ACST212

Combinatorial Probability

S2 Day 2017

Dept of Applied Finance and Actuarial Studies

Contents

Disclaimer

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General Information

Unit convenor and teaching staff
Unit Convenor, Lecturer, Tutor
Jim Farmer
jim.farmer@mq.edu.au
Contact via Dialog in Administration section of this unit's web site
E4A 616
Refer to the unit's iLearn web site

Credit points
3

Prerequisites
Admission to BActStud and (STAT171(Cr) or STAT272)

Corequisites
MATH133

Co-badged status

Unit description
This unit is a study of techniques for assigning probabilities to events, with a particular emphasis on techniques involving combinatorics. Topics include: permutations and combinations; enumeration of equally likely cases; probability theorems; Bayes' Theorem; expected values; recurrence relations; generating functions; the principle of inclusion and exclusion; and application of calculus to probability. Concepts are often developed using simple examples, such as games of chance, but once understood, the concepts can be applied to many of the traditional actuarial problems examined in several 300-level actuarial units.

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:

You should understand the fundamental concepts and principles of the range of probability approaches examined.

You should be able to confidently apply those concepts and principles in determining

probabilities for defined events and solving probability-based problems.

You should be able to explain the concepts, principles and processes you are using, in clear, simple non-technical language, so that another student of the unit could follow your explanation.

You should be able to clearly explain why a problem solution is correct (or not correct), so that another student of the unit could follow your explanation.

You should have further developed your problem-solving skills.

General Assessment Information

Macquarie University uses the grades HD, D, Cr, P and F for grading the achievements of students in units of study. The meaning of each symbol is explained in Schedule 1 of the Assessment Policy, available at

http://www.mq.edu.au/policy/docs/assessment/schedule_1.html

It may be possible to pass this unit by rote learning formulae and applying them to the easier routine questions within the assessment tasks. To obtain a credit or higher grade higher you will need to also be making progress on some of the harder questions in the assessment tasks that test deeper understanding. These questions require

- applying concepts and principles to solve problems which are not necessarily of exactly the same type as problems encountered previously; and
- explaining, in clear, simple, non-technical language the concepts, processes and rationale behind the mathematical symbols.

To assist you in understanding this distinction, the tutorial exercises are divided into routine questions and harder question.

When you work as an actuary or in any other profession, if you have a dangerous misunderstanding of a concept you may provide incorrect advice to a client, possibly with severe financial consequences for your client and yourself. However, if you realise that you don't understand a concept you may refrain from giving advice on it until you have filled the gaps in your knowledge. That is, dangerous misunderstandings have more serious consequences than a recognised lack of knowledge.

The grading philosophy and marking scales adopted in this unit (and in many other university units) reflect this situation. Correct relevant statements earn marks. Statements revealing dangerous misunderstandings result in the deduction of marks. If your answers reveal that your misunderstandings are very severe or numerous, you might earn a negative mark for a question. If a part of a question is worth x marks, the smallest mark you can be allocated for that part is –x marks.

As an example, a minor error when keying numbers into your calculator is not usually regarded as a dangerous error provided the resulting incorrect answer is plausible. However, if a calculator error results in an obviously unreasonable answer, such as a probability outside the range 0 to 1,

or an expected value outside the range of possible outcomes for the random variable, and you fail to state that you realise this answer is unreasonable, this would be regarded as a dangerous misunderstanding.

Results for the online quizzes become available at the deadline for submission. It is the responsibility of students to view their marks for each quiz on iLearn within 20 working days of their release. 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 criteria for all assessment tasks will be provided on the unit iLearn site.

Assessment Tasks

Name	Weighting	Hurdle	Due
Online Quizzes	40%	No	Various. See iLearn Calendar
Final Examination	60%	No	Normal Examination period

Online Quizzes

Due: **Various. See iLearn Calendar**
Weighting: **40%**

You should complete these quizzes online. They are on this unit's iLearn web site.

In answering the assessable quizzes, you may consult your notes or any textbooks you like, but you may not seek assistance from any humans in any way whatsoever. This includes seeking assistance in interpreting what the questions mean. You should not discuss any of the quiz questions with any of your class mates until after the deadline for submitting the quiz has passed, even if you have already submitted the quiz and so can no longer change your answers, because you cannot be sure whether your class mates have submitted their quiz.

There are 6 assessable quizzes, covering topics 0 to 5.

Once you start a quiz, you have a maximum of 1 hour to complete it. Tutorials occur on Friday and Monday, with the Monday tute lagging the lecture. The quiz for a topic becomes available at 12:01 am on the Tuesday after the tutorials on that topic and becomes unavailable at 11:59pm on the following Wednesday. Thus Quiz 0 and Quiz 1 become available in week 2. Each quiz is available for 2 minutes less than 2 days. (We are avoiding using midnight as a cutoff time due to confusion as to whether "midnight Friday" means "midnight at the start of Friday" or "midnight at the end of Friday".) You may start the quiz anytime within that range, but if you start it within 1 hour of the end of that range then it still closes at the end of that range, meaning you get less than 1 hour to complete it.

The simplest way to view the exact days on which each quiz opens and closes is to use the calendar tool within 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 to study is made and approved.

Any approved Disruption to Studies application in relation to quizzes will normally only be considered for special consideration where the disruption lasted for the whole two days that the quizzes were available. Students should not delay efforts to complete the quizzes.

Where a Disruption to Studies application is approved in respect of a quiz, the normal outcome will be to increase the weighting on the other quizzes to compensate. However, if such applications are approved for several quizzes, so that the number of quizzes not covered by the application becomes small, the student may be asked to complete one or more other replacement assessment tasks, at the Unit Convenor's discretion.

On successful completion you will be able to:
- You should understand the fundamental concepts and principles of the range of probability approaches examined.
- You should be able to confidently apply those concepts and principles in determining probabilities for defined events and solving probability-based problems.
- You should have further developed your problem-solving skills.

Final Examination

Due: **Normal Examination period**
Weighting: **60%**

Students may NOT bring any notes or textbooks into the final examination.

Students are permitted to use non-programmable calculators with no text-retrieval capacity.

Schedule 4 of the Assessment Policy includes the rules students must abide by during University examinations. The schedule is available at: http://www.mq.edu.au/policy/docs/assessment/schedule_4.html

In the exam, you are required to write your answers on the ruled (right hand) pages of the answer booklet provided. Anything written on the unruled (left hand) pages will not be marked.

The exam is of 2 hours duration, with no additional reading time.

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clear, simple non-technical language, so that another student of the unit could follow your explanation.

- You should be able to clearly explain why a problem solution is correct (or not correct), so that another student of the unit could follow your explanation.
- You should have further developed your problem-solving skills.

Delivery and Resources

Classes

There are 4 hours of face-to-face teaching per week consisting of 2 hours of lectures and 2 hours of tutorial.

The timetable for classes can be found on the University web site at:

http://www.timetables.mq.edu.au/2017/

Required and Recommended Texts and/or Materials

No textbook are prescribed for this unit. Detailed notes and exercises are available on the unit's web site.

Technology Used and Required

You will require a calculator. For the final exam, you may only use non-programmable calculators which are not able to store text. Sometimes it will be possible to verify solutions by using a spreadsheet or programming language to apply a "brute force" method, but this is not required.

You require access to a computer connected to the internet to access the unit's iLearn web site.

Unit Web Page

The web page for this unit can be accessed at http://ilearn.mq.edu.au

Teaching and Learning Strategy

This unit is taught via lectures and tutorials. However, a significant amount of the lecture time will be spent on attempting problems. The emphasis is on learning by doing.

Unit Schedule

The schedule of topics is provided in a printer-friendly format in the administration section of the unit's web site.

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.

Supplementary exams

Information regarding supplementary exams, including dates, is available at:

http://www.businessandeconomics.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://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

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

- You should understand the fundamental concepts and principles of the range of probability approaches examined.
- You should be able to confidently apply those concepts and principles in determining probabilities for defined events and solving probability-based problems.
- You should be able to explain the concepts, principles and processes you are using, in clear, simple non-technical language, so that another student of the unit could follow your explanation.
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- You should have further developed your problem-solving skills.

Assessment tasks

- Online Quizzes
- 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

- You should understand the fundamental concepts and principles of the range of probability approaches examined.
- You should be able to confidently apply those concepts and principles in determining probabilities for defined events and solving probability-based problems.
- You should have further developed your problem-solving skills.

Assessment task

- 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

- You should understand the fundamental concepts and principles of the range of probability approaches examined.
- You should be able to confidently apply those concepts and principles in determining probabilities for defined events and solving probability-based problems.
- You should have further developed your problem-solving skills.

Assessment tasks

- Online Quizzes
- Final Examination

Research and Practice, Global and Sustainability

This unit uses research from external sources. The subject of probability has a long history. Most

of the techniques used in this unit were developed over a century ago. Hence you can find the research we are using in textbooks on probability and combinatorics rather than needing to source recent research papers.

The mathematical concepts in this unit are independent of any legislative constraints and so do not recognise national or planetary boundaries.