Department of Economics
Faculty of Arts

UNIVERSITY OF CALGARY

Economics 495 (L01) (Intermediate Econometrics)

Instructor: Leonard Goff
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Lecture Location: EDC 280
Lecture Days/Time: MWF 12:00 - 12:50

Office: SS 408 (Zoom possible by request)
Office Hours: 1-3pm Wednesdays

Fall 2023

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. The theoretical structure will include asymptotic properties, partialling out, Lagrange multiplier tests, generalized least squares, maximum likelihood estimators and, data issues of truncated and censored distributions.

Course Learning 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:

1) Introduction, review of least squares regression (Woolridge Chapters 2 & 3)
   Opportunity to review the basic linear regression model.

2) Least squares Asymptotics (Chapter 5)
   What happens to the theoretical properties of least squares estimates when the sample size increases?

3) Time series econometrics (Chapters 10 -12, 18)
   Fundamental characteristics and problems in time series econometrics. Serial correlation, unit roots, and error correction modelling

4) Introduction to panel data (Chapter 13-14)
   Combining independent cross sections, following cross section observations over time, first differencing and policy analysis. Fixed effects, random effects, and dummy variable estimation.

5) Instrumental variables (Chapter 15)
   The importance of instrumental variables in correcting endogenous RHS variables.

6) Limited dependent variable models (Chapter 17)
   Maximum likelihood estimation, logit and probit models, censored distribution and truncated regression analysis.

7) Research Design and Approaching an Empirical Project (Chapter 19)
   Practical issues in defining an econometric problem and carrying out an empirical project.

8) Course Review and final examination preparation

Prerequisites/Corequisites:
Economics 357, 359 and 395.

Required Textbook(s):
Jeffrey M. Wooldridge Introductory Econometrics, A modern approach. 7Edition, South-Western.

Recommended Textbook(s):
For guidance on empirical exercises in Python, students may find the following book useful:

> Heiss, F. and Brunner, D. *Using Python for Introductory Econometrics.* Free electronic version: http://www.upfie.net/

For a more advanced treatment of many topics from the course, students may find the following textbook useful:

> Hansen, B., *Econometrics,* Princeton University Press. Until recently this book was available online for free, but is now sold by Princeton University Press.

Required Access to Technology:
Some homework problem will require access to a computer with free statistical software such as Python. Guidance on using Python will be provided in tutorials.

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:
Students are expected to attend the weekly tutorial section to which they have been assigned. During the tutorials, the TA will discuss pre-assigned questions and additional material relevant to the course that is not covered in lectures.

Grade Determination:

Assignments	30%
Midterm	35%
Final Exam	35%
	100%

Examination Details:

Tests and exams will not involve multiple choice questions.

Tests and exams will not involve multiple choice questions. Non-programmable calculators WILL be allowed during the writing of tests or final examinations

The midterm exam will be on October 16th in class.

Grading Policies:

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

Students must receive a passing grade on the final exam to pass the course. Students committing academic misconduct during the final exam will not receive a passing grade for the course.

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

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.

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.

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 https://www.ucalgary.ca/pubs/calendar/current/g-3-4.html.Under no circumstance will this be accommodated by the Department.

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

Reappraisal of Grades:
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

Academic Misconduct and Intellectual Honesty:
Academic Misconduct refers to student behavior that compromises proper assessment of students' academic activities and includes: cheating; fabrication; falsification; plagiarism; unauthorized assistance; failure to comply with an instructor's expectations regarding conduct required of students completing academic assessments in their courses; and failure to comply with exam regulations applied by the Registrar.

Statement of Intellectual Honesty, see Calendar K.3
https://www.ucalgary.ca/pubs/calendar/current/k-3.html

Plagiarism and Other Academic Misconduct
https://ucalgary.ca/student-services/student-success/learning/academic-integrity

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 https://www.ucalgary.ca/legalservices/sites/default/files/teams/1/Policies-Accommodation-for-Students-with-Disabilities-Procedure.pdf and https://www.ucalgary.ca/legal-services/sites/default/files/teams/1/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 https://www.ucalgary.ca/legal-services/sites/default/files/teams/1/faq-privacy-faculty-members.pdf and https://www.ucalgary.ca/legal-services/sites/default/files/teams/1/faq-privacy-students.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 authorizes by the instructor.

Copyright Legislation:
See the University of Calgary policy on Acceptable Use of Material Protected by Copyright at https://www.ucalgary.ca/legal-services/sites/default/files/teams/1/Policies-Acceptable-Use-of-Material-Protected-by-Copyright-Policy.pdf. Students who use material protected by copyright in violation of this policy may be disciplined under the Non-Academic Misconduct Policy.

Recording of Lectures:
Recording of lectures is prohibited, except for audio recordings authorized as an accommodation by SAS or an audio recording for individual private study and only with the written permission of the instructor. Any unauthorized electronic or mechanical recording of lectures, their transcription, copying, or distribution, constitutes academic misconduct. See https://www.ucalgary.ca/pubs/calendar/current/e-6.html.

Instructor Intellectual Property:
Course materials created by instructors (including presentations and posted notes, labs, case studies, assignments and exams) remain the intellectual property of the instructor. These materials may NOT be reproduced, redistributed or copied without the explicit consent of the instructor. The posting of course materials to third party websites such as note-sharing sites without permission is prohibited. Sharing of extracts of these course materials with other students enrolled in the course at the same time may be allowed under fair dealing.

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 sue@ucalgarysue.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 Tower.

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:

1. 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.

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2023-08-11