UNSW Business School

School of Economics

ECON3209 / ECON5409
Statistics for Econometrics

Course Outline
Semester 1, 2017

Part A: Course-Specific Information

Students are also expected to have read and be familiar with **Part B Supplement to All Course Outlines**. This contains Policies on Student Responsibilities and Support, Including Special Consideration, Academic Misconduct and Plagiarism, and Key Dates. It also contains the BUSINESS SCHOOL PROGRAM LEARNING GOALS.

Table of Contents

1 STAFF CONTACT DETAILS

1.1 Lecturer-in-charge

Scientia Professor Alan Woodland
Room: UNSW Business School 416
Phone Number: 9385 9707
Email: a.woodland@unsw.edu.au

1.2 Communications with staff

Students are encouraged to ask questions related to this subject during lectures when time permits and especially during tutorials.

I am also available for further consultations. Consultations are an opportunity for you to ask questions. You may need to ask about the material introduced in lectures, the problems you have attempted or questions that were not fully answered in tutorials.

Consultation Time: **Wednesday 4:00pm-5:00pm, UNSW Business School 416.**
For access, dial extension **59707** on the intercom in the fourth floor West Lobby of the UNSW Business School Building (outside the Economics office). Other consultation hours may be arranged by appointment.

Emails should have a clear subject line and be sharply focused. I will usually answer your Email enquiries within 48 hours (does not include weekends). Discussion of course subject material will not be entered into via lengthy emails.

2 COURSE DETAILS

2.1 Teaching Times and Locations

There are three scheduled teaching hours per week in a single time block. The available period will normally be divided into two hours of lecture time followed by a one-hour tutorial. There will normally be a short break every hour.

Lecture: **Tuesdays**, **3:00pm-6:00pm.**
Location of Lecture: **Tyree Technology Building (TETB LG05)**.

Location of Computer Laboratories: Computer Laboratories (24/7 access for Business students, except when booked) are located at Quad 1043, Quad G021 and Matthews 211. Students of this course have exclusive use of **Matthews 211, Thursdays 1pm-3pm** during weeks 2-13.

2.2 Units of Credit

The course is worth 6 units of credit.
There is no parallel teaching in this course.

2.3 Summary of Course

This course provides the foundations for modern econometric methods, including statistical distribution theory, asymptotic theory, mathematical methods and an introduction to statistical computing using bootstrap and simulation methods. Mastering this course will give students a deeper understanding of the statistical underpinnings of methods and knowledge acquired in other econometrics courses. Throughout the course, material will be presented in the context of simple models in order to concentrate on the concepts.

2.4 Aims

Statistics for Econometrics aims to cover the parts of probability and statistical distribution theory and statistical inference essential to a deep understanding of econometrics and applied statistics. It develops the statistical foundations for econometric techniques relating to the analysis of economic and financial time series. Uncertainty governs both the data analysis undertaken by scientists and judgments made by all of us in our everyday lives. This course is a first look at the use of quantitative methods to handle decision making under uncertainty.

This course is designed to provide a foundation for the statistical theory covered in statistical inference and other econometrics courses. Ultimately this course aims to develop your ability to model quantitative relationships and deepen your understanding of how statistical concepts are used in econometrics, the science and art of determining what type of model to build, estimating the parameters of the model, and testing the model statistically.

The major topic will be probability theory and introductory inferential statistics. These two topics form the infrastructure on which all statistical work is based. To understand these advanced methods, it is vital to have a background in these topics. Unfortunately, this means that we will read little applied research, and will devote most of our time to the abstract world of probability theory and the logic of statistical inference. Students who intend to take this course should keep in mind that the content is highly theoretical and analytical in nature.

In addition, the course is designed with the following aims in mind:

- Deepen your mathematical and statistical skills;
- Foster your analytical and critical thinking;
- Develop your problem solving abilities;
- Enhance learning by doing.

Pre-requisite mathematics knowledge is at the level of a typical second year quantitative course equivalent to Introductory Econometrics (ECON2206). Students are advised to revise their knowledge of Quantitative Analysis for Business and Economics (ECON1202) and Business and Economic Statistics (ECON1203).
Familiarity with algebra, calculus and elementary linear algebra is assumed. The main vehicle for understanding the material is a solid understanding of calculus: differentiation, integration, infinite series, Taylor expansions, limits, etc. No previous experience with statistics or probability (or gambling) is necessary.

2.5 Relationship to Other Courses

This course is a pre-requisite to enrol in Econometric Theory ECON3203 offered in the second session. The latter is a prerequisite for Advanced Econometric Theory and Methods (ECON4202). Accordingly, this course is a necessary building block for advanced econometric courses at the honours and the graduate level in economics studies and studies of stochastic processes in finance.

2.6 Student Learning Outcomes

The Course Learning Outcomes are what you should be able to DO by the end of this course if you participate fully in learning activities and successfully complete the assessment items. The Learning Outcomes in this course also help you to achieve some of the overall Program Learning Goals and Outcomes for all undergraduate students in the Business School. Program Learning Goals are what we want you to BE or HAVE by the time you successfully complete your degree. You demonstrate this by achieving

specific Program Learning Outcomes - what you are able to DO by the end of your degree. For more information on the Undergraduate Program Learning Goals and Outcomes, see Part B of the course outline.

The following table shows how your Course Learning Outcomes relate to the overall Program Learning Goals and Outcomes, and indicates where these are assessed (they may also be developed in tutorials and other activities).

Program Learning Goals and Outcomes		**Course Learning Outcomes**	**Course Assessment Item**
This course helps you to achieve the following learning goals:		*On successful completion of the course, you should be able to:*	*This learning outcome will be assessed in the following items:*
1	Knowledge	Demonstrate an appreciation of the relationship between theoretical statistics and the econometric techniques used to analyse real world data. Apply the two fundamental results in statistics - the law of large numbers and the central limit theorem. Apply the mathematical techniques of probability to estimation and hypothesis testing, which are the formal methods by which we learn from noisy data, random samples, and other such uncertain real-world measurements. Describe and apply Classical statistical methods and Bayesian inference. Undertake computer calculations concerning statistical distributions and perform computer simulations of models.	• Assignments • Exam
2	Critical thinking and problem solving	Show mastery of the standard mathematical formulations central to the understanding of the goals of inference and to evaluating the statistical methods that achieve these goals. Demonstrate problem solving skills, especially how to analytically prove results from a set of given assumptions.	• Assignments • Exam
3a	Written communication	Demonstrate effective communication of the analytical complexity of the problems encountered.	• Assignments • Exam
3b	Oral communication	Not specifically addressed in this course.	Not specifically assessed.
4	Teamwork	Not specifically addressed in this course.	Not specifically assessed.
5a	Ethical, environmental and sustainability considerations	Not specifically addressed in this course.	Not specifically assessed.

5b	Social and cultural awareness	Not specifically addressed in this course.	Not specifically assessed.

3 LEARNING AND TEACHING ACTIVITIES

3.1 Approach to Learning and Teaching in the Course

The philosophy underpinning this course and its Teaching and Learning Strategies are based on the "Guidelines on Learning that Inform Teaching at UNSW", which may be viewed at: www.guidelinesonlearning.unsw.edu.au. Specifically, the lectures, tutorials and assessment have been designed to appropriately challenge students and support the achievement of the desired learning outcomes. A climate of inquiry and dialogue is encouraged between students and teachers and among students (in and out of class). The lecturers and tutors aim to provide meaningful and timely feedback to students to improve learning outcome.

This is not a course where you can become proficient just by observing. You will need to get involved in class activities - evaluating information, asking and answering questions. You also must learn to organise your independent study and practise enough problems to gain a thorough understanding of concepts and how to apply them.

Students are expected to:

- Put a consistent effort into learning activities throughout the session by preparing for the regular assessment tasks;
- Take a responsible role in preparing for tutorials and participating in them;
- Develop communication skills through engaging in classroom discussions and preparing assignments;
- Concentrate more on understanding how and why to use formulas and less on memorising them;
- Make continuous improvements by using the feedback from assessments.

3.2 Learning Activities and Teaching Strategies

The examinable content of the course is defined by the references given in the Lecture Schedule, the content of Lectures, and the content of the Tutorial and Assignment Program. Out of Class study is an integral part of the learning process. This course requires a solid commitment and a continuing effort.

3.2.1 Lectures

There will be a two-hour lecture per week. These lectures will provide a broad coverage of the main topics considered in the course. Lectures will introduce and emphasise the course content. They will include explanation of relevant topics and theory together with the use of worked examples to demonstrate the theory in practice. However, the student should not regard their content as exhaustive or full.

This is a lecture based course, which will proceed as quickly or slowly as is necessary. Class attendance is very important for understanding the lecture notes.

It is important for the student to devote a considerable amount of time to private study to achieve an appropriate level of understanding and to practice the different econometric tools introduced. Lectures provide one of the principal means of learning instruction, but

it is essential that their contribution be bolstered and supported by other learning resources.

Students are expected to develop the skills and ability to derive the results on their own. Memorizing formulae and final results will not be of a great help in the exams; only a proper ability to develop these results will ensure success.

To get the most out of the lectures, students are strongly encouraged to familiarise themselves with the prescribed text readings as given in the course outline prior to attending each lecture, and to be prepared to take notes during the lecture itself.

3.2.2 Tutorials

The more you read the more you know, but **the more you practice the more you learn and understand**. Accordingly, the key to the understanding of this course is problem solving.

There will be a weekly one-hour tutorial (after the lecture). The purpose of tutorials is to enable you to raise questions about difficult topics or problems encountered in their studies. *Students must not expect another lecture, but must come prepared with informed questions of their own.*

Discussion will be normally based on a sequence of exercise (homework) sheets that will be distributed regularly during the course. You are expected to make a serious attempt at all questions on an exercise sheet before attending the tutorial at which it is discussed. It will not be possible to discuss all the problems set in the allotted time and you should not expect all questions to be solved in depth at the tutorials. Some tutorial exercises (and assignments) will require the use of statistical software (Stata) to undertake calculations concerning distributions and simulations of statistical models.

In tutorials, some students are randomly chosen to discuss his/her attempt to answer the tutorial problems. The aim is to encourage discussion within the classroom and to solve the issues you and your classmates have encountered with the problems.

3.2.3 Out of Class Study

While you may have preferred individual learning strategies, it is important to note that most learning will be achieved outside class time. Lectures can only provide a structure to assist your study, and tutorial time is limited.

The required textbook for this course is by Miller & Miller (see Section 5 Course Resources). There is also a highly recommended book by DeGroot & Schervish. You only need to buy one. The course schedule and reading guide in Section 7 refers to both textbooks.

You are strongly encouraged to (heavily) use the reference textbooks. Both references contain exhaustive and detailed derivations of results and proofs of theorems introduced in the lectures. There are also many applications and case studies presented in the textbooks that will help you understand the possible applications for the various theoretical concepts covered in the classroom.

The reading load for this course is mild - perhaps ten to twenty pages a class. However, the work load will be high. It is important to carefully read and understand every result in the text. This requires full attention when reading the text. My advice to you is to make the book your friend and use the consultation time to come and ask for help understanding what you read.

4 ASSESSMENT

4.1 Formal Requirements

In order to pass this course, you must:

- Achieve a **composite** mark of at least 50%; and
- Achieve a minimal performance level (40%) in **assignments**; and
- Achieve a satisfactory performance level in **examinations**. This means that you must achieve a composite examination grade of at least 50%, and at least 45% in the final exam.

4.2 Assessment Details

Assessment Task	Weight	Length	Due Date
Two Assignments	**30%** (2 x 15%)	See 4.4 below	Weeks 9 and 12
Mid-session Exam	**20%**	1.5 hours	Week 7
Final Exam	**50%**	2 hours	University Exam Period
Total	**100%**		

4.3 Mid-Session Exam

An unseen, closed book exam will be conducted during lecture time of **Week 7, Tuesday, April 11th**. The mid-session exam will test the topics introduced in the first 5 weeks. All lecture, textbook, tutorial and assignment material is examinable.

The main purpose of the mid-semester exam is to:

- Test your knowledge of the topics covered so far;
- Give you an opportunity to demonstrate your learned skills in problem solving;
- Give you a timely feedback on your learning;
- Assess your ability to use formulae appropriately and to perform calculations with speed and accuracy;
- Help develop your analytical skills.

A sheet with relevant formulae will be provided during the exam.

There will be **NO supplementary tests** offered for the mid-session exam. You should make every effort to take the mid-session exam. Students who fail to attend the examination will need to apply for Special Consideration.

In cases of serious illness, students will need full and convincing documentation of that illness. Students who are found to be genuinely too ill to have attended the exam will have their mark in the remaining assessment tasks re-weighted to include the mark reserved for the missed test. In all other cases of non-attendance, students will receive a grade of zero.

Applications for special consideration for the Mid-session exam, and supporting documentary evidence for an absence (e.g., medical certificate, Professional Authority form (pdf - download here)), must be provided to the Lecturer-in-charge within 3 days of the test. Original documents should be provided.

Employment obligations or holiday plans of any kind are not acceptable reasons for absence from any test/examination.

4.4 Assignments

A set of two assignments will be handed out during the course. The completed assignments are to be handed in on time and will be marked as part of the course assessment. Each assignment will count **15%** towards the final mark for the course.

While you are encouraged to collaborate on these assignments, you should not simply copy someone else's answers and you should write up your own individual paper. It is also very important to understand that presentation, explanation and discussion are essential components of a well-crafted assignment solution.

Submission: Students must submit an electronic copy of their assignment as a PDF document. The electronic copy is to be submitted to the course website by 11:59pm on due date. Instructions will be available on the course website. All electronic copies of assignments will checked for plagiarism on the Turnitin software into which they are uploaded. You are also required to submit a hard copy in the School of Economics assignment box, located on the ground floor of the UNSW Business School building in the West wing by 4:59pm on due date.

Late Submission of Assignments: There are no make-up assignments. **10%** of the value of each assignment will be deducted for each day for late submission. Assignments are not accepted more than 7 days late!

4.5 Final Exam

The final examination will be held during the **university examination period**. It will be worth **50%** of the overall mark for the course, and will cover material from the entire course.

The final exam consists of questions designed to test your knowledge, analytical skills, problem solving ability and your ability to explain and discuss issues informatively.

Past exam papers for this subject are useful for your preparation and to gauge your knowledge and understanding of the concepts covered. However, due to recent changes to the course content, you should be advised that they are by no means indicative of the exact material to be covered in the current final exam.

Similar to the mid-session exam, a sheet with relevant formulae will be provided during the exam.

All the material covered in lectures, assignments, tutorials and the textbook is examinable.

My advice to you:

- Don't fall behind. Study the material on a lecture by lecture basis, as you will see that every lecture depends on the previous material.
- Do all the assigned homework. This is an integral part of the course. You should try harder problems - don't give in easily.
- Make use of the resources that are at your disposal: textbook, extra material, and my office consultation hours.

4.6 Quality Assurance

The Business School is actively monitoring student learning and quality of the student experience in all its programs. A random selection of completed assessment tasks may be used for quality assurance, such as to determine the extent to which program learning goals are being achieved. The information is required for accreditation purposes, and aggregated findings will be used to inform changes aimed at improving the quality of Business School programs. All material used for such processes will be treated as confidential and will not be related to course grades.

5 COURSE RESOURCES

The website for this course is on UNSW Moodle at: http://moodle.telt.unsw.edu.au

Lecture Notes: These will be available on the course website on a regular basis.

Required Textbook

The course will mostly follow Miller and Miller (MM) but will skip some topics and add some others from the additional readings. I will make copies of any extra material available to students as we progress. Note that there is a Student Solutions Manual available for the text by DeGroot and Schervish (DG).

- Miller, I., & M. Miller (2014), John S. Freund's Mathematical Statistics, 8th Edition, Pearson Prentice Hall.

Highly Recommended

- DeGroot, M.H., & M.J. Schervish (2010), Probability and Statistics, 4th. Edition, Reading, Mass. Addison-Wesley.
- Schervish, M.J. (2012), Student Solutions Manual (for Probability and Statistics, 4th Edition), Boston, Mass. Addison-Wesley.

Additional Readings

- Casella, G., & R.L. Berger (2002), Statistical Inference, Duxbury Press.
- Hogg, R.V., & A.T. Craig (1978), Introduction to Mathematical Statistics, 4th Edition, New York: Macmillan.
- Bierens, H.J. (2004), Introduction to the Mathematical and Statistical Foundations of Econometrics, Cambridge University Press.

Copies of DeGroot and Miller have been put in reserve at the library.

Software: The Stata software package will be used. It is available on computers in the Quad Labs. You can also purchase your own copy from IT for use on your own computer.

6 COURSE EVALUATION AND DEVELOPMENT

Each year feedback is sought from students and other stakeholders about the courses offered in the School and continual improvements are made based on this feedback. UNSW's myExperience Survey Tool is one of the ways in which student evaluative feedback is gathered. You are strongly encouraged to take part in the feedback process.

7 COURSE SCHEDULE

The schedule in the table below is approximate. The exact content and ordering of topics may vary as the course progresses. Further reading material may be introduced in due course. We hope to cover all of this material. We will go as fast, or as slow, as needed. The dates are tentative as each topic may take more (or less) than one class session. The lecture notes will be posted on the course website.

Course Schedule			
Week	**Date**	**Topics**	**Readings**
1	28 February	Probability *No tutorial*	MM: Chapters 1 & 2 DG: Chapters 1 & 2
2	7 March	Random Variables and Distributions	MM: Chapter 3 DG: Chapter 3
3	14 March	Mathematical Expectation	MM: Chapter 4 DG: Chapter 4
4	21 March	Special Distributions	MM: Chapters 5 & 6 DG: Chapter 5
5	28 March	Functions of Random Variables	MM: Chapter 7 DG: Chapter 3
6	04 April	Estimation Theory	MM: Chapter 10 DG: Chapter 7
7	11 April	***Mid-Session Examination***	
Mid-semester break: Friday 14 – Saturday 22 April inclusive			
8	25 April	*(Tuesday 25 April is the Anzac Day public holiday)* No lecture	
9	2 May	Sampling Distributions of Estimators ***Assignment 1 Due***	MM: Chapters 8 & 10 DG: Chapters 6 & 8
10	9 May	Simulation Methods	DG: Chapter 12
11	16 May	Hypothesis Testing	MM: Chapters 12 & 13 DG: Chapter 9
12	23 May	Hypothesis Testing and Simulation ***Assignment 2 Due***	MM: Chapter 12 & 13 DG: Chapters 9 & 12
13	30 May	Statistical Models in Econometrics	MM: Chapter 14 DG: Chapter 11