

**University of Waterloo
Department of Economics
Economics 421**

Course Outline

(Winter 2016)

Instructor: Dinghai Xu

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Lecture Time: M. & W. 11:30 to 12:50

Lecture Location: DWE 3522A

Office Hours: Fri. 1:30 to 3:00 or by appointment

TA: TBA

Course Description

This course covers several theoretical/applied topics in Econometrics, including regression models, some popular estimation methods and time series analysis. This course will provide a good understanding of the techniques and inference widely used in applied research in economics. The details for each topic of this class are listed below.

The lecture material will be based on a collection of reference books and/or published papers. There is no required textbook.

Useful References:

- [1] **Econometric Theory and Methods (ETM)**, by R. Davidson and J. G. Mackinnon, Oxford University Press
- [2] **Econometrics Analysis (EA)**, by W. H. Greene, Sixth Edition, NY, Macmillan.
- [3] **Time Series Analysis (TSA)**, by J. D. Hamilton, Princeton University Press.
- [4] **Econometrics**, by F. Hayashi, Princeton University Press.
- [5] **Probability and Random Process**, by G. R. Grimmett and D. R. Stirzaker, Oxford Science.

Journals:

Econometrica, Journal of Econometrics, Journal of Business and Economic Statistics, Journal of Finance, Journal of Financial Econometrics, Journal of Applied Econometrics and etc.

Topics

1. Overview of Important Concepts in Statistics (EA: Appendix A, B)

Random Variable and Probability

Distribution Functions

Moments and Statistical Inference

2. Topics in Regression Models and the Statistical Inference

(EA: Chpt. 1, 2, 3, 4, 5, 7, 10; ETM: Chpt. 1, 2, 3, 4, 5)

Linear Regression Models

Non-Linear Regression Models

Multivariate Regression Models

Model Mis-specification Analysis

3. Topics in Estimation Methods and Procedures

(EA: Chpt. 15, 16; ETM: Chpt. 7, 8, 9, 10)

Method of Maximum Likelihood Estimation (MLE);

Method of Moments (MOM)/ GMM;

Generalized Least Squares (GLS) Procedure

Instrumental Variable (IV) Estimation (2SLS)

Monte Carlo Simulation

4. Topics in Time Series (if time permitted)

(TSA: Chpt. 3, 5, 8, 15, 21)

Introduction of Stochastic Process

Statistical Properties of Stationary ARMA

Autoregressive Conditional Heteroskedasticity (ARCH) /

Generalized ARCH (GARCH) Models

Stochastic Volatility Models

Non-Stationarity in Time Series

Some related papers (empirical / theoretical) for each topic might be discussed in the class. *The topics might not be covered in the above order.*

Computing SoftWare

There might be several problem sets which require using statistical software for computation. Feel free to use any computing package you prefer. But I would suggest Stata or R or Matlab. Some popular computing software packages have been installed in the computers in the computer Lab or in Arts' public computing labs. For more information, please consult the Information Systems and Technology (IST) office.

Course Requirements

- Assignments (20%)
- Midterm Exam (30%)
- Final Exam (50%)

Economics Department Deferred Final Exam Policy

Deferred Final Exam Policy found at <https://uwaterloo.ca/economics/current-undergraduates/policies-and-resources/deferred-final-exam-policy>.

Cross-listed course

Please note that a cross-listed course will count in all respective averages no matter under which rubric it has been taken. For example, a PHIL/PSCI cross-list will count in a Philosophy major average, even if the course was taken under the Political Science rubric.

Academic Integrity

Academic Integrity: In order to maintain a culture of academic integrity, members of the University of Waterloo are expected to promote honesty, trust, fairness, respect and responsibility. See the [UWaterloo Academic Integrity Webpage \(https://uwaterloo.ca/academic-integrity/\)](https://uwaterloo.ca/academic-integrity/) and the [Arts Academic Integrity Office Webpage \(http://arts.uwaterloo.ca/current-undergraduates/academic-responsibility\)](http://arts.uwaterloo.ca/current-undergraduates/academic-responsibility) for more information.

Discipline: A student is expected to know what constitutes academic integrity, to avoid committing academic offenses, and to take responsibility for his/her actions. A student who is unsure whether an action constitutes an offense, or who needs help in learning how to avoid offenses (e.g., plagiarism, cheating) or about “rules” for group work/collaboration should seek guidance from the course professor, academic advisor, or the Undergraduate Associate Dean. When misconduct has been found to have occurred, **including writing exams in a section that you are not registered in**, disciplinary penalties will be imposed under [Policy 71 – Student Discipline](#). For information on categories of offenses and types of penalties, students should refer to [Policy 71 - Student Discipline](#). For typical penalties check Guidelines for the Assessment of Penalties found at <http://www.adm.uwaterloo.ca/infosec/guidelines/penaltyguidelines.htm>.

Grievance: A student who believes that a decision affecting some aspect of his/her university life has been unfair or unreasonable may have grounds for initiating a grievance. Read [Policy 70 - Student Petitions and Grievances, Section 4](#). In addition, read [the Student Grievance Process](#) for the Faculty of Arts found at <https://uwaterloo.ca/arts/current-undergraduates/student-support/student-grievances-faculty-arts-processes>.

Appeals: A student may appeal the finding and/or penalty in a decision made under

Policy 70 - Student Petitions and Grievances (other than regarding a petition) or Policy 71 - Student Discipline if a ground for an appeal can be established. Read [Policy 72 - Student Appeals](#).

Other sources of information for students

[Academic integrity \(Arts\) Academic Integrity Office \(uWaterloo\)](#)

Accommodation for Students with Disabilities

Note for students with disabilities: The [AccessAbility Services office](#), located in Needles Hall Room 1401, collaborates with all academic departments to arrange appropriate accommodations for students with disabilities without compromising the academic integrity of the curriculum. If you require academic accommodations to lessen the impact of your disability, please register with the AS office at the beginning of each academic term.