

# Intro to Data Analysis & Applied Econometrics

ECO220Y1Y, 2019/20, Prof. Murdock, Economics Dept, U of T

## 1 Key Course Information

**Sections:** Days, meeting times, classrooms (for switching sections, see Section 4)

**L0201:** Wed 11-1, SS 2117; Fri 9-11 (For Fridays, see Section 5)

**L0301:** Wed 2-4, MP 102; Fri 9-11 (For Fridays, see Section 5)

**L0401:** Tues 2-4, SS 2118; Fri 9-11 (For Fridays, see Section 5)

**Course site:** <https://q.utoronto.ca/courses/116455>

**Piazza:** <https://piazza.com/utoronto.ca/fall2019/eco220y1y>, see Section 8

**Office hours:** 150 St George, Room 312; Tues 12-1 & 4:30-5:30 (any rescheduling is announced)

**Head TA:** Aly Somani

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

## 2 Required Readings, Textbook, & iClicker Remote

Our course includes significant required readings, which Section 12 lists. These include important supplements available to you (at no charge) on Quercus. Also, we use the 2017 *Business Statistics, Third Canadian Edition* by Sharpe, De Veaux, Velleman, and Wright, available at the [U of T Bookstore](#). Used copies from 2017/18, 2018/19, Summers 2018 and 2019 are around. The Economics Study Centre has it. Old editions are inconvenient. For MyStatLab (not required) go to <https://registration.mypearson.com/> using course ID instructo69137.

Also, you need an iClicker remote (used or new): see Section 11.2.1.

## 3 Prerequisites, Academic Integrity, Accessibility & Help

An administrator will remove anyone missing [prerequisites](#). Note that [I cannot waive prerequisites](#). For accessibility concerns visit <http://www.studentlife.utoronto.ca/as>. You are expected to uphold [your academic integrity](#) (click the link to make sure you know what this means and entails).

If you have trouble, seek help right away from us, your College Registrar, and/or the [Academic Success Centre](#). *For any issues that extend beyond our course, contact your College Registrar immediately.*

## 4 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.

## 5 Fridays, our TA Support, and our Head TA

What happens Fridays from 9 - 11am? Of the 24 Fridays, 5 are for tests. The remaining 19 are for sessions with our TAs. There are 14 interactive TA tutorials as part of DACM (see Section 6) from 9:50 - 11am and 3 “regular” TA tutorials from 10:10 - 11am. Also, we use some Friday morning sessions for TA Aid Centres. Also, we offer TA Aid Centres at a variety of times (not just Friday mornings) before tests/exams (announced on Quercus). The course site and the DACM Handbook give detailed calendars. **Our Head TA is Aly Somani ([aly.somani@mail.utoronto.ca](mailto:aly.somani@mail.utoronto.ca))**. Aly manages our TA team and Quercus quizzes. He also handles any remark requests for term tests.

## 6 The Data Analysis Course Module (DACM)

The Data Analysis Course Module (DACM) is required for all sections. It runs from September through April. You will dive into real data and research and replicate key findings. There are five modules (A through E) and five online quizzes. DACM appears as another course for you on Quercus: that site has all DACM materials, including the DACM Handbook and DACM syllabus.

## 7 Economics Study Centre: Open Daily, 150 St George

The Economics Study Centre supports ECO220Y. Learning assistants (LAs) are undergraduates who have done very well in their ECO courses. On Quercus I will alert you to specific LAs that took ECO220Y with me. For in-depth questions, use our course TAs.

## 8 Communication

We use Piazza (<https://piazza.com/utoronto.ca/fall2019/eco220y1y/home>) to facilitate communication. The TAs and I work to ensure proper usage, flag some postings, and possibly answer some questions. ***The emphasis is on student-to-student Q&A.*** It is a complement to face-to-face interactions in office hours, class, TA tutorials/aid centres, etc. ***Piazza is a substitute for e-mail.*** For private matters or to notify me of an issue affecting our course (e.g. broken link on our course site, letter of reference, etc.), my e-mail is [jennifer.murdock@utoronto.ca](mailto:jennifer.murdock@utoronto.ca). I will not explain course content nor will I reveal anything of general interest via a private e-mail exchange. ***For any question that would interest other people (e.g. upcoming test coverage, quiz solution, etc.), you must post on Piazza if you are hoping for an electronic reply.***

## 9 Required Readings & Homework

The course site gives readings and homework for each class. ***Complete readings before class.*** As you may expect, all supplements prepared specifically for our course are important requirements. Next are a few pointers about our required textbook. It 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.

## 10 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

## 11 Marking Scheme

Assessment	Weight	Length	Due Date(s)	Notes
Test #1	11 %	110 min.	Fri., Oct. 11, 9*-11am	Plus reflection†
Test #2	13 %	110 min.	Fri., Nov. 15, 9*-11am	Plus reflection†
Test #3	13 %	110 min.	Fri., Jan. 17, 9*-11am	Plus reflection†
Test #4	13 %	110 min.	Fri., Mar. 6, 9*-11am	Plus reflection†
Test #5: Open make-up		110 min.	Fri., Apr. 3, 9*-11am	Plus reflection†
Graded participation	12 %	–	Sept. 16 – Apr. 3	iClicker & Quercus quizzes
DACM (five online quizzes)	10 %	–	Sept. 27, Nov. 12, Jan. 29, Feb. 28, Apr. 1	See DACM (on <a href="#">Quercus</a> )
Final exam	28 %	3 hrs.	Apr. 6 - 25, <a href="#">TBA by A&amp;S</a>	Cumulative

\* Make sure to arrive to your assigned test room by 9:00am for a prompt start by 9:10am.

† For more on the reflection requirements due *after* each test, see Section 11.1.1.

**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 Tests #1 to #5 and the Final Exam

For all term tests and the exam, bring your TCard and a non-programmable calculator. Also bring pencils and erasers: we use Crowdmark. 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.<sup>1</sup> For Tests #1 through #5 the expected focus (coverage) is already posted on Quercus in the Fall and Winter Schedules next to each test (and notice that Test #5 is not cumulative like the final exam). See Section 11.4 for more on missed work. All five sections of ECO220Y1Y write the same *cumulative* final exam. In addition to quantitative, analytical, and graphical questions, some test and exam questions 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/Aid\\_Sheets\\_ECO220Y1Y.pdf](http://homes.chass.utoronto.ca/~murdockj/eco220/Aid_Sheets_ECO220Y1Y.pdf).

***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. 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.

### 11.1.1 Test Reflections

After each of the five tests you are assigned a reflection that you submit via Crowdmark. Each is out of 5 points. Tests each have 95 points available and your mark is the sum of the two (i.e. out of 100 points). (You must write the test to complete the associated reflection.) Each test reflection will either be assigned shortly after the test or when your marked test is returned (via Crowdmark). Each is due within three business days. One point (of the 5 possible points) is deducted each day (or part of a day) late and it will not be accepted more than 2 days late (0 points earned).

## 11.2 Graded Participation

Graded participation is a 50-50 combination of iClicker class participation (see Section 11.2.1) and Quercus quizzes (see Section 11.2.2).<sup>2</sup> These create learning experiences that help you identify tricky areas needing more study. Hence, rather than feel discouraged about getting an iClicker or Quercus quiz question incorrect, use it to address weaknesses before tests and exams. Even if

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<sup>1</sup>We will replace the one test mark that *most* improves your grade. This deals with the differing weights of tests.

<sup>2</sup>There *may* be some small and limited opportunities for bonus participation marks (e.g. attending a guest lecture).

graded participation does not directly help your grade, it should *indirectly* help by causing higher test and exam marks.

### 11.2.1 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.***<sup>3</sup> You are encouraged to talk with your classmates.

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.<sup>4</sup> ***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 risks the entire iClicker mark (6 percent of the course grade). All suspected infractions will be reported. A student that “helps” by operating someone else’s remote can expect an equally harsh penalty.

### 11.2.2 Quercus Quizzes

Quercus quizzes help you keep up with our course *each week*. Questions are 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. ***What is***

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<sup>3</sup>If you attend the same lecture more than once, only the first counts. Friday TA tutorials do not involve iClickers.

<sup>4</sup>Available first-come, first-serve if you have not made this request before. See me and bring your TCard.

*reasonable collaboration?* Some students form study groups with current classmates and meet in a physical location to prepare for and complete the online quizzes. However, not everything is OK and we will report any suspected academic infractions.

- You may *NOT* have anyone who is not currently enrolled in ECO220Y1Y help you with any of your online quizzes. Tutors (paid or unpaid), friends, family, or anyone outside our current class *cannot* help you with your online quizzes.
- You may *NOT* have anyone else solve any of your online quiz questions for you.
- You may *NOT* post or electronically distribute your quiz questions during the quiz window.

The last bullet clearly prohibits posting any of your quiz questions on platforms such as Facebook or other methods of electronic distribution. ***Taking a screen shot or photo of your quiz or copying-and-pasting it are academic infractions.***<sup>5</sup> After the quiz due date, if you have questions you MAY use Piazza and you MAY include a copy of the question. Remember that all course materials, including quizzes, are copyright protected and you may not distribute them outside of platforms officially sponsored by our course: Quercus and Piazza. ***If you plan to collaborate using any method other than meeting your classmates face-to-face, check with us BEFORE doing it.*** Also, collaboration is not required: many prefer to work alone for various reasons (to test themselves, find it easier to concentrate, scheduling challenges, etc.).

Quercus quizzes become active Fridays at noon with a 6:00pm Monday due date. You must submit your completed quiz *before* the deadline. There are 18 Quercus quizzes in total: the first is due September 16th and the last is due March 23rd. (There are 24 weeks of classes, but there are some breaks for DACM 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. 20 at noon and is due at 6:00pm on Monday, Mar. 23, is a make-up. The make-up 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, 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 quiz well before the deadline and when you have the uninterrupted time needed to finish it. ***How can I see my marked quiz?*** After the due date *and* after marking is complete, you can see the questions and your answers in Quercus.

### 11.3 Workload

You should expect to spend about 8 hours per week on our course.<sup>6</sup> Spend most of your independent study time on actively solving problems (regular homework and old test/exam questions when reviewing) and working with the readings. One of my all-time favorite student quotes from course evaluations is: “Practice, practice, practice. Swimming in the ocean of problems really helps.”

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<sup>5</sup>Why is electronic distribution prohibited but face-to-face collaboration allowed? It comes back to *reasonable collaboration* with your classmates. A platform may include people not even in our course. Also, posting can support things other than collaboration: for example, broadcasting your quiz for anyone to see is not *collaboration*.

<sup>6</sup>During 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.

## 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.<sup>7</sup> ***Test #5, an 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. You do not need to provide medical documentation or reasons for missing one term test. Test #5 is open: you are welcome. If you completed Tests #1 – #4, writing (or not writing) Test #5 is your choice. (If you do worse on Test #5 than Tests #1 – #4, you keep your earlier marks.) For missed iClicker participation or Quercus quizzes: Sections 11.2.1 and 11.2.2 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. 17 and Mar. 6). 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.<sup>8</sup>

## 11.5 Grading

Marks reflect 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](mailto: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. However, these are given a fair look: TAs are *not* seeking to penalize those who believe that part of their answer may have been misread or overlooked by the marking TA. 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.

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<sup>7</sup>This section applies to missed *term work*. Any accommodation for the *final examination* requires a student to formally petition A&S: see <https://www.artsci.utoronto.ca/current/faculty-registrar/petitions>.

<sup>8</sup>Any extraordinary accommodations are at my discretion and may involve a cumulative make-up test, re-weighting, and/or may be contingent on performance on other term work and the final exam.

## 12 Topics and Required Readings (Common for All Sections)

Required readings include extensive supplements created specifically for our course (marked in boldface below and available on Quercus) and our textbook. Also, the [aid sheets for the entire course](#) are posted. Chapter numbers reference our textbook and any exclusions are noted. We finish through Chapter 11 in the Fall term and the rest in the Winter term.

- **“Quiz and Prerequisite Review for ECO220Y1, 2019/20”** pages 1 - 32
- **“The DACM Handbook for ECO220Y1Y, 2019/20”** pages 1 - 178: see 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 for ECO220Y1, 2019/20”** pages 1 - 28
- 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”)
- **“Normal Table: Read it, Use it for ECO220Y1, 2019/20”** pages 1 - 7
- 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” *emphasizing* Sections 21.1 “Indicator (or Dummy) Variables,” 21.2 “Adjusting for Different Slopes – Interaction Terms,” and “Quadratics” (online)

***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**).<sup>9</sup>

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<sup>9</sup>This is an academic journal article co-authored by a winner of the Nobel prize in economics.