

ECO220Y1Y: Quantitative Methods in Economics

2018/19, Prof. Murdock, Economics Department, U of T

1 Key Course Information

Sections: Days, meeting times, rooms

L0201: Wed 11-1, SS 2102; Fri 9-11 (For Fridays, see Section 7)

L0301: Wed 2-4, PB B250 (Fall) / PB B150 (Winter); Fri 9-11 (For Fridays, see Section 7)

L0401: Tues 2-4, MP 102; Fri 9-11 (For Fridays, see Section 7)

Course site: <https://q.utoronto.ca/courses/51262/assignments/syllabus>

Piazza: <https://piazza.com/utoronto.ca/fall2018/eco220ymurdock>, see Section 12

Office hours: Room 312; 150 St George; Tues 11:30-1 & 4:30-5 (any rescheduling is announced)

Head TA: Aly Somani

Economics Study Centre (GE 110): open daily (drop-in), 150 St George, main floor

2 Get Enthusiastic about this Exciting Course

Consider these 2016 conclusions (excerpts) of Professor Richard Thaler, University of Chicago.

It is time to fully embrace what I would call *evidence-based economics*. This should not be a hard sell. Economists use the most sophisticated statistical techniques of any social science, have access to increasingly large and rich datasets, and have embraced numerous new methods from experiments (both lab and field) to brain imaging to machine learning. Furthermore, economics has become an increasingly empirical discipline. Hamermesh (2013) finds that the percentage of “theory” papers in top economics journals has fallen from 50.7 percent in 1963 to 19.1 percent in 2011. We are undeniably an empirical discipline—so let’s embrace that.

Viewed in this context, behavioral economics is simply one part of the growing importance of empirical work in economics. There is nothing unique about incorporating psychological factors such as framing, self-control, and fairness into economics analyses. If such factors help us understand the world better and improve predictions about behavior, then why wouldn’t we use them just like we would use any other new source of data such as web searches or genetic markers?

If economics does develop along these lines the term “behavioral economics” will eventually disappear from our lexicon. All economics will be as behavioral as the topic requires, and as a result, we will have an approach to economics that yields a higher R^2 .^a

^aExcerpt, p. 1597: Thaler, Richard H.. 2016. “Behavioral Economics: Past, Present, and Future.” *American Economic Review*, 106(7): 1577-1600. DOI: 10.1257/aer.106.7.1577

3 Textbook & iClicker Remote

We use the 2017 *Business Statistics, Third Canadian Edition* by Sharpe, De Veaux, Velleman, and Wright, available at the [U of T Bookstore](#) and [Discount Textbooks](#). Some used copies from 2017/18 and Summer 2018 are available. The Economics Study Centre has it. Old editions will be inconvenient for you. For MyStatLab (not required) go to <https://registration.myperson.com/> using course ID **instructo45184**. You need an iClicker remote (used or new): see Section 11.1.

4 Prerequisites, Academic Integrity, Accessibility & Help

An administrator will remove anyone missing prerequisites: <https://fas.calendar.utoronto.ca/course/EC0220Y1>. I cannot waive prerequisites: <http://www.economics.utoronto.ca/index.php/index/undergraduate/load/prerequisites>.

You are expected to uphold your academic integrity: see <http://www.artsci.utoronto.ca/osai>. For accessibility concerns visit <http://www.studentlife.utoronto.ca/as>. If you have trouble, seek help right away from us, your College Registrar, and/or the Academic Success Centre <http://www.studentlife.utoronto.ca/asc>. *For any issues that extend beyond our course, contact your College Registrar immediately.*

5 Lectures

Tuesday and Wednesday lectures use PowerPoint and require your participation (iClicker). The lecture slides are on our course site before class. You may print the lecture slides (black and white is fine): these include blank space for notes. *Take notes: slides are not notes. You may attend L0201, L0301, or L0401, provided there is space.* See Section 1 for rooms and times.

6 The Data Analysis Course Module (DACM)

The Data Analysis Course Module (DACM) complements our course and is required for all sections. It runs from September through April. You will dive into lots of real data and research and replicate key findings. There are five modules (A through E) and five online quizzes. The DACM Handbook at <https://q.utoronto.ca/courses/80238/assignments/syllabus> explains everything.

7 Fridays, our TA Support, and our Head TA

What happens on Fridays from 9 - 11am? Fridays are for TA tutorials (usually 50 minutes) and term tests (110 minutes). Of the 19 scheduled 50-minute TA tutorials, 14 are interactive tutorials as part of DACM (see Section 6) and 5 are regular tutorials. The course site and the DACM Handbook give complete calendars that include the rooms (which may differ from ACORN) and meeting times. Term tests rooms will be announced (and are not the regular lecture/tutorial rooms). TA Aid Centres before tests/exams will be posted on Quercus. **Our Head TA is Aly Somani** (aly.somani@mail.utoronto.ca). Aly manages our TA team and Quercus quizzes. He also handles any remark requests for term tests.

8 Required Readings & Homework

The course site gives readings and homework for each class. *Complete readings before class.* The textbook highlights important points with boxes (sometimes in the margins). Take the boxes seriously, including “Just Checking.” Chapter openers and closers such as “What Can Go Wrong?” are always part of the required reading. Consider our textbook authors as co-instructors. Complete homework soon after each lecture.

9 Learning Objectives: Expected Depth of Understanding

- (1) Translate between plain English and statistical terms and concepts: identify key information regardless of wording and distinguish incorrect statements from correct ones
- (2) Select and apply a suitable quantitative approach to a new situation while making your reasoning clear: may require sentences, precise statements of hypotheses, equations, calculations, fully-labeled graphs, diagrams
- (3) Proficiently read output from various statistical software packages including STATA
- (4) Use Excel to analyze data and replicate published results
- (5) Correctly interpret quantitative results for a non-technical or technical audience
- (6) Draw valid statistical conclusions and steer clear of common pitfalls
- (7) Explain what would change if a researcher made different choices or the data changed
- (8) Identify the underlying assumptions in quantitative analyses and figure out how violations affect conclusions and interpretations
- (9) Read and critically evaluate analyses without being dazzled by data, methods or jargon
- (10) Effectively apply course concepts to a wide range of contexts from popular press articles to papers in peer-reviewed academic journals
- (11) Assess available data or propose a data collection plan to address a research question
- (12) Craft concise, clear, and coherent written arguments that *directly* answer asked questions

Construct *full* replies for homework and old tests/exams in test-like conditions. If you cannot solve a question after a sustained effort, turn to your notes, book, and homeworks. Only as a *last resort*, ask a person or look at the solutions. Browsing solutions (or peeking) undermines your study and robs you of practice for a test/exam. Use solutions to *grade* your own answers.

Topics addressed in lectures, homework, required readings, and DACM are testable. If a concept appears in multiple venues, that signals high importance. Test questions are inspired by our course materials (homeworks, lectures, Quercus quizzes, DACM, readings, etc.). Work with old tests to hone your test-taking skills and assess the required depth of understanding.

10 Economics Study Centre: Open Daily, 150 St George

The Economics Study Centre supports ECO220Y. Peer mentors are undergraduates who have done very well in their ECO courses. On the course site I will alert you to specific peer mentors that took ECO220Y with me. For in-depth questions, use our course TAs.

11 Marking Scheme

The table below shows how course grades are calculated. The five term tests and the final exam are planned to be open-ended questions. **For all term tests and the exam, bring your TCard, pencils, erasers, and a non-programmable calculator.** A mark of zero is recorded for any missed test. Test #5 is an open make-up test: you do not need to ask permission to write it and it can replace your *one* lowest test mark. See Section 11.4 for more on missed work. All five sections of ECO220Y1Y write the same cumulative final exam. For some tests and the final exam, one or more questions (possibly with multiple parts) will require written answers where you interpret and assess quantitative results (e.g. tables, figures, STATA output, etc.). You may have extra background reading and study materials before tests and the exam. You will be given aid sheets: formulas and relevant statistical tables. The aid sheets for the entire course are posted http://homes.chass.utoronto.ca/~murdockj/eco220/AS220_2018_19.pdf: bring a copy and a calculator to classes and TA tutorials. iClickers and Quercus quizzes require weekly participation to lead you towards successful study strategies. Section 6 explains DACM.

Assessment	Weight	Length	Due Dates
Test #1	10 %	110 min.	Friday, Oct. 5, 9:10 - 11am
Test #2	12 %	110 min.	Friday, Nov. 16, 9:10 - 11am
Test #3	12 %	110 min.	Friday, Jan. 18, 9:10 - 11am
Test #4	12 %	110 min.	Friday, Mar. 8, 9:10 - 11am
Test #5 (Open make-up)	–	110 min.	Friday, Apr. 5, 9:10 - 11am
iClicker participation	5 %	–	Sept. 18 – Apr. 3
Quercus quizzes	9 %	–	Sept. 17 – Mar. 25
DACM (five online quizzes)	12 %	–	Sept. 26, Oct. 31, Jan. 30, Feb. 27, Apr. 3
Final exam	28 %	3 hrs.	Apr. 6 - 30, TBA by A&S

Why is there so much term work? In ECO220Y each new concept requires a deep understanding of previous ones. Statistics is learned by doing it and seeking feedback. Only a fraction of your efforts can be graded by us: you are expected to grade yourself against posted solutions for regular homework and old tests/exams. Graded assessments ask you to *do* statistics: make sure that your practice time is focused on *doing* rather than passively reviewing and reading.

11.1 iClicker Class Participation: During All Lectures

iClicker questions encourage you to prepare for class, talk about statistics, and identify misunderstandings. Complete readings before class. Like any class participation, quality matters. Correct iClicker responses earn full marks. Incorrect answers earn partial marks. Each unanswered question earns 0 marks. Point values can vary by question. **You may attend L0201, L0301 or L0401: your iClicker WILL work.**¹ It is your responsibility to: correctly register your iClicker, bring it to class, arrive on time, and stay for the entire class. You may collaborate with your classmates: in fact, you are encouraged to.

¹If you attend the same lecture more than once, only the first counts. Friday TA tutorials do not involve iClickers.

Every lecture, except Lecture 1, counts for marks. Lecture 24 serves as make-up and can replace up to two weeks of lower iClicker scores. (If you do worse, it will not count against you.) At the end of the course, I will post your overall iClicker mark on Quercus.

You may buy a used iClicker, borrow an iClicker or share an iClicker with anyone that is *not* currently taking ECO220 with Prof. Murdock. You must use an iClicker *remote*: iClicker REEF is *not* permitted. *Everyone* must register: go to our Quercus site and click “i>clicker registration” on the left tool bar. If your iClicker’s remote ID is no longer legible, see me before or after class (we can use my iClicker base station to read your remote’s signal and recover its ID). If obtaining an iClicker remote is a financial hardship, please see me in office hours right away (I *can* help you).

A green light illuminates on your iClicker remote when your response is received by an iClicker base: make sure to vote only while voting is active in our class. We use frequency AA. A red light (or no light) indicates a problem. The *last* answer you press (while voting is still active) is graded. If you forget your iClicker, I usually bring a backup.² ***Nearly all strange remote behavior can be fixed by replacing ALL batteries with brand new ones.***

How can I check if I am earning marks with my iClicker? There are TWO separate requirements: (1) attend class, answer while voting is active, and get a green light and (2) register. Check (1) during class. To check (2), click “i>clicker registration” in Quercus. Note: Once you register, you *will* get credit for *all* earlier participation (i.e. even before you had registered).

You may only enter responses yourself using your own properly registered iClicker. Cheating on any question jeopardizes the entire iClicker participation mark (5 percent of the course grade). All cases will be reported to the Economics Department and to the Office of Student Academic Integrity. A student that “helps” by operating someone else’s remote can expect an equally harsh penalty.

11.2 Weekly Quercus Quizzes

Quercus quizzes help you keep up with our course *every week*. Questions are planned to be short-answer: e.g. you type an exact numeric answer. Quercus quiz questions typically require more calculations than the iClicker questions in class. Like the iClicker, reasonable collaboration is allowed. If you are wondering what *reasonable collaboration* is, see page 5 of the DACM Handbook: the DACM online quizzes also allow reasonable collaboration. Your questions may vary from others so only real collaboration (not copying) is helpful. Prior to starting each quiz, make sure you have completed the assigned readings and homework for the most recent lecture. Also, spend about 10 minutes editing the notes you took in class that week. Make sure your calculator, aid sheets, notes, textbook, and homeworks are handy before starting.

Quercus quizzes become active Fridays at noon. You have until 6:00pm on Monday, which is 3.25 calendar days, to complete it. You must submit your completed quiz *before* the deadline. There are 18 Quercus quizzes in total: the first is due September 17th and the last is due March 25th. (There

²Available first-come, first-serve if you have not made this request before. See me and bring your TCard.

are 24 weeks of classes, but we give you some breaks for heavy DACM weeks and for Thanksgiving.) ***Once you begin a Quercus quiz, you typically have a maximum of 60 minutes to finish.*** The last Quercus quiz, which opens Friday, Mar. 22 at noon and is due at 6:00pm on Monday, Mar. 25, is a make-up. The make-up, which may be longer than a usual quiz, may replace up to two of your lowest Quercus quiz marks (including 0's). ***However, beyond the make-up quiz, there are no further accommodations for failing to submit a properly completed quiz before the due date.*** Excuses such as lateness, technical difficulties (browser problem, power outage, laptop malfunction, software issue, etc.), forgetting about it, typing errors, improper rounding, failing to type your answers in the requested format, or unexpected interruptions after starting the quiz, will not be entertained. Start each Quercus quiz well before the deadline and when you have the uninterrupted time needed to finish it.

How can I see my results for each Quercus quiz? After the due date *and* after marking is complete, you can see the questions and your answers in Quercus.

11.3 Weekly Participation: Only a Fraction of Your Weekly Work

You should average at least 8 hours per week on our course.³ Each week, spending 110 minutes participating in lecture, 50 minutes participating in TA tutorials, and about 60 minutes completing Quercus quizzes or DACM tests gets you less than halfway there. The remaining time should be spent primarily on actively solving problems (regular homework and old test/exam questions when reviewing) and working with the readings. Most of your preparatory work will be graded only indirectly (in other words, in tests and exams).

Weekly participation creates learning experiences that help you identify tricky areas needing more study. Hence, rather than feel discouraged about getting a Quercus quiz or iClicker question incorrect, use this feedback to address weaknesses before tests and exams. Even if weekly participation does not directly help your grade, it should *indirectly* help by causing higher test and exam marks.

11.4 Missed Term Work

You are expected to complete work as scheduled in Section 11. The marking scheme already includes multiple accommodations for missed term work.⁴ ***Test #5 (open make-up) accommodates students that cannot write one term test due to illness, injury, personal/family problem/conflict, religious reasons, or extracurricular conflict.*** It also accommodates students who write a test in difficult circumstances. (Note: If you are late for a test, you are expected to show up late and see me.) An open make-up acknowledges the continuous space of reasons for missing or doing poorly on a test, where most are hard to credibly document or are personal. The open make-up puts the responsibility on you to manage your time and life to succeed in the course. You do not need to provide me medical documentation or reasons for missing one term test. Test #5 is open to anyone in the course who wishes to take it for any reason (including as a motivation

³During the regular academic year a full-time student takes 5 courses per term. Presuming full-time means at least 40 hours per week, that is 8 hours per course per week.

⁴This section applies to missed *term work*. Any accommodation for the *final examination* requires a student to formally petition A&S: see <http://www.artsci.utoronto.ca/current/petitions/>.

to study the final part of the course in preparation for the final exam). If you completed Tests #1 – #4, writing (or not writing) Test #5 is your choice. (Also, if you do worse on Test #5 than Tests #1 – #4, it does not override your higher earlier marks.) For missed iClicker participation or Quercus quizzes: Sections 11.1 and 11.2 explain the make-ups for each.

Accommodations for missing *more work* than addressed in the previous paragraph (i.e. missing more than one term test and/or more than two weeks of Quercus quizzes and iClicker) are *extremely limited*: (1) an *ongoing and substantial* injury, illness, or personal/family problem *seriously affecting* the student’s ability to complete term work across all courses over an *extended period of time* where the student’s College Registrar writes to each professor after meeting with the student or (2) *more than one* conflict *not* related to injury, illness or personal/family problems where I am contacted by the student *very far in advance* (e.g. an athlete who notifies me in September of international competitions on Jan. 18 and Mar. 8). In these *limited situations*, I will consider whether accommodations can still meet all course requirements or whether the student must be advised to drop the course and retake it when able to complete the required work.⁵

11.5 Grading

Your percentage mark on a test, exam or other term work reflects any adjustments to the raw scores such as adding points to everyone’s score or not counting an unduly difficult/confusing question. Your mark, not your raw score, best reflects the quality of your submitted work. ***For partial credit, part of your answer must be clearly correct, directly relevant to the question asked, and not contradicted by other parts of your answer.***

11.5.1 Remark Requests

Remark requests must: (1) Be made in an E-MAIL to our Head TA (aly.somani@mail.utoronto.ca), subject “remark request,” that includes the *link* to your paper in Crowdmark (*no* attachments), (2) Explain WHY more points are justified for each disputed question, (3) Be sent within TWO WEEKS of the work’s return to the class. The entire submission may be remarked: your mark can go up, down, or remain unchanged. Any remark requests are batch-processed *after* the two-week deadline, not immediately. We will *not* consider any remark requests made after the two-week deadline.

12 Communication

We use Quercus <https://q.utoronto.ca/courses/51262/assignments/syllabus>. We use Piazza (<https://piazza.com/utoronto.ca/fall2018/eco220ymurdock/home>) to facilitate communication. 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.*** Piazza is a complement to face-to-face interactions in office hours, class, TA tutorials/aid centres, and study groups. ***Piazza is a substitute for e-mail.***

⁵Any extraordinary accommodations are at my discretion and may involve a cumulative open-ended make-up test, re-weighting, and/or may be contingent on performance on other term work and the final exam.

For private matters or to notify me of a general problem/issue affecting our course, my e-mail is jennifer.murdock@utoronto.ca. For e-mails asking for a reply, if I can answer briefly *without* explaining course content or revealing something of general interest, then I will reply within three business days. ***For any question that would interest other people (e.g. a question about an upcoming test, a tricky course concept, etc.), you must post on Piazza if you are hoping for an electronic reply.***

13 Messages to you from recent ECO220Y graduates

- *Practice, practice, practice. Swimming in the ocean of problems really helps.*
- *Do the readings/homework/Quercus quizzes on time no matter how busy you are.*
- *Print out lecture slides in advance and make notes on these rather than writing everything by hand.*
- *Do more practice problems and look over the solutions only AFTER you try to do the problem.*
- *Focus more on the writing side of things (how to explain answers, analysis, etc.), mostly through dedicating more time to practice.*
- *Focus on doing the textbook chapter questions rather than taking study notes of each chapter.*
- *Do ALL of the homework questions rather than just a selected few, before the weekly quizzes.*
- *Before each term test, review all the Quercus quiz questions you did wrong.*
- *Missing a lecture is not a good idea in this course!*
- *DACM allowed me to learn how to use Excel and also it reinforced course materials and concepts.*
- *The DACM module, though I did not get great marks, still prepares me to have a better understanding of the content.*
- *The required readings helped me prepare. In terms of the lectures, I had already gained some background knowledge to prevent me from being lost during the lecture. The readings were also a great reference after lectures if I had forgotten an important concept.*
- *Be prepared to work hard. It does require a lot of time to study, breaking it up into chunks during the week helps. Do the chapter questions that are specific to each section (20.1, 20.2, 20.3 etc) as you read each section. This will help you test your knowledge as you read to make sure you have understood that section. Do the required questions!*
- *ECO study centre is really helpful.*
- *Tutorials were great. Piazza was a fast option as well.*
- *The quizzes and iclicker helped a lot even if they were not always easy. I'd say the course content is pretty tough and requires a lot of work, but it was definitely worth it.*

14 Topics and Required Readings

Required readings, for all sections of ECO220Y1Y, include selections from our textbook and separate supplements. Also, the aid sheets for the entire course are posted: http://homes.chass.utoronto.ca/~murdockj/eco220/AS220_2018_19.pdf. Chapter numbers reference our textbook and all sections are required, with any exceptions noted. We finish through Chapter 11 in the Fall term and the rest in the Winter term.

- “Prerequisite Review with a Diagnostic Quiz” pp. 1 - 28 (http://homes.chass.utoronto.ca/~murdockj/eco220/PREQ_REV_EC0220.pdf)
- “The DACM Handbook for ECO220Y1Y” pp. 1 - 174 (on the DACM Quercus site)
- Chapter 1: “An Introduction to Statistics”
- Chapter 2: “Data”
- Chapter 3: “Surveys and Sampling”
- Chapter 4: “Displaying and Describing Categorical Data”
- Chapter 5: “Displaying and Describing Quantitative Data”
- Chapter 6: “Scatterplots, Association, and Correlation”
- SW11: Chapter 1, “Economic Questions and Data” pp. 1 - 13 from *Introduction to Econometrics, Third Ed.*, 2011, by James H. Stock and Mark W. Watson
- Chapter 7: “Introduction to Linear Regression”
- “Logarithms in Regression Analysis with Asiaphoria” pp. 1 - 27 (http://homes.chass.utoronto.ca/~murdockj/eco220/logarithms_in_regression_analysis_with_Asiaphoria.pdf)
- Chapter 8: “Randomness and Probability”
- Chapter 9: “Random Variables and Probability Distributions” (Excluding Sections 9.7 “The Poisson Distribution” and 9.12 “The Exponential Distribution”)
- “The Normal Table: Read it, Use it” pp. 1 - 7 (http://homes.chass.utoronto.ca/~murdockj/eco220/normal_table_read_it_use_it.pdf)
- Chapter 10: “Sampling Distributions”
- Chapter 11: “Confidence Intervals for Proportions”
- Chapter 12: “Testing Hypotheses About Proportions”
- Chapter 13: “Confidence Intervals and Hypothesis Tests for Means”
- Chapter 14: “Comparing Two Means”
- Chapter 18: “Inference for Regression”
- Chapter 19: “Understanding Regression Residuals”
- Chapter 20: “Multiple Regression”
- Chapter 21: “Building Multiple Regression Models” with *emphasis* on Sections 21.1 “Indicator (or Dummy) Variables” and 21.2 “Adjusting for Different Slopes – Interaction Terms,” and the online-only section “Quadratics”

Make sure to visit the Readings page in Quercus. Also, an optional (and recommended) reading, sometimes referenced in lectures, is “Belief in the Law of Small Numbers” by Amos Tversky and Daniel Kahneman published in 1971 in *Psychological Bulletin* (TK71).⁶

⁶This is an academic journal article co-authored by a winner of the Nobel prize in economics.