EC 423/523 (CRN 12176/12192): Econometrics 1, Fall 2009
Tue, Thurs @ 8:30 - 9:50 and Fri @ 12:00 – 12:50, Deady 208

ECONOMETRICS I

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Office hours: Tue & Thur: 3:00 - 4:30 pm and by appointment

Office Hours
I will do my best to be available during my stated office hours, but you are also welcome to stop by at other times (if I am in), or request an appointment. Whenever you have a question, I will try to help.

Prerequisites
The formal prerequisites are MATH 281 and MATH 341. In addition, MATH 282 and MATH 461 are strongly recommended. Within 2 or 3 weeks, you will be grappling with double integrals. If you are uneasy about your mathematical expertise, please come and see me to discuss ways forward.

Required Text & Lecture Materials
The course text is either one of these two:

> Wackerly, D.D., W. Mendenhall and R.L. Scheaffer (2002). *Mathematical Statistics with Applications*, sixth edition. Duxbury. ISBN: 0-534-37741-6. I'll refer to this as **6e**.
> Wackerly, D.D., W. Mendenhall and R.L. Scheaffer (2008). *Mathematical Statistics with Applications*, seventh edition. Duxbury. ISBN-10: 0-495-11081-7. I'll call this **7e**.

7e is expensive and has virtually no material relevant to this course beyond what is in **6e** (though it does have more exercises). My lecture presentations and homeworks will reference *both* editions, You could surely save money by searching online for **6e** second-hand. I found copies in June 2009 at Alibris, Amazon, AbeBooks and Barnes & Noble, all for around $12 including postage. Duxbury also publishes a *Student Solutions Manual* for each edition, with worked solutions to the odd numbered problems (again, try second-hand/online; the ISBNs are **6e** : 0-534-38236-3 and **7e** : 0-495-38506-9).

The detailed outline overleaf describes the approximate lecture content, week by week, and indicates the location in each book of the following week's material. This should help you to prepare yourself: I shall assume that students have read the assigned chapter sections before I present material in class. Lectures will be given using OHP transparencies, images of which will be available in PDF form for you to download from my homepage. The slides deliver a lot of basic information in a compressed form - you could annotate your downloaded copies as we go along if you wish – but you will definitely need to work with the course text *as well as* with these pages.

Preparation & Homeworks
This course is a *very* demanding introduction to mathematical statistics and probability theory. It is extremely important to prepare for *every* class in order to keep up with the fast pace that will be set. It is strongly recommended that sample exercises and readings from the book are attempted *prior* to in-class presentations. Homeworks will be set in weeks 3 to 10, in the form of even-numbered exercises from the book (exercise numbering in **6e** and **7e** will both be provided). The exercises will be graded by my GTF. You may help each other with homework issues, but the work you submit must be your own, obviously. One hour of each week (the Friday class) will be set aside for problem-solving sessions, quizzes and an occasional lecture.

Grades
The marks for all set work will be on the scale 0-100%. I will be looking for, and rewarding, evidence of the following qualities when assigning final grades on the basis of each person's run of marks:

A^+/A	Excellent. Outstanding individual effort showing sustained high-order insight and rigorous, original analysis. Well-organized and presented.
B^+/A^-	Good. Evidence of sustained, independent, high-level thought. Confident, critical analysis of the relevant issues and clear understanding of their implications, but with some lapses. Well-presented, clearly organized and effective.
B	Competent work. Signs of organization, thought and insight, but with lapses in argument.
C^+	Narrowly conceived, uncritical, lacking focus, weakly argued or of doubtful relevance. Poorly organized.
C	Evidence of some effort but lacking a sound understanding of the subject. Inadequate research and thinking. Extensive irrelevance. A number of factual and interpretative errors.
D	Failure to understand the question, or to identify and resolve the issues it poses. Trivial or perfunctory work showing no effort, thought, reading or competence. Many errors of fact and interpretation

To the extent that the distribution of these qualities among students is fairly constant year by year, whereas the percentage marks awarded in quizzes and examinations contain a subjective element (*e.g.* they may vary by instructor), you might interpret the grade-assignment process as "curving" – but the descriptors are intended to impress upon you that there are absolute requirements as well as relative ones.

Assessment details
The course will be assessed by means of 8 homework assignments, 2 quizzes (to be held during class according to the schedule below), and a final, comprehensive 2-hour examination. The **homeworks** will count for **30%** of the total assessed value and the **quizzes** will be worth **35%** of the total. The **final exam** will account for the other **35%**. I'll place a weight of 0.4 on the lower of your two quiz scores, and 0.6 on the higher of the two. I'll drop the lowest *one* of your eight homework scores (*only*).

Students taking this course pass/no pass must earn a "C-" in the course in order to receive a passing grade. If a quiz is missed for any reason, a written petition fully explaining and documenting why the quiz was missed must be submitted within a week of the quiz missed. If the petition is approved, the weight of the missed quiz will be added to the final exam grade. The alternative is to have a score of zero points for the assessment missed. Any requests for re-grades must be submitted in writing within a week of when the graded material was made available for collection, and must include an argument of why you feel your answer was correct.

Schedule of assessments
Quizzes will be held as follows:

Quiz 1, week 4: Friday October 23rd
Topics: probability rules, discrete and continuous probability distributions, bivariate distributions.

Quiz 2, week 8: Friday November 20th
Topics: bivariate distributions (transformations), sampling distributions, estimation

Final exam: this comprises questions covering the whole of the course, and has been unavoidably scheduled for 8:00am – 10:00am on Monday 7th December 2009 (sorry).

Academic Integrity
In the quizzes, you may refer to lecture notes and to your copy of **6e/7e** , but no other form of assistance or source of information (including communication with other students) will be permitted. The final examination is likely to be closed-book. Foreign students may use approved English-language dictionaries in the final exam. Any violations of academic integrity involving a quiz or exam will result in a failing grade for the course. In addition, a complaint will be filed with the University's Hearing Board.

Students with Special Needs
If you have a documented disability and anticipate needing accommodations in this course, please make arrangements to meet with me soon. Please request that the Counselor for Students with Disabilities send a letter verifying your disability.

Detailed Course Outline
By the end of the term you should have a solid grounding in probability distribution theory, estimation and hypothesis testing ; and you should be able to solve a range of practical problems of the sort that actually occur in the real world. At base, the aim is to give you a clear understanding of the nature and scope of statistical techniques as applicable scientific tools. The course is taught by means of two weekly 80-minute meetings for lecture presentations, together with one 50-minute meeting mainly set aside for exercises. Below is an *indication* of the schedule of topics, week by week (the actual rate of delivery may vary, depending how we get along):

To be read ahead of the first week's lectures: all of Chapter 2 in **6e/7e**

WEEK 1: Introductory Issues and Probabilities

Definitions. What is modelling? Discrete and continuous random variables. Random sampling. What is probability? Some set theory. Independent events. Permutations and combinations. Multinomial coefficients. Bayes' Law. Introduction to probability distributions.

To be read before Week 2's lectures: Chapter 3 in **6e/7e,** excluding §3.6, §3.7, and Chapter 4 in **6e/7e,** excluding §4.6, §4.7, §4.11

WEEK 2: Discrete and Continuous Probability Distributions

The mean and variance. Expectations. Probability and moment generating functions. The geometric and Poisson distributions. The continuous case: density function, distribution function. The uniform and normal distributions. Moment generating function agains. Some other common distributions. Tchebychev's Theorem.

To be read before the Weeks 3-4 lectures: Chapter 5 in **6e/7e,** excluding §5.6, §5.10

WEEKS 3 AND 4: Bivariate Distributions

The discrete case: joint, marginal and conditional probability and distribution functions. The continuous case: ditto. Double integration. Independence, dependence and covariance. Expectations and conditional expectations.

To be read before Week 5's lectures: Chapter 6 in **6e/7e,** excluding §6.6, §6.7

WEEK 5: Functions of Random Variables

Calculating their distribution functions and moment generating functions. The distribution of the sample mean when a normal population is randomly sampled.

To be read before Week 6's lectures: Chapter 7 in **6e/7e,** excluding §7.4

WEEK 6: Sampling Distributions

Sampling randomly from $N(\mu,\sigma^2)$ populations when one or other (or both) of the parameters μ and σ^2 is unknown. Estimates and confidence intervals. The χ^2 distribution and the t-test. Non-normal populations: the Central Limit Theorem.

To be read before the Weeks 7-8 lectures: all of Chapter 8 in **6e/7e**

WEEK 7: Estimation and Confidence Intervals

Methods of estimation, properties of estimators including consistency and relative efficiency. Obtaining confidence intervals using the method of pivots.

To be read before the Weeks 8-9 lectures: Chapter 9 in **6e/7e,** excluding §9.6, §9.8

WEEKS 8 AND 9 : More on Estimation and Estimators

More on consistency, the likelihood function, maximum likelihood estimation, sufficient statistics, the Blackwell-Rao theorem and MVUEs. *[There will be no class on Thursday of Week 9 due to Thanksgiving].*

To be read before Week 10's lectures: all of Chapter 10 in **6e/7e**

WEEK 10: Hypothesis Testing

Connection between confidence intervals and tests. Hypothesis testing. Simple and composite hypotheses. Power of tests and the Neyman-Pearson lemma.
Depending how we got along throughout, we may be "catching up" this week. Certainly we shall find time for a brief review of the entire course at this time.

Peter Lambert
June 2009