk measures.
- Detecting three forms of market efficiency.
- A stochastic approach to the theory of interest - the mean and variance of the
accumulation of a string of payments.

- Understanding option and single to multi-period Binomial option pricing models (discrete time model).

**Assessment tasks**

- Class Test
- Assignment
- Final Examination

**Problem Solving and Research Capability**

Our graduates should be capable of researching; of analysing, and interpreting and assessing data and information in various forms; of drawing connections across fields of knowledge; and they should be able to relate their knowledge to complex situations at work or in the world, in order to diagnose and solve problems. We want them to have the confidence to take the initiative in doing so, within an awareness of their own limitations.

This graduate capability is supported by:

**Learning outcomes**

- Decision making via utility functions.
- Asset pricing using Capital Asset Pricing Model (CAPM), single/multi index models and Arbitrage Pricing Theory (APT) Model.
- Measuring investment risk using various risk measures.
- Detecting three forms of market efficiency.
- A stochastic approach to the theory of interest - the mean and variance of the accumulation of a string of payments.
- Understanding option and single to multi-period Binomial option pricing models (discrete time model).

**Assessment tasks**

- Class Test
- Assignment
- Final Examination

**Research and Practice**

1. This unit uses research from external sources:


2. This unit gives you opportunities to conduct your own research.