

Homework and Extra Practice Problems

Econ 103

January 12, 2017

1 Introduction to Statistics

Lectures 1-3

Basic definitions, observational and experimental data, taxonomy of variables, summary statistics, samples and populations, z-scores, bias.

- High priority exercises
 - Problem set II, Part II, exercises 1, 2, 3, 4, 5, 6, 7.
 - Midterm 1, Spring 2014, question 1, 5.
 - Midterm 1, Fall 2013, question 1, 2, 8, 9.
 - Midterm 1, Spring 2013, question 1, 4, 6, 7, 9.
 - Midterm 1, Fall 2012, question 1.
- Other exercises:
 - Book, Chapter 1: 1, 3, 5, 7, 9, 11, 13, 17.
 - Book, Chapter 2: 1, 3, 5, 7, 13, 15, 17 [bart b, skip the MAD and MSD], 21, 23, 27, 35.
 - Midterm 1, Fall 2012, question 2, 3, 6, 11.
 - Final, Fall 2015, question 1(a,c)

2 Introduction to Regression

Lecture 4

Basic notion of regression, how to obtain the coefficient estimates, interpretation of the coefficients, regression to the mean

- High priority exercises
 - Problem set 3, Part II, exercises 1-4.
 - Midterm 1, Spring 2014, question 2, 6.
 - Midterm 1, Fall 2013, question 3, 4.
 - Midterm 1, Spring 2013, question 3, 5.
- Other exercises
 - Book, chapter 11: 1, 3.
 - Book, chapter 15: 1(a), 5(a).
 - Midterm 1, Fall 2012, question 4, 5.
 - Final, Fall 2012, question 1.

3 Basic Probability

Lectures 5-7

Topics: Definition of probability, terminology, Venn diagrams, axioms of probability, permutations and combinations, independence, multiplication rule, Bayes rule

- High priority exercises
 - Midterm 1, Spring 2014, question 3, 4.
 - Midterm 1, Fall 2013, question 5, 6, 7.
 - Midterm 1, Spring 2013, question 2.
 - Midterm 2, Fall 2014, question 1(a, c).
 - Final, Fall 2013, question 1.
 - Final, Spring 2013, question 8.
 - Problem set 4, additional problems, question 1, 5, 6, 8, 9.
- Other exercises
 - Midterm 1, Fall 2012, question 7, 8, 9, 10.
 - Final, Fall 2012, question 2.
 - Book, Chapter 3: 1, 3, 5, 9, 11, 13, 15, 17, 19, 21, 23, 25, 27, 29.

4 Discrete Random Variables

Lectures 7-10

Topics: Definitions (realization, support set), probability mass function, cumulative distribution function, expected value, variance, Bernoulli random variable, Binomial random variable, joint, marginal, conditionals, independence

- High priority exercises
 - Midterm 1, Spring 2013, question 8.
 - Midterm 2, Spring 2014, question 1.
 - Midterm 2, Fall 2013, question 1.
 - Midterm 2, Spring 2013, question 1, 2.
 - Final, Spring 2014, question 1.
 - Final, Spring 2013, question 3.
 - Problem set 4, additional problems, question 2, 3, 4, 5, 7, 8, 9.
 - Problem set 5, additional problems, questions 1, 2, 3, 4, 5, 9, 11, 13, 17.
- Other exercises
 - Midterm 2, Fall 2012, question 1, 4, 6.
 - Final, Fall 2012, question 5.

5 Continuous random variables

Lecture 11-13

Topics: Probability mass function, cumulative distribution function, expectations, variance, joint, marginal, conditional, independence. Types of continuous random variables (Uniform, normal, χ^2 , student-t, F).

- High priority exercises
 - Midterm 2, Spring 2014, question 2, 3, 6, 7.
 - Midterm 2, Fall 2013, question 2, 3, 6, 7.
 - Midterm 2, Spring 2013, question 3, 4, 5, 7.

- Final, Fall 2013, question 3.
- Final, Spring 2013, question 1, 2.
- Problem set 6, additional problems, question 1, 2, 3, 4, 5, 6, 7, 8.
- Problem set 7, additional problems, question 1.
- Other exercises
 - Midterm 2, Fall 2012, question 2, 3, 7, 8.
 - Final, Fall 2012, question 3, 4, 7.
 - Book, Chapter 4, 19, 21, 23.

6 Sampling distribution and estimation

Lectures 14-15

Topics: Estimator, estimate, sampling distribution, standard error, bias, efficiency, mean-squared error, law of large numbers, central limit theorem.

- High priority exercises
 - Midterm 2, Spring 2014, question 4, 5.
 - Midterm 2, Fall 2013, question 4, 5.
 - Midterm 2, Spring 2013, question 6.
 - Final, Fall 2013, question 2.
 - Final, Spring 2013, question 4, 5.
 - Problem set 7, additional problems, questions 2, 3, 4.
 - Problem set 9, additional problems, question 1, 3.
 - Problem set 10, additional problems, question 1.
- Other exercises
 - Midterm 2, Fall 2012, question 5, 8 (a-c), 9.
 - Book, Chapter 6, questions 1, 3, 5, 7, 15, 17, 19(b), 21.
 - Book, Chapter 7, questions 1, 3, 5, 9, 13, 17, 19.

7 Confidence Intervals

Lecture 16-19

Definitions, confidence level, intuition, confidence intervals for mean and variance, difference in means, confidence interval if population is not normal (central limit theorem), confidence intervals for proportions, independent samples and matched pairs problem, central limit theorem in confidence intervals.

- High priority exercises
 - Midterm 2, Spring 2013, question 8.
 - Final, Spring 2014, question 3(a,b).
 - Final, Fall 2013, question 4 (a-c).
 - Final, Spring 2013, question 6, 9(a-d).
 - Problem set 8, additional problems, questions 1, 2, 17(c,d),19,21.
 - Problem set 9, additional questions, question 2, 4, 5, 6, 7.
 - Problem set 10, additional problems, question 2, 3, 4, 5, 6.
- Other exercises
 - Final, Fall 2012, question 6, 8.
 - Book, Chapter 8, questions 1, 3, 5, 7, 9.

8 Hypothesis testing

Lectures 20-23

Steps in hypothesis testing, Type I and Type II error, significance level, power of a test, critical value, decision rule, test statistic, one-sided and two-sided alternative, p-value, relationship between hypothesis testing and confidence intervals, hypothesis test using differences, hypothesis testing for proportions.

- High priority exercises
 - Final, Spring 2014, question 2, 3, 4, 5.
 - Final, Fall 2013, question 4, 5.

- Final, Spring 2013, question 7, 9.
- Problem set 11, additional problems, question 1, 2, 3, 4, 5, 6.
- Other exercises
 - Final, Fall 2012, question 10.
 - Book, Chapter 9, questions 23, 27, 29.

9 Regression part II

Lectures 24–25

Inference in linear regression, confidence intervals, multiple regression, residual standard deviation, R-squared. testing for proportions.

- High priority exercises
 - Final, Spring 2014, question 6.
 - Final, Fall 2014, question 6.
 - Final, Fall 2013, question 6.
 - Final, Spring 2013, question 10.
 - Problem set 12, additional problems, questions 1, 2.
- Other exercises
 - Book, Chapter 12, questions 2, 3.
 - Book, Chapter 13, questions 5, 12.
 - Book, Chapter 13, questions 1, 3, 5.