# Department of Economics
## Faculty of Arts

UNIVERSITY OF CALGARY

# Economics 495 (L01) (Econometrics II)


Instructor: Daniel V. Gordon
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Office: SS326
Office Hours: MW 13:00 – 13:50


Lecture Location: PF114
Lecture Days/Time: MWF 12:00 – 12:50

(Fall 2019)

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**Course Description:**
Econometrics combines economic Theory, Statistics and Mathematics. This course will focus on the theory and application of the multi-variate linear regression model in time-series, panel data and limited dependent variable models. The least squares estimator will be the principal tool for estimation but the maximum likelihood estimator also will be introduced. The course will emphasize the fundamentals of regression models and deal with model specification, identification, estimation and hypothesis testing. Econ 495 starts at a level that assumes familiarity with the material covered in Econ 395, including proficiency at mathematical statistics and some calculus. The use of a standard econometric software package is emphasized.

**Course Outcomes:**
Students who successfully complete this course will:
i) Know and understand how to model, estimate and interpret the multi-variable regression model. Have knowledge of identification issues in econometrics and the consequences of endogenous regressors.

ii) Know and understand the asymptotic properties of a certain class of estimators and test statistics. Be able to technically show the theoretical properties of the least squares estimator when sample size increases and the properties of a consistent estimate. Have knowledge of the limiting distributions on a certain class of estimators and test statistics.

iii) Know and understand statistical problems arising in time series econometrics. Have knowledge of the fundamental probability characteristics of time series variables. Have knowledge of the consequences of serial correlation in the error structure and procedures for testing and correction.

iv) Know and understand the problems of nonstationary variables in time series econometrics. Know how to test and correct for unit roots in the distribution of time series variables. Have a working knowledge of error-correction models. Know how to build, estimate and interpret error-correction models.

v) Know and understand basic modelling issues using panel data structures. Have knowledge of modelling and identification issues in panel data modelling. Have knowledge of the importance of the difference in differences estimator, its modelling and testing.

vi) Know and understand the fixed and random effect estimators. Know the importance of the Hausman test for testing correlation between unobserved heterogeneity and the error term.

vii) Know and understand identification problems in econometrics. Knowledge of the use and interpretation of instrumental variables.

viii) Know and understand the maximum likelihood estimator for estimating linear and non-linear regression equations. Have a knowledge of likelihood ratio tests, Wald statistics and Lagrange multiplier tests, their application and interpretation.

ix) Know and understand modelling and estimating issues as related to limited dependent variable models. Have knowledge of estimating and interpreting logit, probit and a class of ordered and count limited dependent variable models.

x) Know and understand the estimation problems arising from censored and truncated distributions. Have a knowledge of the sample selectin problem in econometrics, testing and correction.

**Course Outline:**

Introduction, review of least squares regression (Chapters 3 &4)

Opportunity to review the basic linear regression model.

(4 hrs)

Least squares Asymptotics (Chapter 5)

What happens to the theoretical properties of least squares estimates when the sample size increases?

(3 hrs)

Time series econometrics (Chapters 10 &11)

Fundamental characteristics and problems in time series econometrics.

(4 hrs)

Further issues in time series econometrics (Chapter 12 & 18)

Serial correlation. Heteroskedasticity, Unit Roots, and Error Correction modelling.

(6 hrs)

Introduction to panel data (Chapter 13)

Combining independent cross sections, following cross section observations over time, first differencing and policy analysis.

(4 hrs)

Panel data further issues (Chapter 14)

Fixed effects, random effects, and dummy variable estimation.

(3 hrs)

Instrumental variables (Chapter 15)

The importance of instrumental variables in correcting endogenous RHS variables.

(4 hrs)

Limited dependent variable models (Chapter 17)

Maximum likelihood estimation, logit and probit models, censored distribution and truncated regression analysis.

(6 hrs)

Empirical Project (Chapter 19)

Practical issues in defining an econometric problem and carrying out an empirical project.

(3 hrs)

Course Review and final examination preparation

(2 hrs)

**Prerequisites/corequisites:**
Economics 301, 303 and 395; Mathematics 249 or 251 or 265 or 281.

**Required Textbook(s):**

Jeffrey M. Wooldridge Introductory Econometrics, A modern approach. 7th Edition South-Western2013
ISBN-13:978-1-111-53104-1

**Books on Reserve:**

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|---|---|
| Angrist, J.D. & Pischke, J., | Mostly Harmless Econometrics: An Empiricist's Companion |
| Wooldridge, J.M. | Introductory Econometrics: A Modern Approach |
| Verbeek, M. | A Guide to Modern Econometrics |
| Kleiber, C. & Zeileis, A. | Applied Econometrics with R |
| Studenmund, A.H. | Using econometrics: a practical guide |
| Kennedy, P. | A guide to econometrics |
| Gujarati D. & Porter D. | Basic Econometrics |
| Buse, A. | U-statistics, Mm-estimators and resampling |
| Pearl, J. | Causality: models reasoning and inference |
| Angrist, J.D. & Pischke, J. | Mastering metrics |

**Desire2Learn:**
This course will make use of the Desire2Learn (D2L) platform. Students who are registered in the course can log on at http://d2l.ucalgary.ca through their student centre. Please note that D2L features a class e-mail list that may be used to distribute course-related information. These e-mails go to your University of Calgary e-mail addresses only.

**Tutorials:**
Although no regular scheduled computer lab tutorials are set, occasionally such tutorials will be organized to assist student empirical work.

**Grade Determination and Final Examination Details:**

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|---|---|
| ASSIGNMENTS (5@5%) | 25% |
| MIDTERM EXAM (NOVEMBER 6, 2019) | 30% |
| FINAL EXAMINATION | 45% |

The official grading system will be used. See http://www.ucalgary.ca/pubs/calendar/current/f-1-1.html.

A passing grade on any particular component of the course is not required for a student to pass the course as a whole.

If a student's letter grade on the final exam exceeds their midterm letter grade, the weight of the midterm is (are) transferred to the final exam. The student must have written the midterm or provided supporting documentation for the absence such as a medical note or statutory declaration.

As per the Writing Across the Curriculum Statement in the Calendar, writing and grading thereof will be a factor in the evaluation of student work. See https://www.ucalgary.ca/pubs/calendar/current/e-2.html.

Any student work that remains undistributed after the last day of classes will be available to students through the instructor's office during the instructor's office hours.

The final examination will be comprehensive, scheduled by the Registrar, held in a classroom, and last 2 hours. If a student cannot write their final exam on the date assigned by the Registrar's Office, they need to apply for a deferred exam www.ucalgary.ca/registrar/exams/deferred_final. Under no circumstance will this be accommodated by the Department.

Tests and exams WILL NOT involve multiple choice questions

Programmable calculators, cellphones, textbooks, course notes, and other electronic devices will not be allowed during the writing of tests or final examinations. Students are reminded that simply being able to access their cellphone during an exam is academic misconduct.

THERE WILL BE NO MAKEUP OR DEFERRED QUIZZES/TESTS/EXAMS under any circumstances, nor may the quizzes/tests/exams be written early. Students unable to write the quizzes/tests/exams because of documented illness, family emergency, religious observance, or university-sanctioned event will have the weight shifted to the final examination; otherwise a grade of zero will be assigned.

**Reappraisal of Grades and Intellectual Honesty:**
*For reappraisal of graded term work, see Calendar I.2*
http://www.ucalgary.ca/pubs/calendar/current/i-2.html

*For reappraisal of final grade, see Calendar I.3*
http://www.ucalgary.ca/pubs/calendar/current/i-3.html

*Statement of Intellectual Dishonesty, see Calendar K.4*
http://www.ucalgary.ca/pubs/calendar/current/k-4.html

*Plagiarism and Other Academic Misconduct, see Calendar K.5*
http://www.ucalgary.ca/pubs/calendar/current/k-5.html

**Academic Accommodations:**
Students seeking an accommodation based on disability or medical concerns should contact Student Accessibility Services; SAS will process the request and issue letters of accommodation to instructors. Students who require an accommodation in relation to their coursework based on a protected ground other than disability should communicate this need in writing to their Instructor. The full policy on Student Accommodations is available at http://www.ucalgary.ca/policies/files/policies/student-accommodation-policy.pdf.

**Freedom of Information and Protection of Privacy (FOIP) Act:**
Personal information is collected in accordance with FOIP. Assignments can only be returned to the student and will be accessible only to authorized faculty and staff. For more information, see http://www.ucalgary.ca/legalservices/files/legalservices/faq-students.pdf and http://www.ucalgary.ca/legalservices/files/legalservices/faq-faculty_0.pdf.

**Internet and Electronic Communication Device information:**
The use of cell phones for any purpose in class is prohibited. Computers and tablets may be used for note taking only unless otherwise authorized by the instructor.

**Copyright Legislation:**
See the University of Calgary policy on Acceptable Use of Material Protected by Copyright at www.ucalgary.ca/policies/files/policies/acceptable-use-of-material-protected-by-copyright.pdf. Students who use material protected by copyright in violation of this policy may be disciplined under the Non-Academic Misconduct Policy.

**Important Dates:**
Please check: http://www.ucalgary.ca/pubs/calendar/current/academic-schedule.html

**Student Organizations:**
Faculty of Arts Students' Association (F.A.S.A.):

Economics Department Representative
Office: SS 803, E-mail: econrep@fasaucalgary.ca and Web: www.fasaucalgary.ca.

Society of Undergraduates in Economics:

https://www.ucalgarysue.com/.

Society of Undergraduates in Economics is a student run organization whose main purpose is to assist undergraduate economics students to succeed both academically and socially at the University of Calgary. Services include access to the exam bank, career events such as Industry Night and information sessions, mentorship programs, and social events for members. They invite you to join by contacting SUE at societyofundergradsineconomics@gmail.com.

**Faculty of Arts Program Advising and Student Information Resources:**

- Have a question, but not sure where to start? The Arts Students' Centre is your information resource for everything in Arts! Drop in at SS102, call them at 403-220-3580, or email them at artsads@ucalgary.ca. You can also visit the Faculty of Arts website at http://arts.ucalgary.ca/undergraduate, which has detailed information on common academic concerns, including program planning and advice.
- For registration (add/drop/swap), paying fees and assistance with your Student Centre, contact Enrolment Services at 403-210-ROCK [7625] or visit them in the MacKimmie Library Block.

**Student Support and Resources:**

- See https://www.ucalgary.ca/registrar/registration/course-outlines for information on campus mental health resources, the Student Ombuds' Office, Student Success Centre, Safewalk, and Emergency Evacuation and Assembly.
- Online writing resources are available at https://ucalgary.ca/student-services/student-success/writing-support.

**Notes**:

Students are responsible for all assigned material, e.g., supplementary material posted on D2L, regardless of whether or not the material was covered in class.

DVG
2019-08-01