Department of Economics
Faculty of Arts

Economics 615(L01) (Atsuko Tanaka)

Instructor: Atsuko Tanaka
Lecture Location: ZOOM Delivery
Lecture Days/Time: MW 9:30-10:45 am
Email: atanaka@ucalgary.ca
Office: ZOOM Delivery
Office Hours: 12:20-12:50 and another hour (TBA)   (Fall 2021)
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Course Description:
Provides a foundation of econometric theory relevant for empirical work in economics. Covers classical estimation and inference procedures, including linear regression, linear instrumental variables, differences-in-differences, and linear panel data techniques. Also covers the problem of causality and identification in empirical economics.

Course Outcomes:
By the end of the course students should be able to formulate credible identification, estimation and inferential strategies to be applied to economically interesting causal questions.

Course Outline:
This course will closely follow the path set by the following required text:
Mostly Harmless Econometrics: An Empiricist's Companion, Joshua Angrist and Jorn-Steffen Pischke, Princeton University Press, 2008.
It is essential that you own this book.

I assume students are prepared to work with graduate-level mathematical, economic, and econometric concepts. Familiarity with Stata AND another programming language such as GAUSS, R, or Matlab is required. A programming tutorial will not be provided.
                                    N.B. The details of outline are subject to change.

Identification and Estimation of Causal Effects of a Program

1. Introduction (L.1)
    a. Brief discussion on how to choose a research topic
    b. Reduced form analysis vs. Structural estimation
    c. Data
2. Review of Key Concepts in Econometric Theory (L.2)
    a. What is the "problem of identification"?
    b. Identification and Statistical Inference: Definitions and contrasting examples.
    c. Causal Relationships in Economics: The "Experimental Ideal."
    d. Selection bias. Reflection Problem.
    Textbook Readings: AP Chapter 1-2. Wooldridge Ch. 1

3. Regression (L.3)
    a. What is regression? Foundations.
    b. Why regression? Treatment effects.
    c. Identification.
    d. Matching estimators.
    e. Standard Errors.
    f. Partial Identification and Estimation of Bounds
    g. Applications.
    h. Issues: Heterogeneous treatment effects, Omitted variables, Measurement error.
    Textbook Readings: AP Chapter 3 and 8. Wooldridge Ch. 4,
4. Instrumental Variables (L.4)
    a. Motivation: When and Why use IV?
    b. Identification.
    c. Estimation and Inference.
    d. Other Issues: Binary instruments and continuous instruments. Weak Instruments, many
        instruments. Placebo tests. Heterogeneity. Heckman and Urzua vs Angrist and Imbens
        (LATE) debate
    Textbook Readings: AP Chapter 4, Wooldridge Ch. 5
5. Panel Data/Fixed Effects/Differences-in-Differences (L.5)
    a. Motivation:
        i. Why is Panel Data Useful? Identification.
        ii. Why and when use these methods? Relation between DID and FE, Relation
            between RD and IV.
    b. Estimation and Inference.
    c. Other Issues.
    d. Problem Set I
    Textbook Readings: AP Ch. 5, Wooldridge Ch. 6, 10-11, 21, Manski Ch. 7.
6. Regression Discontinuity (L.6)
    a. Motivation: Why and when use these? Relation between DID and FE, Relation between
        RD and IV.
    b. Identification.
    c. Estimation and Inference.
    d. Other Issues.
    e. Problem Set II
    Textbook Readings: AP Ch. 6, Wooldridge Ch. 21
7. Nonstandard Error Issues (L.7)
    Textbook Readings: AP Ch. 8
8. Introduction to Structural Estimation of Behavioral Models (L.8)
    a. Reduced-form Approach
    b. Structural Approach
    c. Forward Looking Dynamic Discrete Choice Models
    d. Dynamic Model of Female Labor Supply
    e. Computational Issues
    f. Problem Set III
    Journal Articles:
    • Chetty, R. (2008) "Sufficient Statistics for Welfare Analysis: A Bridge between Structural
      and Reduced-Form Methods". Annual Review of Economics, Annual Reviews, vol. 1(1),
      pages 451-488, 05.

- Keane, Michael P., Kenneth I. Wolpin, and Petra Todd (2010) "The Structural Estimation of Behavioral Models: Discrete Choice Dynamic Programming Methods and Applications" in Handbook of Labor Economics, Vol. 4, ed. by O. Ashenfelter, and D. Card. Elsevier Science, Amsterdam.

9. Maximum Likelihood, GMM, and Indirect Inference (L.9)
   a. Motivation: Why and when use these?
   b. Relationship between GMM and MLE
   c. GMM versus Indirect Inference
   d. Standard Error Construction
   e. Testing
10. Calibration (L.10)
    a. Motivation: Why calibrate not estimate
    b. Value Function Iteration
    Journal Articles:
- Mark Huggett (1993). "The risk-free rate in heterogeneous-agent incomplete-insurance economies," Journal of Economic Dynamics and Control 17: 953-969.
11. Presentation (L.11)
    a. Students submit their project (research proposal or replication projects) to D2L.
    b. We all look at the submissions and comments on each using D2L Discussion Forum.

The requirements of the class are a midterm exam, a final exam, 3 problem sets, and a presentation of a term project(using D2L Discussion Forum).

Midterm (Monday Oct 27):
The midterm exam is a take-home exam designed and intended to be completed in 75 minutes. Students will have 50% time extension to complete the exam, at a time of your choosing, within a 24-hour period (**between 10:45 am on Oct 26 and 10:45 am on Oct 27**).

Problem sets with brief description:
- Problem Set I: Fixed Effects/Differences-in-Differences
  (Due Friday October 8)
  Using the data set you organized in Problem Set I, you will estimate economic models using reduced-form methods such as fixed-effects regression and differences-in-differences.
- Problem Set II: Regression Discontinuity
  (Due Friday October 22)
  Using the data set you organized in Problem Set I, you will estimate economic models using regression discontinuity.
- Problem Set III: Term project I (paper) Calibration/Estimation
  (Due Friday November 19)
  For this problem set, you will create a project that you will present to the class at the end of this course. The purpose of this exercise is to construct and calibrate/estimate a model. You may use Matlab, R, Fortran, or an equivalent to tackle the problem.
- Presentation: Term project II (oral presentation)
  (Due Friday December 3)
  Each student submits a 5-10 minute presentation video with 5-10 slides, summarizing the term project.

Term Project:
You have 2 options for the term project (you only need to choose one option):

1) Term paper using DID or RDD; research proposal. No need to have the results but you need to describe the identification method and how to implement the idea using the data.
2) Replication of an empirical research paper. Choose a research paper and replicate at least one of the main numerical results, and write a project report. The objective of this exercise is to provide you with experience in applying the statistical and econometric methods examined in this course.

The term paper (Term Project I) should run about 2-5 pages (double-spaced) and should not contain raw computer output. Submit your report and your complete log file (raw computer output) from Stata (or other programming software) separately into the D2L dropbox.

Prerequisites/corequisites:
Economics 615---_Admission to the Master of Arts Economics program or permission of the Department._

Required Textbook(s):
Mostly Harmless Econometrics (Angrist and Pischke)

Recommended Textbook(s):
Causal Inference: The Mixtape (Cunningham)
Econometric Analysis of Cross Section and Panel Data (Wooldridge)
Econometric Analysis (Greene)
Microeconometrics (Cameron and Trivedi)

Books on Reserve:
Mostly Harmless Econometrics (Angrist and Pischke)

Online Delivery:
This course will be delivered online. Students are expected to be able to participate online in accordance with this Course Outline. Lectures, assignments, office hours, exams, readings and other course material, etc. all require online access and this access is the responsibility of the student.

In order to remotely participate in online courses, students will need to have: computer with a current and updated operating system (macOS or Windows will work with all university-supported online learning technologies), a current and updated web browser installed – the latest versions of Firefox, Safari, Chrome or Edge will help to avoid compatibility issues, secure and reliable internet, microphone / headphones, webcam (optional), scanner (or camera to scan your work).

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.

Grade Determination/Assessment:

MIDTERM EXAM (Oct 23)	30%	
FINAL EXAMINATION	35%	
4 PROBLEM SETS	20%	
TERM PROJECT	15%	
	100%	

Grade Determination and Final Examination Details
Department of Economics Criteria for Letter Grades. Economics professors use the following criteria when assigning letter grades:

Grade	Grade Point Value	Description
A+	4.00	Outstanding
A	4.00	Excellent-superior performance, showing-comprehensive understanding of subject matter
A-	3.70	Very good performance
B+	3.30	Good performance
B	3.00	Satisfactory performance
B-	2.70	Minimum pass for students in the Faculty of Graduate Studies
C+	2.30	All grades below "B-" are indicative of failure at the graduate level and cannot be counted toward Faculty of Graduate Studies course requirements. Individual programs may require a higher passing grade.

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

There will be a department scheduled final examination, held in a classroom, lasting 2 hours.   Non-programmable calculators WILL NOT be allowed during the writing of tests or final examinations.

Tests and exams WILL NOT involve multiple choice questions.

Absence from a Test/Exam

THERE WILL BE NO MAKEUP OR DEFERRED QUIZZES under any circumstances, nor may the quizzes be written early. Students unable to write the quizzes 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.   If a student cannot write their final exam on the date assigned by the Department, they need to arrange for a deferred exam with the department.

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

ACADEMIC MISCONDUCT
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.

Student committing academic misconduct during the final exam will not receive a passing grade on the course.

For information on the Student Academic Misconduct Policy and Procedure please visit:
https://ucalgary.ca/policies/files/policies/student-academic-misconduct-policy.pdf
https://ucalgary.ca/policies/files/policies/student-academic-misconduct-procedure.pdf

Additional information is available on the Academic Integrity Website at 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 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.

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.

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

Student Organizations:
Faculty of Grad Studies website: http://grad.ucalgary.ca/home

Graduate Students Association: http://gsa.ucalgary.ca/

Professional Development for Grad Students
          Workshops and resources can be found at http://www.ucalgary.ca/mygradskills/
Economics Graduate Association: http://econ.ucalgary.ca/ega/

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.
- 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.

Notes:

Classes
- **All the class material will be posted to the Desire2Learn (D2L) platform** so that students who are not able to attend the lecture still have access to the material.
- The material covered in each lecture will be all found in <u>one</u> D2L file named "Date" (e.g. September 9 will contain all the materials covered on September 9).
- Before each lecture, I post reading material/slides. During the class time, the students are asked to post their questions on D2L discussion forum to receive immediate response from the instructor and/or the TA.

Communication
- **<u>Email your TA first</u>.** Your TA will forward your email to the instructor. If you have urgent questions or concerns, email your TA by CCing me.
- I will post announcements on D2L Newsfeed. If announcements are important/urgent, I will also email you using the class mail-list.
- My office hours take place using Zoom. I will use the "waiting room" feature when possible or you can me an email in advance to choose an appointment time.

Assignments
- Submit your assignments to the D2L Dropbox before the due. Late assignments, assignments sent by e-mail will not be accepted.
- You are encouraged to work with your classmates. However, you need to write in your own words.
- Assignments Formatting Requirements:
  - Submit your assignments <u>as ONE file</u> unless specified otherwise. **Compressed folders (e.g. .zip or .pages) do not count as single files.** If you are uploading photos of your work, please transform them into a format recognized by Windows (e.g. JPEG, PNG or PDF format). *Please do not submit files with .heic extension.*

- Include your family name and the assignment number in the name of the file you upload to Dropbox in the following form: LASTNAME_hw# where you will substitute the assignment number for the # in the filename.
- You can scan your written homework with a scanner or your device's camera to create scanned pdf files. Before you submit your scanned homework be sure to verify that the scan is easily readable.
- Make sure that the pages are in the correct order; that is, the first page of the document should be the first page of your work and so on. Make sure that the pages are aligned properly; that is, pages are not in a landscape position.
- I recommend that you submit a draft at least one day before the due. If you want to make a change, you can upload the whole file as a new submission in the same folder---**your grade will be based on the most recent submission.**

Exams

On the exam day:

1. download the exam from D2L (the PDF file (along with the formula sheets and tables) will be uploaded in "midterm/final exam" folder 24 hours before the end time)
2. **hand-write** your answers on a piece of paper (iPad/tablet is OK).
3. Scan your answers (you can take a photo) and upload them into the D2L Dropbox folder ("Exam submission") **before the D2L Dropbox folder closes**. Make sure all the files are legible. The folder will close at the end time of the exam. The most recent submission will be graded (i.e. you can submit multiple times).

- You will get 1 extra credit if you submit your answers to the specified D2L Dropbox on time; you will get no extra credit if you submit them by email. If you have a problem with the system or you have no access to technology, send your answers to me by email.
- **No** late submission will be accepted. If I do not **receive** your submission in time, you will receive no credit for the exam.
- **Warning:** This is a take-home exam. Please solve the questions by yourself. **No** discussion will be allowed. If we find the same answers and the same mistakes, the students are suspected to have cheated. Both students will receive 0, regardless of who helped who.

Other 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.
- The final exam is harder than the midterm exams. Try not to miss the midterm exams.

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2021-08-08