STAT402

Topics in Stochastic Finance

S2 Evening 2014

Statistics

Contents

General Information

Unit convenor and teaching staff
Lecturer
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E4A 537
Refer to iLearn

Credit points
3

Prerequisites
39cp including (STAT272(P) or STAT306(P) or STAT371(P))

Corequisites

Co-badged status

Unit description
This unit serves as an introduction to the modern financial theory of security markets and, in particular, share prices and derivatives. It explains how the financial markets work using appropriate mathematical and statistical models and tools. The material provides essential skills to those conducting research in the finance and banking sectors.

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:

Understand no arbitrage asset pricing principles in discrete- and continuous-time statistical models;

In Black-Scholes-Merton model use no arbitrage asset pricing principle for pricing of financial derivatives;

Have a basic understanding of the Markowitz portfolio optimisation theory and Capital Asset Pricing Model;

Understand assumptions and limitations of the statistical models deployed in market and credit risk management.

Assessment Tasks

Name	Weighting	Due
Quiz 1	5%	Week 2
Assignment 1	15%	Week 6
Quiz 2	5%	Week 9
Assignment 2	15%	Week 12
Final Examination	60%	Exam timetable

Quiz 1

Due: **Week 2**
Weighting: **5%**

Quiz 1 is open book online short test.

On successful completion you will be able to:

- Understand no arbitrage asset pricing principles in discrete- and continuous-time statistical models;
- In Black-Scholes-Merton model use no arbitrage asset pricing principle for pricing of financial derivatives;
- Understand assumptions and limitations of the statistical models deployed in market and credit risk management.

Assignment 1

Due: **Week 6**
Weighting: **15%**

The assignment questions will be made available through iLearn.

On successful completion you will be able to:

- Understand no arbitrage asset pricing principles in discrete- and continuous-time statistical models;
- In Black-Scholes-Merton model use no arbitrage asset pricing principle for pricing of financial derivatives;
- Understand assumptions and limitations of the statistical models deployed in market and credit risk management.

Quiz 2

Due: **Week 9**
Weighting: **5%**

Quiz 1 is open book online short test.

On successful completion you will be able to:

- Understand no arbitrage asset pricing principles in discrete- and continuous-time statistical models;
- In Black-Scholes-Merton model use no arbitrage asset pricing principle for pricing of financial derivatives;
- Have a basic understanding of the Markowitz portfolio optimisation theory and Capital Asset Pricing Model;
- Understand assumptions and limitations of the statistical models deployed in market and credit risk management.

Assignment 2

Due: **Week 12**
Weighting: **15%**

The assignment questions will be made available through iLearn.

On successful completion you will be able to:

- Understand no arbitrage asset pricing principles in discrete- and continuous-time statistical models;
- In Black-Scholes-Merton model use no arbitrage asset pricing principle for pricing of financial derivatives;
- Have a basic understanding of the Markowitz portfolio optimisation theory and Capital Asset Pricing Model;
- Understand assumptions and limitations of the statistical models deployed in market and credit risk management.

Final Examination

Due: **Exam timetable**
Weighting: **60%**

A three-hour final examination for this unit will be held during the University Examination period.

You may take ONE hand-written A4 pages (written on one or both sides) of summary notes into

the exam.

To be eligible for a passing grade in this unit, a pass is required in the final examination.

You are expected to present yourself for examination at the time and place designated in the University Examination Timetable. The timetable will be available in Draft form approximately eight weeks before the commencement of the examinations and in Final form approximately four weeks before the commencement of the examinations.

http://exams.mq.edu.au/

The only exception to not sitting an examination at the designated time is because of documented illness or unavoidable disruption. In these circumstances you may wish to consult Disruption to Studies Policy

http://mq.edu.au/policy/docs/disruption_studies/policy.html

A supplementary examination will only be granted if a student has satisfactory coursework (i. e. at least 50% of coursework).

The Macquarie university examination policy details, the principles and conduct of examinations at the University can be viewed at

http://www.mq.edu.au/policy/docs/examination/policy.htm

On successful completion you will be able to:

- Understand no arbitrage asset pricing principles in discrete- and continuous-time statistical models;
- In Black-Scholes-Merton model use no arbitrage asset pricing principle for pricing of financial derivatives;
- Have a basic understanding of the Markowitz portfolio optimisation theory and Capital Asset Pricing Model;
- Understand assumptions and limitations of the statistical models deployed in market and credit risk management.

Delivery and Resources

TEXTBOOK

There is not textbook for this unit.

The list of recommended texts:

Capinski, M. and T. Zastawniak. Mathematics for Finance: An Introduction to Financial Engineering. Springer, 2003.

Lai, T. L. and H. Xing. Statistical models and methods for financial markets. Springer, 2008.

Musiela, M. and M. Rutkowski. Martingale methods in financial modelling. Springer, 1997.

S. R. Pliska. Introduction to mathematical finance: discrete time models. Blackwell Publishing, 1997.

S. Shreve. Stochastic Calculus for Finance II: Continuous-Time Models. Springer, 2004.

INTERNET RESOURCES / TECHNOLOGIES USED

Lecture notes will be available on the iLearn site prior to the lecture.

Consult the unit iLearn page regularly: https://ilearn.mq.edu.au/login/MQ/

SOFTWARE

Matlab and R are the recommended software in this unit.

Unit Schedule

Date	Week	Topic	Assessment
4 August	1	Simple market models	
11 August	2	Continuous-time models	**Quiz 1**
18 August	3	Continuous-time models cont.	
25 August	4	Black-Scholes-Merton (BSM) model: No-arbitrage and risk-neutral pricing	
1 September	5	BSM model: Option pricing	
8 September	6	BSM model: Option pricing cont.	**Assignment 1 is due**
15 September	7	Financial engineering	

22 September – 6 October		Mid-session break *6/10 Labour Day – NSW Public Holiday*	
13 October	9	Portfolio optimization theory	**Quiz 2**
20 October	10	Portfolio optimization theory cont.	
27 October	11	Capital asset pricing model	
3 November	12	Interest rate models. Credit risk modelling.	**Assignment 2** **is due**
10 November	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.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/

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

- Understand no arbitrage asset pricing principles in discrete- and continuous-time statistical models;
- In Black-Scholes-Merton model use no arbitrage asset pricing principle for pricing of financial derivatives;
- Have a basic understanding of the Markowitz portfolio optimisation theory and Capital Asset Pricing Model;
- Understand assumptions and limitations of the statistical models deployed in market and credit risk management.

Assessment tasks

- Quiz 1
- Assignment 1
- Quiz 2
- Assignment 2
- 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

- Understand no arbitrage asset pricing principles in discrete- and continuous-time statistical models;
- In Black-Scholes-Merton model use no arbitrage asset pricing principle for pricing of financial derivatives;
- Have a basic understanding of the Markowitz portfolio optimisation theory and Capital Asset Pricing Model;
- Understand assumptions and limitations of the statistical models deployed in market and credit risk management.

Assessment tasks

- Quiz 1
- Assignment 1

- Quiz 2
- Assignment 2
- 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

- Understand no arbitrage asset pricing principles in discrete- and continuous-time statistical models;
- In Black-Scholes-Merton model use no arbitrage asset pricing principle for pricing of financial derivatives;
- Have a basic understanding of the Markowitz portfolio optimisation theory and Capital Asset Pricing Model;
- Understand assumptions and limitations of the statistical models deployed in market and credit risk management.

Assessment tasks

- Quiz 1
- Assignment 1
- Quiz 2
- Assignment 2
- 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

- Understand no arbitrage asset pricing principles in discrete- and continuous-time statistical models;
- In Black-Scholes-Merton model use no arbitrage asset pricing principle for pricing of

financial derivatives;
- Have a basic understanding of the Markowitz portfolio optimisation theory and Capital Asset Pricing Model;
- Understand assumptions and limitations of the statistical models deployed in market and credit risk management.

Assessment tasks

- Quiz 1
- Assignment 1
- Quiz 2
- Assignment 2
- Final Examination

Changes from Previous Offering

This year two online quizzes (worth 10%) will replace three short tests administered in class previously.

Grading

The Macquarie University grading policy can be found at http://mq.edu.au/policy/docs/grading/policy.html

Note that, in order to be awarded a particular Standardised Numerical Grade (SNG) and Grade, a student must meet the performance standard outlined in the grading policy in both the coursework and the examination sections of the unit.

A Standardised Numerical Grade (SNG) gives you an indication of how you have performed within the band for your descriptive grade. The SNG is not a mark, and you may not be able to work it out based on your raw examination and other assessment marks. Nor are you able to determine you are “one mark away” from a different grade.

Changes since First Published

Date	Description
29/07/2014	Double numbering of learning outcomes has been fixed.