ACST816

Quantitative Asset and Liability Modelling 1

S1 Day 2014

Applied Finance and Actuarial Studies

Contents

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General Information

Unit convenor and teaching staff
Unit Convenor
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E4A 613
Weekly Discussion Board

Credit points
4

Prerequisites
ACST601 and ACST603 and ACST604

Corequisites
ACST851 and STAT810

Co-badged status
This unit is co-badged with ACST306.

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

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

Name	Weighting	Due
Quiz 1 & 2	5%	Tuesday 1 April and 13 May
Assignment	15%	Wednesday 28 April 1:00pm
Class Test	10%	Monday 26 May 10:00am
Final Examination	70%	Examination period

Quiz 1 & 2

Due: **Tuesday 1 April and 13 May**
Weighting: **5%**

There will be two quizzes, each worth 2.5% of the final assessment for the unit.

No materials will be allowed to take into the quiz.

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

Assignment

Due: **Wednesday 28 April 1:00pm**
Weighting: **15%**

Assignment has to be submitted to ACST306/816 Asignment 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 model (discrete time model)

Final Examination

Due: **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 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 10:00-12:00noon E7B T2.

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

Tuesday 4:00-6:00pm E7B 164 (Jiwook Jang (Week 2-13) and Jiaqin Wei (Week 9-13))

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 (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 financia problems l . 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 prerequite 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

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) (Quiz 1 - Tuesday 1 April 5:00pm)

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 (Quiz 2 - Tuesday 13 May 5:00pm)

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 Birtheday 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.businessandeconomics.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

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
- 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

- Quiz 1 & 2
- Assignment
- Class Test
- 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
- 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

- Quiz 1 & 2
- Assignment
- Class Test
- 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

- 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

- Quiz 1 & 2
- Assignment
- Class Test
- 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.