1 Course information.

Instructor. Chris Auld
auld@uvic.ca
250.721.8537
BEC 348

Online resources. See Coursespaces.

Course hours. 3 lecture hours per week, plus labs, which will be held on a discretionary basis.

Course location: BEC 363, Mondays and Thursdays, 11:30–12:50

Office hours: Monday 1:00–2:30, or drop-in or by appointment

Prerequisites. Two semesters of mathematical statistics or econometrics at the undergraduate level, a course in linear algebra, and a course in multivariate calculus. Or instructor’s consent. Economics 545 or equivalent is recommended but not required.

2 Prerequisites.

The course is geared towards students who have taken or are simultaneously taking Economics 545, or equivalent. Economics 545 is not, however, a formal pre or corequisite. You should be comfortable with theory using matrix algebra, have a good grasp of basic probability theory, and have a thorough understanding of the linear multivariate regression model. Familiarity with Stata is also advantageous, although also not necessary.
3 Course description.

The goal of the course is to equip students with the statistical tools and insight required to produce and critically evaluate research in applied econometrics, with emphasis on causal modelling in microeconometrics. Some of the topics we will consider include:

- What does “causal” mean in science?
- When can OLS regression by interpreted as yielding causal estimates?
- A modern guide to finessing non–spherical errors: HCCMEs, HACs and clustering.
- Specifying regression models.
- The logic and pitfalls of frequentist inference.
- The practice of applied econometrics:
  - Issues relating to size and power.
  - p–values and how not to misinterpret them.
  - p–hacking, publication bias, and the “replication crisis” in science.
  - Statistical vs economic significance.
- Classical instrumental variables.
- Instrumental variables and heterogeneous treatment effects.
- Where do we get instruments?
- Panels: difference–in–difference and related methods.
- Regression discontinuity designs.
- Topics as time permits: conditional and unconditional quantile regression, nonlin-ear models for limited dependent variables, computational issues,

All topics will be addressed using a combination of blackboard theory, applied examples from the literature, and hands-on computing exercises using Stata.
4 Objectives.

After finishing this course you should be able to:

1. Evaluate the credibility of statistical evidence presented in the academic literature and elsewhere, particularly research attempting to draw causal inferences from observational data.

2. Develop appropriate microeconometric models to address research questions.

3. Locate, download, and process datasets from online repositories.

4. Manipulate data, calculate descriptive statistics, conduct simulations, write simple programs, test hypotheses, create graphs, and generate publication-ready tables of results.

5. Present results in a clear manner.

5 Evaluation.

Course evaluation is as follows.

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>final examination</td>
<td>50%</td>
</tr>
<tr>
<td>assignments</td>
<td>50%</td>
</tr>
</tbody>
</table>

The course grade is then calculated using the weights indicated above.

If, for some reason, the distribution of grades determined using the aforementioned conversion chart appears to be abnormal the instructor reserves the right to change the grade conversion chart if the instructor, at the instructor’s discretion, feels it is necessary to more fairly represent student achievement.

The examination will either be a three–hour written exam or a take–home examination, at the instructor’s discretion as informed by feedback from the class.

You must pass the final examination to receive a passing grade in the course.
6 Assignments.

There will be approximately four (lengthy) assignments focusing on developing your computing skills, working with econometric theory, writing up results, and evaluating published research. You are encouraged to collaborate with your colleagues while working on the computational aspects of these assignments, however, you must write up your results on your own.

7 Recommended materials.

Previous versions of this course required the Cameron and Trivedi textbook. This year, there is no required textbook, but the following materials are recommended.

7.1 Highly recommended.

A. C. Cameron and P. Trivedi (2010), *Microeconometrics Using Stata*.


7.2 Useful supplemental and reference texts.

- **Stock and Watson**, *Introduction to Econometrics*.

  Stock and Watson is an advanced undergraduate level text. It contains lucid descriptions of many econometric ideas, and may serve as a useful reminder for more basic material.

- **Wooldridge**, *Econometric Analysis of Cross Section and Panel Data*.

  “Papa” Wooldridge is a graduate level text which is quite comprehensive, and is an excellent reference for the methods we will cover and many extensions.

- **Cameron and Trivedi**, *Microeconometrics: Methods and Applications*.

  A more comprehensive and formal treatment than that in the same authors’ *Microeconometrics Using Stata*.

7.3 Software.

You may use any software you wish so long as that software is Stata.
We will make extensive use of the statistical software Stata. The current version of Stata is 15, but any version at least as recent as 11.0 will suffice for the purposes of the course. Some of the datasets we will use are quite large, so you should not use “small” Stata or another student version. “Small” Stata will typically also prove too limited for use in research for your Master’s essay or similar projects.

Stata is installed on student computing facilities on campus. You may also wish to purchase Stata (either a permanent copy or a temporary lease), particularly if you are a Ph.D. student or intend to become one.

7.4 Computing.

A laptop computer with Stata installed is highly recommended so that we may interactively solve econometric problems in class.

8 Notes.

Late Assignments.

If you must hand an assignment in late, please contact me before the due date to discuss the issue. If you do not hand in an assignment on time and do not discuss the issue with me beforehand, I may either refuse to accept the assignment or dock points, at my sole discretion.

Contacting the Instructor.

Questions regarding class material should usually be posed during class or in person during office hours. It is not feasible to provide lengthy explanations of class material over email. Should you send email for whatever reason, please put “ECON 548” in the subject line.

Travel Plans

Students are advised not to make work or travel plans until after the examination timetable has been finalized. Students who wish to finalize their travel plans at an earlier date should book flights that depart after the end of the examination period. There will be no special accommodation if travel plans conflict with the examination.
POLICIES.

Department policies on integrity, exclusivity, and other issues are in effect and detailed here: http://web.uvic.ca/econ/undergraduate/course_policies.php

The University of Victoria is committed to promoting, providing and protecting a positive, supportive and safe learning and working environment for all its members.
9 Tentative Outline.

1. Introduction.
   (a) Correlation and causation.
   (b) Potential outcomes and counterfactuals.
   (c) Endogeneity: omitted variables, simultaneity, measurement error.

2. Linear regression.
   (a) Regression on a constant.
   (b) Agnostic and structural interpretations.
   (c) Regression on a constant and dummy variable.
   (d) The theorem of Frisch, Waugh, and Lovell.
   (e) Pragmatic issues and OLS: dummies, interactions, goodness of fit.
   (f) Issues in estimating standard errors.
   (g) “Bad” controls, mediation.

3. Binary dependent variables.
   (a) Maximum likelihood estimation.
   (b) The linear probability model and alternatives to it.
   (c) “Heteroskedasticity” in binary response models.
   (d) Marginal effects.

4. Interpreting and evaluating results.
   (a) The logic and pitfalls of frequentist hypothesis testing.
   (b) Economic significance versus statistical significance.
   (c) p–values and how to avoid misinterpreting them.
   (d) p–hacking and publication bias.
   (e) Multiple comparisons.

5. Instrumental variables.
   (a) The Wald estimator.
   (b) The linear IV estimator and its statistical properties.
   (c) The generalized method of moments.
   (d) Weak instruments and invalid exclusion restrictions.
   (e) Notions of average causal effects.
(f) The search for identification: where do we get instruments?

6. Models for panel data.
   (a) Difference in difference methods.
   (b) Fixed effects.
   (c) Standard errors with panel data.
   (d) Balance tests.
   (e) Placebo tests.

7. Topics (as time permits).
   (a) Regression discontinuity.
   (b) Matching.
   (c) Quantile regression.