



STAT402

Topics in Stochastic Finance

S2 Evening 2015

Dept of Statistics

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General Information

Unit convenor and teaching staff

Unit Convenor

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Contact via 02 9850 4769

Level 2, The Australian Hearing Hub

Thursday 2 - 4 pm

Lecturer

Nino Kordzakhia

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Level 2, The Australian Hearing Hub

Tuesday 12 - 2 pm

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:

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

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.

Assessment Tasks

Name	Weighting	Due
Online Test	10%	Week 3
2 Individual Assignments	30%	Weeks 6 & 12
Final Examination	60%	TBA

Online Test

Due: **Week 3**

Weighting: **10%**

The online test will be made available on iLearn one week prior to the due dates. Students are allowed two attempts at the tests until the deadline. A "pass" mark (approx. 80% of the total) will be indicated on the test. Inability to "pass" a test necessitates **visiting one of the staff members' consultation hours**. The highest score obtained will count towards the final grade. Students will get a different version of the test in their second attempt. The test is designed to give students an early opportunity to practice the theoretical and the mechanical aspects of the unit. Extensions will only be granted for cases in which an application for disruption to studies has been approved.

On successful completion you will be able to:

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

2 Individual Assignments

Due: **Weeks 6 & 12**

Weighting: **30%**

You will be issued two assignments (made available through *iLearn*) during the semester to be completed individually and submitted via *iLearn*.

Extensions will only be granted for cases in which an application for disruption to studies have been approved.

On successful completion you will be able to:

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

Final Examination

Due: **TBA**

Weighting: **60%**

A three-hour final examination (plus ten minutes' reading time) for this unit will be held during the University Examination period.

You may take ONE A4 pages (written or typed on one or both sides) of summary notes into the exam.

Students **MUST** perform satisfactorily in the final examination in order to pass the unit regardless of their performance throughout the semester.

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:

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

Delivery and Resources

TEXTBOOK

There is not textbook for this unit.

The list of recommended texts:

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

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

Luenberger, D.G. (1998). Investment Science, Oxford University Press.

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

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

Ruppert, D. (2004). Statistics and Finance: An Introduction. Springer, 2004.

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

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/>

Students will need to use a calculator for the final examination and some of the other assessments.

SOFTWARE

Matlab and R are the recommended software in this unit.

Unit Schedule

Date	Week	Topic	Assessment
28 July	1	Introduction: Simple Market Model	
4 August	2	Interest rate modelling	
11 August	3	Interest rate modelling (cont.); Introduction to Portfolio Theory	Online Test

18 August	4	Portfolio optimisation theory	
25 August	5	Portfolio optimisation theory (cont.); Capital asset pricing model	
1 September	6	Capital asset pricing model (cont.)	Assignment 1
8 September	7	Introduction to continuous-time market models	
14 - 25 September		Mid-session break	
29 September	8	Continuous-time models	
6 October	9	Black-Scholes-Merton (BSM) model: No-arbitrage and risk-neutral pricing	
13 October	10	BSM model: Option pricing	
20 October	11	BSM model: Option pricing (cont.)	
27 October	12	Financial engineering; Credit risk modelling.	Assignment 2
3 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/

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](#).

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

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

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

Assessment tasks

- Online Test
- 2 Individual Assignments
- 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

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

- Online Test
- 2 Individual Assignments
- 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

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

Assessment tasks

- Online Test
- 2 Individual Assignments
- 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

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

Assessment tasks

- Online Test
- 2 Individual Assignments
- Final Examination

Changes from Previous Offering

This year a single online test (worth 10%) will replace two online quizzes offered 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.