



UNIVERSITY OF TORONTO

ECO220Y1Y: INTRODUCTION TO DATA ANALYSIS AND APPLIED ECONOMETRICS

Summer 2022

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Course Page:

- <https://q.utoronto.ca/courses/263387>

Course Description:

- An introduction to the use of statistical analysis, including such topics as elementary probability theory, sampling distributions, tests of hypotheses, estimation; analysis of variance and regression analysis. Emphasis is placed on applications in economics and business problems.
- Learn how to analyze data and how to correctly interpret and explain results. Use Stata to analyze a wide variety of data and replicate tables and figures in economics research papers.

Objectives: The course aims to provide students with quantitative skills, which are of value to an economist in both an academic and vocational setting. **The course takes an applied approach with emphasis on moving towards a basic understanding of multiple regression and its issues.** In general the course seeks to provide students with the ability to:

1. Understand the nature of uncertainty and methods of dealing with it.
2. Approach economics empirically.
3. Analyse data with and interpret output tables from econometrics software (Stata).
4. Identify issues and assumptions underlying quantitative analysis

Course Outline: There is no required textbook for the course. All topics will be covered by lectures slides and content lectures. Lectures will devote time to practice questions and these will replace the textbook

questions for practice. If you are interested in getting additional help I have suggested readings corresponding to our lecture notes based on two textbook options below. Optional textbooks are either *Basic Statistics for Business & Economics: Sixth Canadian Edition (2018)* by Douglas Lind, William Marchal, Samuel Wathen and Carol Waite OR *Business Statistics: Third Canadian Edition (2018)* by N. Sharpe, R. DeVeaux, P. Velleman, and D. Wright. Some additional handouts may be provided on the course website to aid your learning and supplement readings and lecture notes.

Topics Covered:

- Topic 1 – Intro & Descriptive Statistics
 - “Math Review” by Prof. Jennifer Murdock for ECO220Y1Y at UofT St. George Campus. [Click Here to Download](#)
 - Basic Statistics for Business & Economics \Rightarrow Chapter 1 – ‘What Is Statistics’, Chapter 2 – ‘Describing Data: Frequency Tables, Frequency Distributions and Graphic Presentation’, Chapter 3 – ‘Describing Data: Numerical Measures’
 - Business Statistics \Rightarrow Chapter 4 – ‘Displaying and Describing Categorical Data’, Chapter 5 – ‘Displaying and Describing Quantitative Data’, Chapter 6 – ‘Scatterplots, Association and Correlation’
- Topic 2 – Probability and Random Variables
 - Basic Statistics for Business & Economics \Rightarrow Chapter 4 – ‘A Survey of Probability Concepts’, Chapter 5.1 to 5.4 – ‘What is a Probability Distribution’, ‘Random Variables’ & ‘The Mean, Variance, & Standard Deviation of a Probability Distribution’
 - Business Statistics \Rightarrow Chapter 8 Randomness and Probability and Chapter 9.1, 9.2 9.3 Random Variables and Probability Distributions
- Topic 3 – Probability Distributions
 - Basic Statistics for Business & Economics \Rightarrow Chapter 5.5 to 5.7 – ‘Binomial Probability Distribution’ to ‘Poisson Probability Distribution’, Chapter 6 – ‘Continuous Probability Distributions’, Chapter 11.2 – ‘The F-Distribution’, Chapter LO14.2 – The Chi-square Distribution on pg. 471
 - Business Statistics \Rightarrow Chapters 9.4 to 9.12 (“Random Variables and Probability Distributions”)
- Topic 4 – Statistical Inference I
 - Basic Statistics for Business & Economics \Rightarrow Chapter 7 – ‘Sampling Methods and the Central Limit Theorem’, Chapter 9 – ‘One-Sample Tests of Hypothesis’, Chapter 8 – ‘Estimation and Confidence Intervals’
 - Business Statistics \Rightarrow Chapter 10 – ‘Sampling Distributions’, Chapter 11 – ‘Confidence Intervals for Proportions’, Chapter 12 – ‘Testing Hypothesis about Proportions’, Chapter 13 – ‘Confidence Intervals and Hypothesis Tests for Means’
- Topic 5 – Statistical Inference II
 - Basic Statistics for Business & Economics \Rightarrow Chapter 10 – ‘Two-Sample Tests of Hypothesis’, Chapter 11 – ‘Analysis of Variance’
 - Business Statistics \Rightarrow Chapter 14 – ‘Comparing Two Means’
- Topic 6 – Linear Regression – Estimation & Inference

- Basic Statistics for Business & Economics \Rightarrow Chapter 12 – ‘Linear Regression & Correlation’, Chapter 13.1 to 13.4 – ‘Multiple Regression Analysis’, ‘Evaluating a Multiple Regression Equation’ & ‘Inferences in Multiple Linear Regression’
- Business Statistics \Rightarrow Chapter 7 – ‘Introduction to Linear Regression’, Chapter 18 – ‘Inference for Regression’, Chapter 20 – ‘Multiple Regression’
- Topic 7 – Linear Regression – Issues & Extensions
 - Basic Statistics for Business & Economics \Rightarrow Chapter 13.5 – ‘Evaluating the Assumptions of Multiple Regression’
 - Business Statistics \Rightarrow Chapter 19 – ‘Understanding Regression Residuals’, Chapter 21 – ‘Building Multiple Regression Models’

Assessment:

- Highest Four Term Tests (10% each), Tutorial/Lab Participation (5% per term), Two Group Data Projects (7.5% each), Final Exam (35%).

Important Dates:

Test #1	6pm - 8pm on Fri May 27 th
Test #2	6pm - 8pm on Fri June 10 th
Test #3	6pm - 8pm on Fri July 8 th
Test #4	6pm - 8pm on Fri July 22 nd
Test #5	6pm - 8pm on Fri Aug 5 th
Group Data Project #1	11:59pm on Tues Jun 14 th
Group Data Project #2	11:59pm on Mon Aug 15 th

Please note term tests are ONE FULL HOUR and start 10 minutes into the indicated start time, although additional time is sometimes given. Tests do not last until the end time listed, this end time is given to ensure students do not double book.

Cheat Sheet:

- The point of this course is not to have you memorize formulas but to understand how/when to use them. All tests and the final exam will include a cheat sheet with commonly used formulas in statistics. You should download and print out this cheat sheet and bring it with you to lectures and tutorials in order to become comfortable with its use ahead of assessments. This cheat sheet will be provided along with statistical tables on all tests and the final exam. You CANNOT bring your own sheet or tables.

Lectures:

- Lecture hours will mostly be delivered in-person but a portion of pre-recorded asynchronous lecture content will be posted and supplement the in-person component. Students should be aware that practice questions are often discussed via quizzes on Socrative during in-person lecture. Many of these will only be active during the actual lecture period as answers to them will be discussed in the lecture. Hence, for the ability to participate in these ungraded practice quizzes and for the full experience of lectures students must attend even if some version of the lectures is later posted online.

Tutorials/Labs:

- There will be weekly tutorials and labs that will cover similar material to the lectures but will focus on practical application. Tutorials and labs will be held in computer rooms with one hour devoted to discussion of material and one hour devoted to the application of this knowledge on Stata. Make sure you **keep up to date with readings from the textbook** and bring the cheat sheet and a non-programmable calculator to your tutorials. A grade of 5% per term will be assigned for participation based on completion of group questions and the completion of in-class Stata exercises.

Tests & Exam:

- There will be five term tests and you will be able to drop the lowest grade resulting in four tests each worth 10% of the final grade and a final exam worth 35% of the final grade. Tests will cover one topic and will be held immediately following each topic.
- Tests will cover material that has been discussed in the lectures, tutorials or readings assigned. Questions on term tests will be very similar to tutorial type questions. All topics will be covered on the final exam as it is cumulative. Non-programmable calculators will be permitted for tests and you should remember to bring one as there will not necessarily be any spares available.
- The final exam will be split into two sections each with equal weight. Students will be asked to complete all questions in section A covering only topics on regression but will be given some choice in section B, which covers material on statistics.
- Students CANNOT petition to re-write a test once the test has begun. If you are feeling ill, please do not start the online or in-class test and seek medical attention immediately and see 'Procedure for Missed Term Work and/or Final Exam' below.

Missed Tests and/or Term Work: Students who miss a test because of circumstances beyond their control (e.g. illness or an accident) can request that the Department grant them special consideration. The following steps must be completed to be considered for academic accommodation for any missed test.

1. Your absence must be declared on ACORN on the day of the missed test, or by the day after, at the latest.
2. You must notify your professor by submitting the Missed Test form within one week of the missed test.
3. Complete an online Special Consideration Request within one week of the missed test. The University is temporarily suspending the need for a doctors note or medical certificate for any absence from academic participation if you are experiencing COVID- 19 symptoms. However, this policy may change at any point during the course.
 - If you missed your test for a reason connected to your registered disability, the department will accept documentation supplied by Accessibility Services.
 - If you visited a Dentist, Nurse/Nurse Practitioner, Physician/Surgeon, Psychologist, Psychotherapist or Social Worker registered and licensed in the Province of Ontario, have them fill out the Universitys Verification of Student Illness or Injury form.
 - In other cases, a Verification of Extenuating Circumstances form is acceptable. Other documentation can include, but is not limited to, automobile collision or police reports, death certificates, and supporting documentation from employers, lawyers and other related personnel.
4. Consult the Office of the Registrar should your absence be lengthy or affect multiple courses.

The written explanation and documentation that you submit represents an appeal from you, requesting the opportunity to account for that portion of your grade through the appropriate Make-Up Test. If an appeal is not received, or if the appeal is deemed unacceptable, you will receive a grade of zero for the item you missed. If the appeal is granted that is, your reason for missing the item is considered acceptable by the professor then you will be allowed to write the Make-Up Test for that semester.

Note that it is your responsibility to ensure that your email account is working. Claims that a Departmental decision was not received will NOT be considered as a reason for further consideration. Also, note that holidays and pre-purchased plane tickets, family plans, your friends wedding, lack of preparation, or too many other tests/assignments are not acceptable excuses for missing a quiz, a test or an item of term work.

Grade Allocation:

- Instructors shall return by the deadline one or more marked assignments and/or term tests worth a combined total of at least 15% of the total course mark for H courses and 25% for Y courses. The deadline for returning such marked work shall be the last regular class meeting prior to the academic drop date, with one exception: for courses that run the entire Fall/Winter Session (Y5Y or H5Y courses), the deadline shall be the last regular class meeting of the first week of classes.
- No one test, essay, exam, etc. can be worth more than 80% of the course mark.

Data Projects:

- A central aim of this course is to prepare students for employment or continuing studies in economics or business which requires applied data skills. Students should be able to convert appropriate data found online into a useful format. They should be able to read this data into an econometrics software package and perform basic statistical operations on it. They should then be able to interpret the output they generate.
- There will be two data projects where students will be motivated by an interesting article or question to follow this process, generating and then interpreting their findings. **Students should form groups of no more than 4 people** and submit one project per group with **ALL** students named on the project. All individuals in a group will receive the same grade. Students can complete the data projects individually if they choose to. Each of the two projects will be worth 7.5% of the final grade.
- Late projects will be subject to a late penalty of 5% per day (including weekends) of the total marks for the assignment. Projects submitted five calendar days beyond the due date will be assigned a grade of zero. Projects handed in **AFTER** the work has been returned to the class cannot be marked for credit. Accommodations due to late registration into the course will **NOT** be approved. **Extensions will only be considered for the project under extenuating circumstances** as students have the option to complete these in groups and over the entire length of the term. I would suggest you manage the time and complete the project well in advance of the deadline to avoid any issues impacting you nearer the deadline.
- Group Data Projects are subject to the general policy covering online submissions for term work listed in the syllabus below (see 'Online Submissions for Term Work').

Email & Office Policy:

- I will answer questions regarding the course content or procedures by email but I would prefer to meet students live to answer any questions or concerns. I cannot guarantee any specific response time for email.
- I would encourage students visit me live during office hours rather than emailing as it will be easier to answer some questions in-person.

Procedure for Missed Final Exam: The following steps must be completed in order to be considered for academic accommodation for any missed exam.

1. Students should inform their professor in writing (e-mail is acceptable) within 24 hours of an exam date of any circumstances that prevent them from writing a exam.
2. Students must complete an online petition: Late petitions will NOT be considered.
3. Declaration of Absence - Absence must be declared on the day of or day after your absence on ACORN in order to be considered for an academic accommodation for any course work such as missed tests, late assignments, and final exams. Absences include those due to illness, death in the family, religious accommodation or other circumstances beyond your control. At this time, the university has temporarily suspended the requirement to provide medical documentation if illness is cited as the reason for a deferred exam request. Fees for deferred exam requests are also temporarily being waived during this examination period.

Students who cannot complete their final examination due to illness or other serious causes must file an online petition within 72 hours of the missed examination. Late petitions will NOT be considered. Students must also record their absence on ACORN on the day of the missed exam or by the day after at the latest. Upon approval of a deferred exam request, a non-refundable fee of \$70 is required for each examination approved.

Note: It is your responsibility to ensure your email account is working and able to receive emails. Claims that a Departmental decision was not received will NOT be considered as a reason for further consideration. Note that holidays and pre-purchased plane tickets, family plans, your friends wedding, lack of preparation, or too many other tests/assignments are not acceptable excuses for missing a quiz, a test, an item of term work, or an extension.

Online Submissions for Term Work: It is every students responsibility to ensure that their online submission is submitted successfully by the due date. Accommodations will not be made for unsuccessful submissions due to, but not limited to, i) the system timing out ii) submitting the incorrect document(s) iii) poor internet connection / no internet connection etc.

Equity Statement and Academic Rights: The University of Toronto is committed to equity and respect for diversity. All members of the learning environment in this course should strive to create an atmosphere of mutual respect. As a course instructor, I will neither condone nor tolerate behaviour that undermines the dignity or self-esteem of any individual in this course and wish to be alerted to any attempt to create an intimidating or hostile environment. It is our collective responsibility to create a space that is inclusive and welcomes discussion. Discrimination, harassment and hate speech will not be tolerated. If you have any questions, comments, or concerns you may contact the UoT Equity and Diversity officer or the University of Toronto Students Union Vice President Equity.

Academic Rights: You, as a student at UofT, have the right to:

- Receive a syllabus.
- Rely upon a syllabus once a course is started. An instructor may only change marks assignments by following the University Assessment and Grading Practices Policy provision 1.3.
- Refuse to use turnitin.com (you must be offered an alternative form of submission).
- Have access to your instructor for consultation during a course or follow up with the department chair if the instructor is unavailable.
- Ask the person who marked your term work for a re-evaluation if you feel it was not fairly graded. You have up to one month from the date of return of the item to inquire about the mark. If you are not satisfied with a re-evaluation, you may appeal to the instructor in charge of the course if the instructor did not mark the work. If your work is remarked, you must accept the resulting mark. You may only appeal a mark beyond the instructor if the term work was worth at least 20% of the course mark.
- Receive at least one significant mark (15% for H courses, 25% for Y courses) before the last day you can drop a course for H courses, and the last day of classes in the first week of January for Y courses taught in the Fall/Winter terms.
- Submit handwritten essays so long as they are neatly written.
- Have no assignment worth 100% of your final grade.
- Not have a term test worth 25% or more in the last two weeks of class.
- Retain intellectual property rights to your research.
- Receive all your assignments once graded.
- View your final exams. To see a final exam, you must submit an online Exam Reproduction Request within 6 months of the exam. There is a small non-refundable fee.
- Privacy of your final grades.
- Arrange for representation from Downtown Legal Services (DLS), a representative from the UofT Students Union, and/or other forms of support if you are charged with an academic offence.

Academic Integrity/Honesty or Academic Offenses: Academic integrity is essential to the pursuit of learning and scholarship in a university, and to ensuring that a degree from the University of Toronto is a strong signal of each students individual academic achievement. As a result, UofT treats cases of cheating and plagiarism very seriously. The University of Torontos Code of Behaviour on Academic Matters outlines behaviours that constitute academic dishonesty and the process for addressing academic offences. Potential offences include, but are not limited to:

- In papers and assignments:
 - Using someone elses ideas or words without appropriate acknowledgement.
 - 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.

- 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, including (but not limited to) doctors notes.
 - With regard to remote learning and online courses, UofT wishes to remind students that they are expected to adhere to the Code of Behaviour on Academic Matters regardless of the course delivery method. By offering students the opportunity to learn remotely, UofT expects that students will maintain the same academic honesty and integrity that they would in a classroom setting. Potential academic offences in a digital context include, but are not limited to:
- Remote assessments:
 - Accessing unauthorized resources (search engines, chat rooms, Reddit, etc.) for assessments.
 - Using technological aids (e.g. software) beyond what is listed as permitted in an assessment.
 - Posting test, essay, or exam questions to message boards or social media.
 - Creating, accessing, and sharing assessment questions and answers in virtual course groups.
 - Working collaboratively, in-person or online, with others on assessments that are expected to be completed individually.

All suspected cases of academic dishonesty will be investigated following procedures outlined in the Code of Behaviour on Academic Matters. If you have questions or concerns about what constitutes appropriate academic behaviour or appropriate research and citation methods, you are expected to seek out additional information on academic integrity from your instructor or from other institutional resources.

It is your responsibility as a student at the University of Toronto to familiarize yourself with, and adhere to, [The Code of Student Conduct](#), which is a University policy that sets out expectations for student behavior, and prescribes processes for dealing with prohibited behaviour. [The Students Companion to the Student Code of Conduct](#) is a set of frequently asked questions and the responses about the Code of Student Conduct. It aims to simplify and clarify Code usage for the University's community members. This means, first and foremost, that you should read them carefully.

- The Code of Student Conduct is available from the U of T website (Registrar > Academic Calendar > Codes and Policies) or in your print version of the Academic Calendar.
- The Code of Behaviour on Academic Matters is available from the U of T website (Registrar > Academic Calendar > Codes and Policies) or in your print version of the Academic Calendar.

Another helpful document that you should read is [How Not to Plagiarize](#), by M. Proctor.

Netiquette: What is netiquette? Netiquette is the code of conduct that an instructor expects in an online environment that is similar to what they expect in the classroom.

- Adhere to the same standards as you would in the classroom. For example, respect your peers. Use proper and respectful language and refrain from any insults, threats or bad jokes. You may think you are being funny by the minor insults, but you are not. Not everyone will have your same sense of humor.
- Be forgiving of mistakes. Do not point out insignificant errors of other students in front of the whole class. It's counterproductive and interrupts the flow of discussion.

- It is advised to mute your microphone during lecture. Background noises are distracting to everyone including how hard you type on your keyboard. Believe it or not, it makes more noise than you think.
- When your professor asks a question please use the chat function to que your answer. This also applies if you have to ask a question. Use the chat function and your professor will answer the questions in the order they appear. Be patient. There will be delays and your instructor and/or your peers needs a few moments to read.
- Before you hit the enter key to send messages through the chat function please re-read your response or question carefully and check for errors. Please note it is okay to make minor errors so long as you are understood.
- Be clear and concise but do not using texting language. Full sentences please. Note: Its okay to use emojis but do not overdo it. J
- Be mindful of internet language, e.g. the interpretation of all cap letters is that you are shouting.
- Do not dominate the discussion. Give other students the opportunity to join in the discussion and present their i
- Be positive. Do not start flame wars (emotionally-charged opinions) and intervene if you see this happening in a positive matter. Challenge the idea and not the student directly. Remember the purpose of a discussion is to increase your knowledge base.
- Do not make fun of someones ability to read, write or speak. Remember we are all here to learn in a supportive environment.
- Avoid using slang and/or vernacular language. UofT is a very diverse community and this could possibly lead to misinterpretation, especially in the chat function.
- If someone posts information that you think may have been posted accidentally, let them know about it privately. Do not spread the accidental post to your peers. Remember we all make mistakes.

Accessibility: U of T is committed to the full participation of students with disabilities in all aspects of campus life. The Accessibility Resource Centre provides academic accommodations and services to students who have a physical, sensory, or learning disability, mental health condition, acquired brain injury, or chronic health condition, be it visible or hidden. Students who have temporary disabilities (e.g., broken dominant arm) are also eligible to receive services. All interested students must have an intake interview with an advisor to discuss their individual needs. Students who require accommodation are advised to visit the Accessibility Resource Centre as early as possible to have their needs assessed, as it may take some time to process the application.

Policy on Religious Observances: As noted in the the Policy on Scheduling of Classes and Examinations and Other Accommodations for Religious Observances, the following provisions are included: “It is the policy of the University of Toronto to arrange reasonable accommodation of the needs of students who observe religious holy days other than those already accommodated by ordinary scheduling and statutory holidays. Students have a responsibility to alert members of the teaching staff in a timely fashion to upcoming religious observances and anticipated absences. Instructors will make every reasonable effort to avoid scheduling tests, examinations or other compulsory activities at these times.

If compulsory activities are unavoidable, every reasonable opportunity should be given to these students to make up work that they miss, particularly in courses involving laboratory work. When the scheduling of tests or examinations cannot be avoided, students should be informed of the procedure to be followed to arrange to write at an alternate time. It is most important that no student be seriously disadvantaged because of her or his religious observances. However, in the scheduling of academic and other activities, it is also important to ensure that the accommodation of one group does not seriously disadvantage other

groups within the University community.”

With respect to minimum advance notice, the Policy provides that “Students have a responsibility to alert members of the teaching staff in a timely fashion to upcoming religious observances and anticipated absences.” Since students would normally be aware of upcoming religious observances as well as examination schedules in advance, a minimum of three weeks advance notice will be considered sufficient. More information and some dates of potential relevance for the U of T community are available at: [Policy on Religious Observances](#).