

UNIVERSITY OF WATERLOO

Department of Economics
ECON 322: Econometric Analysis 1

Course Outline (Winter 2021)

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Course description

This course covers the core topics needed to estimate linear models using ordinary least squares and to interpret estimates for cross-sectional data. Students will learn to interpret the coefficients of linear models for continuous and discrete regressors, to conduct reliable inference for different specifications of the error term, and to determine which model is the most suitable among the class of linear models.

Students will be introduced to a statistical software package and will be required to complete regular computer-based assignments throughout the course that either: (i) simulate the statistical distribution of the least squares estimator under an assumed model; or (ii) estimate the parameters of an assumed model using a sample of data from the real world.

The required statistical software used in this course is R. It runs on Windows, Mac or Linux and can be downloaded for free at <https://www.r-project.org/>. You will be trained to use it through video lectures and tutorial sessions. To prepare for the course, you must go to the above link and install R as soon as possible during the first week of class. It is also required to install R-Studio, which is also available for free at <https://www.rstudio.com/>. It is an IDE (Integrated Development Environment) for R. It greatly facilitates the use of R for beginner, and it will be used to teach you how to use R.

Textbook

The students are expected to read the chapters mentioned in the Topics section below. Ideally, the readings should be done at the beginning or before the week associated with each chapter (See Course Schedule below).

- Wooldridge, Jeffrey M., *Introductory Econometrics: A Modern Approach* Sixth Edition, Cengage Learning 2016 (**previous editions can also be used**)

- Heiss, Florian, *Using R for Introductory Econometrics*, CreateSpace 2016 (**It is available online for free at <http://www.urfie.net/read.html>, or it can be purchased at Amazon.ca**)

Course Schedule

The following schedule may be changed during the term. Any change will be posted in the Announcement section of Learn. Unless indicated otherwise, video lectures will be posted at the beginning of each week and video tutorials (pre-recorded or live) on how to use R at the end of each week. The instructor will also offer regular Q&A meetings to answer questions.

It is your responsibility to keep track of any change. To avoid missing changes, set the Notifications of the Announcement in Learn so that you receive an email and/or an SMS every time a new announcement is posted or an old one is updated.

Week	Topic	Readings	Activities and Assignments	Due Date	Weight (%)
Week 1	Review of Statistics	Appendix B and C			
Week 2	Review of Statistics (Continued)	Appendix B and C	Quiz 1 (intro to R)	Tuesday, January 19 at 11:55 PM	5%
Week 3	The simple regression model	Chapters 1 and 2	Quiz 2 (review of stats)	Tuesday, January 26 at 11:55 PM	10%
Week 4	Multiple regression models	Chapter 3			
Week 5	Multiple regression models(Continued)	Chapter 3	Assignment 1	Sunday, February 7 at 11:55 PM	10%
Week 6	Inference	Chapter 4	Assignment 2	Sunday, February 21 at 11:55 PM	10%
Week 7	Inference (Continued) and large sample properties	Chapters 4 and 5			
Week 8	Functional forms and forecasting	Chapter 6	Assignment 3	Sunday, March 7 at 11:55 PM	10%
Week 9	Regression with dummy variables	Chapter 7			
Week 10	Regression with dummy variables (Continued) and Heteroscedasticity	Chapters 7 and 8	Assignment 4	Sunday, March 21 at 11:55 PM	10%
Week 11	Generalized linear models: Heteroscedasticity (continued)	Chapter 8			
Week 12	Misspecification	Chapter 9	Assignment 5	Sunday, April 4 at 11:55 PM	10%
Final Project				Wednesday April 21 at 11:55 PM	35%

Topics

For each topic, some problems are suggested. They are supplementary problems that you may want to try if you need more practice questions.

1. Introduction: (Appendices B and C)
Overview of important concepts in statistics
 - ◇ **Problems from appendix B:** 1, 2, 4, 9, 10
 - ◇ **Problems from appendix C:** 1, 6, 7, 8, 11

2. The simple regression model (Chap. 1 and 2)
Discussion on the different types of data, estimation of models with 1 regressor, and the interpretation of a regression.
 - ◇ **Theoretical problems:** 2.1, 2.2, 2.3, 2.5, 2.6, 2.7, 2.8, 2.9
 - ◇ **Numerical problems:** C2.1, C2.2, C2.4, C2.6, C2.7, C2.10

3. Multiple regression models (Chap. 3)
Issues regarding data and model selection.
 - ◇ **Theoretical problems:** 3.1, 3.3, 3.4, 3.6, 3.7, 3.12, 3.15, 3.16
 - ◇ **Numerical problems:** C3.1, C3.2, C3.6, C3.8, C3.10

4. Inference (Chap. 4))
Tests of single and multiple linear restrictions
 - ◇ **Theoretical problems:** 4.1, 4.2, 4.4, 4.6, 4.8, 4.10, 4.11
 - ◇ **Numerical problems:** C4.1, C4.2, C4.3, C4.6, C4.8, C4.12

5. Asymptotic properties of the OLS estimators (Chap. 5)
Analysis of the properties of the estimators when the sample size increases
 - ◇ **Theoretical problems:** 5.2, 5.3, 5.5
 - ◇ **Numerical problems:** C5.1, C5.2, C5.4, C5.6

6. Functional forms and forecasting (Chap. 6)
Discussion on how to choose the functional form, and the forecasting of the dependent variable.
 - ◇ **Theoretical problems:** 6.1, 6.3, 6.4, 6.7, 6.10
 - ◇ **Numerical problems:** C6.1, C6.2, C6.3, C6.5, C6.8, C6.11, C6.14

7. Regression with dummy variables (Chap. 7)
Including unquantifiable information in a regression: the qualitative variables
- ◇ **Theoretical problems:** 7.1, 7.2, 7.5, 7.8, 7.9
 - ◇ **Numerical problems:** C7.2, C7.4, C7.8, C7.10, C7.12, C7.14, C7.16
8. Generalized linear models: Heteroscedasticity (Chap: 8)
The properties of OLS with heterogenous error terms, and the weighed least quares (WLS) method
- ◇ **Theoretical problems:** 8.1, 8.2, 8.3, 8.5, 8.6, 8.8
 - ◇ **Numerical problems:** C8.1, C8.5, C8.8, C8.12, C8.14
9. Misspecification (Chap: 9)
Measurement errors, missing data, and functional form misspecification
- ◇ **Theoretical problems:** 9.1, 9.2, 9.3
 - ◇ **Numerical problems:** C9.1, C9.3, C9.8, C9.11, C9.13, C9.14

Evaluation

This online version of ECON 322 does not contain any exam. You are only evaluated through quizzes, assignments and a final project that are mostly applications using R. It is an applied econometrics course, so the main focus is on estimating models with data.

Assignments and quizzes (See schedule for due dates): 65%
Final project (See schedule for the due date): 35%

Policy regarding the assignments

Although you are encouraged to work in groups, you have to submit your own assignments with your own answers. You will all have different datasets, so it is unlikely that two students obtain the same answers. Two or more students submitting identical answers is a violation of Policy 72 and disciplinary penalties may be imposed under Policy 71 (see below). Turnitin will be used to verify that all students submit different answers.

In all assignments, you have to answer theoretical and/or computer questions. You must submit the answers to the computer questions using a text processor or your choice (Word, Open Office, Google Docs etc.) , and convert your document to a PDF. Your answers must include the R codes, the output produced by R (copy-paste from RStudio), any graphs if you are asked to produce them, and a discussion if required. A guideline will be provided for each assignment.

Policy regarding missed assignments and quizzes

For each quiz, you have 48 hours to submit it. No late submission is accepted. It is therefore recommended to start the quiz as soon as it becomes available on Learn.

For each assignment, you have two weeks to submit it. Therefore, there are no valid reasons for not submitting an assignment (e.g. being sick or having internet problem on the submission day will not be considered to be a valid excuse). To avoid last minute problems, it is strongly recommended to start the assignment as soon as it is available. Late submissions for assignments will be deducted 20% per day. Assignment submissions more than 3 days late will not be accepted.

Cross-listed course

Please note that a cross-listed course will count in all respective averages no matter under which rubric it has been taken. For example, a PHIL/PSCI cross-list will count in a Philosophy major average, even if the course was taken under the Political Science rubric.

Academic Integrity

Academic Integrity:

In order to maintain a culture of academic integrity, members of the University of Waterloo are expected to promote honesty, trust, fairness, respect and responsibility. See the UWaterloo Academic Integrity webpage and the Arts Academic Integrity webpage for more information.

Discipline:

A student is expected to know what constitutes academic integrity, to avoid committing academic offences, and to take responsibility for his/her actions. A student who is unsure whether an action constitutes an offence, or who needs help in learning how to avoid offences (e.g., plagiarism, cheating) or about “rules” for group work/collaboration should seek guidance from the course professor, academic advisor, or the Undergraduate Associate Dean. When misconduct has been found to have occurred, disciplinary penalties will be imposed under Policy 71 – Student Discipline. For information on categories of offenses and types of penalties, students should refer to Policy 71 - Student Discipline. For typical penalties check Guidelines for the Assessment of Penalties.

Grievance:

A student who believes that a decision affecting some aspect of his/her university life has been unfair or unreasonable may have grounds for initiating a grievance. Read Policy 70 - Student Petitions and Grievances, Section 4. When in doubt, please be certain to contact the department’s administrative assistant who will provide further assistance.

Appeals

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A decision made or penalty imposed under Policy 70 - Student Petitions and Grievances (other than a petition) or Policy 71 - Student Discipline may be appealed if there is a ground. A student who believes he/she has a ground for an appeal should refer to Policy 72 - Student Appeals.

Accommodation for Students with Disabilities

Note for students with disabilities:

Note for students with disabilities: The AccessAbility Services office, located on the first floor of the Needles Hall extension (1401), collaborates with all academic departments to arrange appropriate accommodations for students with disabilities without compromising the academic integrity of the curriculum. If you require academic accommodations to lessen the impact of your disability, please register with the AS office at the beginning of each academic term.

Mental Health Support

All of us need a support system. The faculty and staff in Arts encourage students to seek out mental health supports if they are needed.

On Campus

- Counselling Services: counselling.services@uwaterloo.ca / 519-888-4567 xt 32655
- MATES: one-to-one peer support program offered by Federation of Students (FEDS) and Counselling Services
- Health Services Emergency service: located across the creek from Student Life Centre

Off campus, 24/7

- Good2Talk: Free confidential help line for post-secondary students. Phone: 1-866-925-5454
- Grand River Hospital: Emergency care for mental health crisis. Phone: 519-749-433 ext. 6880
- Here 24/7: Mental Health and Crisis Service Team. Phone: 1-844-437-3247
- OK2BME: set of support services for lesbian, gay, bisexual, transgender or questioning teens in Waterloo. Phone: 519-884-0000 extension 213

Full details can be found online at the Faculty of ARTS website
Download UWaterloo and regional mental health resources (PDF)
Download the WatSafe app to your phone to quickly access mental health support information