Course outline

Course description  The overall aim of this course is to provide students with an advanced understanding of the principles underlying estimation methods and hypothesis tests in econometrics. The course first covers basic probability theory, then introduces asymptotic approximation theory, and finally moves to statistics and econometrics. To focus on general ideas, the course abstracts from real-world issues and turns to the laboratory/sandbox called mathematics.

The course is essentially a course in (univariate) mathematical statistics, with asymptotic theory.

Learning outcomes  On successful completion of this course, students will be able to

- Calculate expected values and higher order moments for random variables.
- Derive distributional properties of random variables and statistics from first principles using various mathematical techniques.
- Use asymptotic theory to calculate approximate distributions for random variables and statistics.
- Derive properties of estimators and compare their performance.
- Derive properties of test statistics.
- Appreciate the connections between the many different methods used in econometrics.

A side-objective of the course is for students to practice rigorous mathematical reasoning and to enhance their analytical skills.

Course format  Each week there will be approximately 2 lectures of about an hour each and 1 tutorial also of about 1 hour. There are 4 contact hours timetabled per week. The aim is to have 3 contact hours per week on average, so “overtime” in a given week will be offset with “undertime” in another.

There will be a weekly homework/tutorial problem set. The main purpose of tutorials is for students to solve problems on a white board. Problem solving is the most important aspect of this course. Readings and homework assignments will be posted on Wattle.

Readings  The prescribed text is Amemiya (1994), Introduction to Statistics and Econometrics, Harvard University Press. Supplementary material may be assigned later, depending class progress and interests.

We cover Amemiya’s chapters 1–9 for sure. The core topics are probability theory, random variables and distributions, expectations and moments, binomial and normal random variables,
large sample theory, point estimation, interval estimation, and test of hypotheses. The focus is on the univariate case. Examples of potential supplementary topics are simple linear regression, nonparametric regression, model selection, and Monte Carlo computer simulation methods.

The following textbooks have been placed on library reserve:


Hogg, McKean and Craig (2005) is the latest edition of a time-honoured textbook on mathematical statistics. It is very thorough, but doesn’t go much into asymptotic approximations. Casella and Berger (2002) is another popular textbook on mathematical statistics used at many top US universities. Amemiya (1994) is more concise, probably a little easier to read, and very substantially cheaper.

**Assessment**  The assessment consists of three parts:

1. Homework problems count 15% of the final mark. Problems are assigned each week (with some exceptions eg when the midsemester exam is held) and due to be handed in the following week. (Generally COB on Wednesdays, but please check Wattle for due dates.) Late submissions are not accepted. Each problem set is marked. At the end of the course, the problem set with lowest mark is omitted when calculating the final mark.

2. The midsemester exam is closed book and counts 35% of the final mark.

3. The final exam is closed book and counts 50% of the final mark.

Your final mark is determined as the weighted sum of your raw marks, possibly scaled to conform with CBE and RSE standards. The weighting may be changed for students with approved special consideration.

Students presentations and class participation are also required but will not be assessed.

**Communication**  Notices of prescribed readings, lecture notes, assignments etc will be posted on Wattle.

All email correspondence from students to the instructor should have “EMET8014” at the beginning of the subject line (to ensure it is read in a timely fashion).

Students who are unable to see the instructor during scheduled office hours due to a work or study conflict are welcome to arrange an alternative time via email.

**Instructor’s contact details**

Instructor: Tue Gørgens  
Office: Crisp 2084  
Hours: See Wattle for current office hours  
E-mail: tue.gorgens@anu.edu.au  

Please begin the subject line in e-mails with “EMET8014”.

**University policies**  The university has rules covering special examinations, supplementary examinations, misconduct/discipline, and academic honesty. The policies can be found on the university’s web site. Students are responsible for knowing and complying with these rules.