Faculty Liberal Arts and Professional Studies
Department of Economics

Course: GS/ECON 5220 M 3.0 – Econometric Theory
Course Webpage: https://eclass.yorku.ca
Term: Winter 2023-2024
Prerequisite / Co-requisite: ECON 5025 3.00, or equivalent.
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Course Instructor: Tuvaandorj, Pujee
Email: tpujee@yorku.ca
Time: Monday 14:30-17:30

Location: MC (McLaughlin College) 211

Office Hours: via Zoom on Wednesday 17:00-18:00

Course Description

This course covers the fundamentals of modern cross-sectional and time series econometrics. The objective is to introduce the econometric tools that will provide a foundation for empirical analysis in economics (as well as other fields that require econometric/ quantitative/statistical methods).
The first part of the course will introduce the elements of asymptotic theory and provide a detailed account of linear models with heteroskedastic, clustered and autocorrelated errors.
The second part of the course will cover cross-sectional econometric methods that include instrumental variables regression, discrete choice, sample selection and causal inference/treatment effects models.
The third (last) part of the course will be devoted to time series analysis where both univariate and multivariate time series modelling techniques will be introduced.

The course materials including announcements, lecture slides, notes, and problems will be posted on https://eclass.yorku.ca

Learning goals: At the end of this course, students will be able to

1. understand the essential concepts in causal inference and time series analysis,
2. analyze cross-sectional and time series data using econometric models,
3. estimate basic cross-sectional and time series models for empirical research,
4. interpret a computer output of model estimation and testing,
5. develop basic programming skills.

Required Textbook

- B. Hansen (2022a), *Econometrics*, Princeton University Press
  Available at
  https://www.amazon.com/Econometrics-Bruce-Hansen/dp/0691235899/
  https://www.ssc.wisc.edu/~bhansen/econometrics/

- B. Hansen (2022b), *Probability and Statistics for Economists*, Princeton University Press
  Available at
  https://www.amazon.com/Probability-Statistics-Economists-Bruce-Hansen/dp/0691235945/
  https://www.ssc.wisc.edu/~bhansen/probability/

Supplementary Textbooks (optional)

The following list of books may be useful as references for further study.

- J. Angrist and J-S. Pischke (2015), *Mastering Metrics*, Princeton University Press,
- R. Davidson and J. G. MacKinnon (2003), *Econometric Theory and Methods*, Oxford University Press,
- C. Cameron and P. K. Trivedi (2005), *Microeconometrics*, Cambridge University Press,
- J. D. Hamilton (1994), *Time Series Analysis*, Princeton University Press.
- F. Hayashi (2000), *Econometrics*, Princeton University Press.
- J. Wooldridge (2017), *Econometric Analysis of Cross Section and Panel Data,* MIT press,

Outline

1. Mathematical/Statistical Preliminaries: Asymptotic theory, Matrix Algebra, Maximum Likelihood

   Hansen (2022b), Ch. 7-8, 10-11, 13
   Davidson & MacKinnon (2004)-Ch. 1, 10

2. Linear Regression with Heteroskedastic and Clustered error (HR, CR and Newey-West standard errors, R example)

   Hansen (2022a), Ch.2- Ch.9
   Davidson & MacKinnon (2004), Ch. 2-5, 7

3. Instrumental Variables (IV) Regression (Theory, Empirical example, R illustration)

   Hansen (2022a), Ch.12
   Davidson & MacKinnon (2004)-Ch. 8, 12

4. Discrete Choice (Binary e.g., logit and probit, and Multiple Choice, Empirical example, R illustration)

   Hansen (2022a), Ch.25, 26
   Davidson & MacKinnon (2004)-Ch. 11
   Wooldridge (2010)-Ch. 15, 16, 17, 19

5. Sample Selection (Theory, Heckman's model, Empirical example, R illustration)

   Hansen (2022a), Ch.27
   Davidson & MacKinnon (2004)-Ch. 11

6. Causal Inference/Treatment Effects (Randomized controlled trials, Average treatment effects, Regression discontinuity designs, Empirical example, R illustration)

   Hansen (2022a), Ch.12
   Wooldridge (2010), Ch. 21
   Angrist-Pischke (2015)

7. Univariate Time Series (ARMA model, Box-Jenkins methodology, Empirical example, R illustration)

   Hansen (2022a), Ch.14
   Hamilton (1994), Ch.3

8. Vector Time Series (Vector autoregression and moving average models, Granger causality, Impulse responses, Empirical example, R illustration)

Hansen (2022a), Ch.15
Hamilton (1994), Ch.10, 11

9. Nonstationary Time Series, Unit Roots (Theory, Empirical example, R illustration)

Hansen (2022a), Ch.16
Hamilton (1994), Ch.15-17

10. Cointegration, Error Correction Model (Theory, Empirical example, R illustration)

Hansen (2022a), Ch.16
Hamilton (1994), Ch.18-20

Note: The lecture outline is tentative and will be updated as the course progresses.

Evaluation

The overall grade for the course will be based on the **maximum** of

a) Final exam;
b) 0.7*Final exam+0.3*Midterm exam;
c) 0.5* Final exam+0.3*Midterm exam+0.2*Assignments;
d) 0.8*Final exam+0.2*Assignments;
where the highest possible marks for each (Final, Midterm, Assignments) is 100.

This means that no student will get a lower grade than the one from **the final.**

Category	Weight	Date	Due
Assignments	20%		
Midterm Exam	30%		
Final Exam	50%		

There will be 2 assignments that include both problem solving and computer tasks. For the computer exercises, I recommend R or RStudio which can be downloaded free of charge from R-Project website: http://www.r-project.org https://rstudio.com/

Assignments received later than the due date will not be accepted. The final exam will be comprehensive.

Grading System: The grading scheme for the course conforms to the 9-point grading system used in undergraduate programs at York (e.g., A+ = 9, A = 8, B+ = 7, C+ = 5). Assignments and exams will bear either a letter grade designation or a corresponding number grade (e.g. A+ = 90 to 100, A = 80 to 90, B+ = 75 to 79, etc.) For a full description of York grading system see: https://calendars.students.yorku.ca/2020-2021/grading-scheme-and-feedback

Organization of the Course

The course materials will be posted on the course's Moodle/eClass website. The slides for the covered topics will be posted before each class. More details and explanations on the lecture topics will be provided during the meeting.

A part of the class time will be devoted to computer illustrations of the theoretical concepts, Q&A related to the

presentation, and interactive activities.

Weekly virtual office hours will be held via Zoom through which students will interact with the course director/TA, as well as with one another. The Zoom link will be posted on the course's eClass website.

Please note the following:
- Zoom is hosted on servers in the U.S. This includes recordings done through Zoom.
- If you have privacy concerns about your data, provide only your first name or a nickname when you join a session.
- The system is configured in a way that all participants are automatically notified when a session is being recorded. In other words, a session cannot be recorded without you knowing about it.

To attend virtual office hours and participate in our virtual classroom, it is required that you have a computer with webcam and microphone or a smart device with these features.
Here are some useful links for student computing information, resources and help:
[Student Guide to eClass/Moodle](#)
[Zoom@YorkU Best Practices](#)
[Zoom@YorkU User Reference Guide](#)
[Computing for Students Website](#)
[Student Guide to eLearning at York University](#)

Assignment Submission, Lateness Penalties and Missed Tests

Assignment Submission: Proper academic performance depends on students doing their work, not only well, but on time. Accordingly, assignments for this course must be received on the due date specified for the assignments.

Lateness Penalty: Assignments received later than the due date will not be accepted and will be given a grade zero. Exceptions to the lateness penalty for valid reasons such as illness, compassionate grounds, etc., may be entertained by the Course Instructor but will require supporting documentation (e.g., a doctor's letter). If a student misses the assignments, and have a documented excuse, the final exam will carry the extra weight.

Missed Exams: If a student misses the midterm, and have a documented excuse, the final exam will also carry the extra weight. There will be no make-ups for the midterm exam. A deferral for the final exam will be granted only for with a documented reason, such as illness, compassionate grounds, etc., which is confirmed by supporting documentation (e.g., doctor's letter).

Other Important Course Information for Students

All students are expected to familiarize themselves with the information on Academic Standards, Curriculum & Pedagogy.

Academic honesty and integrity: In this course, we strive to maintain academic integrity to the highest extent possible. Please familiarize yourself with the meaning of academic integrity by completing SPARK's Academic Integrity module at the beginning of the course. Breaches of academic integrity range from cheating to plagiarism (i.e., the improper crediting of another's work, the representation of another's ideas as your own, etc.). All instances of academic dishonesty in this course will be reported to the appropriate university authorities, and can be punishable according to the Senate Policy on Academic Honesty. See for details:
https://www.yorku.ca/gradstudies/students/current-students/regulations/academic-honesty/

Turnitin: To promote academic integrity in this course, students will be normally required to submit their written assignments to Turnitin (via the course e-Class) for a review of textual similarity and the detection of possible plagiarism. In so doing, students will allow their material to be included as source documents in the Turnitin.com reference database, where they will be used only for the purpose of detecting plagiarism. The terms that apply to the University's use of the Turnitin service are described on the Turnitin.com website.

Additional important information can be found on the Senate Committee webpage:
http://secretariat-policies.info.yorku.ca/
- Ethics Review Process for research involving human participants
- Course requirement accommodation for students with disabilities, including physical, medical, systemic, learning and psychiatric disabilities
- Student Conduct Standards
- Religious Observance Accommodation

Course Add/Drop Deadlines

Information on important dates are available at :
https://www.yorku.ca/gradstudies/students/current-students/registration-enrolment/important-dates/

	Winter Term 2023-2024 (W)
Last date to add a course **without permission** of instructor (also see Financial Deadlines)	January 22
Last date to add a course with permission of instructor (also see Financial Deadlines)	January 31
Last date to drop a course without receiving a grade (also see Financial Deadlines)	February 8
Course Withdrawal Period (withdraw from a course and receive a grade of "W" on transcript)	March 11