McGill University
Department of Economics
Economics 257D: Honours Statistics
Term 2: Winter 2024
Course outline

Professor: Jean-Marie Dufour

January 2024
Version: April 10, 2024

This course covers basic statistical and econometric theory for Honours students. The topics include: point estimation, hypothesis testing, confidence sets, linear regression, some additional advanced topics.

In addition to the main recommended textbook, documents and other material relevant to the course will be available from my web page:

`http://www.jeanmariedufour.com`

Lecture hours: Monday 13:05 - 14:25; Wednesday 13:05 - 14:25.
Room: Arts W-120.
The course involves 26 lectures of 80 minutes.
Beginning: Monday, 8 January 2024. End: Wednesday, 11 April 2024.
March 4-8 is the Winter reading break (no lectures)
Monday April 1 is a holiday (no lecture). It is replaced by Thursday, April 11.
Final exam period: Monday 15 April 2024 to Tuesday, 30 Aptil 2024.
Office hours: (Leacock 525) Monday 16:15 - 17:30 (or by appointment).
Teaching assistants:
Miroslav Zhao (Miroslav.zhao@mail.McGill.ca)

TA sessions: TBA
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Evaluation will be based on 3 elements:

1. a mid-term exam: 25%;
2. assignments: 25%; as part of the assignments, students are expected to learn how to a run linear regressions using the R software;
3. a final exam: 50%.

Student
In accord with McGill University's Charter of Students' Rights, students in this course have the right to submit in English or in French any written work that is to be graded.

McGill University values academic integrity. Therefore all students must understand the meaning and consequences of cheating, plagiarism and other academic offences under the Code of Student Conduct and Disciplinary Procedures (see www.mcgill.ca/students/srr/honest/) for more information).
L'université McGill attache une haute importance à l'honnêteté académique. Il incombe par conséquent à tous les étudiants de comprendre ce que l'on entend par tricherie, plagiat et autres infractions académiques, ainsi que les conséquences que peuvent avoir de telles actions, selon le Code de conduite de l'étudiant et des procédures disciplinaires (pour de plus amples renseignements, veuillez consulter le site www.mcgill.ca/students/srr/honest/).

Class schedule

Week	Day	Time (13:05-14:25)	
1	Monday	8 January 2024	
	Wednesday	10 January 2024	
2	Monday	15 January 2024	
	Wednesday	17 January 2024	
3	Monday	22 January 2024	
	Wednesday	24 January 2024	
4	Monday	29 January 2024	
	Wednesday	31 January 2024	
5	Monday	5 February 2024	
	Wednesday	7 February 2024	
6	Monday	12 February 2024	
	Wednesday	14 February 2024	
7	Monday	19 February 2024	
	Wednesday	21 February 2024	Mid-term exam
8	Monday	26 February 2024	
	Wednesday	28 February 2024	
9	Monday	4 March 2024	Study break
	Wednesday	6 March 2024	Study break
10	Monday	11 March 2024	
	Wednesday	13 March 2024	
11	Monday	18 March 2024	
	Wednesday	20 March 2024	
12	Monday	25 March 2024	
	Wednesday	27 March 2024	
13	Monday	1 April 2024	
	Wednesday	3 April 2024	
14	Monday	8 April 2024	
	Wednesday	10 April 2024	Last lecture
15		15-30 April 2024	Final exam (time to set)

Readings and main references

The symbol * represents required readings. Photocopied lecture notes also constitute required reading.

1. Review of matrix algebra
2. Basic statistical theory
   (a) Statistical problems
   (b) Sampling distributions
   (c) Asymptotic notions: laws of large numbers and central limit theorems
   (d) Point estimation
   (e) Interval estimation and confidence intervals
   (f) Hypothesis tests
3. Statistical dependence and regression theory
   (a) Multivariate distributions
   (b) Measures of dependence between random variables
   (c) Optimal prediction and statistical regression
4. Linear regression
   (a) Estimation of linear regression models
   (b) Hypothesis testing in the classical linear regression model
   (c) Confidence intervals
   (d) Prediction from linear regression
   (e) Asymptotic theory
   (f) Coefficients of multiple determination
   (g) Partitioning formulas
   (h) Specification errors
   (i) Monte Carlo tests in linear regressions
   (j) Multicollinearity
   (k) Binary regressors
   (l) Tests for structural change
   (m) Analysis of residuals

5. Optional topics [subject to time availability]

    (a) Introduction to time series models
    (b) Generalized least squares and related topics
    (c) Instrumental variables methods
    (d) Multivariate models
    (e) Maximum likelihood estimation
    (f) Methods of moments
    (g) Simultaneous equations

Final exam (Monday, April 15, 2024)

The exam will be a closed book exam.

Students are responsible for the notes covered in class from January 8 to till April 10 (inclusive), except for the following material.

1. From "Covariance, correlation and linear regression between random variables":
   (a) Section 5.3, 5.4, and 5.5.
2. From "Covariance matrices and multiple linear regression between random variables":
   (a) Section 3
3. From "Classical linear model":
   (a) Proof of Theorems 3.7 to 3.11.
   (b) Proof of 3.16
   (c) Section 8.
4. Notes number 14-17 (on home page).