



ACST306

Quantitative Asset and Liability Modelling 1

S1 Day 2019

Department of Actuarial Studies and Business Analytics

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General Information

Unit convenor and teaching staff

Unit Convenor

Jiwook Jang

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Contact via jiwook.jang@mq.edu.au

E4A 613

Weekly Discussion Board

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 and 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 Criteria

Assessment criteria for all assessment tasks will be provided on the unit iLearn site

GradeBook

Assignment and class test mark are available on GradeBook. It is the responsibility of students to view their marks for each within session assessment on iLearn within 20 working days of posting. If there are any discrepancies, students must contact the unit convenor immediately. Failure to do so will mean that queries received after the release of final results regarding assessment marks (not including the final exam mark) will not be addressed.

Feedback Prior to the Census Date

Self-assessment exercise question(s) will be released in Week 3 for feedback prior to the census date. Its answer will be also provided before the census date in Week 4.

Assessment Tasks

Name	Weighting	Hurdle	Due
<u>Assignment</u>	20%	No	Thursday 11 April 12:00noon
<u>Class Test</u>	20%	No	Thursday 23 May 12:00noon
<u>Final Examination</u>	60%	No	University Examination Period

Assignment

Due: **Thursday 11 April 12:00noon**

Weighting: **20%**

Assignment has to be submitted via both on **iLearn** and 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 special consideration 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.

Class Test

Due: **Thursday 23 May 12:00noon**

Weighting: **20%**

Class test will be 95 minutes written papers with no reading time, held during the lecture time.

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 be returned to the students at the end of the class test. Non-programmable calculators with no textretrieval capacity are allowed. Dictionaries are not permitted.

Students who do not sit the test will be awarded a mark of 0, 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 and 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).

Final Examination

Due: **University Examination Period**

Weighting: **60%**

The final examination will be a three-hour written exam with ten minutes reading time, held during the University Examination period.

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 be returned to the students 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 and 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: Thursday 12:00-2:00pm, 14 SCO T2.

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 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

None.

Unit Schedule

Week	Lecture Topics
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- | | |
|----|--|
| 1. | Utility Theory |
| 2. | Decision making via utility functions |
| 3. | Mean-Variance portfolio theory |
| 4. | The CAPM |
| 5. | Single/Multi index models |
| 6. | Arbitrage pricing theory (APT) |
| 7. | Measurements of investment risk |
| | (Assignment due - Thursday 11th April at 12noon) |

Semester Break

- | | |
|-----|---|
| 8. | Options |
| 9. | Single/Multi period Binomial option pricing model |
| 10. | American and Exotic option pricing via Binomial model |
| 11. | Class Test (Thursday 23rd May 12:00-2:00pm) |
| 12. | Stochastic interest rate models / Efficient market hypothesis |

13. Revision

Policies and Procedures

Macquarie University policies and procedures are accessible from [Policy Central](https://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/policy-central) (<https://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/policy-central>). Students should be aware of the following policies in particular with regard to Learning and Teaching:

- [Academic Appeals Policy](#)
- [Academic Integrity Policy](#)
- [Academic Progression Policy](#)
- [Assessment Policy](#)
- [Fitness to Practice Procedure](#)
- [Grade Appeal Policy](#)
- [Complaint Management Procedure for Students and Members of the Public](#)
- [Special Consideration Policy](#) (**Note:** *The Special Consideration Policy is effective from 4 December 2017 and replaces the Disruption to Studies Policy.*)

Undergraduate students seeking more policy resources can visit the [Student Policy Gateway](https://students.mq.edu.au/support/study/student-policy-gateway) (<https://students.mq.edu.au/support/study/student-policy-gateway>). It is your one-stop-shop for the key policies you need to know about throughout your undergraduate student journey.

If you would like to see all the policies relevant to Learning and Teaching visit [Policy Central](https://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/policy-central) (<https://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/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/study/getting-started/student-conduct>

Results

Results published on platform other than [eStudent](#), (eg. iLearn, Coursera etc.) 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 or if you are a Global MBA student contact globalmba.support@mq.edu.au

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://stu>

[dents.mq.edu.au/support/](https://unitguides.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

If you are a Global MBA student contact globalmba.support@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 and 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

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 and 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 and 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 and 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

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.