Applied Econometrics I (94-834)
MINI 1, Fall 2015

Instructor
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Lectures: Monday and Wednesday, 1:30 – 2:50pm, HBH 2503
Recitations: Friday, 1:30 – 2:50pm, computer lab: HBH 239

Grading:
40% Weekly homework assignments, with lowest score dropped
20% Mid-mini exam, given during review session on September 28
40% Final exam, given during regular lecture time on October 14

Prerequisites:
90-711, Empirical Methods for Public Policy and Management, or
90-786, Intermediate Empirical Methods, or
95-796, Statistics for IT Managers
(or equivalent coursework in statistics that includes regression analysis)

Course Description:
This course introduces students to applied econometric analysis, focused on the basic and most widely used method: multivariate linear regression. Students will learn the important properties of the linear regression estimator, the construction of hypothesis tests, and the assumptions required for these properties to hold. There will be extensive applied work with real-world datasets using the statistical software Stata. There will also be brief coverage of models for panel data and methods to adjust variance estimates for common issues such as correlated observations.

Course Objectives:
Upon completion of the course, students should:
1. Fully understand the linear regression estimator – its properties, assumptions, and sampling distribution.
2. Have mastery of common hypothesis tests and confidence intervals based on regression models.
3. Be competent and confident in the use of Stata to perform regression analysis with large datasets.
4. Understand and apply modern practices in the use of regressions, specifically – recognizing the difference between causal and statistical associations, using large-sample theory for inference, and accounting for common forms of non-independence of the error term.

**Textbook, Software, Course Website**

**Required textbook:** Stock and Watson, *Introduction to Econometrics*, 3rd Edition.

Recommended software: Stata. This program is available in the virtual lab and on the computers in HBH 239. We will provide instruction and support only for Stata, but you are free to use any other software that can perform the required analyses for the homework. If you are interested in purchasing Stata for your own computer, see: [http://www.heinz.cmu.edu/computing-services/software/index.aspx](http://www.heinz.cmu.edu/computing-services/software/index.aspx)

The course website is on Blackboard.

**Course Policies**

**Attendance:** Attendance at the first lecture is required. Attendance at recitations is required and you must sign-in at recitation. **You must notify the TA by email at least 48 hours in advance if you will miss a recitation.**

**Reading assignments:** Students are expected to complete the reading assignments prior to each lecture. During class you may be called on individually to explain basic concepts from the reading.

**Problem sets:** Discussion among students about assignments is permitted and encouraged. **However, the completed assignment must be your own work. The derivations, estimation results, and descriptions cannot be copied from another person or any other source.** While the final answers to mathematically based homework problems are often very specific, the exact details of how a derivation or calculation is completed will vary from student to student. The same applies to the presentation and interpretation of statistical results. Submissions where these details are identical or nearly identical, either among students or with another source, will be regarded as cheating. The minimum sanction for copying or other forms of cheating on a homework assignment is the loss of credit equal to two assignments, and sanctions may range up to the termination of your enrollment at CMU. All suspected incidents will be recorded with Heinz College administration at the same time the student is notified.

**Exams:** Exams are closed book. Answers on exams must reflect your work alone. Cheating on exams will at a minimum result in a zero exam score, and may result in termination of your enrollment at CMU. All suspected incidents will be recorded with Heinz College administration at the same time the student is notified.

**Course Outline**
The required reading from the textbook for each unit is listed below. We will assume that you have completed the required reading before lecture. The specific sections assigned for each lecture will be posted on Blackboard.

**Univariate Regression Review**
Chapters 1, sections 1.1 and 1.3; Chapter 2, sections 2.2 and 2.3; Chapter 3, section 3.7; Chapters 4 and 5
- motivation: econometric framework, observational data, scatterplots
- formula for the estimator
- assumptions
- distribution of the estimator, the Central Limit Theorem
- hypothesis tests and confidence intervals

**Multivariate Regression**
Chapters 6 and 7
- population regression model
- assumptions (incl. multicollinearity)
- estimation and partial regression
- distribution of the estimator
- hypothesis tests and CIs for one coefficient
- joint hypotheses (Wald, LR tests)
- confidence regions for multiple coefficients
- dummy variables
- assessing model fit
- model specification and sensitivity analysis
- effect size and interpretation of results

**Panel Data**
Chapter 10
- examples of panel data
- panel regression model
- before/after estimation
- fixed effects estimation
- error correlation and heteroskedasticity
- robust standard errors
  (Chapter 5, section 5.4; Chapter 15, section 15.4; Chapter 17, section 17.5)