STAT890

Stochastic Finance

S2 Evening 2016

Dept of Statistics

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General Information

Unit convenor and teaching staff
Unit Convenor
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Level 2, The Australian Hearing Hub
Monday 10am - 12 pm

Lecturer
Nino Kordzakhia
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Tuesday 12 - 1 pm & 2 - 3 pm

Credit points
4

Prerequisites
Admission to MAppStat or PGDipAppStat or PGCertAppStat or GradDipAppStat

Corequisites

Co-badged status
STAT790

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 a useful edge to those competing for jobs 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:

Demonstrate and apply the Markowitz portfolio optimisation theory and Capital Asset

Pricing Model;
Utilise no arbitrage asset pricing principles in discrete- and continuous-time statistical models;
Demonstrate and apply the Black-Scholes-Merton model for pricing financial derivatives;
Recognise the assumptions and limitations of the statistical models deployed in market and credit risk management.

Assessment Tasks

Name	Weighting	Due
Online Quiz 1	10%	Week 3
1 Individual Assignment	10%	Week 7
Online Quiz 2	10%	Week 10
Class test	10%	Week 12
Final Examination	60%	TBA

Online Quiz 1

Due: **Week 3**
Weighting: **10%**

1 short (open book) online quiz will be made available on ***iLearn*** one week prior to the due dates.

Students will have 1 hour to complete the quiz and submit the solution in a document (word document, pdf, scanned hand-written solution etc) using the iLearn's online submission system. Students are allowed one attempt at the quiz.

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 disruption of studies is made and approved.

On successful completion you will be able to:

- Utilise no arbitrage asset pricing principles in discrete- and continuous-time statistical models;
- Recognise the assumptions and limitations of the statistical models deployed in market and credit risk management.

1 Individual Assignment

Due: **Week 7**

Weighting: **10%**

One assignment (made available through *iLearn*) to be completed individually and **submitted via *iLearn***.

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 disruption of studies is made and approved.

On successful completion you will be able to:

- Demonstrate and apply the Markowitz portfolio optimisation theory and Capital Asset Pricing Model;
- Utilise no arbitrage asset pricing principles in discrete- and continuous-time statistical models;
- Recognise the assumptions and limitations of the statistical models deployed in market and credit risk management.

Online Quiz 2

Due: **Week 10**
Weighting: **10%**

Details on this online quiz will be made available via *iLearn* at a later date.

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 disruption of studies is made and approved.

On successful completion you will be able to:

- Utilise no arbitrage asset pricing principles in discrete- and continuous-time statistical models;
- Demonstrate and apply the Black-Scholes-Merton model for pricing financial derivatives;
- Recognise the assumptions and limitations of the statistical models deployed in market and credit risk management.

Class test

Due: **Week 12**
Weighting: **10%**

There will be one open book class test. Students will take this test in class and the test will last for 50 minutes.

Students who have not completed the test will be awarded a mark of 0 for the test, except for cases in which an application for disruption of studies is made and approved.

On successful completion you will be able to:

- Utilise no arbitrage asset pricing principles in discrete- and continuous-time statistical models;
- Demonstrate and apply the Black-Scholes-Merton model for pricing financial derivatives;
- Recognise the assumptions and limitations of the statistical models deployed in market and credit risk management.

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.

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.

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:

- Demonstrate and apply the Markowitz portfolio optimisation theory and Capital Asset Pricing Model;
- Utilise no arbitrage asset pricing principles in discrete- and continuous-time statistical models;
- Demonstrate and apply the Black-Scholes-Merton model for pricing financial derivatives;
- Recognise the assumptions and limitations of the statistical models deployed in market and credit risk management.

Delivery and Resources

Textbook

There is no 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.

Assessment

Your final mark (see Grading, below) for STAT890 will be a weighted average of marks on your work during the semester and in the final examination.

Grading

Your final grade in STAT890 will be based on your work during semester and in the final examination as specified in the Assessment section above. The grades allocated (HD, D, Cr, et cetera) are as set out in the Grading Policy (see the Policies and Procedures page).

Unit Website

Enrolment in STAT890 should automatically make the STAT890 iLearn site available to you from the start of semester. To access it, log in at https://ilearn.mq.edu.au/login/MQ/ and select STAT890 from your list of iLearn units. If STAT890 doesn't appear, though, and you enrolled in the unit more than 24 hours ago, please contact the Unit Convenor immediately.

The iLearn site is an important part of this unit, giving you access to the online discussion facility, lecture notes, assignments, tutorial exercises and solutions. Unit information appears there too, including this unit outline. During the semester, you should visit the iLearn site at least twice per week.

Software/ Technologies Used

Matlab and R are the recommended software in this unit.

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

Unit Schedule

Date	Week	Topic	Assessment
1 August	1	Introduction: Simple Market Model	
8 August	2	Interest rate modelling	
15 August	3	Interest rate modelling (cont.); Introduction to Portfolio Theory	**Online Quiz 1**
22 August	4	Portfolio optimisation theory	
29 August	5	Portfolio optimisation theory (cont.); Capital asset pricing model	
5 September	6	Capital asset pricing model (cont.)	
12 September	7	Introduction to continuous-time market models	**Assignment 1**
19 - 30 September		Mid-session break	
3 October	8	Labour Day (No Lecture)	
10 October	9	Continuous-time models	
17 October	10	Black-Scholes-Merton (BSM) model: No-arbitrage and risk-neutral pricing	**Online Quiz 2**
24 October	11	BSM model: Option pricing	
31 October	12	BSM model: Option pricing (cont.)	**Class Test**
7 November	13	Financial engineering; Credit risk modelling; 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

New Assessment Policy in effect from Session 2 2016 http://mq.edu.au/policy/docs/assessment/policy_2016.html. For more information visit http://students.mq.edu.au/events/2016/07/19/new_assessment_policy_in_place_from_session_2/

Assessment Policy prior to Session 2 2016 http://mq.edu.au/policy/docs/assessment/policy.html

Grading Policy prior to Session 2 2016 http://mq.edu.au/policy/docs/grading/policy.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 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://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

- Demonstrate and apply the Markowitz portfolio optimisation theory and Capital Asset Pricing Model;
- Utilise no arbitrage asset pricing principles in discrete- and continuous-time statistical models;
- Demonstrate and apply the Black-Scholes-Merton model for pricing financial derivatives;
- Recognise the assumptions and limitations of the statistical models deployed in market and credit risk management.

Assessment tasks

- Online Quiz 1
- 1 Individual Assignment
- Online Quiz 2
- 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

- Demonstrate and apply the Markowitz portfolio optimisation theory and Capital Asset Pricing Model;
- Utilise no arbitrage asset pricing principles in discrete- and continuous-time statistical models;

- Demonstrate and apply the Black-Scholes-Merton model for pricing financial derivatives;
- Recognise the assumptions and limitations of the statistical models deployed in market and credit risk management.

Assessment tasks

- Online Quiz 1
- 1 Individual Assignment
- Online Quiz 2
- 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

- Demonstrate and apply the Markowitz portfolio optimisation theory and Capital Asset Pricing Model;
- Utilise no arbitrage asset pricing principles in discrete- and continuous-time statistical models;
- Demonstrate and apply the Black-Scholes-Merton model for pricing financial derivatives;
- Recognise the assumptions and limitations of the statistical models deployed in market and credit risk management.

Assessment tasks

- Online Quiz 1
- 1 Individual Assignment
- Online Quiz 2
- Class test
- Final Examination

Changes from Previous Offering

A different set of assessment tasks will be used and none of the assessment task will be a hurdle assessment in this offering.