

**ECON 8002/4162: Microeconomic Analysis**

**PROBLEM SET #4**

(due in the TA session, 11/29)

These questions require the spreadsheet PS4.XLS which has (made up) data on corn yield ( $C$ ), fertilizer use ( $K$ ), and fertilizer price ( $q$ ) for 1000 farms. The underlying production function is

$$C_i = Q_i K_i^\alpha S_i,$$

where  $Q$  is unobservable land quality, and  $S$  is rainfall. Farmers know their own land quality and the price they must pay for fertilizer (but have only a common expectation about rainfall) when they choose the quantity of fertilizer so as to maximize expected profits. Assume that variations in land quality are independent of variation in the fertilizer price. The price of corn is 1.

Your objective is to tell me what is the value of  $\alpha$ .

1. Do a scatter plot of  $\ln C$  vs.  $\ln K$ . What is the OLS regression slope? What does this slope tell you about the value of  $\alpha$ ?
2. Do a scatter plot of  $\ln K$  vs.  $\ln q$ . What is the OLS regression slope? What does this slope tell you about the value of  $\alpha$ ?
3. Plot the frequency distribution of the share of farm revenue spent on fertilizer. What is the mean value of the share of farm revenue spent on fertilizer? What does this figure, and the mean value, indicate about the value of  $\alpha$ ?
4. Suppose  $\ln S_i$  has a normal distribution. Farmers know this, and also know the parameters of the distribution. Use this information to improve on your estimate of  $\alpha$  from the question above. (Hint, use a result on page 189-190 of Varian.)