UNIVERSITY OF TORONTO

# ECO372H1 Data Analysis and Applied Econometrics in Practice

# Winter 2020

Section L0101 & L0201— Instructor : Patrick Blanchenay

*This version:**2020-01-05**.* [ Latest version ]



## Key Information

| Section | Lecture + Tutorial |
|---|---|
| L0101 | Wed 10.00-13.00 in SS1069* |
| L0201 | Wed 14.00-17.00 in SS1087* |

** You may attend either, subject to seat availability.*

**Course site**: Quercus (all announcements and material)
**Piazza**: https://piazza.com/utoronto.ca/winter2020/eco372h1/home
**Calendar**: ECO372 Winter 2020 Calendar
**Instructor**: Patrick Blanchenay
**Drop-in Office hours**: Tuesdays 9.30-11.30 in room GE348 (150 St-George st); rescheduling on Quercus.
**Communication**: see Communication below

All announcements will be made *using* Quercus. All material will be posted on Quercus.

## Description

**ECO372 Data Analysis and Applied Econometrics in Practice** is an intermediate level course in econometrics for students at the University of Toronto (St-George campus). Its goal is to equip students with a modern approach to data analysis and econometrics, focussing on the use of data to answer causal questions. Students will learn about different empirical techniques that economists use to do so: random assignment, linear regression, difference-in-differences, instrumental variables and regression discontinuity design. Students will learn about applications of these techniques in academic research. Students will also put these techniques in practice and gain familiarity with Stata, one of the most widespeard statistics software in economics.

## Course Prerequesites

The course prerequisites and exclusions are listed here: https://fas.calendar.utoronto.ca/course/eco372h1 .
I cannot waive prerequisites. An administrator will remove anyone missing prerequisites.

## Learning Outcomes

By the end of this course you should be able to:

1. Understand the notion of causality, and its importance in empirical research.
2. Identify five strategies that can be used to answer causal questions using data: random assignment, regressions, instrumental variables, difference-in-differences, and regression discontinuity design, and their associated regression specification.
3. Clearly articulate each method's requirements, typical use, and limitations, and know how to interpret their quantitative results.
4. Read (well-written) abstracts of unfamiliar research papers and understand the research question and basic estimation strategy / econometric model used to answer it.
5. Interpret and comment on tables of estimated coefficients from a wide range of econometric models, in various formats.
6. Use your understanding of the methods to assess the validity and quality of empirical studies, including the ability to judge whether a method may or may not work in a specific research context.
7. Articulate short well-crafted arguments to answer true/false questions regarding each of these methods.
8. Reproduce key results of empirical papers using Stata.
9. Apply these methods to actual datasets, using Stata programming language.

## Textbook (required) and Readings (required)

The required textbook is *Mastering 'Metric*s by Angrist & Pischke (Princeton University Press, ISBN: 978-0-691-15284-4). It is available at UofT Bookstore, as well as on Amazon, Indigo and many other online platforms. There are copies available at UofT libraries, but I strongly recommend that you buy your own copy. Not only is it an engaging and accessible book, it is also one that can stay useful for a lifetime (even if you opt for a career outside academia).

The course will follow the textbook pretty closely, although not in the original order; ahead of each lecture, I will post the required readings, which will include parts of the book, and additional readings (typically research papers) that I will upload to Quercus.
All assigned readings are examinable, and you should read the material before each lecture and come prepared to lecture. First, you will not be able to follow the lectures if you do not do the readings ahead. Second, regular work is much more efficient than last-minute cramming.

You are free to supplement with other textbooks of your choice; I find Stock and Watson's *Introduction to Econometrics* (Pearson) excellent on Regression analysis, and Instrumental Variables, but it has almost nothing about Difference-in-Differences and Regression discontinuity design.

## Lectures and tutorials

The course is built on weekly 2-hour lectures, followed by one-hour tutorials, but some weeks will feature a 3-hour lecture. See the Course calendar for the list of topics and readings; the calendar is subject to (limited) changes.

### *Lectures*

Before each lecture, you are expected to do the required readings. Readings will usually be taken from the textbook, but will occasionally come from additional sources. Two-hour lectures usually have a 10min break in the middle. You may attend the morning or the afternoon session, subject to seat availability.

### *Tutorials*

The one-hour tutorial follows directly the lecture, and but will be dedicated to practice material from the previous week's lecture and/or get hands-on Stata experiene. Each tutorial is an opportunity to discuss readings, and put to practice the methodologies seen in class with hands-on Stata experience. For Stata tutorials, it is important that you have bring or share a laptop with Stata installed on it (see Stata and laptop).

### *In-class behaviour*

To keep lectures and tutorials as useful and productive as possible, I ask you to keep a professional and adequate attitude in class, in order to limit disruptions to other students (and to the teacher). This includes: arriving on time (or being discrete if you if you have to enter the room late), not chatting with your classmates, not visiting websites, watching or listening to other media, not texting/messaging. I do not like reminding problematic students about this, but I will if I have to.

## Stata (required) and laptop (recommended)

One objective of the course is to get students to perform analyses using statistical software. Some tutorials will provide hands-on experience to Stata, one of the most widely used statistics software in the world. Each student is expected to come with their own laptop, or share with another student.

Stata is a proprietary commercial software, available on Windows, macOS and Linux. It comes in several "flavours" of increasing memory capacity, but for the purpose of this course, the simplest Stata/IC is sufficient. A 6-month license to Stata/IC for students costs 45 USD (make sure to click on the **6-month** tab). (You are free to buy a more expensive flavour or a longer license, but it is unnecessary for this course. Do NOT buy Small Stata.) If you alreay have Stata version 14 or above, you do not need to buy the latest version, as most commands we will use haven't changed. Stata 13 is unable to open datasets provided for the tutorials and assignments (see also FAQ: Can I use Stata 10/11/12/13?).

Stata is also available on computers of the Map and Data Library room at Robarts Library; it is your responsibility to adequately transfer your files.

See also FAQ: Do I need to buy Stata? Can I use R instead? and Am I going to become a Stata/programming wizard?

# Evaluation

Evaluation for the course is a mix of in-class tests and take-home assignments. The breakdown is as follows. The final course grade will be rounded to the nearest integer, with no exception.

| Evaluation | Date | Percentage of final grade |
|---|---|---|
| Midterm Test | Thurs 27th Feb 2020, 17.00-19.00 (**outside of class time**) | Total: 70%<br>(Highest grade: 40%<br>Lowest grade: 30%) |
| Final Exam | 6-25 April 2020, TBD by A&S | |
| Assignment #1 | Due Sun 9 Feb 2020, 18.00 | 10% |
| Assignment #2 | Due Sun 15 Mar 2020, 18.00 | 10% |
| Assignment #3 | Due Wed 01 Apr 2020, 18.00 | 10% |

## *Mid-term Test and Final Exam*

**For the term test and the exam, bring your TCard, pencils, erasers, and a non-programmable calculator.**

The final exam is cumulative. For the midterm test and the final exam, one or more questions (possibly with multiple parts) is planned to require a longer written answer where you interpret and assess quantitative results (e.g. tables, figures, Stata output, etc.).

Tests are scanned and marked using Crowdmark; this means that you can write using pencil and eraser if you prefer. During the test you must show your student ID and sign the "signup sheet". Stay seated until all tests have been collected and counted. To avoid disruption, you cannot leave the room in the last 15 minutes.

The midterm test and exam begin at the official start time. You must be in the exam room no later than 10 minutes *before* official start time. You will not be given extra time if you are late.

## *Assignments*

There are three assignments to hand in. These exercises involve a mix of algebra, questions on research articles, performing statistical analyses using Stata, and writing about your analysis in a clear rigorous way. You will be graded on the quality of your answers, with a big emphasis on clarity.

For every assignment, you will be asked to submit three documents:

- a PDF containing the answers to your questions, with the adequate explanations and interpretations
- the code (do-file) that you used for the analysis, duly commented (instructions will be posted on Quercus);
- the log file automatically generated by your code.

You will have to upload these documents before the deadline, both on Quercus; files are automatically processed by Turnitin, a plagiarism detection software. See sections Academic Integrity and Turnitin.com.

## *Missed term work*[1]

You are expected to complete all required work as scheduled in the Evaluation section. Assignments dates and instructions are posted well in advance, and it is your responsibility to ensure adequate time to complete the work and deal with any issues, including technical issues. Failure to submit an assignment will result in a grade of zero. Assignments are considered submitted by the time all the files have been uploaded *in the correct format* to Quercus according to the assignment instruction. Assignments that are submitted late will suffer a penalty of 10 points per day of lateness, starting immediately at the deadline (by the deadline). Make sure to allow ample time for submission before the deadline; excuses such as: "the website is slow", "I only submitted one minute late", "I have had a stomach bug on the last day before deadline", "I forgot to upload one of the files", etc. are not valid excuses. These rules are there to limit unwarranted individual requests, which take up valuable time that I could spend improving the course content.

## *Policy on Missing the Midterm*

The midterm takes place outside of normally scheduled class time; if you have a documented class conflict, **please inform me as soon as possible.**

Feeling unprepared to write a midterm is not an acceptable excuse for missing the midterm. This is however, a sign that you may benefit from accessing academic skill resources to help you be prepared. These services are listed below (Academic Skills Resources). The following policy is for students who miss the midterm for reasons other than a documented class conflict, please read it in full.

1. A student who does not feel able to write a test should
(1) unless circumstances make this impossible, contact me *before the end of the test*, by e-mail at patrick.blanchenay@utoronto.ca; if not possible, at the earliest time after that;
(2) follow the protocol below to request a make-up for the missed midterm.
If you fail to contact me before the end of the test but, in my opinion, could have, your request for accommodation might be denied. If you anticipate any reason why you should be unable to complete the midterm test (e.g. international sports competition), you should contact me well in advance. It is a necessary (but not sufficient) condition to get an accommodation.

2. If you submit acceptable documentation (see point 4), you will be granted an opportunity for a make-up test at a later date. The date will be communicated to all eligible students in time; you are expected to be reasonably flexible and make arrangements to be available (since other students might also sit on the make-up test); the only exceptions would be a *documented* class or test conflict. There is no make-up opportunities for a missed make-up.

3. If you miss the make-up test or if your request for request for the missed midterm is denied, you will be assigned a score of 0% on your midterm. (Exceptional circumstances will warrant meaningful consideration.)

4. The following documentation are accepted to support your request accomodations:
- UofT Verification of Illness or Injury Form , or a similar form providing the same information (see point 5. below for further details in this case).
- Student Health or Disability Related Certificate, provided by UofT internal doctors.

[1] This section applies to *term* work. Any accommodation for the final examination requires a student to formally petition Arts & Science: see http://www.artsandscience.utoronto.ca/ofr/calendar/Rules_&_Regulations.html

- College Registrar's Letter
- Accessibility Services Letter

5. If you supply the UofT Verification of Illness or Injury Form or a form containing the same information (and only in those cases):
   A. The form must be completed by a registered health practitioner.
   B. The form must be in original (not scanned, copied, or emailed) or a certified copy.
   C. Unless circumstances make this impossible, your form must be presented **in person** with a valid U of T student card within a week of the missed test (that is up to the following Tuesday) at the Department of Economics' reception at 150 St. George Street (and you must e-mail me to confirm that you have submitted the note). Beyond the week after the test , further documentation might be required (e.g., confirming the continuing illness).

For ongoing injury, illness, or personal issues, **you are strongly encouraged to contact your College Registrar office for guidance and support**.

### *Academic Skills Resources*

Even the most seasoned, organized and dedicated student can benefit from speaking with a Learning Strategist to explore setting achievable goals, preparing for tests and time management strategies. You can schedule an appointment with a Learning Strategist at any time of the year.
https://sidneysmithcommons.artsci.utoronto.ca/can-a-learning-strategist-help-me/

## Calendar

The authoritative calendar is the one posted on the Quercus course page.
The due dates are definitive, but topics might be adjusted; all announcements will be made on Quercus.

## Student Well-Being and Academic Accomodations

### *Well-Being*

University of Toronto aims at giving you an enriching learning experience, and has a number of resources to help you stay healthy and be well: http://studentlife.utoronto.ca/bewell

However, sometimes things do not go as planned. **In case of emergency, call 911.** For ongoing injury, illness, or personal/family problems, or if you feel you are falling behind in your courses, you must contact your College Registrar immediately. The earlier you do, the easier it is to find solutions.

There are also a number of resources in case you are feeling distressed: http://studentlife.utoronto.ca/feeling-distressed
Once again, the earlier you reach out, the easier it is to remedy the situation and find solutions. Do not wait until the end of the academic year.

### *Ongoing Learning Disability or Accommodation Requirement*

Students with diverse learning styles and needs are welcome in this course. If you have an ongoing disability issue or accommodation need, you should register with Accessibility Services (AS) (http://accessibility.utoronto.ca) **at the**

**beginning of the academic term**. (Without registration, you will not be able to verify your situation with your instructors, and instructors will not be advised about your accommodation needs.) AS will then assess your medical situation, develop an accommodation plan with you, and support you in requesting accommodation for your course work. Remember that the process of accommodation is private: AS will not share details of your condition with any instructor, and your instructors will not reveal that you are registered with AS.

For more information on services and resources available to instructors and students, please contact Tanya Lewis, Director, Director of Academic Success and Accessibility Services, at (416) 978-6268; tanya.lewis@utoronto.ca. Accessibility services: http://studentlife.utoronto.ca/as/

### *Accommodations for Religious Observances*

As a student at the University of Toronto, you are part of a diverse community that welcomes and includes students and faculty from a wide range of backgrounds, cultural traditions, and spiritual beliefs. For my part, I will make every reasonable effort to avoid scheduling tests, examinations, or other compulsory activities on religious holy days not captured by statutory holidays. Further to University Policy, if you anticipate being absent from class or missing a major course activity (like a test) due to a religious observance, please let me know as early in the course as possible, and with sufficient notice (at least two to three weeks), so that we can work together to make alternate arrangements.

## Academic Integrity

All students, faculty and staff are expected to follow the University's guidelines and policies on academic integrity. For students, this means following the standards of academic honesty when writing assignments, citing and using source material appropriately, collaborating with fellow students, and writing tests and exams. Ensure that the work you submit for grading represents your own honest efforts. Plagiarism, representing someone else's words as your own or submitting work that you have previously submitted for marks in another class or program, is a serious offence that can result in sanctions. Speak to me or your TA for advice on anything that you find unclear. Also, see the U of T writing support website at http://www.utoronto.ca/writing. Consult the Code of Behaviour on Academic Matters (http://www.governingcouncil.utoronto.ca/policies/behaveac.htm) for a complete outline of the Universitys policy and expectations.

Potential offences include, but are not limited to:

- In papers and assignments:
    - Using someone else's ideas or words without appropriate acknowledgement. This includes verbatim copying of any lecture notes distributed by the instructor.
    - Submitting your own work in more than one course without the permission of the instructor.
    - Making up sources or facts.
    - Obtaining or providing unauthorized assistance on any assignment.
- On tests and exams:
    - Using or possessing unauthorized aids, including smartphones.
    - Looking at someone else's answers during an exam or test.
    - Misrepresenting your identity.
- In academic work:
    - Falsifying institutional documents or grades.
    - Falsifying or altering any documentation required by the University, including (but not
    - limited to) doctor's notes

I do encourage you to pay close attention to these sections on Perils and Pitfalls http://academicintegrity.utoronto.ca/perils-and-pitfalls and Smart Strategies http://academicintegrity.utoronto.ca/smart-strategies

### *Turnitin.com*

Normally, students will be required to submit their course assignments to Turnitin.com for review of textual similarity and detection of possible plagiarism. In doing so, students will allow their essays to be included as source documents in the Turnitin.com reference database, where they will be used solely for the purpose of detecting plagiarism. The terms that apply to the University's use of the Turnitin.com service are described on the Turnitin.com web site.

## Communication

I do not use Quercus messaging tool; please do not send any message via Quercus. Instead we have two channels of communication: Piazza, and email.

### *Piazza*

We use Piazza (https://piazza.com/utoronto.ca/winter2020/eco372h1/home) to facilitate communication.
To register, go to : https://piazza.com/utoronto.ca/winter2020/eco372h1
The TAs and I periodically check Piazza to ensure proper usage, flag some postings, and possibly answer some questions. However, Piazza's emphasis is on student-to-student Q&A. Questions and answers can be made anonymous to other students.

Piazza is a complement to face-to-face interactions in office hours, class, TA tutorials, and study groups. Piazza has several advantages over email; first, it promotes student engagement by encouraging you to answer other students' questions, an excellent way of testing your understanding of the material; second, it allows questions/answers to be shared to all students, who can benefit from this positive externality.

### *Email*

Email is not an appropriate forum for discussing course material details, which are better addressed on Piazza or through office hours. That said, email can be helpful on occasion, and within limits and I will try to reply to email provided your question(s) can be answered with a one or two sentence answer. I have more time to reply to email on Mondays and Tuesdays; if anything is urgent, you can also come to my office hour.

Answering email takes up valuable time that could be used more productively on improving the course; I will not answer about information that can be found in the syllabus or on the Quercus page (for example: test dates) nor questions about grades, nor questions about the course material (which should be posted on Piazza). Please do not send attachments and do not submit term work by email. **Please always include [ECO372] in the title of *any* email. Emails that do not include this will be ignored.**

The instructor's email address is: patrick.blanchenay@utoronto.ca

Email checklist:

- ❏ Your email is sent from your University address.
- ❏ Title includes "[ECO372] " followed by the subject of the email.

- ❏ The message is straight to the point and no-longer than 10 sentences.
- ❏ Your email does not contain attachment, unless I had specifically asked you to send something.
- ❏ Your signature includes your Student number, and both the name you are usually addressed by, and your ACORN name if it differs from the name you go by.

## Frequently Asked Questions (FAQ)

### *How is this course different from ECO375?*

Both courses constitute an introduction to econometrics beyond the 2nd year empirical methods that you have already seen, and both courses discuss how different quantitative methods (all based on regressions) can be used to answer research questions. Therefore, the material has some similarities. But the focus of ECO375 is more on understanding the statistical properties of these methods, while ECO372 focusses on their application, and understanding in what contexts these methods can be fruitfully used (or not). As such ECO375 has more algebra and proofs, while reasoning and logic plays an important role in ECO372. ECO375 is recommended if you intend on carrying on postgraduate studies, ECO372 less so.

### *Is there a lot to memorize?*

This course is a methodological course: you will learn about new methods, how they have been used by researchers, and how *you* can use them. The same method applied in different contexts will face different issues and yield different results. Therefore the course emphasis is less on memorization and more on understanding these methods. I test your understanding by asking you to apply the methods to real data (assignments), and by asking reasoning questions about the methods in the test/exam. There are however a few important formulas that you must know.

### *Is this course math-intensive?*

There is *some* algebra, and knowledge of 2nd year statistics/quantitative methods is vital, as basics will not be covered again. However, the focus is not on proofs and calculus *per se*. The course uses equations and formulas (you will see regression equations almost every week of the course), but the focus is on understanding what those formulas can teach us, and how we can interpret them. The course also requires that some familiarity with abstract thinking, and makes heavy use of mathematical notation.

### *Is this course easy?*

The fact that the course is not overly mathematical does not mean it is easy. The course requires good understanding of the methods, in order to apply them in a context that is new to you. In particular this course therefore requires good *reasoning* skills. (The midterm and final exams always contain true/false questions in which you must assess the validity of a statement.)

### *Do I need to buy the textbook?*

Yes, we are using the textbook quite heavily (including the mathematical appendices). The textbook has its quirks (and I'll point them out in class), but it is written by two well-respected professors, in a style that is very accessible. It is short, and reads like a novel. It is cheap compared to standard textbooks (around 40CAD), and not heavy. You are free to supplement it with additional readings (eg fom Stock and Watson *Introduction to Econometrics*).

### *Do I need to buy Stata? Can I use R instead?*

Yes you need a working version of Stata (14 or above) for the assignments, and for the tutorials. No, you cannot use R instead. All the statistical analysis in this course is performed using Stata. Stata is a de-facto standard for econometrics, and is widely used by economists. Stata has its quirks, but it has an easier learning curve than R, and the help documentation is consistent and excellent.
Stata comes in different "flavours"; Stata/IC is the cheapest flavour. Although it has limitations compared to the more expensive flavours (hello price discrimination), Stata/IC capacities are well above what is needed for this course.
Stata is also available for free on computers of the Map and Data Library room at Robarts Library.

### *Can I use Stata 10/11/12/13 instead of the latest version?*

All commands we see in the course are the same. However, Stata versions 13 and below are unable to open Stata 14/15/16 datasets. You will not be unable to open most of the files I provide. I advise you against using Stata 13 or below. If you decide to do so anyway, it is your responsibility to find a charitable person that can convert the provided datasets to Stata 13 datasets using `saveold`.

### *Am I going to become a Stata/programming wizard?*

No. This course uses Stata as a *tool* towards data analysis. Doing so requires to learn Stata basics. While I aim to equip you with the basics, and good programming habits, you will not become a Stata or programming expert.

### *Do I need to already know Stata for this course?*

All materials & skills necessary for this course will be provided. Pre-existing knowledge of Stata is not required.

### *I submitted my assignment only 2 minutes after the deadline, can you waive the penalty?*

No. It is your responsibility to allow ample time for submission.

### *I have another test/assignment due the same week as our midterm/assignment, can I skip/submit late?*

See policy about Missed term work and Policy on Missing the Midterm (in particular point 1).

### *How do I do well on this course?*

Work regularly and use all the help you can.
This course is not easy. It makes heavy use of abstract thinking using mathematical notation, and logical reasoning; and new material arrives fast. To do well, you need to make sure you understand the material well. Working regularly ensures that you digest material as fast as new material arrives. If you let things pile up, you'll only have time for superficial understanding.
I will not be holding your hand; you should take ownership of your own learning. Make sure to use all the help you can, and use all the resources at your disposal: attend all lectures/tutorials, ask questions during office hours or on Piazza, check the textbook, other textbooks if needed, etc.

### *Is the final exam cumulative?*

Yes, although you can expect that, with probability 0.9999, it will feature questions on topics that have been seen after the midterm test.

### *Is there extra work I can do to improve my grade? / Can you raise my course grade by X points? I really need to preserve my GPA.*

No, as this would be unfair to other students.