

Dalhousie University
Economics 6534 Section 01
Course CRN: 23275
Advanced Econometrics
Winter 2023

Dalhousie University is located in Mi'kma'ki, the ancestral and unceded territory of the Mi'kmaq. We are all Treaty people.

We acknowledge the histories, contributions, and legacies of the African Nova Scotian people and communities who have been here for over 400 years.

Instructor: Kuan Xu

Lecture Hours: Format: In-person; 11:35 am–12:55 pm, Monday and Wednesday, Studley MONA CAMPBELL BUILDING 3011

Office Hours: Format: Online; 4:30 pm – 6:00 pm, Tuesday via Teams (or by appointment)

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- **Course Description:**

This course is designed for graduate students to learn more specialized topics in addition to ECON 5575/5576 Econometrics I/II. During the academic year of 2022–2023, we focus on univariate time series, VAR, VECM, SVAR, Markov switching models, Lasso and Lasso IV.

- **Econometrics Software Packages:**

At Dalhousie University, students have direct access to Stata/SE 17 (Windows and Mac) at

<https://software.library.dal.ca/>

In addition, students are encouraged to use the following widely-used open-source software packages for econometrics, statistics, data science, and mathematics—Gretl, R, RStudio, and wxMaxima.

Gretl is a software package for econometrics.

(see <http://gretl.sourceforge.net/>).

R is a software package for data science/statistics/econometrics.

(see <http://www.r-project.org/>).

RStudio is an IDE (integrated development environment), or a “shell” or “platform”, for R.

(see <https://www.rstudio.com/>)

RStudio can be installed after R has been installed.

xwMaxima is a software package for symbolic mathematics.

(see <http://wxmaxima.sourceforge.net>).

- **Assignments, Exams, and Evaluation:**

(1) There will five assignments (30%), one project (30%), and one final exam (40%).

(2) The final exam will be a closed-book two-hour exam that covers all topics.

(3) The project should be an empirical research paper that employs one of the models discussed in the course to address an interesting research question in economics. A project proposal is required. The evaluation criteria of the final project are given in Project Grading Rubric.

(4) No late submissions of assignments and project are acceptable.

(5) If a student misses an assignment for a justifiable reason (e.g., maximum two Student Declarations of Absence (SDA) per term), the marks of the missed assignment will be automatically added to the final exam. No alternative assignments will be given. See

https://www.dal.ca/campus_life/safety-respect/student-rights-and-responsibilities/academic-policies/student-absence.html

The grading scheme in this course is as follows:

A+	90–100
A	85–89
A–	80–84
B+	77–79
B	73–76
B–	70–72
F	less than 70

- **Textbooks and References:**

1. James D. Hamilton (Hamilton), *Time Series Analysis*, Princeton University Press, 1994. (This is used as a reference, Appendix A of which is provided to students.)
2. Helmut Lütkepohl and Markus Krätzig (LK), *Applied Time Series Econometrics*, Cambridge University Press, 2004. (The ebook of this title is available from Dalhousie Library.)

3. Bernhard Pfaff (P), *Analysis of Integrated and Cointegrated Time Series with R*, Springer, 2008. (This ebook of this title is available from Dalhousie Library.)
4. Walter Zucchini and Iain L. MacDonald (ZM), *Hidden Markov Models for Time Series: An Introduction Using R*, CRC Press, 2009. (The ebook of this title is available from Dalhousie Library.)
5. W.N. Venables and B.D. Ripley (VR), *Modern Applied Statistics with S*, Springer, 2002. (The ebook of this title is available from Dalhousie Library.)
6. Christoph Hanck, Martin Arnold, Alexander Gerber, and Martin Schmelzer (HAGS), 2020. Introduction to Econometrics with R, see <https://www.econometrics-with-r.org/index.html>
7. Robert Tibshirani, 2011. Regression Shrinkage and Selection via the Lasso: A Retrospective, *Journal of the Royal Statistical Society: Series B (Statistical Methodology)*, 73(3), 273–282.
8. A. Belloni, D. Chen, V. Chernozhukov, and C. Hansen, 2012. Sparse Models and Methods for Optimal Instruments with an Application to Eminent Domain. *Econometrica*, 80, 2369-2429.
9. Frank Windmeijer, Helmut Farbmacher, Neil Davies, and George Davey Smith, 2019. On the Use of the Lasso for Instrumental Variables Estimation with Some Invalid Instruments, *Journal of the American Statistical Association*, 114 (527), 1339-1350.
10. Victor Chernozhukov, Christian Hansen, and Martin Spindle, 2016, High-Dimensional Metrics in R
11. Lecture slides and other materials will distributed on Brightspace at:
<https://www.dal.ca/brightspace>

Weeks, Topics, Readings

1. *Weeks 1-2: Mathematical Review and Overview*

Readings:

Lütkepohl and Krätzig, Chapter 1

Hamilton, Appendix A Mathematical Review

Lecture Notes on Mathematical Review

2. *Week 3: A Brief Introduction to R*

Readings:

Venables and Ripley, Chapters 1–4.

Christoph Hanck, Martin Arnold, Alexander Gerber, and Martin Schmelzer, Chapters 1–4

Lecture Notes on R Introduction

3. *Weeks 4–5: Univariate Time Series Analysis*

Readings:

Lütkepohl and Krätzig, Chapter 2

Pfaff, Chapters 1, 3, and 5

Lecture Notes on Univariate Time Series

4. *Weeks 6–7: Vector Autoregressive and Vector Error Correction Models*

Readings:

Lütkepohl and Krätzig, Chapter 3

Pfaff, Chapters 2.1–2.2, 4, 6, 7 and 8

Lecture Notes on VAR and VECM

5. *Weeks 8–9: Structural Vector Autoregressive Models*

Readings:

Lütkepohl and Krätzig, Chapter 4

Pfaff, Chapters 2.3

Lecture Notes on SVAR

6. *Weeks 10–11: Markov Switching Models*

Readings:

Zucchini and MacDonald, Chapters 1–6 and 13

Lecture Notes on MSM

7. *Weeks 12–13: Lasso and Lasso IV*

Readings:

Tibshirani (2011), Belloni et al. (2012), and Windmeijer et al. (2019)

Victor Chernozhukov, Christian Hansen, and Martin Spindle, hdm: High-Dimensional Metrics

Table 1: Schedule in One Page

Week No.	Dates	Topic	Assignments, Tests, and Exam
1	2023-01-09—2023-01-13	Math Review & Overview	
2	2023-01-16—2023-01-20	Math Review & Overview	As1 dist 2023-01-18
3	2023-01-23—2023-01-27	Introduction to R	As1 due 2023-01-25
4	2023-01-30—2023-02-03	Univariate Time Series Analysis	As2 dist 2023-02-01
5	2023-02-06—2023-02-10	Univariate Time Series Analysis	As2 due 2023-02-08
6	2023-03-13—2023-03-17	VAR and VECM	As3 dist 2023-02-15
	2023-03-20—2023-03-24	Study break	Study break
7	2023-02-27—2023-03-03	VAR and VECM	As3 due 2023-03-01
8	2023-03-06—2023-03-10	SVAR	Proposal due 2023-03-08
9	2023-03-13—2023-03-17	SVAR	As4 dist 2023-03-15
10	2023-03-20—2023-03-24	Markov Switching Model	As4 due 2023-03-22
11	2023-03-27—2023-03-31	Markov Switching Model	As5 dist 2023-03-29
12	2023-04-03—2023-04-07	Lasso	As5 due 2023-04-05
13	2023-04-10—2023-04-11	Lasso IV	Paper due 2023-04-10
	2023-04-13—2023-04-25	Final Exam Period	time & location TBA

Project Grading Rubric

Student Name: _____ B00: _____

Rubric Criteria	Excellent	Good	Competent	Problematic	Score
Knowledge Gap/Topic (max 10 pts)	10 The student identifies a substantial knowledge gap, and the topic is clearly defined.	8 The student identifies a knowledge gap, and the topic is clearly defined.	6 The student identifies a knowledge gap, but under develops it, and the topic is not very clear.	4 Knowledge gap is vague or unclear, as the topic is not properly defined.	
Style; Writing and Structure (max 20 pts)	20 The student follows the style guidelines. Logical organization of facts and ideas with linear reasoning, and effective use of figures/tables. Conclusion summarizes/integrates/discusses findings.	16 The student mainly follows the style guidelines. Content is organized in sections, but transition between paragraphs is poorly executed; paragraphs mingle too many ideas. Conclusion offers a clear overview of the paper.	12 The student attempts to follow the style guidelines, but the content is not properly organized. Transition between paragraphs is poorly executed; paragraphs mingle too many ideas or repeat the same argument. The conclusion is not very clear.	8 The student does not follow the style guidelines, and has many errors. The content is not organized, and it has no flow. Poor conclusion. The student ignored comments on first draft.	
Motivation (max 10 pts)	10 The motivation is clearly and explicitly stated, and it grabs attention.	8 The student provides a clear and explicit motivation.	6 The student attempts to provide a clear motivation.	4 There is no clear motivation.	
Background and Related Literature (max 10 pts)	10 The student provides a comprehensive and relevant literature review.	8 The student provides a large and relevant literature review.	6 The student attempts to provides a relevant literature review, but either omits important papers or cites irrelevant papers.	4 The student does not provide a proper literature review; incomplete and erroneous.	
Research Design and Analysis (max 50 pts)	50 The analysis is substantial enough for this stage of the research process.	40 Insufficient/weak analysis for this state of the research process.	30 The method is unsuitable to address the research question or the analysis is wrong, and the student ignored comments on first draft.	20 No apparent line of argument.	
Total (maximum 100 points)					



Faculty of Science Course Syllabus (Section B) (revised April-2022)
Fall/Winter 2022-23

University Policies and Statements

This course is governed by the academic rules and regulations set forth in the University Calendar and by Senate

Academic Integrity

At Dalhousie University, we are guided in all of our work by the values of academic integrity: honesty, trust, fairness, responsibility and respect (The Center for Academic Integrity, Duke University, 1999). As a student, you are required to demonstrate these values in all of the work you do. The University provides policies and procedures that every member of the university community is required to follow to ensure academic integrity.

Information: https://www.dal.ca/dept/university_secretariat/academic-integrity.html

Accessibility

The Advising and Access Services Centre is Dalhousie's centre of expertise for student accessibility and accommodation. The advising team works with students who request accommodation as a result of a disability, religious obligation, or any barrier related to any other characteristic protected under Human Rights legislation (Canada and Nova Scotia).

Information: https://www.dal.ca/campus_life/academic-support/accessibility.html

Student Code of Conduct

Everyone at Dalhousie is expected to treat others with dignity and respect. The Code of Student Conduct allows Dalhousie to take disciplinary action if students don't follow this community expectation. When appropriate, violations of the code can be resolved in a reasonable and informal manner—perhaps through a restorative justice process. If an informal resolution can't be reached, or would be inappropriate, procedures exist for formal dispute resolution.

Code: https://www.dal.ca/dept/university_secretariat/policies/student-life/code-of-student-conduct.html

Diversity and Inclusion – Culture of Respect

Every person at Dalhousie has a right to be respected and safe. We believe inclusiveness is fundamental to education. We stand for equality. Dalhousie is strengthened in our diversity. We are a respectful and inclusive community. We are committed to being a place where everyone feels welcome and supported, which is why our Strategic Direction prioritizes fostering a culture of diversity and inclusiveness

Statement: <http://www.dal.ca/cultureofrespect.html>

Recognition of Mi'kmaq Territory

Dalhousie University would like to acknowledge that the University is on Traditional Mi'kmaq Territory. The Elders in Residence program provides students with access to First Nations elders for guidance, counsel and support. Visit or e-mail the Indigenous Student Centre (1321 Edward St) (elders@dal.ca).

Information: https://www.dal.ca/campus_life/communities/indigenous.html

Important Dates in the Academic Year (including add/drop dates)

<https://academiccalendar.dal.ca/Catalog/ViewCatalog.aspx?pageid=viewcatalog&catalogid=117&chapterid=-1&topicgroupid=31821&loaduseredits=False>

University Grading Practices

https://www.dal.ca/dept/university_secretariat/policies/academic/grading-practices-policy.html



Faculty of Science Course Syllabus (Section C) (revised April-2022)
Fall/Winter 2022-23

Student Resources and Support

Advising

General Advising https://www.dal.ca/campus_life/academic-support/advising.html

Science Program Advisors: <https://www.dal.ca/faculty/science/current-students/undergrad-students/degree-planning.html>

Indigenous Student Centre: https://www.dal.ca/campus_life/communities/indigenous.html

Black Students Advising Centre: https://www.dal.ca/campus_life/communities/black-student-advising.html

International Centre: https://www.dal.ca/campus_life/international-centre/current-students.html

Academic supports

Library: <https://libraries.dal.ca/>

Writing Centre: https://www.dal.ca/campus_life/academic-support/writing-and-study-skills.html

Studying for Success: https://www.dal.ca/campus_life/academic-support/study-skills-and-tutoring.html

Copyright Office: <https://libraries.dal.ca/services/copyright-office.html>

Fair Dealing Guidelines <https://libraries.dal.ca/services/copyright-office/fair-dealing.html>

Other supports and services

Student Health & Wellness Centre: https://www.dal.ca/campus_life/health-and-wellness.html

Student Advocacy: <https://dsu.ca/dsas>

Ombudsperson: https://www.dal.ca/campus_life/safety-respect/student-rights-and-responsibilities/where-to-get-help/ombudsperson.html

Safety

Biosafety: <https://www.dal.ca/dept/safety/programs-services/biosafety.html>

Chemical Safety: <https://www.dal.ca/dept/safety/programs-services/chemical-safety.html>

Radiation Safety: <https://www.dal.ca/dept/safety/programs-services/radiation-safety.html>

Scent-Free Program: <https://www.dal.ca/dept/safety/programs-services/occupational-safety/scent-free.html>

Dalhousie COVID-19 information and updates: <https://www.dal.ca/covid-19-information-and-updates.html>