STAT1008
Quantitative Research Methods

Course Description

Quantitative Research Methods provides basic training in the gathering, description and analysis of quantitative information in the social, business, management and financial sciences.

This is a course in basic research methods including discussions of: data gathering issues and techniques; sources of data and potential biases; graphical and numerical data description techniques including simple linear regression and basic time series; sampling behaviour of averages and the Central Limit Theorem; point and interval estimation procedures; concepts in hypothesis testing for comparing two populations, simple and multiple linear regression; p-values and significance levels.

<table>
<thead>
<tr>
<th>Semester and Year</th>
<th>S2 2014</th>
</tr>
</thead>
<tbody>
<tr>
<td>Course URL</td>
<td><a href="http://programsandcourses.anu.edu.au/course/STAT1008">http://programsandcourses.anu.edu.au/course/STAT1008</a></td>
</tr>
<tr>
<td>Mode of Delivery</td>
<td>On campus</td>
</tr>
<tr>
<td>Prerequisites</td>
<td></td>
</tr>
<tr>
<td>Incompatible Courses</td>
<td>STAT1003</td>
</tr>
<tr>
<td>Course Convener</td>
<td>Dr Hanlin Shang</td>
</tr>
<tr>
<td>Office Location</td>
<td>Room 4.38, Level 4, CBE building</td>
</tr>
<tr>
<td>Phone:</td>
<td>02 6125 0535</td>
</tr>
<tr>
<td>Email:</td>
<td><a href="mailto:hanlin.shang@anu.edu.au">hanlin.shang@anu.edu.au</a></td>
</tr>
<tr>
<td>Consultation hours:</td>
<td>4-5pm Tuesdays in teaching weeks</td>
</tr>
<tr>
<td>Bio and research interests</td>
<td>My research interests are functional data analysis, nonparametric and semiparametric statistics, Bayesian econometrics, Computational Statistics, and demographic forecasting</td>
</tr>
<tr>
<td>Tutor(s)</td>
<td>To be determined in the first week</td>
</tr>
<tr>
<td>Student Administrators</td>
<td>Mrs Tracy Skinner, RSFAS general office at Level 4</td>
</tr>
<tr>
<td></td>
<td>Phone: 612 50487</td>
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</tbody>
</table>
COURSE OVERVIEW

Course Learning Outcomes

Upon successful completion of the requirements for this course, students should have the knowledge and skills to:

LO1: Compare and contrast different sampling methodologies and assess suitability for a range of situations; discuss issues with choice of sampling method; sampling vs nonsampling errors; sample vs census choice

LO2: Discuss different types of variables and produce appropriate graphical and numerical descriptive statistics

LO3: Understand and apply probability rules and concepts relating to discrete and continuous random variables, including univariate and bivariate distributions and some specific probability density functions, concepts of expectation, variance, correlation and portfolio construction

LO4: Understand the importance of the Central Limit Theorem and its uses and applications; judging appropriate conditions for its application; use the CLT to find probabilities associated with a range of values for a sample average; sample size determination

LO5: Consider concepts of estimation – point and interval estimators, unbiasedness and consistency, calculation and interpretation of confidence intervals for a range of situations

LO6: Perform and interpret hypothesis tests for a range of situations, identifying the situation at hand and assessing whether assumptions are met; discuss types of errors, significance, p-values, make appropriate conclusions with regards to decision making

LO7: Perform and interpret simple and multiple linear regressions, assessing suitability of the model for the data type and situation; apply and interpret simple time series models

Research-Led Teaching

In order to investigate new fields, make sense of new areas and tackle new problems, we need appropriate tools to explore and summarise data, graphically and numerically, deal with the variation it presents and make decisions under uncertainty. This course will use examples from finance, economics and accounting to introduce statistical tools, methods and ways of thinking to students and prepare them for future courses, work and research projects.

Continuous Improvement

We use feedback from students, professional bodies and staff to make regular improvements to the course. In response to this feedback, design improvements from the previous version of the course include:

- Individual student assignments will have minimal written comments after marking; tutors can provide further verbal comments on performance in assignments in consultation times
• Verbal feedback will be given to the entire class in each Monday lecture about the performance in each quiz.

• Students may seek individual feedback from the lecturer if they desire on performances in quizzes or assignments. This may be sought over email, but is most easily given in scheduled consultation times.

**Student Feedback**

All CBE courses are evaluated using Student Experience of Learning and Teaching (SELT) surveys, administered by Planning and Statistical Services at the ANU. These surveys are offered online, and students will be notified via email to their ANU address when surveys are available in each course. Feedback is used for course development so please take the time to respond thoughtfully. Course feedback is anonymous and provides the Colleges, University Education Committee and Academic Board with opportunities to recognise excellent teaching and to improve courses across the university. For more information on student surveys at ANU and reports on feedback provided on ANU courses, visit [http://unistats.anu.edu.au/surveys/selt/students/](http://unistats.anu.edu.au/surveys/selt/students/) and [http://unistats.anu.edu.au/surveys/selt/results/learning/](http://unistats.anu.edu.au/surveys/selt/results/learning/)

**COURSE SCHEDULE**

Note that the table below gives an indication of the Sections of the course expected to be covered in each week, but that this will change as the semester progresses.

<table>
<thead>
<tr>
<th>Week</th>
<th>Summary of Activities</th>
<th>Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Students can assess Wattle material</td>
<td>Practice quiz (non-assessable)</td>
</tr>
<tr>
<td>1</td>
<td>3 lectures; Section 1 and sign up for tutorials</td>
<td>Quiz 1 due 4pm, 1st August</td>
</tr>
<tr>
<td>2</td>
<td>3 lectures, 1 tutorial; Section 2</td>
<td>Quiz 2 due 4pm, 8th August</td>
</tr>
<tr>
<td>3</td>
<td>3 lectures, 1 tutorial; Section 2</td>
<td>Quiz 3 due 4pm, 15th August</td>
</tr>
<tr>
<td>4</td>
<td>3 lectures, 1 tutorial; Section 3</td>
<td>Assignment 1 due 3pm, 22nd August</td>
</tr>
<tr>
<td>5</td>
<td>3 lectures, 1 tutorial; Section 3</td>
<td>Quiz 5 due 4pm, 29th August</td>
</tr>
<tr>
<td>6</td>
<td>3 lectures, 1 tutorial; Section 4, Section 5</td>
<td>Quiz 6 due 4pm, 5th September</td>
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<tr>
<td>7</td>
<td>3 lectures, 1 tutorial; Section 6</td>
<td>Quiz 7 due 4pm, 26th September</td>
</tr>
<tr>
<td>8</td>
<td>2 lectures, 1 tutorial; Section 7</td>
<td>Assignment 2 due 3pm, 3rd October; Quiz 8 due 4pm, 3rd October</td>
</tr>
<tr>
<td>9</td>
<td>3 lectures, 1 tutorial; Section 7</td>
<td>Quiz 9 due 4pm, 10th October</td>
</tr>
<tr>
<td>10</td>
<td>3 lectures, 1 tutorial; Section 8, Revision</td>
<td>Quiz 10 due 4pm, 17th October</td>
</tr>
<tr>
<td>11</td>
<td>3 lectures, 1 tutorial; Section 8</td>
<td>Assignment 3 due 3pm, 24th</td>
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<tr>
<td>12</td>
<td>3 lectures, 1 tutorial; Section 9</td>
<td></td>
</tr>
</tbody>
</table>

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Assessment Summary

<table>
<thead>
<tr>
<th>Item</th>
<th>Title</th>
<th>Value</th>
<th>Due Date</th>
<th>Linked Learning Outcomes (optional)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Assignment 1</td>
<td>10% of final raw score</td>
<td></td>
<td>LO1, LO2, LO3</td>
</tr>
<tr>
<td>2</td>
<td>Assignment 2</td>
<td>10% of final raw score</td>
<td></td>
<td>LO1, LO2, LO3, LO4, LO5, LO6</td>
</tr>
<tr>
<td>3</td>
<td>Assignment 3</td>
<td>10% of final raw score</td>
<td></td>
<td>LO1, LO2, LO3, LO4, LO5, LO6, LO7, LO8</td>
</tr>
<tr>
<td>4</td>
<td>Quizzes</td>
<td>Best 10 of 12 count for 10% of final raw score (that is, each of the best 10 quizzes will count for 1%)</td>
<td></td>
<td>LO1, LO2, LO3, LO4, LO5, LO6, LO7, LO8</td>
</tr>
<tr>
<td>5</td>
<td>Examination</td>
<td>60% of final raw score</td>
<td>TBA</td>
<td>LO1, LO2, LO3, LO4, LO5, LO6, LO7, LO8</td>
</tr>
</tbody>
</table>

Your raw mark for the course will be calculated as 10% Assignment 1 + 10% Assignment 2 + 10% Assignment 3 + 10% (Best 10 Quizzes) + 60% final exam.

Assessment Task 1:

Details of task:

Students will be required to research specific sampling methodologies, provide a recommendation of a sampling plan for given situations and demonstrate an understanding of the different types of sampling available. They will further be required to show an ability to effectively use graphical and numerical summaries and descriptions for various types of data and provide interpretations of these summaries. Further, they may be required to perform calculations, both by hand and using the provided statistical computer program; and provide explanations and comments appropriate for the results they obtain. Other skills may also be required, relevant to the data and the course material. All skills will be shown in respect of
answering specific questions, writing appropriate advice and performing specific tasks outlined in the assignment sheet.

**Value: 10% of the final raw score**  
**Presentation requirements:** To be presented on A4 paper, with coversheet on the front, held together by a staple. Output from the Minitab computer program must be computer printed.  
**Estimated return date:** In tutorials in Weeks 6 and 7.

**Assessment Task 2:** Assignment 2

**Details of task:** Students will be required to demonstrate the skills learnt in the course, including summarising data, and interpreting these summaries; performing regressions and hypothesis tests, both by hand and in Minitab, and interpreting the results of these as well as assessing the appropriateness of various statistical tests in different situations and discussing their results and conclusions. They may be required to generate or collect simple data sets, summarise these appropriately and perform tests relevant to the situation given. They should demonstrate an understanding of random variables of different types and relevant associated concepts. Other skills may also be required, relevant to the data and the course material. All skills will be shown in respect of answering specific questions and performing specific tasks outlined in the assignment sheet.

**Value: 10% of the final raw score**  
**Presentation requirements:** To be presented on A4 paper, with coversheet on the front, held together by a staple. Output from the Minitab computer program must be computer printed.  
**Estimated return date:** In tutorials in Weeks 10 and 11.

**Assessment Task 3:** Assignment 3

**Details of task:** Students will be required to demonstrate the skills learnt in the course, including summarising data, and interpreting these summaries; performing regressions and hypothesis tests, both by hand and in Minitab, and interpreting the results of these as well as assessing the appropriateness of various statistical tests in different situations and discussing their results and conclusions. Other skills may also be required, relevant to the data and the course material. All skills will be shown in respect of answering specific questions and performing specific tasks outlined in the assignment sheet.

**Value: 10% of the final raw score**  
**Presentation requirements:** To be presented on A4 paper, with coversheet on the front, held together by a staple. Output from the Minitab computer program must be computer printed.  
**Estimated return date:** In tutorials in Week 13.

**Assessment Task 4:** Weekly Quizzes

**Details of task:** A quiz will be held each teaching week of semester, run on the Wattle site for the course. A practice quiz will be held in Week 1 to allow students to familiarise themselves with the quizzing process; with assessable quizzes run in each of weeks 2 to 13. A 2 hour time limit exists on the quiz program such that after a student opens a quiz they have a maximum of 2 hours to click “Submit” or their quiz score is not recorded.
Questions may include multiple choice, multiple answer, true/false, ordering questions and calculation questions among others. The quizzes should be completed individually, but can be considered as “open book”.

**Value:** The best 10 (of 12) quiz scores for each student will be combined to give a total of 10% of the final raw score. That is, each of the best 10 quizzes will each contribute 1%.

**Presentation requirements:** Quizzes must be answered through the Wattle site.

**Estimated return date:** Quiz results will be available following the quiz deadline; quizzes will also be discussed in each Monday lecture (Tuesday if there is a public holiday on Monday).

**Examination(s)**
A final examination will be held during the university examination period at the end of semester. It will contribute 60% to your final raw score. It may include material from the entire semester. Permitted materials for the final exam are an English language dictionary, a non-programmable calculator, and one A4 sheet of paper with notes on both sides.

**Assignment Submission**
Assignments must be submitted to the School Office and include the appropriate cover sheet, which is available on the Wattle site. Email and fax submissions are not acceptable. You must keep a copy of assessment materials submitted for your records.

**Extensions and Penalties**
Extensions will not be given. Late assignments and quizzes will not be accepted. Students with documented extenuating circumstances should see the lecturer before the due date of the assessment. In such situations, the weighting of the assessment piece may be reallocated to other tasks.

**Returning Assignments**
Assignments 1, 2 and 3 will be returned in tutorial classes. As such it is important that students fill in assignment cover sheets correctly, naming the correct tutor and tutorial class.

**Resubmission of Assignments**
Assignments will not be accepted for resubmission.

**Scaling**
Your final mark for the course will be based on the raw marks allocated for each of your assessment items. However, your final mark may not be the same number as produced by that formula, as marks may be scaled. Any scaling applied will preserve the rank order of raw marks (i.e. if your raw mark exceeds that of another student, then your scaled mark will exceed or equal the scaled mark of that student), and may be either up or down.

**Referencing Requirements**
It is unlikely that you will need to reference sources in this course, (there are no essays etc.). If you do need to reference any source, you should provide sufficient detail in your assignment that a reader may confirm your quote or evidence from the original source. Harvard referencing (also known as Parenthetical referencing)
should be used.

READING LISTS

The prescribed text is Business Statistics: An Introductory Course STAT1008, compiled by Dr Bronwen Whiting; published by Pearson. It is available from the Co-op bookshop, as well as being on Reserve (2 hour and 2 day) in Chifley library.

If you purchase the text you may choose to purchase access to an online learning area. This area will not be mandatory to the course, although some students may find it helpful to assist their learning.

The course will also use the statistical software program Minitab. It is available free on the campus PCs. You may choose to purchase a license for your own computer – academic pricing can be a substantial discount.

TUTORIAL AND/OR SEMINAR REGISTRATION

Enrolment in tutorials will be completed online using the CBE Electronic Teaching Assistant (ETA). To enrol, follow these instructions:

1. Go to http://eta.fec.anu.edu.au
2. You will see the Student Login page. To log into the system, enter your University ID (your student number) and password (your ISIS password) in the appropriate fields and hit the Login button.
3. Read any news items or announcements.
4. Select "Sign Up!" from the left-hand navigation bar.
5. Select your courses from the list. To select multiple courses, hold down the control key. On PCs, this is the Ctrl key; on Macs, it is the ⌘ key. Hold this key down while selecting courses with the mouse. Once courses are selected, hit the SUBMIT button.
6. A confirmation of class enrolments will be displayed. In addition, an email confirmation of class enrolments will be sent to your student account.
7. For security purposes, please ensure that you click the LOGOUT link on the confirmation page, or close the browser window when you have finished your selections.
8. If you experience any difficulties, please contact the School Office (see page 1 for contact details).

COMMUNICATION

Should you have questions, come to one of the consultation sessions.

Email

If necessary, the lecturers and tutors for this course will contact students on their official ANU student email address. Information about your enrolment and fees from the Registrar and Student Services' office will also be sent to this email address.

Announcements
Students are expected to check the Wattle site for announcements about this course, e.g. changes to timetables or notifications of cancellations. Notifications of emergency cancellations of lectures or tutorials will be posted on the door of the relevant room.

**Course URLs**

More information about this course may be found on:

- Programs and Courses (http://programsandcourses.anu.edu.au/2014/Catalogue )
- the College of Business and Economics website (http://cbe.anu.edu/courses) and
- Wattle (https://wattle.anu.edu.au), the University's online learning environment. Log on to Wattle using your student number and your ISIS password.

**POLICIES**

The University offers a number of support services for students. Information on these is available online from http://students.anu.edu.au/studentlife/

ANU has educational policies, procedures and guidelines, which are designed to ensure that staff and students are aware of the University’s academic standards, and implement them. You can find the University's education policies and an explanatory glossary at: http://policies.anu.edu.au/

Students are expected to have read the **Student Academic Integrity** Policy before the commencement of their course.

Other key policies include:

- Student Assessment (Coursework)
- Student Surveys and Evaluations