

UNIVERSITY OF WATERLOO
ECONOMICS 421: ECONOMETRICS
FALL 2014

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Office hours: Mondays, 3:00 p.m. – 5:00 p.m.

Classes: Tuesdays and Thursdays, 1:00 p.m. – 2:20 p.m.
PAS 1229

Course description:

This course provides an advanced treatment of topics covered in ECON 321 through an extensive use of matrix algebra and statistical theory. A review of required matrix algebra and statistical theory will be part of the course. Topics covered will include classical linear models and associated problems such as multicollinearity, functional form, heteroskedasticity and autocorrelation; generalized least squares; and an introduction to instrumental variables, maximum likelihood estimation, and simultaneous equations.

Text:

William H. Greene, *Econometric Analysis* (7th edition), Prentice-Hall: Saddle River, New Jersey, 2012.

Evaluation:

Final grades will be calculated as follows:

Assignments:	30%
Midterm exam:	30%
Final exam:	40%

A mixture of problem solving and computing assignments will be distributed over the term. The computing assignments may be completed using your preferred statistical software package. Due dates of these assignments will vary according to the amount of work required. Assignment must be handed in at the beginning of the class on their due date. *Late assignments will be assigned a grade of zero, with no exceptions.*

The midterm and final exam will be based on lecture material. The midterm will be held during the regular class time on **October 16** and the final exam will be scheduled by the Registrar's Office. The format of these exams will be discussed in class. Should you be ill and miss the midterm exam and can produce the mandatory *University of Waterloo Verification of*

Illness Form within 48 hours of the missed midterm, the weight will be added to your final exam. Should you miss the final exam, a deferred can be written. Details on requesting a deferred exam, can be found here: <https://uwaterloo.ca/economics/current-undergraduates/policies-and-resources/deferred-final-exam-policy>. Note that requests for deferred exams must be received within 48 hours of the scheduled exam time.

Course outline:

1. **Background Material:**

Matrix algebra; Probability and distribution theory; Estimation and inference; Large sample distribution theory (*Appendices A, B, C and D*)

2. **The Linear Regression Model:**

The linear model; Model assumptions (*Chapter 2*)

3. **The Least Squares Estimator:**

Least squares regression; Frisch-Waugh Theorem; Finite and large sample properties; Interval estimation; Prediction and forecasting; Data problems (*Chapter 3 and 4*)

4. **Hypothesis Testing:**

Testing methodology; Size, power, and consistency; Wald tests; Fit based tests; Large sample tests (*Chapter 5*)

5. **Functional Form:**

Binary variables; Nonlinearities; Structural breaks (*Chapter 6*)

6. **Instrumental Variables Estimation:**

Extended model; Instrumental variables (IV) estimator; Two-stage least squares (2SLS); Hausman-Wu test; Overidentification test; Weak instruments (*Chapter 8*)

7. **The Generalized Regression Model:**

Inefficient least squares estimation; Generalized least squares (GLS); Feasible generalized least squares (FGLS); Heteroskedasticity; Weighted least squares (WLS) (*Chapter 9*)

8. **Systems of Equations:**

Seemingly unrelated regression (SUR); Demand systems; Identification and the order condition; Three-stage least squares (3SLS) (*Chapter 10*)

9. **Maximum Likelihood Estimation:**

Likelihood functions; Efficient estimation; Information matrix; Cramer-Rao lower bound (*Chapter 14*)

Avoidance of Academic Offenses:

Academic Integrity: In order to maintain a culture of academic integrity, members of the University of Waterloo community are expected to promote honesty, trust, fairness, respect and responsibility. See the UWaterloo Academic Integrity webpage (www.uwaterloo.ca/academic-integrity/) for more information.

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. See Policy 70, Student Petitions and Grievances (<https://uwaterloo.ca/secretariat/policies-procedures-guidelines/>)

policy-70). When in doubt please be certain to contact the department's administrative assistant who will provide further assistance.

Discipline: A student is expected to know what constitutes academic integrity to avoid committing an academic offence, and to take responsibility for his/her actions. A student who is unsure whether an action constitutes an offence, or who needs help in learning how to avoid offences (e.g., plagiarism, cheating) or about "rules" for group work/collaboration should seek guidance from the course instructor, academic advisor, or the undergraduate Associate Dean. For information on categories of offences and types of penalties, students should refer to Policy 71, Student Discipline, (<http://www.adm.uwaterloo.ca/infosec/Policies/policy71.htm>). For typical penalties check Guidelines for the Assessment of Penalties (<http://www.adm.uwaterloo.ca/infosec/guidelines/penaltyguidelines.htm>).

Appeals: A decision made or penalty imposed under Policy 70 (Student Petitions and Grievances) (other than a petition) or Policy 71 (Student Discipline) may be appealed if there is a ground. A student who believes he/she has a ground for an appeal should refer to Policy 72, Student Appeals (<http://www.adm.uwaterloo.ca/infosec/Policies/policy72.htm>).

Note for Students with Disabilities: The Office for Persons with Disabilities (OPD), located in Needles Hall, Room 1132, 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 OPD at the beginning of each academic term.