Name: Adarsh Shankar

Student ID: 2117611

DSC 423: Data Analytics and Regression

Assignment 10

Honor Statement: "I have completed this work independently. The solutions given are entirely my own work."

1. ***(10 points) An economist is interested in the effect of the rising price of gas on drivers. He puts an add on the radio, "Call 1-800-GAS-PUMP, and let me know what you think about the costly price of gasoline." This is obviously a terrible way to conduct a survey. Identify three ways bias could enter the study.***

   To carry out a decent enough experimental design for the survey, we need adhere to the rules of reducing noise and improving signal. The survey seems to have suffered as a result of the economist's remarks. The economist did not raise the signal or decrease the noise, which are the main points.

   First of all, it appears that He is using a vague set of criteria and has no established system for allocating treatments to trial units. The audience is more likely to receive inaccurate information when he uses letters rather than numbers to express the phone number to be called because of audience members' poor pronouncing or spelling of the letters. In order to leave a message, callers are unable to dial the proper number.

   Secondly, the survey findings can be unreliable if the incorrect survey item was used to choose the treatments. The research object in this example is a driver, but since everyone who hears this broadcast can write a note on it, there may be some debate over the choice.

   The required number of observations must also be determined. No set period of time has been established by economists for making calls or leaving messages. Uncertainty surrounds the economist's capacity to gather enough data in the allotted amount of time.

2. ***(10 points) Yvette is a young banker. She and all her friends carry cell phones and use them heavily. Last year, two of Yvette's acquaintances developed brain tumors. Yvette wonders if the tumors are related to use of cell phones. Explain why the experience of Yvette's friends does not provide good evidence that cell phones cause brain tumors.***

The experiences of Yvette's acquaintances refute the idea that cell phones cause brain tumors.

We can set up a two-factor factorial experiment for "using mobile phones" and "brain cancers".

One study that looked at more than 420,000 cellphone users over a 20-year period found no evidence of a connection between smartphones and brain tumors. Since there is no interaction between these two factors and no main effect between these main effects, we may rule out any further investigation of the factor showing up.

3. *A manufacturer of food products uses package liners that are sealed at the top by applying heated jaws after the package is filled. The customer peels the sealed pieces apart to open the package. What effect does the temperature of the jaws have on the force required to peel the liner? To answer this question, the engineers prepare 60 pairs of pieces of package liner. They seal five pairs at each of 250 F, 275 F, 300 F, and 325 F of three different types of liner (A, B, C). Then they measure the peel strength of each seal.*

a. *(5 points) Identify the experimental units or subjects*

   Package liner.

b. *(5 points) Identify the factors*

   Seal temperature. And types of liner.

c. *(5 points) Identify the treatments*

   The twelve combinations of seal temperature and types of liner

d. *(5 points) Identify the response variables*

   The measure of the peel strength of each seal.

e. *(5 points) Write the regression model for this experiment.*

   $E(y) = \beta_0 + \beta_1 * x_1 + \beta_2 * x_2 + \beta_3 * x_3$ $x_1 := 1$ if treatment 2

   $= 0$ if not

   $x_2 := 1$ if treatment 3

= 0 if not x3: = 1 if

treatment 4

= 0 if not

f. ***(5 points) Is this a Randomized Block Design? Explain.***

Yes. In order for block randomization to function, an equal number of participants are assigned to each treatment inside of each block. This figure shows a randomized block design with b = 3 blocks and p = 4 treatments. We can make three different kinds of liners operate in four different temperatures, each under a unique set of conditions.