# UNIVERSITY OF WATERLOO

## ECONOMICS 323: ECONOMETRIC ANALYSIS 2

### WINTER 2021

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**Course description:**

This is an online course which covers the most important econometric methods beyond use of the ordinary least squares (OLS) estimator with cross-sectional data. It begins by reviewing sampling distributions of estimators and the simple and multiple linear regression models. It then extends the least squares estimator to estimation using time-series data. Panel data methods and instrumental variables are then presented as solutions to the ubiquitous endogeneity problems that complicate causal inferences when using OLS. The course concludes by considering maximum likelihood estimators where the dependent variable is qualitative, sometimes with multiple values, or count data. Students will receive regular assignments, which require that they use a statistical software package to apply the methods learned in lectures to real-world data.

**Textbook:**

> Wooldridge, Jeffrey M., *Introductory Econometrics: A Modern Approach* (7th edition), South-Western Cengage Learning, 2019. (online purchases: `https://bit.ly/3OFNkUf`)

Lectures will follow the textbook material closely. Students are strongly advised to obtain a copy of the textbook and to keep up to date with assigned readings (see below) as the course progresses.

**Lectures:**

The course will be delivered entirely online through asynchronous pre-recorded video lectures. The lectures will be posted on the LEARN course site (`https://learn.uwaterloo.ca`) and can be watched at students' convenience. Approximately 3 hours of lecture material will be provided per week in multiple video files. Files will be posted on Mondays, Wednesdays, and Fridays. It is your responsibility to ensure that you are able to view the video files and keep pace with the material as the course proceeds.

**Office Hours:**

Once the term has begun, regular synchronous office hours will be scheduled providing a minimum of 4 hours per week for students to ask questions directly to the instructor or teaching assistant. The Bongo platform will be used for office hours, which can be accessed through the "Virtual Classroom" under "Content" in LEARN.

**Assignments:**

Students will be required to complete regular assignments. Most weeks will have one assignment due, which will require students upload a PDF file to a Dropbox folder on LEARN. However,

popup assignments with shorter completion time frames will also be given, which are intended to keep students motivated and engaged in the course. All assignments will require students to use a statistical software package to apply the theory learned in lectures. While any software package is acceptable, lectures will provide examples using R. R runs on Windows, Mac or Linux and can be downloaded for free at `https://www.r-project.org/`. Students enrolled in the course should download and install R on their computers as soon as possible. It is recommended, but not required, to install RStudio, which is available for free at: `https://www.rstudio.com/` (you need to download R to your computer first before installing RStudio). RStudio is an Integrated Development Environment (IDE) for R. It greatly facilitates the use of R. While collaboration with classmates on the programming requirements of assignments is highly encouraged, students are expected to independently answer the interpretive questions in assignments. Students are asked to post and answer programming queries in the "Discussion" section on LEARN, rather than contacting the course instructor or teaching assistant directly.

**Final exam:**

A final exam will be scheduled by the Registrar's Office during the official examination period (December 9-23). You will have 24 hours to write the exam. Distribution, collection, and grading of final exams will be done through the Dropbox utility in the "Submit" section on LEARN. The final exam will be an open-book exam and will be comprised entirely of questions requiring handwritten answers. Completing the exam will not require the use of any statistical software.

**Evaluation:**

Final grades will be based on the evaluation of assignments and the final exam. The final exam will be graded out of 100 marks. All assignments will receive a grade of zero, 50, or 100. A grade of zero will be given when an assignment is not submitted; a grade of 50 will be given when an assignment is submitted on time, but the quality of what is submitted does not meet expectations; and a grade of 100 will be given when an assignment, which meets expectations, is submitted on time. The objective will be to have 10 regular assignments and 5 popup assignments during the 12-week term. Final grades will be calculated as: $(0.5 \times A) + (0.2 \times B) + (0.3 \times C)$, where $A$ is the average grade on the regular assignments; $B$ is the average grade on popup assignments; and $C$ is the grade on the final exam.

**Textbook readings:**

1. Review of Ordinary Least Squares Estimator

    (a) Simple regression model (Chapter 2)
    (b) Multiple regression analysis (Chapters 3 and 4)

2. Regression with Time Series Data

    (a) Basic time-series regression (Chapter 10)
    (b) Further issues with time-series regression (Chapter 11)
    (c) Serial correlation and heteroskedasticity (Chapter 12)

3. Solutions to Endogenous Covariates

    (a) Panel data methods (Chapter 13 and 14)
    (b) Instrumental variables estimation (Chapter 15)

4. Other Topics

    (a) Limited dependent variable models (Chapter 17)

    (b) Sample selection corrections (Chapter 17)

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**Deferred Exams:** Details on requesting a deferred exam, can be found here: `https://uwaterloo.ca/economics/undergraduate/resources-and-policies/deferred-final-exam-policy`. Note that requests for deferred exams must be received within 48 hours of the scheduled exam time.

**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 Integritity 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.

**Grievances:** 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 departments administrative assistant who will provide further assistance.

**Appeals:** 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: 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. This is especially true during the current pandemic. The faculty and staff in Arts encourage students to seek out mental health supports, if they are needed. If you're uncertain whether you need support, never hesitate to ask.

University of Waterloo contacts:

- 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 the Student Life Centre

Other contacts:

- Good2Talk: Free confidential helpline 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

**Territorial Acknowledgement:** The Department of Economics acknowledges that we are living and working on the traditional territory of the Attawandaron (also known as Neutral), Anishinaabe and Haudenosaunee peoples. The University of Waterloo is situated on the Haldimand Tract, the land promised to the Six Nations that includes six miles on each side of the Grand River.