ECO220Y1Y, Introduction to Data Analysis and Applied Econometrics

Economics Department, University of Toronto, with Prof. Murdock, 2022/23

1 Welcome and Intro to ECO220Y1Y

Welcome to my favorite course! You have the chance to gain essential analysis and exposition skills – ours is a practical course – and learn about what many economists really do. If you're curious about how to analyze data, which kinds of questions researchers ask in a variety of fields of economics, and how to present and interpret results, then this is the course for you. While you'll need to hone your preexisting reading, writing, and quantitative analysis skills and while some of the new skills are challenging to acquire and require substantial practice, our TAs and I are your allies. Your classmates are also your allies: make an extra effort to socialize and form new connections. Working together we can be successful.

Our course is coordinated across the six lecture sections. Sections LEC0101, LEC0201, and LEC0301 share this syllabus and our Quercus site (https://q.utoronto.ca/courses/277426). All six sections write a common final exam and participate in the Data Analysis Course Module (DACM) where you dive into real data and research and replicate key findings.

2 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, 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 compelling, concise, precise, clear, and coherent written arguments

3 For Everyone: Accessibility, Absences, and Help

Our course design anticipates you may face challenges at some point. Accommodations are part of the design of the course. If you require further accommodation, register with both https://studentlife.utoronto.ca/department/accessibility-services/ and Accommodated Testing Services (ATS): https://lsm.utoronto.ca/ats/. Everyone may use the Academic Success Centre.

You must declare ALL absences on ACORN: http://www.illnessverification.utoronto.ca.

For complex/challenging situations, you must ***work with your College Registrar***. They give guidance and, when appropriate, contact your professors for you while guarding your privacy. This requires *working closely with* your College Registrar, and not merely having them restate your requests to your professors. For significant challenges lasting over a week, work with your College Registrar immediately. Also, there are limits to what we can accommodate: in some cases the only viable option is to drop our course.

4 Academic Integrity

Please do not create a horrible situation for yourself, your classmates, our TAs, and me. Even if you are suffering stress, under extreme pressure, far behind, facing failure, and/or lacking self-confidence, cheating is not worth it. Infractions can take many, many agonizing months to resolve and sanctions can be severe. We must all work together supporting the integrity of our course and U of T. Read this link and sublinks https://www.artsci.utoronto.ca/current/academic-advising-and-support/student-academic-integrity.

5 Required Readings and Textbook

Section 16 lists the readings and Quercus gives each unit's assignment. For our required textbook – *2020 Business Statistics, Fourth Canadian Edition* by Sharpe, De Veaux, Velleman, and Wright – you may buy:

- the eText directly from Pearson for $49.99 (ISBN 9780136964032),
- the print textbook from Pearson that also has an access code for the eText for $189.99 (ISBN 9780136726548),
  - Note that MyLab Statistics is *neither* required nor recommended: we do not use it.
- a used copy of the *Fourth Canadian Edition*. Older editions or the US / international editions are not good substitutes: they are missing topics and do not match the numbering in our book. However, the *Third Canadian Edition* is an acceptable substitute: only some end-of-chapter exercises differ.

Our textbook highlights important points with boxes (sometimes in the margins): take the boxes seriously, including "Just Checking." Also, don't skip "What Can Go Wrong?" See Quercus for more on readings.

6 Prerequisites

An administrator will remove anyone missing prerequisites. Note that I cannot waive prerequisites.

7 Required Lecture Videos

For each unit, required videos and slides are on Quercus in the Friday cells. Complete readings before the videos. Watch the lecture videos before the workshop on that unit. (See Section 11 for the weekly routine.)

8 Tuesdays / Wednesdays: Workshops

Tuesdays (LEC0101 and LEC0201) and Wednesdays (LEC0301) we meet for required workshops. These give you a chance to practice your skills, collaborate with others, and work with mini case studies. Complete the unit's reading and lecture video before your workshop. Expect to be active in solving questions, writing, and interacting with your classmates and the instructional team. Your preparation and regular and active participation counts towards your participation mark (see Section 12.3). You must attend with your section: do not schedule any conflicts during your two-hour ACORN time slot. See the Workshops page on Quercus for important details about times and dates each week and what you need to bring (e.g. TCard, pencils, erasers, paper, etc.).

9 Fridays: Term Tests, DACM Practicums & TA Tutorials

Every Friday there is either a term test, a DACM practicum, or a TA tutorial *except* on September 9th: instead of meeting, read this syllabus and work on the readings and lecture video for Unit 1 on the Schedule page on Quercus in the cell "Fri, Sep 9." Do not schedule any conflicts on Fridays from 9-11am.

9.1 DACM Practicums

Some weeks have required DACM practicums (50 minutes) in the Friday 9-11am meeting time. These give you a chance to learn practical data analysis skills and to reinforce your understanding of our core course curriculum. Bring your laptop with an up-to-date installation of Microsoft 365 ProPlus. Be prepared to actively work with others. Complete the assigned readings in the DACM Handbook and the DACM companion videos ahead of time. You must attend with your ACORN section in your assigned classroom at the assigned time given in the DACM page on Quercus. Your preparation and regular and active participation counts towards your DACM mark (see Section 12.5).

9.2 TA Tutorials

Some weeks have TA tutorials (50 minutes). In a smaller group, connect with a TA and your classmates. You collaboratively work with course concepts and deepen your working understanding. We offer sections during Fridays 9-11am and other times. On Quercus via People you sign-up for a tutorial section: sign-up opens September 15. Attend only with your tutorial section. If you need to switch sections, you may do so yourself in People so long as there is space in your desired group. Complete the unit's reading and lecture videos *before* your TA tutorial. See the TA tutorials page on Quercus.

10 Ungraded Homework

Each unit has ungraded homework – end-of-chapter textbook exercises and required problems – and solutions on Quercus. (For more on solutions to textbook exercises, see the Readings page on Quercus.)

11 Planned Usual Routine

Quercus shows our estimated schedule as a calendar to visualize our course rhythm. It starts with each unit's materials – readings, lecture slides and videos, ungraded homework, and relevant parts of the DACM Handbook – and then you attend subsequent workshops, tutorials, and/or DACM practicums.

(1) Complete the unit's readings in the textbook, supplements, and/or the DACM Handbook.

(2) Watch the unit's lecture videos (see Section 7) and any DACM companion videos.

(3) Attend your workshop. (See Section 8.)

(4) Complete the ungraded homework. You may also work on this earlier. (See Section 10.)

(5) In weeks without a term test, attend your DACM practicum or your TA tutorial (see Section 9).

12 Course Grades and Marking

Planned Assessment	**Estimated Weight** †	**Estimated Date(s), Time***
Term Test #1 (Section 12.2)	14 % †	Friday, Oct. 28*, 9-11am
Term Test #2 (Section 12.2)	14 % †	Friday, Dec. 2*, 9-11am
Term Test #3 (Section 12.2)	14 % †	Friday, Feb. 10*, 9-11am
Term Test #4 (Section 12.2)	14 % †	Friday, Mar. 31*, 9-11am
Participation (Section 12.3)	10 % †	Sept. 8* to Apr. 10*
DACM (Section 12.5)	10 %	Sep. 16*, Sep. 30*, Oct. 14*, Nov. 25*, Jan. 27*, Mar. 3*, Mar. 17*, Apr. 6*
Final Exam (Section 12.2)	24 % †	TBA by A&S: Apr. 11* to Apr. 28*

† Section 12.1 explains alternate weights. Section 12.11 explains automatic accommodated weights.

* Dates are rough guides to the approximate timing: actual timing may be plus/minus days or weeks.

Quercus will give details, including penalties for lateness, when applicable. Make sure to see Section 15. Normally, students will be required to submit their course essays to the University's plagiarism detection tool for a 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 tool's reference database, where they will be used solely for the purpose of detecting plagiarism. The terms that apply to the University's use of this tool are described on the Centre for Teaching Support & Innovation web site (`https://uoft.me/pdt-faq`).

12.1 Alternate Weights *If* Forced Online

Section 12 presumes that all four term tests and the final exam are in person as planned. Otherwise, alternate weights apply for computing course grades.

- If the final exam cannot be in person it becomes a final assessment and its weight decreases to 20%.
  - If any of the term tests can be held in person, then the 4 percentage point weight reduction of the final exam is evenly redistributed among the in-person term tests. If none of the term tests can be held in person, the weight of participation increases to 14%.
- If the final exam can be in person but any of the term tests could not be in person, then the weight of the final exam increases to 35% and the weight of any term tests not in person are reduced equally.

12.2 Term Tests #1 to #4 and the Final Exam

The aid sheets – formulas and statistical tables – are on Quercus: we give you these during assessments. ***You are responsible for topics in lecture videos, DACM, homework, workshops, required readings, and TA tutorials.*** If a concept appears in multiple venues, that signals high importance. The final exam is cumulative.[1] Work with old tests and exams to hone your 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, turn to your notes, book, and homeworks. Only as a *last resort*, ask a person or look at the solutions. Browsing solutions undermines your study. Use solutions to *grade* your own answers.

12.3 Participation

Workshops are the most significant component of participation. *Quality* matters. Other smaller opportunities may be announced. For activities counting for participation, late submissions are *not* possible. Any negative participation – such as academic integrity concerns, failing to follow instructions, and any behaviors negatively affecting your peers, TAs, and/or me – may lead to a mark of **zero**.

12.4 Participation Mark and Course Grades

You will only learn your participation mark indirectly after your course grade is on ACORN. Given your other known marks, you can deduce your participation mark, which cannot be appealed. Course grades reflect a fair assessment of submitted work and are not subject to negotiation.

12.5 DACM Practicums and DACM Assignments

DACM is worth 10% of your course grade and DACM cases and skills can appear in other assessments. DACM Assignments #1 and #2 are worth 3% and 4%, respectively: you present your analysis of data and no collaboration is allowed. Your participation in DACM practicums is worth 3% (see Section 9).

12.6 Proactively Avoid Problems and Promptly Address Issues

Proactively maintain your devices and software. You must install and keep up-to-date Microsoft 365 ProPlus: we use both Word and Excel. For Zoom, download and regularly update the Zoom Desktop Client: you must use UTORid authentication. Immediately contact The Information Commons Help Desk with any technical issues around your devices, software, Quercus, or connectivity.

12.7 Workload

You should expect to work about 8 hours per week on our course. Here's a direct quote from course evaluations: "Practice, practice, practice. Swimming in the ocean of problems really helps."

12.8 Grading

Marks reflect any adjustments to raw scores such as adding points or not counting an unduly difficult/confusing question. Marks, not raw scores, measure your performance. For partial credit, part of your answer must be correct, directly relevant to the question, and not contradicted elsewhere in your answer.

[1] Why have a *cumulative* final exam? Pedagogically, revisiting earlier material aids learning and long-term retention of skills. Practically, it allows the final to have a higher weight and be an opportunity to rebound.

12.9 Remark Requests

Remark requests must: (1) Be submitted to Remark Test or Remark DACM Assignment, which are MS Forms, (2) Explain WHY more points are justified, (3) Be submitted within TWO WEEKS of the work's return to the class. Your mark may remain unchanged, go up, or go down. These are given a fair look: TAs are *not* seeking to penalize those with genuine marking concerns. Requests are reviewed *after* the two-week deadline, not immediately. We will *not* consider any remark requests after the deadline.

12.10 Missed Work and Accommodations

Complete work as scheduled in Section 12. Any missed work earns a mark of zero. This section explains accommodations for: illness, injury, personal/family problems, religious reasons, extracurricular conflicts, quarantine or travel issues, accessibility concerns, and/or other challenging situations. ***For significant challenges lasting over a week, work with your College Registrar immediately.***

12.10.1 Missing a Term Test

For a missed term test, complete BOTH of these steps.

First Step: Complete Missed Term Test, which is an MS Form. ***It must be submitted AT LEAST ONE HOUR BEFORE THE START TIME.*** It is unacceptable to fail to show up without any advance notice. In extreme circumstances (e.g. being arrested), we may accept a later form. We do NOT wish to see any documents from a doctor or other professional. All questions in the MS form are *required*, including a copy of your Absence Declaration (https://www.artsci.utoronto.ca/faculty-staff/teaching/academic-handbook#fall-winter-2022-23-absence-declaration).

Second Step: Write *all* other tests as scheduled. Write a *cumulative* make-up test. Within three business days of the missed test, you receive an e-mail to your U of T account. Subsequent e-mails may clarify the date, time, and location of the make-up. Your make-up test and MS Form submission are considered for your course grade. There are no accommodations for missing the make-up test.

Accommodations for missing more than one test are *extremely limited*: **(1)** a ***College Registrar*** writes to me after working *extensively* with a student – see Section 3 – and formally requests an accommodation on the student's behalf 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 conflicts with international competitions). 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. Any such extraordinary accommodations are at my discretion and may involve completing work at an alternate time, an oral and/or other assessment, re-weighting, and/or may be contingent on performance on other work.

12.10.2 Automatic Accommodations for Missed Workshops or a DACM Practicum

To accommodate those who cannot attend up to three workshops, we drop the three worst weeks. To accommodate those who cannot attend one DACM practicum, we drop the worst week. Save these for situations entirely outside your control: do not miss for any potentially avoidable reasons. These are *automatic* – please do *not* e-mail – and this also accommodates those who attend but face any challenges negatively affecting their performance.

12.11 Automatic Accommodated Weights for Relatively Poor Performance

Automatic accommodate weights may help if your performance is relatively poor for one test because of any kind of problem or challenge. If we are able to hold all of our term tests and our final exam in person as planned, and if it helps your course grade, we lower the weight on your lowest test to 6% and reweight to the final exam (increase the weight by 8 percentage points). Any questions around your academic integrity for *any* work disqualify you from automatic accommodated weights. If any term tests or the final exam are forced online, then there are no automatic accommodated weights and Section 12.1 applies.

12.12 Rebounding from Failures and Handling Errors and Ambiguity

Even though none of us enjoy them, failures are an expected part of learning and growth. We do *not* mark you as a person or you as a student: we only mark your submitted work. How do you react to a poor mark? Instead of feeling discouraged or frustrated, try reflecting on how that poor mark came to be and what is within your control to change going forward. If you're unsure of the causes, speak with me or your TAs, and especially earlier in the course when there is time to adjust.

Let me share a true story. In my first term in the College of Agriculture and Life Sciences at Cornell, I enrolled in Calc II using my AP credit for Calc I from high school. I found the course challenging and studied many hours. My only activities were studying, working in the dining hall, and the necessities of life (eating, sleeping, etc.). I went to the professor's office hours every week at 8am. I thought the first test went pretty well and then I got my marked paper back. At Cornell, numeric marks had no meaning: everything was curved. I waited for the professor to write the letter grades for each range of marks on the chalk board. He never it made it as low as my mark: I wasn't even close to a D-. I remember walking around campus in a daze and crying behind a building. But then I asked for help. The registrar worked with me to switch me into Calc I. I went to see my new professor to catch up. I ended up with top marks, became a math major, and transferred to a new school. So what is the point of this story? It's not that everything we fail at will ultimately become a great success. Sometimes we need to ask for help and adjust our approach. Sometimes we will ultimately find some measure of success, just not yet.

Practicing economists often fail and there are few "right answers." Many research endeavors have false starts, dead ends, and months of wasted work. There are also well-publicized examples of economists making a small coding error that means their headline empirical results are wrong. Further, people entering their second year of university often think in dualistic terms. Dual means two and symptoms are thinking in terms of black/white or right/wrong. Almost all empirical results in economics are subject to some debate: there is no one correct answer (even if many answers are definitely incorrect). While our course will often be on firm ground, we do venture into real research where we have to deal with shades of grey and ambiguity.

To support you, we include automatic accommodations in the design of the marking scheme: see Section 12.11. However, we cannot offer individual opportunities to rebound. In other words, we cannot change the marking scheme or offer bonus assignments upon request. While some may perceive this as being "strict," my goal is to be fair and kind. It is not fair to make exceptions only for those who contact me: many are not comfortable asking. Further, I cannot build fair individual-level marking schemes in a large course. Finally, in many cases where extraordinary accommodations would be needed, the ultimate outcome is failing or dropping the course. It is not kind to carry on without a realistic chance of an acceptable outcome.

13 Student Hours, Study Centre, RSGs, Ed Discussion, and E-mail

Use student hours, which are hosted by our TAs and by Prof. Murdock, for your questions. TA hours may have a theme (e.g. help with DACM), and these focus on questions about course curriculum and skills. You may attend with Prof. Murdock for either questions about course curriculum and skills or for personal matters. See the Student Hours page on Quercus for details and the latest schedule of student hours.

Visit the Economics Study Centre! On Quercus we alert you to the Learning Assistants who have taken ECO220Y1Y themselves last year or two years ago. Also, check out Recognized Study Groups, which can help you connect with more people currently in our course and stay on track with your study plans.

If you are hoping for an *electronic* reply to a question that would interest others – e.g. about course content or an upcoming assessment – post on Ed Discussion. We use moderation: posts must be approved before visible to the class. We usually check it once a day on business days, but *not* evenings, weekends, or when U of T is closed. Access Ed Discussion from our Quercus site (left toolbar).

We will not reply to e-mails with questions about the course curriculum, skills, or assessments: you must use Ed Discussion for electronic communication. For personal matters, either use student hours with Prof. Murdock or, if necessary, e-mail eco220+murdock@utoronto.ca, but you *must* use the appropriate MS Forms, *not* e-mail, for any remark requests (see Section 12.9) or missed work (see Section 12.10). For personal matters related to DACM, e-mail eco220+dacm@utoronto.ca, but you *must* use the appropriate MS Form, *not* e-mail, for any DACM remark requests (see Section 12.9).

14 Should You Pay for Tutoring or Study Services?

The supports and resources necessary for your success are already paid for by your tuition (with the exception of our textbook), including our TAs and me and the many resources on Quercus. Also remember the Economics Study Centre.

Be careful with paid services with marketing approaches that may prey on your worst fears or may promise top marks with less work: real learning is hard and requires a sustained effort. Also, outside services have contributed to students being sanctioned for academic infractions. In contrast, services provided by U of T are safe for you to use. Also, please be aware that in May of 2022 U of T sued Easy EDU.

15 Anticipating Challenges, Changes, and Disruptions

Make your best efforts starting immediately and on every assessment and every participation opportunity. Do not count on future work to achieve the course grade you are hoping for. Beyond challenges that may affect you, all dates and details in this syllabus are subject to adjustment should any situations arise that disrupt our original plans for the course. Make sure to review the alternate weights in Section 12.1 so that you understand what will happen to the relative weights of assessments in some possible contingencies. Also, the planned format of assessments and activities may change and the weights may need to change in unexpected ways. As always, you are expected to keep a sharp eye on our Quercus site for announcements and information. Be prepared for disruptions and changes.

16 Topics and Required Readings

Required readings include supplements created for our course (marked in boldface below and available on Quercus) and our textbook. Chapter numbers reference our textbook and any exclusions are noted. We typically finish through Chapter 11 in the Fall term and the rest in the Winter term.

- ***Prerequisite Review for ECO220Y1Y, 2022/23*** pages 1 - 45
- ***The DACM Handbook for ECO220Y1Y, 2022/23*** pages 1 - 183
- 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 ECO220Y1Y, 2022/23*** pages 1 - 28
- Chapter 8: *Randomness and Probability*
- Chapter 9: *Random Variables and Probability Distributions* (Excluding Sections 9.7 *The Poisson Distribution*, 9.12 *The Exponential Distribution*, and "Normal Probability Plots" pp. 280-2)
- ***Normal Table: Read it, Use it for ECO220Y1Y, 2022/23*** 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* (Excluding "How does the Normal probability plot work?" pp. 607-8)
- 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) (Excluding "Residuals and Standardized Residuals" and "Influence Measures" pp. 737-9)

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**).[2]

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