STAT890

Stochastic Finance

S2 External 2017

Dept of Statistics

Contents

General Information

Unit convenor and teaching staff
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Credit points
4

Prerequisites

Corequisites
((Admission to MAppStat or GradDipAppStat) and STAT683) or (admission to MSc or MActPrac)

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 Black-Scholes-Merton model for pricing financial derivatives;
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.
Demonstrate and apply the Markowitz portfolio optimisation theory and Capital Asset Pricing Model;

Assessment Tasks

Name	Weighting	Hurdle	Due
Online Quiz 1	10%	No	Week 3
Test	15%	No	Week 7
Online Quiz 2	10%	No	Week 10
Assignment	15%	No	Week 12
Final Examination	50%	No	TBA

Online Quiz 1

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

The Online Quiz 1 notification will be issued in Week 2.

The quiz will be made available from 9:00 Thursday 17/08 on the iLearn site of the unit. The quiz's due date is 9:00 Friday 18/08.

No extensions will be given, except for cases in which a Special Consideration is granted on the basis of Disruption to Studies (DS) application. According to Macquarie University Disruption to Studies Policy all DS applications must include supporting documentary evidence and are to be made online

https://ask.mq.edu.au/account/user/login

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.

Test

Due: **Week 7**
Weighting: **15%**

This is open book class test. For externally enrolled students the test will be administered via iLearn.

In case you are not available to sit the test due to unavoidable circumstances you may wish to consult Disruption to Studies Policy

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

On successful completion you will be able to:

- Demonstrate and apply the Black-Scholes-Merton model for pricing financial derivatives;
- Utilise no arbitrage asset pricing principles in discrete- and continuous-time statistical models;
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Online Quiz 2

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

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

No extension will be given, except for cases in which a Special Consideration is granted on the basis of Disruption to Studies (DS) application. According to Macquarie University Disruption to Studies Policy all DS applications must include supporting documentary evidence and are to be made online

https://ask.mq.edu.au/account/user/login

On successful completion you will be able to:

- Demonstrate and apply the Markowitz portfolio optimisation theory and Capital Asset Pricing Model;

Assignment

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

The assignment will be made available through iLearn and is to be completed individually.

No extension will be given, except for cases in which a Special Consideration is granted on the basis of Disruption to Studies (DS) application. According to Macquarie University Disruption to Studies Policy all DS applications must include supporting documentary evidence and are to be

made online

https://ask.mq.edu.au/account/user/login

On successful completion you will be able to:

- Demonstrate and apply the Markowitz portfolio optimisation theory and Capital Asset Pricing Model;

Final Examination

Due: **TBA**
Weighting: **50%**

A three-hour long final examination will be held during the University Examination period.

You are permitted ONE A4 page of paper containing reference material printed or handwritten on both sides. The page will not be returned at the end of the final examination. Calculators will be needed but must not be of the text/programmable type.

You must 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 at

https://students.mq.edu.au/study/exams-and-results/exam-timetables

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

Important:

If you lodge the **Disruption to Studies** application for your final examination, **you must make yourself available for the week of December 11 – 15**.

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:

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- Recognise the assumptions and limitations of the statistical models deployed in market

and credit risk management.

- Demonstrate and apply the Markowitz portfolio optimisation theory and Capital Asset Pricing Model;

Delivery and Resources

Classes

Lectures begin in Week 1.

Students must attend three hours of lectures per week. The lecture slides and exercises will be made available on iLearn before the lecture.

The timetable for classes can be found at http://www.timetables.mq.edu.au

iLearn

All unit related materials including lecture notes, tutorials and instructions for assessment tasks and administrative updates, will be posted on iLearn at

https://ilearn.mq.edu.au/login/

Software/ Technologies Used

Matlab and R are the recommended software in this unit.

Students will need to use a calculator for the test and final examination.

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.

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

Unit Schedule

Date	Week	Topic	Assessment
2 August	1	Introduction: Simple Market Model	

9 August	2	Continuous-time models	
16 August	3	Black-Scholes-Merton (BSM) model: No-arbitrage and risk-neutral pricing	**Online Quiz 1**
23 August	4	BSM model: Option pricing	
30 August	5	BSM model: Option pricing (cont.)	
6 September	6	Financial engineering	
13 September	7	Credit risk modelling	**Test**
		Mid-session break	
4 October	8	Interest rate modelling	
11 October	9	Interest rate modelling (cont.); Introduction to Portfolio	**Online Quiz 2**
18 October	10	Theory Portfolio optimisation theory	
25 October	11	Portfolio optimisation theory (cont.)	**Assignment**
1 November	12	Capital asset pricing model	
8 November	13	Capital asset pricing model (cont.)	

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.

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 Black-Scholes-Merton model for pricing financial derivatives;
- 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.
- Demonstrate and apply the Markowitz portfolio optimisation theory and Capital Asset Pricing Model;

Assessment tasks

- Online Quiz 1
- Test
- Online Quiz 2
- Assignment
- 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 Black-Scholes-Merton model for pricing financial derivatives;
- 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.
- Demonstrate and apply the Markowitz portfolio optimisation theory and Capital Asset Pricing Model;

Assessment tasks

- Online Quiz 1
- Test
- Online Quiz 2

- Assignment
- 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 Black-Scholes-Merton model for pricing financial derivatives;
- 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.
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Assessment tasks

- Online Quiz 1
- Test
- Online Quiz 2
- Assignment
- Final Examination

Changes from Previous Offering

In this offering the assessment weightings have been adjusted according to the amount of work and effort required for their completion. There are no hurdle assessment tasks.