

Economics 3818  
Office: Room 108

Professor Donald Waldman  
waldman@colorado.edu  
Tues/Thurs 4:00 - 5:30, and by appointment

### Course Information

Welcome to Econ 3818. This is a first course in probability and statistics, with an introduction to econometrics. Applications will be taken from topics in economics, and other areas. Both simulated and real data will be used in these examples.

Please read this carefully--there is a lot of information here to help you navigate this course. In particular, the final grade for this course depends on weekly quizzes and problem sets that must be completed in a timely manner.

#### Instructor

Donald M. Waldman,  
Professor



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Office: Econ 108  
Tues, Thurs: 2 pm - 3:15 pm  
and by appointment

#### Teaching Assistants

Eric Penner  
Ph.D. Student



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Office: TBD

Tyler Shenkel  
Ph.D. Student



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#### Instructor Short Biographies

Donald Waldman is a professor in the Economics Department. Both his teaching and research concentrate on statistical methods (econometrics) and applied microeconomics

(environmental economics, nonmarket valuation, labor economics, industrial organization). He has taught this course many times.

Eric Penner and Tyler Shenkel are advanced graduate students in the Economics Department. They have completed the Ph. D. level course requirements in statistics and econometrics in the Economics Department.

### **Prerequisites**

The most important background to bring into this course is ability to think abstractly. In addition, students will find it easier if they have a good understanding of algebra at the level of high school Algebra II; differential and integral calculus play a smaller role in this course, but they will be used. Calculus will be reviewed during the course.

The course prerequisites are *one* of the following:

ECON 1078 and 1088;  
MATH 1300;  
MATH 1310;  
MATH 1081;  
MATH 1080, 1090, and 1100;  
APPM 1350.

If you have not taken one of these classes, you cannot take Econ 3818 without a waiver.

### **In the first week of class:**

- Please read Caniglia (the course textbook), Chapter 2.
- If you are not already comfortable with Microsoft Excel, try it out. The University has a site license to the MS Office package, so you can get it for free. It is often included in Windows PCs and some Macs, and it is available on all computers in the CU computer labs. If you want help installing it on your personal computer, go to bugbusters or see

*<http://www.colorado.edu/oit/services/messaging-collaboration/microsoft-office-365/help/proplus>*

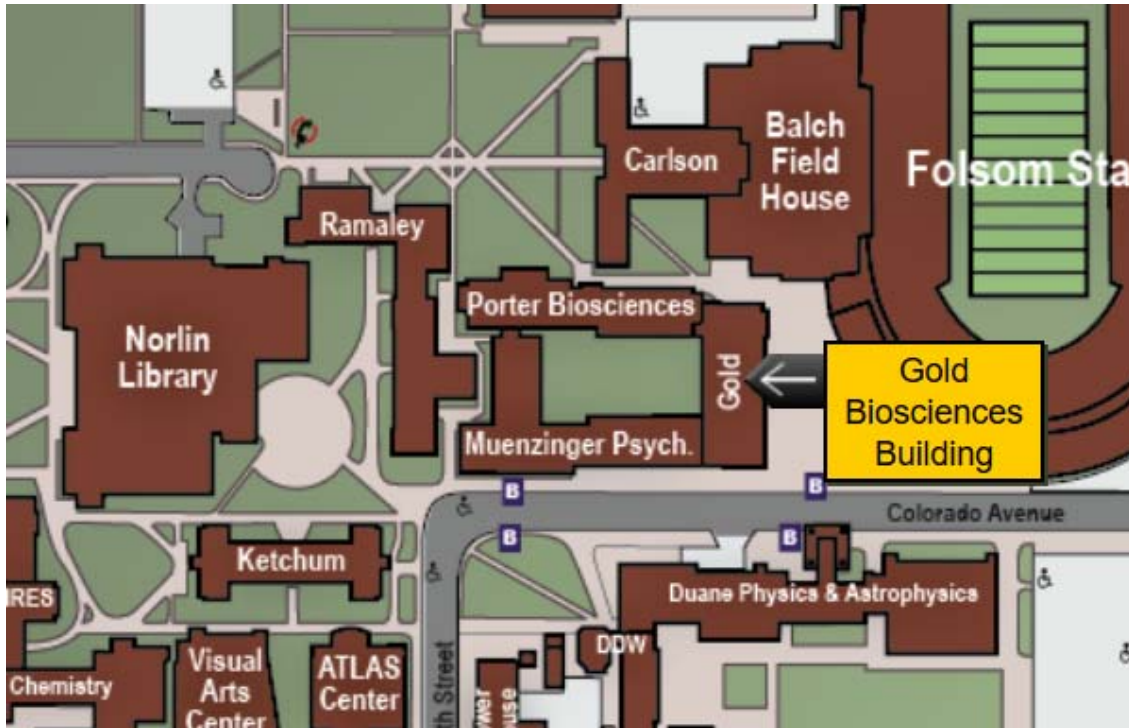
### **Course Objectives**

- Statistics is the study of data (resulting from either the physical or social world) that is subject to randomness. The major objective of this course is to convey the basic language, mathematical symbols, tools, and techniques of statistics.
- Statistics is the building block of econometrics, which is the application of statistics to economic models and data. A second goal of this course is to provide an introduction to econometrics.

- Since the applied economist uses statistics on data, a third objective of the course is to provide the student with the ability to organize and investigate data using Microsoft Excel.

## Lectures, Recitation, Work Load

There will be two lectures weekly, meeting Tuesday and Thursday from 11:00 to 12:15 p.m. in GOLD A2B70 .



Attendance is mandatory!!! It is possible to learn statistics by reading the text, but it is not desirable. You will learn the subject as it applies to economics much better by attending class. In addition, you will help your classmates by being part of the group, asking questions during lecture, collaborating in working out in-lecture exercises, and in other ways. I recognize that there may be times when you cannot attend, so the lecture attendance policy is lenient:

To pass the course, you must be present for 24 of the 30 lectures (but of course I urge you to attend all of the lectures)! At each lecture a sign-in sheet will be passed around. It is your responsibility to sign the sheet. If you come late, come to the front of the class at the conclusion of the lecture to sign. If you forget to sign the sheet, that lecture becomes one of your six missed lectures--you cannot

In addition, you should be registered for one of the recitations:

<u>Number</u>	<u>Day</u>	<u>Time</u>	<u>Room</u>
111	M	3:00—3:50	MCOL E158
112	M	4:00—4:50	MCOL E155
113	T	3:30—4:20	EDUC 205
114	T	5:00—5:50	HLMS 247
115	W	3:00—3:50	MUEN E130
116	W	4:00—4:50	HUMN 180

117	TH	3:30—4:20	DUAN G1B25
118	TH	5:00—5:50	HLMS 263

In recitation material will be presented relevant to the lectures and problem sets. In addition, Excel programming and issues will be discussed. Recitation is an integral part of the course. There are more than 150 students enrolled, so recitation is the best chance to learn one-on-one. Since you will receive four credits if you pass the course compared to the usual three credit course, recitation attendance is also mandatory:

**To pass this course, you must attend at least 10 recitations.**

In my experience, for a student with average mathematical background, an additional one to two hours *per lecture* will be required to read the text and work out assignments in order to fully understand the course material. This course starts with fairly basic concepts, but don't let this mislead you--both the conceptual and mathematical rigor increase as the semester progresses.

## Course Outline

The course begins with *probability*, continues with *statistics*, and ends with *econometrics*, all terms to be defined.

The following is a list of sections, one covered roughly every three weeks. This list may be useful to you to see where we are in the text or if you have had a statistics course previously (but I expect it will have little meaning to most of you at this point).

### *Section 1*

- Research in “Hard” and “Soft sciences
- Summation notation
- Introduction to probability. Axioms; Venn diagrams
- Addition and complement rules of probability
- Conditional probability
- Tree diagrams
- Independence and mutual exclusivity
- Bayes' law
- Urn problems
- Bayes' Law for partitions

### *Section 2*

- Random variables and probability distributions
- Discrete random variables; the probability mass function
- Bernoulli, binomial, and Poisson random variables
- Mathematical expectation
- Expectation of a function of random variables; variance
- Continuous random variables; the probability density function

- The power, exponential, and standard normal distribution
- Bivariate, marginal, and conditional distributions
- Conditional expectation and variance
- Covariance and correlation

### *Section 3*

- The general normal distribution
- From probability to statistics - population and sample
- Sampling theory - the distribution of the sample mean
- The Central Limit Theorem
- The chi-squared distribution
- Point estimation
- Unbiasedness as a property of an estimator
- Relative efficiency and best (minimum variance estimation)
- Examples from portfolio theory
- Comparing biased and unbiased estimators--mean-squared error
- Maximum likelihood estimation
- Confidence intervals

### *Section 4 - hypothesis testing*

- Introduction - the State of Nature and the outcome of a test
- Type I and Type II errors. The power of the test
- Testing hypotheses about the population mean - classical method
- p-value and the p-value method of testing hypotheses
- Using confidence intervals
- Testing hypotheses about the population proportion
- Some caveats in testing hypotheses

### *Section 5 - the classical, normal, linear regression model*

- Model specification and assumptions
- Estimation and hypothesis testing
- Prediction and goodness-of-fit
- Multiple regression
- Review

### **Text**

Caniglia, Statistics for Economists, An Intuitive Approach, Harper Collins Publisher, 1992. This book is out of print, but available in soft cover at the CU bookstore for \$60. Since there is no disk or key to unlock a publisher web site associated with this book, and since there is only one edition, any used copy is equivalent to a new copy. The text has been used for this course at CU extensively for the last five years, so that it is available on all the second hand book sites, on line (3rd party through Amazon, currently starting at \$16), and other places.

## Grading Criteria

- *Quizzes* (15%)
- *Weekly Problem sets* (20%)
- *Three midterm exams* (15% each)
- *Final exam* (20%)

Course grades will be assigned based upon overall percentage course score:

93 - 100	A
90 - 92	A-
87 - 89	B +
84 - 86	B
80 - 83	B -
75 - 79	C +
70 - 74	C
65 - 69	C -
60 - 64	D
< 60	F

Grades may be curved at the end of the term.

## Notes

- The weekly 10 minute quiz is available online after Thursday's lecture. It will consist of four to eight multiple choice questions covering the material presented in that week's lectures. For maximum benefit in learning the mostly sequential material of this course, the quiz must be completed by **the start of the next Tuesday's class**, so by 12:30 pm.
- The weekly problem sets will be available on Thursday as well, and are due the following Thursday by 6 pm. They may be handed in in lecture, in recitation, or in the envelope posted outside your TA's office door.
- The three in-class midterm exams are scheduled for Thursday, September 22, Thursday, October 20, and Tuesday, November 15. They will be composed of questions from the quizzes and problem sets, as well as additional questions.
- The final exam is cumulative, to be given on Tuesday, December 13, 4:30 to 7:00 p.m.

Additional notes on the problem sets:

- You must answer all exercises, but not all will be graded.
- On some problem sets, there will be an Extra Credit problem or problems. These are truly extra credit: they can only raise your grade. To be clear, at the end of the term I will calculate grades for every student without regard to the extra credit problems. Then I will return to my assessment spreadsheet and raise the grades of students who have tried and at least sometimes successfully attempted some or all of the extra credit problems.

Like many courses but unlike, perhaps, a “topics-in something” course, this course is sequential in nature. That is, Thursday's material will likely be unintelligible unless Tuesday's material has been mastered. Therefore, to make understanding material easier, answers to quizzes and problem sets will be made available shortly after their due date and time. This means strict deadlines for completion of quizzes and problem sets.

The lowest problem set score and the lowest quiz score will be dropped. Given this policy, the fact that solutions will be posted immediately after the assignment is due, and the importance of keeping up on the material in this course, **no late problem sets or quizzes will be accepted.**

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*Notice for students with disabilities:*

If you qualify for accommodations because of a disability, please submit to me a letter from Disability Services in a timely manner so that your needs can be addressed. Disability Services determines accommodations based on documented disabilities. Contact: 303-492-8671, Willard 322, and [www.Colorado.EDU/disabilityservices](http://www.Colorado.EDU/disabilityservices)

Disability Services' letters for students with disabilities indicate legally mandated reasonable accommodations. The syllabus statements and answers to Frequently Asked Questions can be found at [www.colorado.edu/disability services](http://www.colorado.edu/disability_services)

*Honor Code Policies*

All students of the University of Colorado at Boulder are responsible for knowing and adhering to the academic integrity policy of this institution. Violations of this policy may include: cheating, plagiarism, aid of academic dishonesty, fabrication, lying, bribery, and threatening behavior. All incidents of academic misconduct shall be reported to the Honor Code Council ([honor@colorado.edu](mailto:honor@colorado.edu); 303-735-2273).

Students who are found to be in violation of the academic integrity policy will be subject to both academic sanctions from the faculty member and non-academic sanctions (including but not limited to university probation, suspension, or expulsion). Other information on the Honor Code can be found at <http://www.colorado.edu/policies/honor.html> and at <http://www.colorado.edu/academics/honorcode/>.

*Excused absences:* for sickness and religious holidays. Please advise your TA.



*Classroom behavior:* Students and faculty each have responsibility for maintaining an appropriate learning environment. Those who fail to adhere to such behavioral standards may be subject to discipline. Professional courtesy and sensitivity are especially important with respect to individuals and topics dealing with differences of race, color, culture, religion, creed, politics, veteran's status, sexual orientation, gender, gender identity and gender expression, age, disability, and nationalities.

*Sexual Misconduct, Discrimination, Harassment and/or Related Retaliation:*

The University of Colorado Boulder (CU Boulder) is committed to maintaining a positive learning, working, and living environment. CU Boulder will not tolerate acts of sexual misconduct, discrimination, harassment or related retaliation against or by any employee or student. CU's Sexual Misconduct Policy prohibits sexual assault, sexual exploitation, sexual harassment, intimate partner abuse (dating or domestic violence), stalking or related retaliation. CU Boulder's Discrimination and Harassment Policy prohibits discrimination, harassment or related retaliation based on race, color, national origin, sex, pregnancy, age, disability, creed, religion, sexual orientation, gender identity, gender expression, veteran status, political affiliation or political philosophy. Individuals who believe they have been subject to misconduct under either policy should contact the Office of Institutional Equity and Compliance (OIEC) at 303-492-2127.