EC1340 – Fall 2016

Midterm

8:30-9:30am, October 19, 2016

Matt Turner

You will have 50 minutes to complete this exam. No notes or books are allowed, but you may use a calculator. Cell phones and any device with a wireless connection must be off.

When you write up your answers, your goal should be to (1) be correct, and (2) convince your reader that your answer is correct. Answers which do not achieve these goals will not be awarded full credit. To accomplish the second objective, it is helpful if your work is legible and if all steps are presented, possibly with a line of explanation. Total points =40/Share of total grade =15% .

1. (10)In 'Storms of Grandchildren', James Hansen makes a policy recommendation about how we should use coal. What is this policy recommendation?

2. (10) 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) : (2,1),(5,2),(3,3). 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) Plot the three data points and your regression line.

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

3. (10) The Nanticoke coal fired power plant is the largest in Ontario and one of the largest on the continent. At its peak, it generated 24 billion kWh per year, although it is currently operating well below that level. The lifetime of these sorts of power plants is usually about 40 years.

   Suppose that the Nanticoke power plant runs for 40 years at 20 billion kWh/year. Calculate how much cooler the world would be in 2100 if this plant had been nuclear rather than coal fired.

   You may find the following constants useful for this calculation: Nordhaus rule of thumb, doubling CO_2 concentration from 280ppm to 560ppm causes 3 degrees Celsius of warming by 2100; 1ppm of atmospheric carbon weighs 2.12 Gt; one kWh causes about 0.95 kg of CO_2 emissions; 0.55 of each unit of CO_2 emissions remains in the atmosphere after one year; 44/12 tons of CO_2 contains one ton of carbon. World income in 2013 is 77 trillion. An average dollar of consumption requires about 0.17 kg of C.

4. (10) In their 1995 paper in American Economic Review, Mendelsohn et al estimate the relationship between US agricultural land rent, and temperature and rainfall in

four seasons. Simplifying a little, they estimate that

$$\text{rent/acre} = 1490 - 57 \times \text{January temp} + 75 \times \text{January rain} + \epsilon,$$

where rainfall is inches and temperature is degrees Fahrenheit.

To make things easy, suppose that initial January temperature and rainfall are zero. Suppose that there are two competing climate models. The first predicts 1 degree of warming and 2 inches of rain for January. The second predicts 2 degrees of warming an one inch of rain. Finally, suppose that ϵ is a random variable that takes the values 200 and minus 200 with equal probability.

(a) (10) Calculate the expected change and standard deviation of land rent if the first climate model is correct. Repeat these calculations when the second climate model is correct.

(b) (10) Suppose that you think both climate models are equally likely and that the draws of ϵ are independent of which model is true. Calculate the expected value and standard deviation of land rent for this case.

(c) (5) In this example, does climate model uncertainty increase or decrease our uncertainty about the effect of climate change on land rent? Explain briefly.