

## Syllabus of Economics 482

Econometrics

Winter 2015

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### Course Description and Outline

This course centers on the use of regression analysis in economics. Students should be able to read, understand and interpret (and know the limitations) applied economic papers that apply basic econometric techniques. In particular, we will focus on the use of regression and how to avoid its misuse. To oversimplify, we will examine models of the form  $\mathbf{y}=\mathbf{X}\mathbf{b}+\mathbf{e}$ . We will learn how to estimate the coefficient vector  $\mathbf{b}$ ; how to test hypotheses; and how to forecast future values of  $\mathbf{y}$  based on known values of  $\mathbf{X}$ . You can get a pretty detailed idea of some of the course material by looking at the tentative outline below. The course is largely theoretical, though it includes also hands-on computer work. The aim of the course is to develop careful, applied, econometricians laying the necessary groundwork for potential econometric courses in your future PhD studies.

### Class Sessions

There will be two meetings per week, each lasting one hour and fifty minutes, Tuesdays and Thursdays from 1:30 to 3:20. Most class sessions will involve a lecture and some in addition also a discussion section.

Students are expected to do the suggested readings before the class. Since part of the exams, the in class quizzes are often "open book", it is suggested that you bring the respective reading material to class. Active participation in the class is required.

### Problem Sets:

- (a) During the quarter you or your study group of max. 3 students will go over several problem sets which will require you to apply the topics we discuss in class and in the readings. In order to solve the problem sets some amount of math (calculus and a limited amount of statistics) is required.
- (b) You are **encouraged** to work in your group on the problem sets. You should write all the names of the group members that participated in your study/problem set on each of the problem sets and your group name.
- (c) Grading of the problem sets: The total number of problems sets is not fixed yet. Let's say, we have in total  $M$  problem sets. For your final grade  $M-1$  problem sets will be taken into account only. The problem set that will be dropped from the evaluation is your problem set that received the least points during the quarter. So your study group can screw up once without regret.
- (d) Please write legibly or use a computer.
- (e) Generally, PSs are due 1:30pm on the due date. If you or your group misses the deadline, you'll obtain 0 points for the PS.

**Office Hours:**

My weekly office hours are Tuesdays 3:40pm to 5:00pm, Savery Hall Room 349. If this time window systematically conflicts with your time schedule, please let me know in class, so that we can find a different time. Also, feel free to email me at [hgwoff@u.washington.edu](mailto:hgwoff@u.washington.edu) for any research or urgent course related questions. Please note, however, that emails with questions regarding course material shortly before problem set due dates or exams will NOT be answered.

**Exams:**

There will two 110 minute midterm exams. They are tentatively scheduled for:

- (a) **Exam 1:** Feb 5
- (b) **Exam 2:** March 12

A small portion (typically the last 15 minutes) of these exams will be “open book”. Hence feel free to bring the required textbook that we have used during the quarter if you think it could help you.

**Assessment & Evaluation**

Class Participation: 10%  
Problem Sets: 20%  
Midterm Test1: 35%  
Midterm Test2: 35%

**Course outline**

The tentative outline of the course is as follows:

**1. Introduction:**

What is “Econometrics”?

Why is it important?

Review of Random Variables, Sampling and Estimation from you prior Statistics course (R1 to R8 in Dougherty)

Probability distribution example:  $X$  is the sum of two dice

Expected value of a random variable

Expected value of a function of a random variable

Population variance of a discrete random variable

Expected value rules

Independence of two random variables

Alternative expression for population variance

The fixed and random components of a random variable

Continuous random variables

Covariance, covariance and variance rules, and correlation.

Sampling and estimators

Unbiasedness and efficiency

Conflicts between unbiasedness and minimum variance  
Estimators of variance, covariance, and correlation  
Asymptotic properties of estimators: plim and consistency  
Asymptotic properties of estimators: simulations and the CLT

## **2. Simple Regression Analysis**

Simple regression model  
Deriving linear regression coefficients  
Interpretation of a regression equation  
Goodness of fit

## **3. Properties of the Regression Coefficient and Hypothesis Testing**

Types of Data and Regression Model  
Assumptions for regression models with non-stochastic regressors  
The random components and unbiasedness of the OLS regression coefficients  
A Monte Carlo Experiment  
Precision of the regression coefficients  
Testing Hypothesis regarding the regression coefficients  
The F test and Goodness of fit

## **4. Multiple Regression Analysis**

Derivation and interpretation of the multiple regression coefficients  
Properties of the multiple regression coefficients  
Multicollinearity  
Goodness of Fit  
Prediction

## **5. Transformation of Variables**

Linearity and nonlinearity  
Logarithmic transformations  
Models with quadratic and interactive variables

## **6. Dummies**

Illustration  
Extension to more than two categories  
Multiple Sets of dummies  
Slope dummies  
The Chow test

Fixed Effect Models (Year and State Fixed Effects)

Difference in Difference Estimation

## **7. Model Specification**

The effect of omitted variables

The effect of including a variable that ought not to be included

Proxy variables

Testing

Residual Analysis

## **8. Heteroskedasticity**

Heteroskedasticity and its implications

Detection

Goldfeld-Quandt test

White test

Remedies of Heteroskedasticity

## **9. Stochastic Regressors and Measurement Error**

Consequences of Measurement Error

Identification

Instrumental Variables

Advanced Topics:

## **10. Simultaneous Equations and Instrumental Variables**

## **11. Binary Choice Models**

## **12. Limited Dependent Variable Models**

## **13. Introduction into Panel Data Models**

## **Reading and Textbooks**

Some of the reading will consist of journal articles, that summarize key advances in the literature or provide recent empirical examples.

As textbooks for this course the following book is **required**:

Christopher Dougherty: "Introduction to Econometrics", Oxford University Press, fourth Edition.

## **Missed Classes:**

If you miss a class, it is your responsibility to get a copy of the lecture notes from your class mates. Please understand that I do not provide private one to one lectures or summaries via email of what has been covered in class. However, that being said, always feel free to come to my office hours with questions concerning the class material or your research ideas.

## **Help with Writing**

The Odegaard Writing & Research Center offers free, one-one-one help with all aspects of writing at any stage in the writing process. To make an appointment or browse the center's online resources, please visit: <http://www.depts.washington.edu/owrc>. Located on the third floor of the Odegaard Library, the OWRC is open Sunday through Thursday from 12:00-9:00 p.m. To make the best use of your time there, please bring a copy of your assignment with you and double-space any drafts you want to bring in. The OWRC will not proofread papers or talk with you about grades.

## **And finally a message by the UW Human Resources:**

Violence awareness and prevention remains an important issue. Please include the following information in the announcement section of 2009 -2010 course syllabi:

**\*UW SafeCampus\***

Preventing violence is everyone's responsibility. If you're concerned, tell someone.

- \* Always call 911 if you or others may be in danger.
- \* Call 206-685-SAFE (7233) to report non-urgent threats of violence and for referrals to UW counseling and/or safety resources. TTY or VP callers, please call through your preferred relay service.
- \* Don't walk alone. Campus safety guards can walk with you on campus after dark. Call Husky NightWalk 206-685-WALK (9255).
- \* Stay connected in an emergency with UW Alert. Register your mobile

number to receive instant notification of campus emergencies via text and voice messaging. Sign up online at [www.washington.edu/alert](http://www.washington.edu/alert)

For more information visit the SafeCampus website at [\\*www.washington.edu/safecampus\\*](http://www.washington.edu/safecampus).