



ACST816

Quantitative Asset and Liability Modelling 1

S1 Day 2017

Dept of Applied Finance and Actuarial Studies

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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

4

Prerequisites

ACST603 or (admission to MActPrac post 2014)

Corequisites

ACST851 and (STAT806 or STAT810)

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 derivatives – forwards, futures and options – the single period binomial option pricing model (discrete time model) and the Black-Scholes option pricing model (continuous time model) 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 ACST816 and ACST817 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 model (discrete time model), American and Exotic option pricing via Binomial 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 marks 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>Class Test 1</u>	5%	No	Wednesday 29 March 5:00pm
<u>Assignment</u>	15%	No	Monday 10 April 12:00noon
<u>Class Test 2</u>	20%	No	Monday 29 May 1:00pm
<u>Final Examination</u>	60%	No	Examination period

Class Test 1

Due: **Wednesday 29 March 5:00pm**

Weighting: **5%**

Class test 1 will be 45 minutes written papers with no reading time, held during the tutorial time.

No materials will be allowed to take into the class test 1. Non-programmable calculators with no text-retrieval capacity 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 disruptions to studies 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

Assignment

Due: **Monday 10 April 12:00noon**

Weighting: **15%**

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 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

Class Test 2

Due: **Monday 29 May 1:00pm**

Weighting: **20%**

Class test 2 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 2. Nonprogrammable calculators with no text-retrieval capacity 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 disruptions to studies 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 model (discrete time model), American and Exotic option pricing via Binomial model

Final Examination

Due: **Examination period**

Weighting: **60%**

The final examination will be a three-hour written paper 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 text-retrieval 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 model (discrete time model), American and Exotic option pricing via Binomial model

Delivery and Resources

Classes

This unit consist of 2 hours of lectures and 2 hours tutorial per week, Lectures are held at the following times: Monday 1:00-3:00pm E7B T5.

ACST816 Tutorials are held at the following times, commencing in Week 2:

Wednesday 4:00-6:00pm X5B 138

You must attend the tutorial class. 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.

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

Required and Recommended Texts and/or Materials Prescribed

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 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.

Changes since the last offering

Class test 2 weighs 20% and Final exam weighs 60%.

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
(Class Test 1 - Wednesday 29 March 5:00pm)
6. Arbitrage pricing theory (APT)
7. Measurements of investment risk
(Assignment due - Monday 10th April 12:00noon)

Semester Break

8. 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 2 (Monday 29 May 1:00-3:00pm)
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:

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

Assessment Policy http://mq.edu.au/policy/docs/assessment/policy_2016.html

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

Complaint Management Procedure for Students and Members of the Public http://www.mq.edu.au/policy/docs/complaint_management/procedure.html

Disruption to Studies Policy (in effect until Dec 4th, 2017): http://www.mq.edu.au/policy/docs/disruption_studies/policy.html

Special Consideration Policy (in effect from Dec 4th, 2017): <https://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/policies/special-consideration>

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/

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.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://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

PG - Discipline Knowledge and Skills

Our postgraduates will be able to demonstrate a significantly enhanced depth and breadth of knowledge, scholarly understanding, and specific subject content knowledge in their chosen

fields.

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 model (discrete time model), American and Exotic option pricing via Binomial model

Assessment tasks

- Class Test 1
- Assignment
- Class Test 2
- Final Examination

PG - Critical, Analytical and Integrative Thinking

Our postgraduates will be capable of utilising and reflecting on prior knowledge and experience, of applying higher level critical thinking skills, and of integrating and synthesising learning and knowledge from a range of sources and environments. A characteristic of this form of thinking is the generation of new, professionally oriented knowledge through personal or group-based critique of practice and theory.

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 model (discrete time model), American and Exotic option pricing via Binomial model

Assessment tasks

- Class Test 1
- Assignment
- Class Test 2
- Final Examination

PG - Research and Problem Solving Capability

Our postgraduates will be capable of systematic enquiry; able to use research skills to create new knowledge that can be applied to real world issues, or contribute to a field of study or practice to enhance society. They will be capable of creative questioning, problem finding and problem solving.

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
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Assessment tasks

- Class Test 1
- Assignment
- Class Test 2
- Final Examination

Research and Practice

- 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.

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