

## BUS 735: Business Decision Making and Research

Instructor: Dr. James Murray

Take Home Exam 1 - Fall 2016

Due Wednesday, October 26, 2016

**Directions:** Type up answers to all of the following questions. Include in your document only the relevant R code and output that you need to answer the question. Every time you conduct a hypothesis test, indicate what statistical test you are using, what are the null and alternative hypotheses, what is your p-value, and a plain English description of what is your conclusion.

1. The dataset `teacherratings.csv` contains data on average course evaluations (`eval`) on a continuous scale from 0.0-5.0 for 463 courses for the academic years 2000-2002 at the University of Texas at Austin. The dataset includes a dummy variable for whether the instructor identified himself or herself as a racial minority (`minority=1` if a minority, `minority=0` otherwise), age (in years), gender (`female = 1` if female and `female = 0` otherwise), whether or not the course was a one-credit course (`onecredit=1` if one credit, `onecredit=0` otherwise), a rating of instructors' physical appearance (`beauty`) based on the average rating of a panel of six students from another university on a continuous scale from 1-10, and whether or not the course was an introductory course (`intro=1` if introductory, `intro=0` otherwise).
  - (a) Without accounting for the influence of any of the other variables, test the hypothesis that minority instructors have different average evaluation scores on average than non-minority instructors.
  - (b) Estimate a regression that uses all of the given instructor and course characteristics to predict an instructor's expected evaluation score. Write down the estimated regression equation.
  - (c) Using the regression results in question (b), test whether or not the physical appearance of the instructor affects his or her evaluation score.
  - (d) Describe whether and how instructor age influences evaluation scores.
  - (e) What percentage of the variability in course evaluation is predicted by your explanatory variables. Note that none of your explanatory variables should capture anything about teacher quality. Can you draw a recommendation for university policy makers using instructor evaluations for personnel decisions?
  - (f) Test the hypothesis that at least one of these explanatory variables that should be unrelated to teaching quality help explain teacher evaluations.
  - (g) What would you predict would be the evaluation score for your BUS 735 instructor, someone who is a male, non-minority instructor, 37 years old, is not teaching a one-credit course or introductory course, and is incredibly good looking (`beauty=10`)?

2. The dataset `cps.csv` contains information about union membership and background characteristics for 1084 individuals. The variables include,
- `educ`: years of education
  - `south`: dummy variable = 1 if employee lives in the South
  - `nonwhite`: dummy variable = 1 if employee is not white
  - `female`: dummy variable = 1 if employee is female
  - `exper`: years of experience
  - `y85`: dummy variable = 1 if year of the observation is 1985, = 0 if the year of the observation is 1978
  - `union`: dummy variable = 1 if the employee is a member of a labor union.
- (a) Without accounting for the other variables in the model, is there evidence of a difference in union membership rates between 1985 and 1978? What is the membership rate in each year in your sample?
  - (b) Estimate a logistic regression that predicts the probability that a person is a member of a union based on all the other variables given above. What is your estimated regression equation?
  - (c) Is there evidence that males and females have different propensities to be a member of a union, taking into account the other variables in your model? If so, which gender is more likely to be a member of a union?
  - (d) Is there evidence that more work experience leads to higher probability that someone is a member of a union? If so, for the average person in the sample, how much more likely does it become that someone is in a union for each additional year of experience they gain?
  - (e) Use your regression model to predict the probability that a white woman from Wisconsin with 12 years of education and 12 years of experience was a member of a union in 1985.
  - (f) What is the marginal effect on the probability of union membership for living in the South, for a person similar to the one described in the previous question?
3. The following questions use the dataset `cex.csv` which is recent (2010:Q2) consumer income data from the Current Population Survey. The variables included in this data file include:
- `hrsweek`: Hours worked per week
  - `emptype`: Employee Type: 1=private company, 2=government employee, 3=self-employed, 4=working without pay.
  - `self`: Dummy variable for whether a person is self employed (=1) or works for an employer (=0)
- (a) Is there evidence that the median hours per week is different for self employed people vs people working for an employer?
  - (b) Is there evidence that median hours per week is different for different employment types? Report the median and interpolated median number of hours for each employment type.
  - (c) Is there evidence that mean hours per week is different for different employment types?
  - (d) For which pairs of employment types is there statistical evidence for a differences in mean number of hours of work?