# Carleton University

# ECON 5027: Econometrics I

# Fall 2024

Professor Thomas  Russell

## General Information

### The Instructor

**Instructor:**  Thomas Russell
**Email:** thomas.russell3@carleton.ca
**Office Location:** Loeb Building B846
**Office Hours:**  By appointment

### Course Delivery

**Course  Delivery:** In person only
**Lectures:** Thursday 2:35 pm - 5:25 pm EST, check Carleton Central for location

**TA:** TBA

**Brightspace  Course  Webpage:** https://brightspace.carleton.ca/d2l/home/288678

**Course Description:**  An introduction to econometrics at the graduate level. Topics include the analysis and treatment of univariate and multivariate regression models, GLS, IV, and maximum likelihood estimation, hypothesis testing, seemingly unrelated regression models, and simultaneous equations models, together with relevant economic applications.

**Learning Outcomes:**  The goal of this course is to provide students with the technical background required to responsibly use a variety of common econometric methods. The focus of the course is primarily theoretical, although students will apply the material learned in class to analyze data and conduct simula-

tion studies in the assignments. Introductory concepts related to simple and multiple regression models are assumed to be known. The course will study linear regression using matrix algebra, will introduce students to the asymptotic properties of the ordinary least squares estimator, and will provide a rigorous treatment of hypothesis testing and confidence set construction.

**Course Preclusions**: Precludes additional credit for ECON 5005 (no longer offered).
**Course Prerequisites**: None (MA status).

# Course Calendar

Table 1 displays a list of important dates. The evaluation dates below are subject to change.

| Dates | Event |
|---|---|
| September 5 | First Class. |
| September 19 | Assignment I Posted. |
| September 26 | Assignment I Due at 11:59 pm EST. |
| October 3 | Assignment II Posted. |
| October 17 | Assignment II Due at 11:59 pm EST. |
| October 21 - 25 | Fall Break, no classes. |
| October 31 | Midterm (in class) |
| November 14 | Assignment II Posted. |
| November 28 | Assignment II Due at 11:59 pm EST. |
| December 5 | Last Class. |
| December 9 - 21 | Final Exam Period. |

*Table 1:* Important dates for ECON 5027.

The tentative course outline is displayed in Table 2. Depending on the pace of the lectures, this course outline may be subject to modification.

## Programming Requirements

Students will be required to use R for the assignments. Programming in R will be taught in class. R is open-source and freely available. Students may also find it useful to install Rstudio. Instructions on how to install R and RStudio will be posted on the course website before the first lecture. These programs should be installed before the first class.

# Textbooks and Readings

There is no required textbook for this class. However, the lectures were compiled from a variety of sources listed below. The most heavily-used sources are marked with an asterisk.

| Topic # | Lecture Dates | Topic |
|---|---|---|
| 1 | September 5<br>September 12<br>September 19 | Advanced Math & Stats |
| 2 | September 26<br>October 3<br>October 10 | Linear Regression - Basic Theory |
| 3a | October 17 | Linear Regression - Asymptotic Theory |
| — | October 23 - October 27 | Winter Break: No classes |
| — | October 31 | Midterm Exam |
| 3b | November 7<br>November 14 | Linear Regression - Asymptotic Theory (cont'd) |
| 4 | November 21<br>November 28<br>December 5 | Hypothesis Testing and Confidence Sets |

*Table 2:* A tentative course outline for ECON 5027.

• Angrist, J. D. and Pischke, J. (2008). *Mostly Harmless Econometrics: An Empiricist's Companion*. Princeton University Press.

• Anton, H., and Rorres, C. (2013). *Elementary linear algebra: applications version.* John Wiley & Sons.

• Cameron, A. C. and Trivedi P. K. (2005). *Microeconometrics: Methods and Applications*. Cambridge University Press.

• Davidson, R., and MacKinnon, J. G. (1993). *Estimation and inference in econometrics.* Oxford University Press.

• Davidson, R., and MacKinnon, J. G. (2004). *Econometric theory and methods.* New York: Oxford University Press.

* Hayashi, F. (2000). *Econometrics*. Princeton University Press.

• Train, K. (2009). *Discrete Choice Methods with Simulation*. Cambridge University Press.

* White (1984). *Asymptotic Theory for Econometricians*. Academic Press.

• Wooldridge, J. M. (2010). *Econometric Analysis of Cross Section and Panel Data*. MIT Press.

# Evaluation

- Assignment I — 5%. To be posted on the course website on September 19, 2024. Due on September 26, 2024, at 11:59 pm EST. To be submitted via the course website.

- Assignment II — 15%. To be posted on the course website on October 3, 2024. Due on October 17, 2024, at 11:59 pm EST. To be submitted via the course website.

- Midterm — 25%. The midterm will take place in class on October 31, 2024.

- Assignment III — 15%. To be posted on the course website on November 14, 2024. Due November 28, 2024, at 11:59 pm EST. To be submitted via the course website.

- Final Exam— 40%. The final exam will be administered during the exam period, sometime between December 9 - 21, 2024. The final exam will be scheduled later in the term and more details will be released at that time.

## Assignments

Students can work in groups of one or two individuals. Only one assignment per group needs to be submitted – list all groups members on your assignments. Assignments will require students to apply programming skills learned in class to a mix of theoretical and applied questions. All assignments will be submitted via the course website. Students will submit both a written portion of the assignment (containing any mathematical derivations or explanations required to answer the assignment questions), as well as meticulously labelled R code used to answer any of the programming-based questions. Assignment marks may be deducted if any supporting code is not clearly labelled and/or explained. **Late assignments will be penalized 1 mark for each minute they are late, without exception. For instance, an assignment that is submitted 5 minutes late will receive a 5 mark deduction from the total assignment score.**

The use of generative artifical intelligence (AI) tools (e.g. ChatGPT) is prohibited. Any use of generative AI tools to produce assessed content is considered a violation of academic integrity standards as per the statement on Plagiarism. Re-use of the same piece of work previously submitted for credit in another course is also prohibited.

## Midterm Exam

The midterm will be administered in class on October 31, 2024, and will cover lecture material up to and including the lecture on October 17, 2024.

**There will not be a make up exam for those who miss a midterm.** Those unable to complete the midterm for a valid reason will have the weight of the midterm shifted to the final exam, resulting in a final exam worth 65%. Students absent from the midterm should email the instructor as soon as possible. However, documentation may be required. The instructor reserves the right to request a Self-Declaration form or PMC letter of accommodation depending on the length of incapacitation. The documentation provided by students for missed or incomplete midterms will be subject to verification by the instructor. Submitting a forged note is regarded as a serious academic offense. Students who miss the midterm exam and fail to provide sufficient documentation will receive a score of zero, without exception.

## Final Exam

The final exam will be administered in-person and will be scheduled by the University during the final exam period from December 9 - 21, 2024. The final exam will cover lecture material up to and including the final lecture on December 5, 2024. The exam will be scheduled later in the term, and relevant details for the final exam will be announced at that time.

Students absent from the final exam should email the instructor as soon as possible. However, documentation may be required. The instructor reserves the right to request a Self-Declaration form or PMC letter of accommodation depending on the length of incapacitation. The documentation provided by students for missed or incomplete final exams will be subject to verification by the instructor. Submitting a forged note is regarded as a serious academic offense. Students who miss the final exam and fail to provide sufficient documentation will receive a score of zero, without exception.

Students are not to make travel plans during the exam period as that is not a valid reason for missing a final exam.

## Satisfactory Performance Criteria

Students must fulfill all of the course requirements, including the final exam, in order to achieve a passing grade.

## Deferred Final Exam

Students who do not write the final examination because of illness or other circumstances beyond their control may apply to write a deferred final examination by contacting the Registrar's Office no later than three working days after the original final examination was scheduled. In the event that a student writes a deferred examination, the deferred examination will carry the same weight as the final examination in determining the course grade. Any deferred examination will not be identical to the original final examination.

### E-proctoring

E-proctoring will not be used for evaluations in this course.

# Additional Information

### Email Communication

Communication outside of class and office hours will be done through email. **For security purposes, please communicate only using your carleton.ca email address.** Please include the course name "ECON 5027" in the subject line of your email. You can expect to receive a response to your email within 48 hours. However, communication outside of class hours should occur only in exceptional cases; in particular, email is not the appropriate medium to ask questions about course material. Students who request clarification on course material through email will be directed to ask their question during class or office hours.

### Course Standing

Standing in a course is determined by the course instructor subject to the approval of the Faculty Dean. This means that grades submitted by the instructor may be subject to revision. No grades are final until they have been approved by the Dean. Application to write a deferred final examination must be made at the Registrars Office.

### Copyright of Course Materials

The lectures and course materials (including all slides, handouts, recorded lecture videos, exams, R tutorial materials, and other similar materials) are protected by copyright. The course instructor is the exclusive owner of the copyright and intellectual property of all course materials. You may take notes and make copies of course materials for your own educational use. You may not reproduce or distribute lecture notes, videos, or other course materials publicly without the express written consent of the instructor.

### Plagiarism, Resources and Mental Health, Academic Accommodations

You are responsible for reading and knowing the information about plagiarism, Carleton University resources, and academic accommodations found here.