



AFIN270

Stochastic Methods in Applied Finance

S2 Day 2015

Dept of Applied Finance and Actuarial Studies

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Disclaimer

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General Information

Unit convenor and teaching staff

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Contact via iLearn

By appointment

Tutor

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On iLearn

Tutor

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On iLearn

Credit points

3

Prerequisites

(15cp including (ACST101 and (AFIN100 or ACST152) and (STAT170 or STAT171))) or ACST252

Corequisites

Co-badged status

Unit description

The applied finance discipline has become more reliant on quantitative analysis in recent years. Increasingly, models employed by practitioners and researchers are based on assumptions about the stochastic properties of financial time series. This unit provides students with a more detailed insight and understanding of the valuation models introduced in earlier units and includes extensive use of Excel. The unit addresses a number of topics, within which theoretical models are developed and then explored further using Excel. These topics include random walks, martingales, Ito calculus, and arbitrage.

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:

Understanding economic and financial market dynamics, in particular, how prices are determined by supply and demand

Understanding the difference between randomness and risk in the economy and financial markets

Modelling risk using probability distributions, no-arbitrage pricing, stochastic calculus fundamentals and Monte Carlo simulation

Performing data analysis, cash flow valuation and simulation using MS Excel Spreadsheet

Recognising the role of ethics in applying financial models, with reference to past financial disasters arising from misunderstanding or abuse of models

Understand the importance of independence and objectivity with respect to duties to their clients as part of dealing with conflicts of interest.

General Assessment Information

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.

It is the responsibility of students to view their marks for each within session assessment on iLearn within 20 working days of posting. If there are any discrepancies, students must contact the unit convenor immediately. Failure to do so will mean that queries received after the release of final results regarding assessment marks (not including the final exam mark) will not be addressed.

Assessment Tasks

| Name | Weighting | Due |
|----------------------------|-----------|--------------------|
| <u>Assessed Coursework</u> | 15% | Throughout |
| <u>Group Presentation</u> | 15% | Week 3 and onwards |
| <u>Class Test</u> | 15% | Week 6 |
| <u>Final Examination</u> | 55% | Examination Period |

Assessed Coursework

Due: **Throughout**

Weighting: **15%**

Tutorial exercises form a critical part in the study process, as they serve to reinforce concepts that are covered in class. Students have often failed a unit as they do not follow a disciplined approach over the session. To this end, students will be required to attend tutorial classes with their attempts. The teaching staff will check during class time that these are satisfactorily attempted.

In addition to the exercises, students are encouraged to document their learning process by way of a reflective piece, outlining the concepts they have developed and tracking their progress. A reflective piece is not a topic summary outlining the material learnt. Rather, the piece outlines one's personal view on what they have learnt and how they approached any issues faced. The teaching staff will grade the reflective pieces according to the correctness of the format rather than the accuracy of the unit content.

Deliverables :

- Tutorial Exercise Attempts (7.5%). Tutors will collect exercises on five (5) occasions at the end of class, without prior notice. Marks are awarded for the completeness and evidence that corrections are made as appropriate during class-time.

- Reflection Piece (7.5%). Tutors will collect reflective pieces on five (5) occasions at the end of class, without prior notice. Marks are awarded for writing reflective pieces that demonstrate learning experience. Penalties apply for writing a topic summary instead of a reflective piece.

Late penalty - 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:

- Understanding economic and financial market dynamics, in particular, how prices are determined by supply and demand
- Understanding the difference between randomness and risk in the economy and financial markets
- Modelling risk using probability distributions, no-arbitrage pricing, stochastic calculus fundamentals and Monte Carlo simulation
- Performing data analysis, cash flow valuation and simulation using MS Excel Spreadsheet
- Understand the importance of independence and objectivity with respect to duties to their clients as part of dealing with conflicts of interest.

Group Presentation

Due: **Week 3 and onwards**

Weighting: **15%**

This unit encourages students to collaborate in developing an understanding of current affairs relating to the financial markets, applying the concepts into real world problems, and discussing their findings with their peers. Starting from Week 3, students will be presenting in groups of 3-5 on a weekly exercise. Students are highly encouraged to demonstrate their software skills in preparing their presentation, and to share any useful tips with their peers. The presentation will be graded based predominantly on the presentation style and the level of audience engagement, with a small weighting on the content.

Each student will present once per semester.

Late penalty - 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:

- Understanding economic and financial market dynamics, in particular, how prices are determined by supply and demand
- Understanding the difference between randomness and risk in the economy and financial markets
- Modelling risk using probability distributions, no-arbitrage pricing, stochastic calculus fundamentals and Monte Carlo simulation
- Performing data analysis, cash flow valuation and simulation using MS Excel Spreadsheet
- Recognising the role of ethics in applying financial models, with reference to past financial disasters arising from misunderstanding or abuse of models
- Understand the importance of independence and objectivity with respect to duties to their clients as part of dealing with conflicts of interest.

Class Test

Due: **Week 6**

Weighting: **15%**

The class test is a 1 hour assessment (with 5 minutes reading time). The test will be held during lecture time. Students are allowed to bring a permissible type calculator (refer to "Delivery and Resources" section for more details). You are permitted ONE A4 page of paper containing reference material printed on both sides. The material may be handwritten or typed. The page will not be returned to you after the examination.

Students who are unable to attend the test will be awarded a mark of 0 for the test, except for cases where an application for special consideration has been made and approved.

On successful completion you will be able to:

- Understanding economic and financial market dynamics, in particular, how prices are determined by supply and demand
- Understanding the difference between randomness and risk in the economy and financial markets
- Modelling risk using probability distributions, no-arbitrage pricing, stochastic calculus fundamentals and Monte Carlo simulation

Final Examination

Due: **Examination Period**

Weighting: **55%**

To be eligible to pass this unit, a pass is required in the combined examinations component of the assessment

The final examination is a 3 hour assessment (with 10 minutes' reading time) and will be open book. Students are allowed to bring a permissible type calculator (refer to "Delivery and Resources" section for more details). Students may also bring their lecture material and textbooks into the examination room.

Students who are unable to attend the final examination will be awarded a mark of 0 for this task, except for cases where an application for special consideration has been made and approved.

The final examination timetable will be posted on the Timetables portal:

<http://timetables.mq.edu.au> approximately one month before the examination period. It is the student's responsibility to familiarise themselves with the date and time, as no special consideration will be accepted for reading the timetable incorrectly.

On successful completion you will be able to:

- Understanding economic and financial market dynamics, in particular, how prices are determined by supply and demand
- Understanding the difference between randomness and risk in the economy and financial markets
- Modelling risk using probability distributions, no-arbitrage pricing, stochastic calculus fundamentals and Monte Carlo simulation
- Understand the importance of independence and objectivity with respect to duties to their clients as part of dealing with conflicts of interest.

Delivery and Resources

This unit will be taught in a blended learning environment, comprising a mix of lectures, computer laboratory workshops and student-centric tutorials. The rationale for this approach is that the practice of finance focuses on problem-solving, teamwork, communication and competency in the use of software packages. These skills are suitably developed in an environment where students take a more active role in their learning, by partaking in hands-on activities and exploring different possibilities to gain insights into financial theory and practice.

Each week, students will attend a 2 hour lecture and a 2 hour tutorial/workshop that are conducted in a computer laboratory. The date and time of the classes can be found on the Timetables portal: <http://timetables.mq.edu.au>.

The contact hours in this unit serve different purposes, in order to accommodate the different learning needs of individuals. Some students may be more comfortable with learning in a more guided environment that is offered by the lecture/workshops while others may prefer more interactive and exploratory learning that is offered in the computer laboratory tutorials.

The lectures are designed to be more of a workshop rather than a traditional lecture, whereby students are encouraged to attend classes having completed preliminary readings so they are ready to participate in informal discussions on key concepts. A typical lecture session comprises a discussion of the topic material in context of the unit and how the key components link together in a framework. Key examples and concepts are covered in class to consolidate understanding, as well as exploring the relevance and limitations of such concepts in practice. Time will be set aside during these workshops to complete exercises where students are given the opportunity to engage in informal discussions with each other.

The computer laboratory tutorial sessions provide students with the opportunity to attempt exercises and undertake research into current affairs related to the financial markets using a computer. Students will use MS Excel to construct spreadsheets used to analyse market data and solve quantitative problems. They will also be given support and guidance in learning to write simple VBA code to automate procedures. Students will be presenting to their peers on real-life applications of the unit material to develop their ability to address an audience. Note that these tutorial sessions contain a broad range of activities, which justifies the need for a two hour session.

Unit Schedule

| Week | Topic |
|------|---|
| 1 | Overview of Market Dynamics and Pricing |
| 2 | Modelling Randomness and Risk |
| 3 | Analysing Market Dynamics |
| 4 | Parameter Estimation in Financial Modelling |
| 5 | Mathematical Models for Asset Prices I |

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|----|--|
| 6 | Mathematical Models for Asset Prices II |
| 7 | Mathematical Models for Asset Prices III |
| 8 | Risk-Neutral Pricing |
| 9 | Numerical Methods in Stochastic Financial Modelling I |
| 10 | Numerical Methods in Stochastic Financial Modelling II |
| 11 | Implementing Models for Pricing and Risk Management |
| 12 | Ethics of Financial Modelling |
| 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.

Supplementary Exams

Further information regarding supplementary exams, including dates, is available here

http://www.businessandconomics.mq.edu.au/current_students/undergraduate/how_do_i/disruption_to_studies

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

- Performing data analysis, cash flow valuation and simulation using MS Excel Spreadsheet
- Recognising the role of ethics in applying financial models, with reference to past financial disasters arising from misunderstanding or abuse of models

Assessment tasks

- Assessed Coursework
- Group Presentation

Capable of Professional and Personal Judgement and Initiative

We want our graduates to have emotional intelligence and sound interpersonal skills and to demonstrate discernment and common sense in their professional and personal judgement. They will exercise initiative as needed. They will be capable of risk assessment, and be able to handle ambiguity and complexity, enabling them to be adaptable in diverse and changing environments.

This graduate capability is supported by:

Learning outcome

- Understand the importance of independence and objectivity with respect to duties to their clients as part of dealing with conflicts of interest.

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

- Understanding economic and financial market dynamics, in particular, how prices are determined by supply and demand
- Understanding the difference between randomness and risk in the economy and financial markets
- Modelling risk using probability distributions, no-arbitrage pricing, stochastic calculus fundamentals and Monte Carlo simulation
- Performing data analysis, cash flow valuation and simulation using MS Excel Spreadsheet
- Understand the importance of independence and objectivity with respect to duties to their clients as part of dealing with conflicts of interest.

Assessment tasks

- Assessed Coursework
- Group Presentation
- Class Test
- 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

- Understanding economic and financial market dynamics, in particular, how prices are determined by supply and demand
- Understanding the difference between randomness and risk in the economy and financial markets
- Modelling risk using probability distributions, no-arbitrage pricing, stochastic calculus fundamentals and Monte Carlo simulation
- Performing data analysis, cash flow valuation and simulation using MS Excel Spreadsheet
- Recognising the role of ethics in applying financial models, with reference to past financial disasters arising from misunderstanding or abuse of models
- Understand the importance of independence and objectivity with respect to duties to their clients as part of dealing with conflicts of interest.

Assessment tasks

- Assessed Coursework
- Class Test
- Final Examination

Effective Communication

We want to develop in our students the ability to communicate and convey their views in forms effective with different audiences. We want our graduates to take with them the capability to read, listen, question, gather and evaluate information resources in a variety of formats, assess, write clearly, speak effectively, and to use visual communication and communication

technologies as appropriate.

This graduate capability is supported by:

Learning outcome

- Recognising the role of ethics in applying financial models, with reference to past financial disasters arising from misunderstanding or abuse of models

Assessment tasks

- Group Presentation
- Class Test
- Final Examination

Changes since First Published

| Date | Description |
|----------------|--|
| 01/09/ 2015 | Reordered learning outcomes |
| 01/09/ 2015 | Amendments to Learning Outcome 5 relating to independence and the issue of conflict of interest in professional practice |
| 25/07/ 2015 | Changes to tutor details |