



# ECON2032

## Intermediate Econometrics

Session 2, In person-scheduled-weekday, North Ryde 2024

*Department of Economics*

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#### **Disclaimer**

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## General Information

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|---|
| Unit convenor and teaching staff<br>Hanbat Jeong<br><a href="mailto:hanbat.jeong@mq.edu.au">hanbat.jeong@mq.edu.au</a>  |
| Credit points<br>10   |
| Prerequisites<br>ECON241 or ECON2041 or STAT272 or STAT2372 or STAT171 or STAT1371 or STAT270 or STAT2170 or STAT273 or STAT2173 or STAT271 or STAT2371   |
| Corequisites  |
| Co-badged status  |
| Unit description<br>This unit covers econometric techniques that go beyond the classical regression model. It helps students to develop literacy in important methods commonly used to analyse data in economics, finance and business environments. The topics covered may include heteroscedasticity, stochastic regressors, limited dependent variables, time-series regression and panel data analysis. |

## 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:

- ULO1:** Identify and describe econometric concepts and theories.
- ULO2:** Estimate econometric models and test parametric hypotheses using techniques that are appropriate for the problem at hand.
- ULO3:** Diagnose and resolve problems relating to the violation of standard assumptions in econometric models, and make conclusions and recommendations.
- ULO4:** Critique the appropriateness of alternative econometric techniques in practical applications to appropriate problems.

## General Assessment Information

### Late Assessment Submission Penalty (written assessments)

Unless a Special Consideration request has been submitted and approved, a 5% penalty (of the total possible mark) will be applied each day a written assessment is not submitted, up until the 7th day (including weekends). After the 7th day, a grade of '0' will be awarded even if the assessment is submitted. Submission time for all written assessments is set at 11.55pm. A 1-hour grace period is provided to students who experience a technical concern. For any late submissions of time-sensitive tasks, such as scheduled tests/exams, performance assessments/presentations, and/or scheduled practical assessments/labs, students need to submit an application for [Special Consideration](#).

## Assessment Tasks

| Name                               | Weighting | Hurdle | Due                         |
|------------------------------------|-----------|--------|-----------------------------|
| <a href="#">Assignment</a>         | 20%       | No     | Week 13                     |
| <a href="#">Final exam</a>         | 50%       | No     | University Examination Week |
| <a href="#">Tutorial exercises</a> | 15%       | No     | Weeks 3, 5, 7, 9, and 11    |
| <a href="#">Mid-session Test</a>   | 15%       | No     | Week 8                      |

## Assignment

Assessment Type <sup>1</sup>: Modelling task

Indicative Time on Task <sup>2</sup>: 19 hours

Due: **Week 13**

Weighting: **20%**

Students will be given an applied econometric problem to work on and will be required to submit a written report on their investigation of the problem. Students may also be required to submit relevant computer files.

On successful completion you will be able to:

- Identify and describe econometric concepts and theories.
- Estimate econometric models and test parametric hypotheses using techniques that are appropriate for the problem at hand.
- Diagnose and resolve problems relating to the violation of standard assumptions in econometric models, and make conclusions and recommendations.

- Critique the appropriateness of alternative econometric techniques in practical applications to appropriate problems.

## Final exam

Assessment Type <sup>1</sup>: Examination

Indicative Time on Task <sup>2</sup>: 50 hours

Due: **University Examination Week**

Weighting: **50%**

A two-hour examination, consisting of multiple choice, numerical, and short answer questions, will be held during the University Examination Period.

On successful completion you will be able to:

- Identify and describe econometric concepts and theories.
- Estimate econometric models and test parametric hypotheses using techniques that are appropriate for the problem at hand.
- Diagnose and resolve problems relating to the violation of standard assumptions in econometric models, and make conclusions and recommendations.
- Critique the appropriateness of alternative econometric techniques in practical applications to appropriate problems.

## Tutorial exercises

Assessment Type <sup>1</sup>: Problem set

Indicative Time on Task <sup>2</sup>: 5 hours

Due: **Weeks 3, 5, 7, 9, and 11**

Weighting: **15%**

Tutorial exercise quiz in W3 is weighted 5% and designed to ensure that you quickly review key concepts in maths and statistics taught in prerequisite units which will be necessary for you to progress through the new material in this unit; the remaining Tutorial exercise quizzes in W5, 7, 9, 11 are worth 2.5% each. Each quiz will be a problem set to be completed at the end of the week in a designated time window. The tutorial classes will help you prepare for the quizzes.

On successful completion you will be able to:

- Identify and describe econometric concepts and theories.
- Estimate econometric models and test parametric hypotheses using techniques that are

appropriate for the problem at hand.

- Diagnose and resolve problems relating to the violation of standard assumptions in econometric models, and make conclusions and recommendations.
- Critique the appropriateness of alternative econometric techniques in practical applications to appropriate problems.

## Mid-session Test

Assessment Type <sup>1</sup>: Quiz/Test

Indicative Time on Task <sup>2</sup>: 3 hours

Due: **Week 8**

Weighting: **15%**

The test assesses the work covered in lectures up to the submission deadline, and consists of a set of questions to be answered on iLearn. It may consist of true-false, multiple choice, numerical and simple answer questions.

On successful completion you will be able to:

- Identify and describe econometric concepts and theories.
- Estimate econometric models and test parametric hypotheses using techniques that are appropriate for the problem at hand.
- Diagnose and resolve problems relating to the violation of standard assumptions in econometric models, and make conclusions and recommendations.
- Critique the appropriateness of alternative econometric techniques in practical applications to appropriate problems.

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<sup>1</sup> If you need help with your assignment, please contact:

- the academic teaching staff in your unit for guidance in understanding or completing this type of assessment
- the [Writing Centre](#) for academic skills support.

<sup>2</sup> Indicative time-on-task is an estimate of the time required for completion of the assessment task and is subject to individual variation

## Delivery and Resources

### Delivery format

Two hours of face-to-face lecture

One hour of face-to-face or online tutorial

Each week, there will be two hours of face-to-face lectures. Also, weekly one-hour tutorials will be held to review assigned problems. The problems covered in the tutorial sessions will reinforce the topics discussed in the main lectures.

### **REQUIRED AND RECOMMENDED TEXTS AND/OR MATERIALS**

Wooldridge, Jeffrey M., *Introductory Econometrics: A Modern Approach*, 7th edition,

The textbook is available online via the Macquarie University Library. As the unit progresses, material such as lecture slides, examples, etc., will be made available on the unit website.

### **TECHNOLOGIES USED AND REQUIRED**

The main software package used is Gretl. It is free and open-source, and available on Windows, Mac, or Linux. Students will need to install Gretl on their personal computers. Visit the Gretl website:

<https://gretl.sourceforge.net/>

choose an operating system from the left-hand side of the page, and follow the download and installation instructions.

### **EMAIL USE**

It is University policy that the University issued email account will be used for official University communication. All students are required to access their University account frequently. Only contact Macquarie University staff (including tutors), using your official MQ student's account because this is one method used to verify your identity.

## **Unit Schedule**

### Week 1: Probability theory

- Summary
- Probability Spaces
- Random Variables
- Distribution Functions (discrete and continuous)
- Expected value, Variance, and Moments
- Readings

*Wooldridge, Introductory Econometrics: A Modern Approach (7th ed)*: Appendices A and B (pp. 666-697)

### Week 2: Probability theory

- Summary
- Important Distribution Functions

- Joint Probability Distribution Functions
- Covariance and Correlation
- Conditional Probability Distribution Functions
- Conditional Moments
- Law of Iterated Expectations
- The Sample Mean/The Laws of Large Numbers
- The Central Limit Theorem
  
- Reading

Wooldridge, *Introductory Econometrics: A Modern Approach* (7th ed): Appendix B (pp. 697-713)

### Week 3: Estimation and hypothesis testing

- Summary
- Identify a point estimator and the small and large sample properties that may be of interest.
- Construct a confidence interval
- Standardize a random variable
- Understand when a standardized sample mean follows a Standard Normal versus a t-distribution
- Perform a hypothesis test
- Understand critical value method and p-value method
- Understand one-sided versus two-sided tests.
  
- Reading

Wooldridge, *Introductory Econometrics: A Modern Approach* (7th ed): Appendix C (pp. 714-743)

### Week 4: Linear regression

- Summary
- Understand the main features of a Linear Model
- Understand how to estimate the parameters of a Linear Model
- Know the Classical Assumptions motivating the Ordinary Least Square (OLS) Estimator
- Perform Hypothesis Testing on Linear Models
  
- Reading

Wooldridge, *Introductory Econometrics: A Modern Approach* (7th ed): Chapter 2 (pp. 20-36)  
[Univariate Regression]

Wooldridge, *Introductory Econometrics: A Modern Approach* (7th ed): Chapter 3 (pp. 67-96)

[Multivariate Regression]

Wooldridge, *Introductory Econometrics: A Modern Approach* (7th ed): Chapter 4 (pp. 120-145)

[Hypothesis Testing]

#### Week 5: Heteroskedasticity

- Summary
- Understand the definition of Heteroskedasticity in Linear Regression
- Know the impacts of Heteroskedasticity for the OLS estimator
- Recognize Heteroskedasticity in a plot
- Know how to test for the presence of Heteroskedasticity
- Know how to correct for Heteroskedasticity
- Reading

Wooldridge, *Introductory Econometrics: A Modern Approach* (7th ed): Chapter 8 (pp. 262-284)

#### Week 6: Model specification

- Summary
- Concept of model specification
- Identify different violations of correct model specification and their impact
- Understand how non-linear relationships can be captured by linear models (in higher dimensional spaces)
- Know what a dummy variable is and how they affect a linear model
- Know how to test null hypotheses about model specification
- Reading

Wooldridge, *Introductory Econometrics: A Modern Approach* (7th ed): Chapter 6 (pp. 186-194)

Wooldridge, *Introductory Econometrics: A Modern Approach* (7th ed): Chapter 9 (pp. 295-303, 310-313)

#### Week 7: Endogeneity

- Summary
- Define Endogeneity and describe its impact on the OLS estimator
- Define an Instrumental Variable and know the definition of a valid instrument
- Understand Two Stage Least Squares
- Understand the problem of weak instruments
- Implement tests for exogeneity and instrument strength
- Reading



Wooldridge, *Introductory Econometrics: A Modern Approach* (7th ed): Chapter 15 (pp. 495-519)

#### Week 8: Binary Dependent variables

- Summary
- Define a binary variable, and state its Probability Distribution Function and Moments
- Understand the problems with standard OLS (aka the Linear Probability Model) given a binary dependent variable
- Understand the Maximum Likelihood Estimation (MLE) Method
- Gain some intuition on how the estimation procedure of Maximum Likelihood works
- Understand the Logit and Probit models, how we estimate them, and how we generate predictions using them
- Conduct hypothesis testing with Logit and Probit (possibly in early next weeks lectures)
- Reading

Wooldridge, *Introductory Econometrics: A Modern Approach* (7th ed): Chapter 17 (pp. 559-571)

#### Week 9: Stationary Time Series

- Summary
- Understand how time-series analysis differs from the cross-section
- Define autocorrelation and understand it in the context of several popular time series models
- Understand Weak Dependence, especially in the context of Autocorrelation
- Laws of Large numbers and Central Limit Theorems for Time-series
- Reading

Wooldridge, *Introductory Econometrics: A Modern Approach* (7th ed): Chapter 10 (pp. 334-344)

#### Week 10: Stationary Time Series

- Summary
- Understand the Strong Time Series Assumptions for OLS, including strict exogeneity
- Define Stationarity
- Understand the regular Time Series Assumptions for OLS
- Heteroskedasticity and Autocorrelation Consistent Standard Errors
- Distributed Lag Models, Autoregressive Models, and Autoregressive Distributed Lag Models
- Reading

Wooldridge, *Introductory Econometrics: A Modern Approach* (7th ed): Chapter 11 (pp. 367-376)

Wooldridge, *Introductory Econometrics: A Modern Approach* (7th ed): Chapter 12 (pp. 394-401)

### Week 11: Nonstationary Time Series

- Summary
- Detecting Autocorrelation in OLS residuals
- Definition of Nonstationarity
- Nonstationarity in Autoregressive models and Random Walks
- Nonstationarity and deterministic trends
- Further topics for advanced courses (financial econometrics)
- Reading

Wooldridge, *Introductory Econometrics: A Modern Approach* (7th ed): Chapter 12 (pp. 401-407)

Wooldridge, *Introductory Econometrics: A Modern Approach* (7th ed): Chapter 10 (pp. 351-357)

### Week 12: Panel Data

- Summary
- Definition of Panel Data
- Common Panel Data restrictions and assumptions
- Pooled Regression Models
- Policy analysis with pooled cross sections
- Reading

Wooldridge, *Introductory Econometrics: A Modern Approach* (7th ed): Chapter 13 (pp. 426-461)

### Week 13: Panel Data

- Summary
- Two-Period Panel Data analysis
- Policy analysis with Two-Period Panel Data
- Differencing with More Than Two Time Periods
- Fixed-Effect Models and Random-Effect Models

Wooldridge, *Introductory Econometrics: A Modern Approach* (7th ed): Chapter 13 (pp. 426-461)

Wooldridge, *Introductory Econometrics: A Modern Approach* (7th ed): Chapter 14 (pp. 462-494)

## **Policies and Procedures**

Macquarie University policies and procedures are accessible from [Policy Central \(https://policies.mq.edu.au\)](https://policies.mq.edu.au). Students should be aware of the following policies in particular with regard to

Learning and Teaching:

- [Academic Appeals Policy](#)
- [Academic Integrity Policy](#)
- [Academic Progression Policy](#)
- [Assessment Policy](#)
- [Fitness to Practice Procedure](#)
- [Assessment Procedure](#)
- [Complaints Resolution Procedure for Students and Members of the Public](#)
- [Special Consideration Policy](#)

Students seeking more policy resources can visit [Student Policies](https://students.mq.edu.au/support/study/policies) (<https://students.mq.edu.au/support/study/policies>). It is your one-stop-shop for the key policies you need to know about throughout your undergraduate student journey.

To find other policies relating to Teaching and Learning, visit [Policy Central](https://policies.mq.edu.au) (<https://policies.mq.edu.au>) and use the [search tool](#).

## Student Code of Conduct

Macquarie University students have a responsibility to be familiar with the Student Code of Conduct: <https://students.mq.edu.au/admin/other-resources/student-conduct>

## Results

Results published on platform other than [eStudent](#), (eg. iLearn, Coursera etc.) 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](http://ask.mq.edu.au) or if you are a Global MBA student contact [globalmba.support@mq.edu.au](mailto:globalmba.support@mq.edu.au)

## Academic Integrity

At Macquarie, we believe [academic integrity](#) – honesty, respect, trust, responsibility, fairness and courage – is at the core of learning, teaching and research. We recognise that meeting the expectations required to complete your assessments can be challenging. So, we offer you a range of resources and services to help you reach your potential, including free [online writing and maths support](#), [academic skills development](#) and [wellbeing consultations](#).

## Student Support

Macquarie University provides a range of support services for students. For details, visit <http://students.mq.edu.au/support/>

## The Writing Centre

[The Writing Centre](#) provides resources to develop your English language proficiency, academic writing, and communication skills.

- [Workshops](#)
- [Chat with a WriteWISE peer writing leader](#)
- [Access StudyWISE](#)
- [Upload an assignment to Studiosity](#)
- [Complete the Academic Integrity Module](#)

The Library provides online and face to face support to help you find and use relevant information resources.

- [Subject and Research Guides](#)
- [Ask a Librarian](#)

## Student Services and Support

Macquarie University offers a range of [Student Support Services](#) including:

- [IT Support](#)
- [Accessibility and disability support](#) with study
- Mental health [support](#)
- [Safety support](#) to respond to bullying, harassment, sexual harassment and sexual assault
- [Social support including information about finances, tenancy and legal issues](#)
- [Student Advocacy](#) provides independent advice on MQ policies, procedures, and processes

## Student Enquiries

Got a question? Ask us via [AskMQ](#), or contact [Service Connect](#).

## IT Help

For help with University computer systems and technology, visit [http://www.mq.edu.au/about\\_us/offices\\_and\\_units/information\\_technology/help/](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.

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Unit information based on version 2024.03 of the [Handbook](#)