

AEDECON 7140
Spring Semester 2025
Assignment #2
Distributed: Thursday March 6, 2025
Due Date: Friday March 21, 2025

Note:

1. The assignment should be submitted by **3:00pm** on the due date. Late submission will not be accepted.
 2. Group work is allowed, but each individual student must submit his/her own work separately.
 3. Please label your answer clearly. While it's not required, you are encouraged to type your answers as much as possible in a word processor and convert to PDF if you wish. No LaTeX please.
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Problem #1

This problem helps refresh the summation operator. Suppose x and y are two column vectors both have n elements. Show the following is true. You may find it's easier to work from the right-hand side to the left.

$$\frac{n(\sum x_i y_i)}{n \sum (x_i^2) - (\sum x_i)^2} = \frac{n\bar{x}\bar{y} + \sum (x_i - \bar{x})(y_i - \bar{y})}{\sum (x_i - \bar{x})^2}$$

Problem #2

Refer to handout "Application and Interpretation of Dummy Variables". Provide output for all questions (and clearly label them according to question numbers) unless otherwise noted.

- 2.1 Based on Model 2.2 in the handout, suppose you also wanted to see how individuals' experience affects their wage. In addition to just experience itself, you suspect experience may play a different role in different gender. You also further assume experience does not make a difference in different occupations. Show a model that would enable you to express your ideas and calculate the wage of a female doctor based on sample average experience.
- 2.2 Estimate model $Y = \beta_0 + \beta_{MD}D_{MD} + \beta_{FP}D_{FP} + \beta_{MP}D_{MP} + \beta_{FL}D_{FL} + \beta_{ML}D_{ML} + \varepsilon$ and calculate the wage rate of a female professor. Compare this measure to the female professor's wage rate suggested in model M32 in the handout (no need to show M32 estimation result). What do you find? Also compare and comment on the R^2 s and adjusted R^2 s between these two models.
- 2.3 Suppose you suspect that the impact of experience to wage rate may follow a quadratic pattern. Based on everything in Model M5, you added another variable Exper^2 . Show this model estimation result and calculate the wage rate of a doctor based on sample mean experience.

Question #3

Many studies are interested in decomposing land values. One such study collected a sample of 651 land auctions last year. Key variables of this sample are summarized below.

<i>Variable</i>	<i>Definition</i>
LandID:	An ID number indexes pieces of land sold at auctions
Value:	Auction price of land, measured by thousand dollars per acre
Building:	Whether there are any building structures on the land; 1 indicates yes and 2 for no.
Genertn:	Number of generations the original owners have been owning the land
Rain:	Annual rainfall on land, measured by inches
UseType:	Type of land use 1 the land is most suitable for shrubs 2 the land is most suitable for orchards/vineyards/horticulture 3 the land is most suitable for rangeland 4 the land is most suitable for crop/pasture

Provide only the most relevant computer output for each question and clearly label them according to question numbers. When you do the analysis, please don't forget to check your data to ensure that your software has actually taken all observations in the data.

There is something less than perfect to the observations of rainfall. Specifically, there is one observation taking an absurd value. You should be able to identify this value by checking the descriptive statistics of data. Before you conduct any data analysis, you need to find this observation in variable *Rain* and replace it with the sample average rainfall calculated from the remaining 650 observations of variable *Rain*.

- 3.1 Using the OLS estimator, show the estimation result of model: $Value = \beta_0 + \beta_1 Built + \beta_2 Genertn + \beta_3 Rain + \beta_4 Orchard + \beta_5 Range + \beta_6 Crop + \varepsilon$, where *Built* is a dummy variable equal to one if the land had any building structures on it; *Orchard*, *Range*, and *Crop* are dummy variables for land types of orchard, rangeland, and crop respectively. Interpret the following four variables in terms of marginal effect and elasticity: *Built*, *Genertn*, *Rain* and *Orchard*. Please note that even after you have replaced the odd observation for variable *Rain*, the data are still not quite ready for this above regression. You need to do some further transformation to the data. Use words to briefly explain what transformations you did.
- 3.2 Estimate a Log-Lin, Lin-Log, and Log-Log model in that order, and interpret the marginal effect and elasticity of the coefficient associated with variables *Rain* and *Range* in each of the three models. Show model estimation results from the software.