# HW2- Advanced Data Analysis

1. (10pt) Rats were given one of four different diets at random, and the response measure was liver weight as a percentage of body weight. The responses are given in the file HW2(Diets) Let $\mu_1, \mu_2, \mu_3$ and $\mu_4$ be the mean responses corresponding to the four diets respectively.

   (a) (4pt) Compute the analysis of variance table for these data. What would you conclude about the four diet means? (use $\gamma = 0.05$)

   (b) (2pt) Compute a $95\%$ confidence interval for $\mu_1 - \mu_2$

   (c) (2pt) Compute a 95% confidence interval for $L = \frac{\mu_1+\mu_2}{2} - \frac{\mu_3+\mu_4}{2}$

   (d) (2pt) Test $H_0 : L = 0$ against $H_a : L \neq 0$ using $\gamma = 0.05$.

2. In this problem we use the factor effects model to analyze the data in problem 1). The model we use is

$$y_{ij} = \mu + \alpha_i + \epsilon_{ij}$$

   where $\alpha_1 + \alpha_2 + \alpha_3 + \alpha_4 = 0$.

   (a) (2pt) Obtain estimates of $\mu, \alpha_1, \alpha_2, \alpha_3$ and $\alpha_4$. (Hint: do regression using

$$D_i = \begin{cases} 1, & \text{if diet is i} \\ -1, & \text{if diet is 4} \\ 0, & \text{otherwise} \end{cases}$$

   $i = 1, 2, 3.$)

   (b) (4pt) Test $H_0 : \alpha_1 = \alpha_2 = \alpha_3 = 0$ against $H_a$ : Not $H_0$ at $\gamma = 0.05$. Compare your answer with your answer for a) in Problem 1)

3. (4pt) Suppose you have three different feeds that may affect the size of eggs that chickens lay. You randomly assign 10 chickens to each one of the three feeds and record the size of the eggs (maximum length, in centimeters) that the chickens lay the following week. The null hypothesis is that all the chicken feeds have the same effect on the length of the major axis. The alternative is that the feed has so me causal effect. A partial output is

| Source | df | SS | MS | F |
|---|---|---|---|---|
| feed | —- | 23.43 | ——— | ——— |
| error | —- | —— | —— | |
| total | —— | 28.10 | | |

(a) (2pt) Complete the table above

(b) (2pt) Test the null hypothesis is that all the chicken feeds have the same effect on the length of the major axis against the alternative is that the feed has some causal effect. Use $\alpha = 0.05$.