UNSW Course Outline

ECON5403 Econometric Theory and Methods - 2024

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General Course Information

Course Code : ECON5403
Year : 2024
Term : Term 3
Teaching Period : T3
Is a multi-term course? : No
Faculty : UNSW Business School
Academic Unit : School of Economics
Delivery Mode : Multimodal
Delivery Format : Standard
Delivery Location : Kensington
Campus : Sydney
Study Level : Postgraduate
Units of Credit : 6

<u>Useful Links</u>

<u>Handbook</u> <u>Class Timetable</u>

Course Details & Outcomes

Course Description

The course offers a broad interdisciplinary perspective on econometrics, data science, statistical and machine learning methods through the lens of econometric theory and applications. The course emphasises the links between the theory, computational methods, and the application of

the models to real examples. Being equipped with this knowledge will enable you to conduct a broad range of econometric modelling tasks.

Course Aims

The course aims to provide students an understanding of modern econometric, statistical, and machine learning methods and theoretical justifications of their use. The methods are useful in a range of economics and business applications. In addition to understanding of the theory and ideas behind the methodology, you will learn how to apply the methods to data using the Python computer package. You will learn to analyse data and report results based on the evidence. By the end of the course, you should be able to employ modern econometric, statistical and machine learning methods to address economic and business problems.

Relationship to Other Courses

The course will develop ideas from first principles, but students are expected to have knowledge of elementary econometrics (ECON5205). Students should also have some familiarity with matrix algebra and an understanding of probability distributions and estimation. The course will give students sound preparation for courses that use applied econometrics as well as a sound basis for continuing to further study in economics.

Course Learning Outcomes

Course Learning Outcomes	Program learning outcomes
CLO1 : Employ and utilize appropriate econometric and computational methods for tackling an array of econometric problems.	• PLO1 : Business Knowledge • PLO2 : Problem Solving
CLO2 : Conduct comprehensive model diagnostics and critically assess the results to determine whether a model and estimation approach are appropriate for a particular application.	• PLO1 : Business Knowledge • PLO2 : Problem Solving
CLO3 : Demonstrate a high level of proficiency in understanding the theoretical underpinning of econometric models, presenting an intuition for the generalisability of the models and associated methods.	• PLO1 : Business Knowledge • PLO2 : Problem Solving
CLO4 : Construct written code demonstrating proficient and effective interpretation of programming output, to fit and adjust models.	• PLO1 : Business Knowledge • PLO2 : Problem Solving
CLO5 : Propose innovative improvements or alternatives to rectify inadequacies inappropriate methods or poorly fit models, demonstrating creative problem-solving skills.	• PLO2 : Problem Solving
CLO6 : Synthesize the results of an econometric analysis in a report that lays out the problem to be solved, a description of the data, the methodology used and the proposed results, which effectively communicates ideas.	• PLO3 : Business Communication
CLO7 : Collaboratively engage in a task to demonstrate teamwork and cooperation towards achieving completion.	• PLO4 : Teamwork

Course Learning Outcomes	Assessment Item
CLO1 : Employ and utilize appropriate econometric and computational methods for tackling an array of econometric problems.	• Quiz • Group Project • Final Exam
CLO2 : Conduct comprehensive model diagnostics and critically assess the results to determine whether a model and estimation approach are appropriate for a particular application.	• Quiz • Group Project • Final Exam
CLO3 : Demonstrate a high level of proficiency in understanding the theoretical underpinning of econometric models, presenting an intuition for the generalisability of the models and associated methods.	• Quiz • Group Project • Final Exam
CLO4 : Construct written code demonstrating proficient and effective interpretation of programming output, to fit and adjust models.	• Group Project
CLO5 : Propose innovative improvements or alternatives to rectify inadequacies inappropriate methods or poorly fit models, demonstrating creative problem-solving skills.	• Quiz • Final Exam • Group Project
CLO6 : Synthesize the results of an econometric analysis in a report that lays out the problem to be solved, a description of the data, the methodology used and the proposed results, which effectively communicates ideas.	• Group Project
CLO7 : Collaboratively engage in a task to demonstrate teamwork and cooperation towards achieving completion.	• Group Project

Learning and Teaching Technologies

Moodle - Learning Management System

Learning and Teaching in this course

Approach to Learning and Teaching in the Course

Learning will be through:

- Weekly lectures and seminar classes.
- The lecture slides and recording made available on Moodle.
- Assigned reading supplementing the lectures. These consist of additional notes posted on Moodle, readings from chapters in the assigned text book as well as material from other sources.
- Feedback on the assessment items, which will be discussed during tutorials.

Learning Activities and Teaching Strategies

<u>Lectures</u>

The lectures will include explanation of methodology, practice, and some of the theory of the topics in the course. However, students should not regard the lecture contents as exhaustive.

It is important for students 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 instruction, but it is essential that their contribution be bolstered and supported by other learning resources.

The examinable content of the course is defined by the references given in the lecture schedule, the lecture content, and the content of the tutorial program.

Seminars

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

Seminars will be delivered online in live/synchronous mode. The purpose of seminars is to enable you to raise questions about difficult topics or problems encountered. Students must come prepared with questions of their own.

Out-of-Class Study

Most learning will usually be achieved outside of class time. Lectures can only provide a structure to assist your study, and tutorial time is limited.

You are encouraged to acquire the recommended textbook and other books for this course (see Course Resources section) and read the assigned chapters. Make the books your friends.

Assessments

Assessment Structure

Assessment Item	Weight	Relevant Dates	Program learning outcomes
Quiz Assessment Format: Individual	25%	Start Date: Not Applicable Due Date: Week 7	• PLO1 : Business Knowledge • PLO2 : Problem Solving
Group Project Assessment Format: Group	25%	Start Date: Week 4 Due Date: Week 9	• PLO1 : Business Knowledge • PLO2 : Problem Solving • PLO3 : Business Communication • PLO4 : Teamwork
Final Exam Assessment Format: Individual	50%	Start Date: Not Applicable Due Date: University Exam Period	• PLO1 : Business Knowledge • PLO2 : Problem Solving

Assessment Details

Quiz

Assessment Overview

The quiz will consist of computational and short-answer questions and will cover the course materials introduced up to the week preceding the quiz. This includes all the materials covered in the lectures, class notes, and seminars.

Course Learning Outcomes

- CLO1 : Employ and utilize appropriate econometric and computational methods for tackling an array of econometric problems.
- CLO2 : Conduct comprehensive model diagnostics and critically assess the results to determine whether a model and estimation approach are appropriate for a particular application.
- CLO3 : Demonstrate a high level of proficiency in understanding the theoretical underpinning of econometric models, presenting an intuition for the generalisability of the models and associated methods.
- CLO5 : Propose innovative improvements or alternatives to rectify inadequacies inappropriate methods or poorly fit models, demonstrating creative problem-solving skills.

Assessment Length

90 minutes

Assignment submission Turnitin type

Not Applicable

Generative AI Permission Level

No Assistance

This assessment is designed for you to complete without the use of any generative AI. You are not permitted to use any generative AI tools, software or service to search for or generate information or answers.

For more information on Generative AI and permitted use please see here.

Group Project

Assessment Overview

The purpose of the group project is to test your ability to analyse data using the methodology you have learnt in the course concisely summarise the issues involved and the conclusions you reach, and work cooperatively in a team. It is your responsibility to find partners with whom to work.

Course Learning Outcomes

- CLO1 : Employ and utilize appropriate econometric and computational methods for tackling an array of econometric problems.
- CLO2 : Conduct comprehensive model diagnostics and critically assess the results to determine whether a model and estimation approach are appropriate for a particular application.
- CLO3 : Demonstrate a high level of proficiency in understanding the theoretical underpinning of econometric models, presenting an intuition for the generalisability of the models and associated methods.
- CLO4 : Construct written code demonstrating proficient and effective interpretation of programming output, to fit and adjust models.
- CLO5 : Propose innovative improvements or alternatives to rectify inadequacies inappropriate methods or poorly fit models, demonstrating creative problem-solving skills.
- CLO6 : Synthesize the results of an econometric analysis in a report that lays out the problem to be solved, a description of the data, the methodology used and the proposed results, which effectively communicates ideas.
- CLO7 : Collaboratively engage in a task to demonstrate teamwork and cooperation towards achieving completion.

Assessment Length

Week 4 - Week 9

Assignment submission Turnitin type

Not Applicable

Generative AI Permission Level

Assistance with Attribution

This assessment requires you to write/create a first iteration of your submission yourself. You are then permitted to use generative AI tools, software or services to improve your submission in the ways set out below.

Any output of generative AI tools, software or services that is used within your assessment must be attributed with full referencing.

If outputs of generative AI tools, software or services form part of your submission and are not appropriately attributed, your Convenor will determine whether the omission is significant. If so, you may be asked to explain your submission. If you are unable to satisfactorily demonstrate your understanding of your submission you may be referred to UNSW Conduct & Integrity Office for investigation for academic misconduct and possible penalties.

For more information on Generative AI and permitted use please see here.

Final Exam

Assessment Overview

The final exam will consist of computational and short-answer questions. All materials covered in the lectures and seminars throughout the entire course is examinable.

Course Learning Outcomes

- CLO1 : Employ and utilize appropriate econometric and computational methods for tackling an array of econometric problems.
- CLO2 : Conduct comprehensive model diagnostics and critically assess the results to determine whether a model and estimation approach are appropriate for a particular application.
- CLO3 : Demonstrate a high level of proficiency in understanding the theoretical underpinning of econometric models, presenting an intuition for the generalisability of the models and associated methods.
- CLO5 : Propose innovative improvements or alternatives to rectify inadequacies inappropriate methods or poorly fit models, demonstrating creative problem-solving skills.

Assessment Length

2 hours

Assignment submission Turnitin type

Not Applicable

<u>Generative AI Permission Level</u>

No Assistance

This assessment is designed for you to complete without the use of any generative AI. You are not permitted to use any generative AI tools, software or service to search for or generate information or answers.

For more information on Generative AI and permitted use please see here.

General Assessment Information

<u>Grading Basis</u>

Standard

<u>Requirements to pass course</u>

In order to pass this course students must:

• Achieve a composite mark of at least 50 out of 100

• Engage actively in course learning activities and attempt all assessment requirements

• Meet any additional requirements specified in the assessment details

Course Schedule

Teaching Week/Module	Activity Type	Content
Week 1 : 9 September - 15 September	Lecture	Introduction and key concepts (read chapters 1 and 2 of the ISL textbook)
	Seminar	Introduction to Python (read chapter 2.3)
Week 2 : 16 September - 22 September	Lecture	Linear regression and estimation techniques (read chapters 3.1-3.4; 4.3.2); hypothesis testing (chapter 13.1)
	Seminar	Practice week 1 lecture material
Week 3 : 23 September - 29 September	Lecture	Classification (chapters 4.1-4.3)
	Seminar	Practice week 2 lecture material
Week 4 : 30 September - 6 October	Lecture	Model selection and regularisation (Chapters 6.1-6.2)
	Seminar	Practice week 3 lecture material
Week 5 : 7 October - 13 October	Lecture	No lecture on Monday - Public holiday Labour day
	Seminar	Practice week 4 lecture material
Week 6 : 14 October - 20 October	Other	No scheduled lecture/semiar, self-work on the group project
Week 7 : 21 October - 27 October	Lecture	Going Beyond Linearity (chapter 7)
	Seminar	Practice week 4 lecture material and Q&A on the group project
Week 8 : 28 October - 3 November	Lecture	Neural networks and deep learning (chapter 10)
	Seminar	Practice week 7 lecture material
Week 9 : 4 November - 10 November	Lecture	Neural networks and deep learning, cont. (chapter 10).
	Seminar	Practice week 8 lecture material
Week 10 : 11 November - 17 November	Lecture	Course overview
	Seminar	Practice week 8 lecture material

Attendance Requirements

Students are strongly encouraged to attend all classes and review lecture recordings.

Course Resources

Prescribed Resources

The website for this course is on UNSW [Moodle](#).

Lecture Notes

These are comprehensive and will be available on Moodle. Note however that there may be additional discussion of concepts during the lectures beyond the notes that you should endeavour to understand.

Recommended textbook

- *An Introduction to Statistical Learning: With applications in Python*, 2023, by James, G., Witten, D., Hastie, T., & Tibshirani, R. Freely available from https://www.statlearning.com

Other useful references

- *The Elements of Statistical Learning: Data Mining, Inference, and Prediction,* 2009, by by Hastie, T., Tibshirani, R., Friedman, J. H., & Friedman, J. H., Second addition, Springer, Freely available from https://hastie.su.domains/ElemStatLearn/   A theory-oriented version of ISL textbook above: well-written, deep in theory, suitable for students with a *sound* maths background.

- *Deep Learning*, 2016, by Goodfellow, I., Bengio, Y., & Courville, A., MIT Press, Freely available from https://www.deeplearningbook.org/

Software

Python will be used in this course for practice and implementing the statistical methodologies.

Staff Details

Position	Name	Email	Location	Phone	Availability	Equitable Learning Services Contact	Primary Contact
Convenor	Valentyn Panchenko			0290651096	Tuesday 11am-12pm or by appointment	No	Yes
Tutor	Asror Nigmonov					No	No

Other Useful Information

Academic Information

COURSE POLICIES AND SUPPORT

The Business School expects that you are familiar with the contents of this course outline and the UNSW and Business School learning expectations, rules, policies and support services as listed below:

- Program Learning Outcomes
- Academic Integrity and Plagiarism
- Student Responsibilities and Conduct
- Special Consideration
- Protocol for Viewing Final Exam Scripts
- Student Learning Support Services

Further information is provided on the Policies and Guidelines page.

Students may not circulate or post online any course materials such as handouts, exams, syllabi or similar resources from their courses without the written permission of their instructor.

STUDENT LEARNING OUTCOMES

The Course Learning Outcomes (CLOs) – under the Outcomes tab – are what you should be able to demonstrate by the end of this course, if you participate fully in learning activities and successfully complete the assessment items.

CLOs also contribute to your achievement of the Program Learning Outcomes (PLOs), which are developed across the duration of a program. PLOs are, in turn, directly linked to UNSW graduate capabilities. More information on Coursework PLOs is available on the Policies and Guidelines page. For PG Research PLOs, including MPDBS, please refer to UNSW HDR learning outcomes.

Academic Honesty and Plagarism

As a student at UNSW you are expected to display academic integrity in your work and interactions. Where a student breaches the UNSW Code of Conduct with respect to academic integrity, the University may take disciplinary action. To assure academic integrity, you may be

required to demonstrate reasoning, research and the process of constructing work submitted for assessment.

To assist you in understanding what academic integrity means, and how to ensure that you do comply with the UNSW Code of Conduct, it is strongly recommended that you complete the [Working with Academic Integrity](#) module before submitting your first assessment task. It is a free, online self-paced Moodle module that should take about one hour to complete.

Submission of Assessment Tasks

SHORT EXTENSIONS

Short Extension is a new process that allows you to apply for an extended deadline on your assessment without the need to provide supporting documentation, offering immediate approval during brief, life-disrupting events. Requests are automatically approved once submitted.

Short extensions are ONLY available for some assessments. Check your course outline or Moodle to see if this is offered for your assessments. Where a short extension exists, all students enrolled in that course in that term are eligible to apply. Further details are available the UNSW [Current Students](#) page.

SPECIAL CONSIDERATION

You can apply for special consideration when illness or other circumstances beyond your control interfere with your performance in a specific assessment task or tasks, including online exams. Special consideration is primarily intended to provide you with an extra opportunity to demonstrate the level of performance of which you are capable.

Applications can only be made online and will NOT be accepted by teaching staff. Applications will be assessed centrally by the Case Review Team, who will update the online application with the outcome and add any relevant comments. The change to the status of the application immediately sends an email to the student and to the assessor with the outcome of the application. The majority of applications will be processed within 3-5 working days.

For further information, and to apply, see Special Consideration on the UNSW [Current Students](#) page.

LATE SUBMISSION PENALTIES

LATE SUBMISSION PENALTIES

For assessments other than examinations, late submission will incur a penalty of 5% per day or part thereof (including weekends) from the due date and time. An assessment will not be accepted after 5 days (120 hours) of the original deadline unless special consideration has been approved. In the case of an approved Equitable Learning Plan (ELP) provision, special consideration or short extension, the late penalty applies from the date of approved time extension. After five days from the extended deadline, the assessment cannot be submited.

An assessment is considered late if the requested format, such as hard copy or electronic copy, has not been submitted on time or where the 'wrong' assessment has been submitted.

For assessments which account for 10% or less of the overall course grade, and where answers are immediately discussed or debriefed, the LIC may stipulate a different penalty. Details of such late penalties will be available on the course Moodle page.

FEEDBACK ON YOUR ASSESSMENT TASK PERFORMANCE

Feedback on student performance from formative and summative assessment tasks will be provided to students in a timely manner. Assessment tasks completed within the teaching period of a course, other than a final assessment, will be assessed and students provided with feedback, with or without a provisional result, within 10 working days of submission, under normal circumstances. Feedback on continuous assessment tasks (e.g. laboratory and studio-based, workplace-based, weekly quizzes) will be provided prior to the midpoint of the course.

Faculty-specific Information

PROTOCOL FOR VIEWING FINAL EXAM SCRIPTS

UNSW students have the right to view their final exam scripts, subject to a small number of very specific exemptions. The UNSW Business School has set a protocol under which students may view their final exam script. Individual schools within the Faculty may also set up additional local processes for viewing final exam scripts, so it is important that you check with your School.

If you are completing courses from the following schools, please note the additional school-specific information:

- Students in the **School of Accounting, Auditing & Taxation** who wish to view their final examination script should also refer to this page.

- Students in the **School of Banking & Finance** should also refer to this page.
- Students in the **School of Information Systems & Technology Management** should also refer to this page.

COURSE EVALUATION AND DEVELOPMENT

Feedback is regularly sought from students and continual improvements are made based on this feedback. At the end of this course, you will be asked to complete the myExperience survey, which provides a key source of student evaluative feedback. Your input into this quality enhancement process is extremely valuable in assisting us to meet the needs of our students and provide an effective and enriching learning experience. The results of all surveys are carefully considered and do lead to action towards enhancing educational quality.

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.

TEACHING TIMES AND LOCATIONS

Please note that teaching times and locations are subject to change. Students are strongly advised to refer to the Class Timetable website for the most up-to-date teaching times and locations.