1 Course Objectives

The goal of this course is to familiarize PhD students with a wide range of topics in modern econometrics, focusing on what matters for applying and understanding empirical work.

Prerequisites include a masters-level course in econometrics [for example, the ECON 5027 course at Carleton] that covers Regression Analysis, Ordinary and Generalized Least Squares (OLS and GLS), Instrumental Variables (IV) and Maximum Likelihood estimation. Matrix Algebra and fundamental statistical principles [for example Appendix A and B of the course textbook Green (2012)] are assumed known. The course will nevertheless cover chapters 2-5 on linear regression and inference, Chapter 8 on IV and 9 on GLS, and several matrix algebra principles and important statistical concepts from Appendix C and D, in Green (2012).

First and second year PhD students may have heterogenous training with regards to masters-level material: the course thus aims to standardize background knowledge and skills before introducing non-linear methods. Within the non-linear class, the Generalized Method of Moments and likelihood-based models for discrete choice and time varying volatility will receive specific attention. The Kalman Filter will be introduced, aiming an application with time-varying parameters or Dynamic Stochastic General Equilibrium models.\(^1\)

The course exposition is formal and technical, and departs from a recipe-book/tool-kit approach. While the focus is on applicability, theory and principles will be emphasized. These include standard asymptotic theory. The course sets the minimum requirement in this field at the PhD level, which may be summarized as understanding rather than just using econometrics.

This course is required for all PhD students, whether they will choose econometrics as a field or not. Instruction will reflect this fact, while students interested in econometrics as a PhD field can sharpen their knowledge particularly on the theory side. Rigor and notational clarity is expected in exams and assignments, which will be reflected in grading. Writing skills will also be assessed through the written assignments (see below).\(^2\)

\(^1\)Depending on time and students’ backgrounds.

\(^2\)Writing matters in econometrics; many good papers remain unpublished because of poor writing and presentation.
Some knowledge of econometric software is required. Training sessions are offered on STATA and MatLab. In addition to main econometric methods, software training will also cover optimizing non-standard statistical objective functions, some programming principles and an introduction to simulation-based studies and methods. Equal focus on cross-section and time series principles and applications is maintained.

The course includes assignments using well known data sets and econometric problems of recent interest in economics.

2 Lectures

Seminar core course: Thursday 8h35-11h25. Attendance is required and cannot be substituted by e.g. out-of-class meetings with the professor (nor with any TA). Office hours of Lynda Khalaf: to be decided at the beginning of the session depending on students’ availability (and by appointment on exceptional basis).

Note: two software training sessions, on Matlab and Stata, will be offered in addition to the regular class lectures; date and time to be determined.

3 Grading Scheme and regulations

- Grades

1. Exam I (35%), 3 hours. October 12. A pre-exam preparatory session will be offered. Students who can document a compelling reason for missing Exam I will be excused and their final grade will be based on their performance in the rest of the course: the weight (%) of Exam I will be automatically added to Exam II. There will be no deferred midterm exam offered, and the weight of Exam I cannot, under any condition, be added to the final take home exam. Without a documented, compelling reason, failure to take exam I will result in a grade of zero (out of 35%).

2. Exam II (35%), 3 hours. November 23. A pre-exam preparatory session will be offered. Failure to write Exam II will result in a grade of zero (out of 35%). In order to write a deferred exam II, students who can document a compelling reason for missing Exam II must contact the Economics department. The weight of exam II cannot, under any condition, be added to exam I nor to the final take home exam.

3. Final Exam, Take home (30%), due December 18, 4 pm. Failure to hand in the
- Regulations time will result in a grade of zero (out of 30%).

3Please be advised that classes on Friday, December 8th will follow a Monday schedule. These are Carleton University regulations. The fall break at Carleton University is October 23-27; no class.
1. **Plagiarism.** Please be aware that plagiarism is a serious offence at Carleton and should be recognized and avoided. For further information on how to do so, please see “Pamment on Plagiarism and Paraphrasing” at www.carleton.ca/economics/courses/writing-preliminaries.

2. **Academic Accommodations.** Please check the official graduate calendar website for dates and deadlines: http://www1.carleton.ca/registrar/registration/dates-and-deadlines/, and www.carleton.ca/equity for further information on accommodations and equity services.

   (a) For Religious Obligations: To be worked out on individual basis with instructor. Consult Equity Services Website or an Equity Advisor for Policy and list of Holy Days.

   (b) For Pregnancy: Contact Equity Services to obtain letters of accommodations.

   (c) For Students with Disabilities: Students with disabilities needing academic accommodations are required to contact a coordinator at the Paul Menton Centre (PMC) to complete the necessary letters of accommodation. The student must then make an appointment to discuss their needs with the instructor at least two weeks prior to the first class test or ITV test. This is to ensure sufficient time is available to make the necessary accommodation arrangements.

4 **Textbook**

4.1 **Basic Textbooks**


4.2 **Reference Manuals**

Class notes will be available to guide readings.4 Selected exercises will be provided as a preparation for the exam. Extra readings will also be recommended for specific Chapters.

1. **Graduate level textbooks**


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4Student or professor materials created for this course (including presentations and posted notes, assignments and exams) remain the intellectual property of the author(s). They are intended for personal use and may not be reproduced or redistributed without prior written consent of the author(s).
5 Proposed Course Outline

This outline is tentative. Adjustments may be needed, particularly for the post Exam I sessions.

1. September 7: Background unifying training: basic principles, the linear model, asymptotic theory, time series regressions. Ref: Chapters 2-3-4-5; some sections of 9.

2. September 14: Background unifying training, continued.

3. September 21: Likelihood: general principles, time series and discrete choice. Time series covers, among others, ARMA and (G)ARCH models. Ref: Chapters 12.2, 14, some sections of 18, 20 and 21 [over three lectures]

4. September 28: Likelihood, continued

5. October 5: Review Session

6. October 12: Exam I.

7. October 19: Likelihood, continued

8. October 26: Carleton University Fall Break. No class.

9. November 2: IV regression and GMM. Ref: Chapter 8, some sections of Chapters 12 and 13.

10. November 9: IV regression and GMM, continued.

11. November 16: Review Session

12. November 23: Exam II

13. November 30: The Kalman Filter