EC313-Fall 2011
Problem Set 4

(Updated 13 October 2011)

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When you write up your answers, your goals should be to (1) be correct, and (2) convince your reader that your answer is correct. It is always helpful if your work is legible and if all steps are presented, possibly with a line of explanation.

In the case of empirical exercises, your goal should be to provide enough information to allow a reader to replicate your answer. This requires a description of data and data sources as well as a description of your analysis of the data.

Answers which do not achieve these goals will not be awarded full credit.

Problems

1. Let $t = 0,1,2,...$ index years. Suppose that one ton of CO_2 emissions today causes 0\$ of damage for $t < 100$ and 50\$ of damage for $t \geq 100$. Let M denote the amount spent on mitigation at $t = 0$. If the interest rate is r how much will a planner who maximizes the discount present value of consumption be willing to spend on abatement to reduce future damage to zero.

2. This exercise asks you to figure out how dummy variables work in a regression.

   Suppose that your data set consists of three observations of $(y,x) : (1,3),(2,4),(3,2)$. Define a dummy variable D which is equal to 1 for $x > 3/2$ and zero otherwise.

   We would like to estimate the following regression equation,

   $$y = A_0 + A_1 D + \epsilon$$

   (a) Calculate A_0 and A_1 using OLS.

   (b) Let $\hat{y} = \hat{A}_0 + \hat{A}_1 D$. Plot $(\hat{y},x)$ and (y,x).

   (c) Explain, in one or two sentences, what the coefficient of the dummy variable measures.

3. Suppose that value of an average acre of US farmland in 1978 is 1500\$ and that the value of every other variable except January temperature is zero and constant (the idea is that all these other variables drop out of the regression equation). Using the results of table 3 in Nordhaus and Mendelsohn, write the equation describing the way that land value varies with changes in climate. Plot this equation as January temperature varies from 20 to 50 (note that temperature is Fahrenheit here). What does this graph suggest about the importance of a 5 degree Fahrenheit increase in January temperature?

4. In table 2 of their paper 'Climate Change, Mortality, and Adaptation: Evidence from Annual Fluctuations in Weather in the U.S.', (at `http://mit.dspace.org/bitstream/handle/1721.1/38467/MITJPSPGC_Rpt153.pdf?sequence=1`), O. Deschenes and M. Greenstone find that an increase of daily average temperature of about 4 degrees Fahrenheit causes about 6 extra deaths per day in the United States.

Suppose that in 100 years, the rest of the world's death rate responds to changes in climate in just the same way as does the US today. Also suppose that the world population and US population are the same as they are today.

Use this information, together with the discussion from lecture, to calculate the increase in the daily death rate in 100 years that results from burning one 50 liter tank of gasoline.