



ACST306

Quantitative Asset and Liability Modelling 1

S1 Day 2014

Applied Finance and Actuarial Studies

Contents

| | |
|--|----|
| <u>General Information</u> | 2 |
| <u>Learning Outcomes</u> | 2 |
| <u>Assessment Tasks</u> | 3 |
| <u>Delivery and Resources</u> | 4 |
| <u>Unit Schedule</u> | 6 |
| <u>Policies and Procedures</u> | 6 |
| <u>Graduate Capabilities</u> | 7 |
| <u>Research and Practice</u> | 10 |

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General Information

Unit convenor and teaching staff

Unit Convenor

Jiwook Jang

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E4A 613

Weekly Discussion Board

David Pitt

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Credit points

3

Prerequisites

ACST202(P) and STAT272(P)

Corequisites

Co-badged status

This unit is co-badged with ACST816.

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).

Assessment Tasks

| Name | Weighting | Due |
|--|-----------|-------------------------------|
| <u>Assignment</u> | 20% | Monday 28 April 1:00pm |
| <u>Class Test</u> | 10% | Monday 26 May 10:00am |
| <u>Final Examination</u> | 70% | University Examination Period |

Assignment

Due: **Monday 28 April 1:00pm**

Weighting: **20%**

Assignment has to be submitted to ACST306/816 Assignment Box in BESS (E4B106).

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:

- Decision making via utility functions.
- Asset pricing using Capital Asset Pricing Model (CAPM), single/multi index models and Arbitrage Pricing Theory (APT) Model.

Class Test

Due: **Monday 26 May 10:00am**

Weighting: **10%**

Students will be allowed to take one A4 page into the exam (handwritten or typed and filled in one or two sides).

No subsequent test will be provided for students who do not sit the class test. Students who have not sat the class test will be awarded a mark of 0 for the test, 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).

Final Examination

Due: **University Examination Period**

Weighting: **70%**

Students will be allowed to take one A4 page into the exam (handwritten or typed and filled in one or two sides).

Non-programmable calculators with no text-retrieval capacity are allowed.

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 T2.

ACST306 Tutorials are held at the following times, commencing in Week 2:

Monday 12:00-1:00pm W5C 309 (David Barnes)

Monday 2:00-3:00pm W5C 309 (David Barnes)

Monday 3:00-4:00pm W5C 309 (David Barnes)

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.

There is no tutorial held during Week 1. Tutorials commence in Week 2.

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 (8th Edition); 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 language (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 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

Week Lecture Topics

1. Utility Theory
2. Decision making via utility functions
3. Mean-Variance portfolio theory
4. The CAPM
5. Single/Multi index models and Arbitrage pricing theory (APT)
6. Measurements of investment risk

Semester Break

7. Stochastic interest rate models (Assignment due - Monday 28 April 1:00pm)
8. Options, Single period Binomial option pricing model
9. Multi period Binomial option pricing model
10. American and Exotic option pricing via Binomial model
11. Class Test (Monday 26 May 10:00-12:00noon)
12. Efficient market hypothesis
13. Queens Birthday Public Holiday

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:

Academic Honesty Policy http://mq.edu.au/policy/docs/academic_honesty/policy.html

Assessment Policy <http://mq.edu.au/policy/docs/assessment/policy.html>

Grading Policy <http://mq.edu.au/policy/docs/grading/policy.html>

Grade Appeal Policy <http://mq.edu.au/policy/docs/gradeappeal/policy.html>

Grievance Management Policy http://mq.edu.au/policy/docs/grievance_management/policy.html

Disruption to Studies Policy http://www.mq.edu.au/policy/docs/disruption_studies/policy.html *The Disruption to Studies Policy is effective from March 3 2014 and replaces the Special Consideration Policy.*

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/

Supplementary Exams

Further information regarding supplementary exams, including dates, is available here http://www.businessandconomics.mq.edu.au/current_students/undergraduate/how_do_i/special_consideration

Student Support

Macquarie University provides a range of support services for students. For details, visit <http://students.mq.edu.au/support/>

Learning Skills

Learning Skills (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://informatics.mq.edu.au/help/>.

When using the University's IT, you must adhere to the [Acceptable Use Policy](#). The policy applies to all who connect to the MQ network including students.

Graduate Capabilities

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

- Assignment
- Class Test
- 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

- Assignment
- Class Test
- 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

- Assignment
- Class Test
- Final Examination

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).

Research and Practice

1. This unit uses research from external sources:

- Edwin J. Elton and Martin J. Gruber: "Modern portfolio theory, 1950 to date", *Journal of Banking & Finance*, 21 (1997) 1743-1759.
- Markowitz, H.M. (March 1952): "Portfolio Selection", *Journal of Finance*, 7 (1): 77–91.
- Ross, Stephen (1976): "The arbitrage theory of capital asset pricing", *Journal of Economic Theory* 13 (3): 341–360.
- Neumann, John von & Morgenstern, Oskar (1944): *Theory of Games and Economic Behavior*, Princeton, NJ: Princeton University Press.
- John C. Cox, Stephen A. Ross, and Mark Rubinstein (1979): "Option Pricing: A Simplified Approach", *Journal of Financial Economics* 7: 229-263.

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