Answers to Problem Set 1^*

Student: Ruoyun Tan ECON-UA 266.006 Intro to Econometrics

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1. (Gujarati and Porter, ch.2, 2.6)

Answer.

- a. This model is linear in parameters, but it is not linear in variables.
- **b.** This model is linear in parameters, but it is not linear in variables.
- **c.** This model is linear in parameters, but it is not linear in variables. The equations could be written as $Y_i = e^{\beta_1 + \beta_2 X_i + u_i}$.
- **d.** This model is neither linear in parameters nor linear in variables. The equations could be written as $Y_i = \beta_1 X_i^{\beta_2} \cdot e^{u_i}$.
- e. This model is linear in parameters, but it is not linear in variables. The equations could be written as $Y_i = e^{\beta_1 \beta_2 \frac{1}{X_i} + u_i}$.

In all, a, b, c, and e are linear regression models.

2. (Gujarati and Porter, ch.2, 2.10)

Answer. The general solution drawn from the scattergram is that in developing countries, the average growth in manufacturing wages is positively corelated with the average annual change in export-GNP ratio. The regression line is a sample regression line.

3. (Gujarati and Porter, ch.2, 2.15)

Answer.

- a. Figure 1 below shows the plotted data and the sketched regression line.
- **b.** Among the rural Indian households, there is a positive correlation between the expenditure on food and the total expenditure.
- **c.** Expenditure will not increase linearly as total expenditure increases. This is because the quantity of the food needed by a household is limited. This in fact coincides with the concept of the "Engel's Law".

^{*}All graphs in this document are generated by RStudio.



Figure 1: Total Expenditure and the Expenditure on Food

4. (Gujarati and Porter, ch.2, 2.16)

Answer.

a. Figure 2 and Figure 3 shows the plotted data for males and females seperately.



Figure 2: Critical Reading and Math Scores for Males



Figure 3: Critical Reading and Math Scores for Females

- **b.** For males, the critical reading scores and the math scores tend to diverge; while for females, the two scores tend to converge.
- **c.** For males, their math scores are likely to be lower than their critical reading scores. For females, their math scores are likely to be about the same as their math scores.
- **d.** Figure 4 shows that over the years the math scores of males are about 40 points higher than that of females. But the changing pattern of the two are very generally the same.



Figure 4: Math Scores for Males and Females