# ACST306

Quantitative Asset and Liability Modelling 1

S1 Day 2016

Dept of Applied Finance and Actuarial Studies

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## Disclaimer

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General Information

Unit convenor and teaching staff
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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 http://students.mq.edu.au/student_admin/enrolmentguide/academicdates/

Learning Outcomes

1. Decision making via utility functions.
4. Detecting three forms of market efficiency.
5. A stochastic approach to the theory of interest - the mean and variance of the accumulation of a string of payments.
6. 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>
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</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.

This Assessment Task relates to the following Learning Outcomes:
• 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 12:00 noon
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.

This Assessment Task relates to the following 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.

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 text retrieval capacity are allowed. Dictionaries are not permitted.

This Assessment Task relates to the following 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).

Delivery and Resources

CLASSES

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

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 atempt 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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<tr>
<td>1.</td>
<td>Utility Theory</td>
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<tr>
<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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<tr>
<td>4.</td>
<td>The CAPM</td>
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<td>5.</td>
<td>Easter Monday</td>
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<tr>
<td>6.</td>
<td>Single/Multi index models and Arbitrage pricing theory (APT)</td>
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Semester Break

7. ANZAC Day
   (Assignment due - Tuesday 26th April at 12noon)

8. Measurements of investment risk / Options

9. Single/Multi period Binomial option pricing model

10. American and Exotic option pricing via Binomial model

11. Stochastic interest rate models / Efficient market hypothesis

12. Class Test (Monday 30 May 10:00-12:00noon)

13. Revision
Policies and Procedures

Macquarie University policies and procedures are accessible from Policy Central. Students should be aware of the following policies in particular with regard to Learning and Teaching:


In addition, a number of other policies can be found in the Learning and Teaching Category 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.

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.
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
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

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
Research and Practice

1. This unit uses research from external sources:


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