EXAM I

ID#:

K Foster, Statistics and Introduction to Econometrics, Eco B2000, CCNY, Fall 2011

> The questions are worth 120 points. You have 120 minutes to do the exam, one point per minute. All answers should be put into the blue books or submitted electronically. You may refer to your books, notes, calculator, computer, or astrology table. The exam is "open book." However, **you must not refer to anyone else, either in person or electronically**! You must do all work on your own. Cheating is harshly penalized. If you do work on the computer, please submit all those files via Blackboard and email. Please silence all electronic noisemakers such as mobile phones.

Good luck. Stay cool.

- 1. (15 points) You might find it useful to sketch the distributions.
 - a. For a Standard Normal Distribution, what is the area closer to the mean than 1.45?
 - b. For a Standard Normal Distribution, what is the area to the right of 2?
 - c. For a Normal Distribution with mean 5 and standard deviation 7.6, what is area to the right of 14.1?
 - d. For a Normal Distribution with mean 1 and standard deviation 7.8, what is area in both tails farther from the mean than 11?
 - e. For a Normal Distribution with mean -5 and standard deviation 1.6, what is area in both tails farther from the mean than -2.6?
 - f. For a Normal Distribution with mean -1 and standard deviation 9.8, what values leave probability 0.157 in both tails?
- (15 points) In a medical study (reference below), people were randomly assigned to use either antibacterial products or regular soap. In total 592 people used antibacterial soap; 586 used regular soap. It was found that 33.1% of people using antibacterial products got a cold; 32.3% of people using regular soap got colds.
 - a. Test the null hypothesis that there is no difference in the rates of sickness for people using regular or antibacterial soap. (What is the p-value?)
 - b. Create a 95% confidence interval for the difference in sickness rates. What is the 90% confidence interval? The 99% interval?
 - c. Every other study has found similar results. Why do you think people would pay more for antibacterial soaps?

E.L.Larson, S.X. Lin, C. Gomez-Pichardo, P. Della-Latta, (2004). "Effect of Antibacterial Home Cleaning and Handwashing Products on Infectious Disease Symptoms: A Randomized Double-Blind Trial," Ann Intern Med, 140(5), 321-329.

- 3. (15 points) A study of workers and managers asked both how much management listened to workers' suggestions (on a scale of 1-7 where "1" indicates that they paid great attention). Managers averaged a 2.50 (standard deviation of 0.55); workers answered an average 2.08 (standard deviation of 0.76) managers ignore their workers even more often than the employees realize. There were 137 workers and 14 managers answering.
 - a. Test the null hypothesis that there was no difference between workers and managers: how likely is it that there is actually no difference in average response? (What is the p-value?)
 - b. Create a 95% confidence interval for the difference between workers and managers. What is the 90% confidence interval? The 99% interval?

- 4. (15 points) A recent survey by Intel showed that 53% of parents (561 were surveyed) were uncomfortable talking with their children about math & science. Previous surveys found that 57% of parents talked with their kids about sex & drugs.
 - a. Test the null hypothesis that parents are as comfortable talking about math & science as sex & drugs; that the true value of parents uncomfortable with math and science is not different from 57%. What is the p-value?
 - b. Create a 95% confidence interval for the true fraction of parents who are uncomfortable with math & science. What is the 90% confidence interval? The 99% interval?
- 5. (15 points) The New York Times reported on educational companies that over-sell their products and gave the example of "Cognitive Tutor" (CT) that helps math students. The CT students improved by 17.41 (standard error of 5.82); the regular students improved by 15.28 (standard error of 5.33). There were 153 students in the new program and 102 regular students.
 - a. Test the null hypothesis that there is no difference between regular students and those in the CT group. What is the p-value for this difference?
 - b. Create a 95% confidence interval for the difference between regular and CT students. What is the 90% confidence interval? The 99% interval?
- 6. (20 points) Use the ATUS data (available from Blackboard) on the time that people spend in different activities.
 - a. Among households with kids, what is the average time spent on activities related to kids?
 - b. Among households with kids, how much time to men and women spend on activities related to kids? Form a hypothesis test for whether there is a statistically significant difference between the time that men and women spend with kids. What is the p-value for the hypothesis of no difference? What is a 95% confidence interval for the difference in time?
 - c. Why do you think that we would find these results? Explain (perhaps with some further empirical results from the same data set).
- 7. (25 points) Use the PUMS data (available from Blackboard) on the residents of NYC. Consider the time (in minutes) spent by people to travel to work; this variable has name JWMNP.
 - a. How many men and women answered this question? What variables do you think would be relevant, in trying to explain the variation in commuting times?
 - b. Form a linear regression with the dependent variable, "JWMNP Travel Time to Work," and relevant independent variables.
 - c. Which independent variables have coefficients that are statistically significantly different from zero?