Economics 21:
Empirical Methods
Fall 2020

Coordinator:

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Instructor: **Lecture Time/Loc:**

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Teaching Assistants: **Exercise Session Times/Locs:**
Head TA:

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Exercise Session TAs:

Matteo Greco   **(Weeks 2-4)**
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Lexi Schubert   **(Weeks 5-8)**
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Sara Bagagli   **(Weeks 9-14)**
PhD Student, Dept. of Economics   Wed, 2:15-4:00 p.m.
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CoVid19 Policy

The organization of the classes this year will follow the university guidelines to insure social distancing due to the corona pandemic. The lecture will be offered both *on-site* in two rooms with a limited numbers of attending students *and online*. **Important:** Not every lecture will take place *on-site*. Ideally one every two lectures will take place *online only* via Zoom. In any case, I will inform you every Monday about whether the next class will take place on campus or online. A podcast of the lecture will be anyway made available right after the class. I will personally live stream the lecture on Zoom when I teach on site, for those of you who can't attend in person but still want to attend "live". However, this is a test that we will run in the first weeks. If attendance is high, and the live stream appreciated, this will be made permanent. If this does not work out well, only the podcast will be available after class. Online lectures will be always live streamed and recorded on Zoom. Exercise session take place on site on Wednesday and Thursday. The Exercise *on Wednesday* will be also podcasted. Live streaming is a personal decision of every TA.

Zoom link The live streaming of the lectures can be attended at the following link
https://uzh.zoom.us/s/96844345372.

Rotation Scheme for On-site Attendance

Current university regulation limits the capacity of lecture rooms to about a fifth of the usual number of students. We have designed a rotation scheme to enable every student to attend some of the course events in person. However, attendance is optional: you should always feel conformable staying at home even when you have been invited to join in person. In line with the faculty's recommendations, we have divided course participants in 10 groups as per the last number of their matriculation numbers. Attendance to every lecture and tutorial is only possible for the students belonging to designated groups (two groups for the lectures on campus, and one group for each tutorial).

		Student's Last Matriculation Number	
Week	Lecture	Wednesday's Tutorial	Thursday's Tutorial
1	1,2	No tutorials	No tutorials
2	3,4	3	2
3	5,6	5	4
4	7,8	7	6
5	9,0	9	8
6	1,2	2	0
7	3,4	4	1
8	5,6	6	3
9	7,8	8	5
10	9,0	0	7
11	1,2	1	9
12	3,4	3	2
13	5,6	5	4
14	7,8	7	6

Course Description

This course presents a Masters-level introduction to the "Empirical Methods" used in economics. An alternative name for the course would be "(Masters-level) Introductory Econometrics." The topical coverage is similar to what students might have seen in an undergraduate econometrics course, but there is a big difference in emphasis. While undergraduate courses typically focus on teaching students the tools of econometrics (e.g. the Classical Linear Regression Model, or CLRM, and common "extensions" like heteroskedasticity), the focus of this course will be to teach you *how to (correctly) use these tools*.

To do so, we will repeatedly ask (and answer) questions like the following: "What are the possible sources of bias in your econometric specification?" "What is the likely sign of any bias on your coefficient of interest?" "Are there estimation strategies that would allow you to consistently estimate your coefficient of interest?" and "What are they and why do they resolve the issues of bias that you were worried about?" Answering such questions requires thinking carefully about the process generating the data that you are analyzing, why the CLRM may cause bias, and which among several alternative estimation strategies might allow you to solve these issues.

Fall 2020 is the fourth time this course take place at the University of Zurich, though the first time I teach it. My (aspirational) goal is to divide the course into four parts. After introducing myself in the first lecture, we will review the basics of the CLRM, including multiple regression, hypothesis testing, dummy variables, and nonlinear specifications. The purpose here is to both re-familiarize students with "that which they should already know" and provide a second, deeper, pass through this material. The second section of the course will cover Sources of Bias and Instrumental Variables (IV) estimation in depth. We will cover the theory, but we will also spend considerable time with practical examples trying to answer the types of questions listed above. The third section of the course will cover panel data methods. Panel data is becoming increasingly common and often provides a credible alternative to IV for causal inference. If time permits, in a final section I will provide a very brief introduction to Big Data methods, both introducing the basic tools (e.g. machine learning) and differentiating them from the typical focus of econometric methods. This last section is definitely aspirational - a more realistic goal is to cover well the first three sections of the course - but I'll try.

Emphasis throughout the course will be placed on both theory and practice. To this end, the theoretical material covered in lecture will be augmented using both theoretical and empirical (data) problem sets. Based on what is commonly in use in Zurich, the use of the statistical package R will be emphasised in problem sets. Based on what is commonly in use outside Zurich (especially among "older types"), examples in lecture will use the statistical package Stata. Students may choose either to solve the empirical problem sets.

A primary goal of the course is to have significant classroom participation, both in the form of answers to my questions as well as questions on points of confusion from students. I encourage classroom participation for two reasons: I think that it enhances student engagement with the material and I think that it draws out the econometrician's (i.e. my) thought processes in the context of particular problems. Thus we will often have (sometimes long) discussions about a topic that pulls us away from the lecture material. This is good. It is through these discussions that you will really learn how to do econometrics.

I am passionate about the value of good econometric skills to analyze questions of interest in almost any subject area. I hope I can convince you of the same by the end of the course.

Rules of the Game

In Class

Please try to ask questions during class. I prefer it. I will ask you as well, sometimes directly or sometimes in groups (I like to have you vote - so be ready!). Please also try not to use laptops, tablets, smartphones etc. during class other than for note-taking. In general, lecture notes (with some portions missing to encourage in-class thinking) will be provided before lecture, albeit perhaps with not much lead time.

Student Questions Policy

Questions from students outside of class should first go to the course discussion board (which will be explained/described by Matteo in the first exercise session) and, if still unresolved, then to one of the TAs in an email. If you send them an email, it should be short and to the point. Emails should always have a title that begins with MOEC0021, as it helps them to know the email is related to the course. Untitled emails may not get a response! The course email policy is to reply within 48 hours, thus feel free to write them a reminder if they do not respond. It's often better for emails to be relatively 'maths free' as it can be hard to write back to such emails succinctly; if you have maths-y questions, feel free to drop by your TA's Office Hours or talk to one of them after class.

Course Assessment

There will be two forms of assessment:

- Problem Sets: 20%
- Final exam: 80%

FINAL EXAM:
The final exam is comprehensive in nature - all material related to topics presented in lecture and exercise sessions are fair game. The final exam will be on Monday, January 18, 2020, from 10:00-12:00 **online via OLAT**. It will use the full two hours. In case of failure, there will be a re-examination on Monday, March 30th from 10:00-12:00 that will (also tentatively) use the full two hours. The final exam in the re-examination will still count for 80% of the final (re-examination-semester) grade, with the problem set scores from the teaching semester continuing to count 20%.

PROBLEM SETS:
You will be expected to submit 4 problems sets during the semester. Each problem set contains analytical ("theory"-based) questions and empirical exercises. The analytical questions are designed to build your intuition by using simplified models from the lecture to highlight important results. Empirical exercises serve two purposes:

1. First, they are designed to teach you how to use statistical software to implement many of the estimators discussed in class

2. Second, they aim to highlight some of the conceptual problems you might face when confronted with data in either your thesis or on the job.

Based on the success of doing this in related courses in previous years, I am not only allowing students to submit the problem sets in groups of no more than *three* people, I am actively *encouraging* it. Some important comments about this:

- While you don't *have* to work in a group, if not enough form groups, I will make it compulsory.
  - Group work is very common in the real world. You might as well get used to it!
- You should all contribute *equally* to your group's output
  - Learning how to do econometrics via problem sets is very highly correlated with final exam performance
  - In cases where a subset of group members feels some other subset has not contributed their fair share, they should reach agreement on the relative contributions and communicate this to their TA. The Problem Set grade(s) will then be adjusted accordingly.

Empirical Data Analysis

We would prefer you to use R for the empirical exercises in each problem set. You could also use Stata if you are more familiar with this software. All instruction in exercise sessions will be in R, and no Stata scripts will be made available. While we are (relatively) neutral about which software package you choose, note that you will not always get *exactly* the same answer when comparing across software - although they should be 'close'. (Small) Differences lie 'deep in the heart' of the program you choose, and are beyond the scope of this course. We will try to have written answers in each of the software packages so we can anticipate any differences in your submitted answers.

Podcasts

Subject to the equipment functioning as intended, each Monday's lecture will be made available in a podcast as soon as possible after the end of the lecture. Wednesday's exercise sessions will be also podcasted.

Exercise Sessions

Based on the success of the system first introduced last year, the TAs will divide their duties *across time* (and thus across subjects). Thus, for weeks 2-4, you will all have Matteo Greco covering the relevant material, for weeks 5-8, you will have Lexi Schubert, and for weeks 9-14 you will have Sara Bagagli. For those subjects for which an Exercise Session TA is responsible, he/she will teach both exercise sessions in those weeks (and none of the exercise sessions in the weeks/subjects for which he/she is not responsible).

Exercise Sessions will cover the following topics. First, early in the semester, they will provide introductions to R and the statistical foundations of econometrics. If you are already familiar with this material, you may safely skip these sessions. Beginning in week 5, they will largely alternate between (a) going through problems *like those* on the problem sets and exam (what we call "exercises") and (b) going through solutions to the assigned problem sets. Sessions dedicated to "exercises" will generally be during the week in which you are working on the associated problem set and sessions dedicated to solutions to the problem sets will be in the days immediately after you turn in your problem sets. **Please note:** written solutions will be provided for problems covered in the sessions devoted to the exercises, *but not for the sessions devoted to the problem sets*. For the remaining weeks, if any, the TAs will cover special topics complementary with the material presented in lecture. The TAs will also provide exam questions from previous years and hold a Q&A session to go through these and any other exam-prep problems in the week before the final exam in January.

Reading Materials

ASSIGNED TEXTBOOK:

There is no assigned textbook. (See the discussion on the usefulness of econometrics textbooks in the first lecture.)

That being said, you may find the books listed below useful as references on top of the course lecture notes. We have sorted them into books that are technically 'easier' and those that are 'more difficult.'

- EASIER BOOKS (TECHNICALLY):
    - Gujarati, Basic Econometrics
        * I was taught econometrics from this book... many many (many!) years ago
    - Kennedy, A Guide to Econometrics
        * This book is particularly well-known for using "regular language" to teach econometrics.
    - Stock and Watson, Introduction to Econometrics
        * This is the text used in both UZH Bachelor's Degree courses in econometrics (at least that was so as recently as 2017)
    - Verbeek, M; A guide to modern econometrics, 4/E
        * This is the text used in this course prior to my taking it over in 2017
    - Wooldridge, Introductory Econometrics: A Modern Approach
        * The author of this text is also the author of a very popular PhD-level text (see below)

- MORE ADVANCED (TECHNICALLY):
    - Arellano, Panel Data Econometrics
    - Baltagi, Econometric Analysis of Panel Data

∗ As suggested, these texts focus on panel data methods
　　– Cameron & Trivedi, Microeconometrics
　　　　∗ This text comes with integrated examples and exercises in Stata
　　– Davidson & MacKinnon, Foundations of Econometrics
　　– Greene, Econometric Analysis
　　　　∗ For many years, this was the standard PhD text (and it is still popular in that space)
　　– Wooldridge, Econometric Analysis of Cross Section and Panel Data
　　　　∗ The popular PhD-level text mentioned above

Course Content

We intend to cover the following topics. This is subject to change, though I very much hope not to change it:

Week	Lecture Topic	Tutorial Topic	Problem Set and Exercises Info
1	Introduction	No tutorials	–
2	Probability/Statistical Foundations	Intro to R I	–
3	CLRM Basics	Intro to R II	Ex1 & PSet1 Assigned
4	CLRM Basics / CLRM Interpretation	Statistics Review	–
5	Hypothesis Testing	Ex1 Solutions	PSet1 Due
6	Sources of Bias I	PSet1 Solutions	Ex2 & PSet2 Assigned
7	Sources of Bias II	Coefficient interpretation	–
8	Sources of Bias III	Ex2 Solutions	–
9	IV I	PSet2 Solutions	PSet2 Due; Ex3 Assigned
10	IV II	Ex3 Solutions	PSet3 Assigned
11	IV III	Omitted Var Bias	–
12	Panel I	PSet3 Solutions	PSet3 Due; Ex4 & PSet4 Assigned
13	Panel II	Ex4 Solutions	–
14	Machine Learning	PSet4 Solutions	PSet4 Due
Pre-Exam (January)	–	Exam Prep Q&A	–