

Assignment 5

(Due next Thursday 10/06/05)

1. An experiment is conducted to study the impact of hormone on the liver of rat. Two types of hormones (I, II) each with two levels are involved. We consider the following four treatments: (A) Hormone I at high level; (a) Hormone I at low level; (B) Hormone II at high level; (b) Hormone II at low level. Each treatment is applied to six randomly selected rats. The response is the amount of glycogen (in mg) in the liver of a rat after a certain period of time.

Treatment	Responses					
A	106	101	120	86	132	97
a	51	98	85	50	111	72
B	103	84	100	83	110	91
b	50	66	61	72	85	60

Suppose we are interested in the following three contrasts:

Comparison	A	a	B	b
Hormone I vs Hormone II	1	1	-1	-1
Low Level vs High level	1	-1	1	-1
Equivalence of Level	1	-1	-1	1

- Use ANOVA to check if there exist differences between the treatments ($\alpha = 5\%$).
- Show that the contrasts are orthogonal to each other.
- Use contrast sum of squares to test if the contrasts are significant ($\alpha = 5\%$). Interpret the results. (You need use datalines to input the data. To avoid some unexpected complexity in SAS, please code the treatments as 1, 2, 3 and 4 respectively).

2. An experiment is run to determine whether four specific firing temperatures have different effects on the density of certain brick. The experiment generates the following data (temperature.dat on the class website).

temperature density

1	22.8	1	22.5	1	21.5	1	21.6	1	22.1
2	21.2	2	19.5	2	20.3	2	20.6	2	19.8
3	20.8	3	21	3	22.2	3	21.6	3	20.4
4	23.7	4	23.3	4	22.4	4	22.6	4	22.9

where the temperature levels are 100, 125, 150 and 175 coded as 1, 2, 3 and 4 respectively.

a). Test if the firing temperatures have different effects? Use $\alpha = .05$.

b). Since temperature is a quantitative factor, the experimenter is also interested in modeling the functional relationship between brick density and temperature. Use orthogonal contrasts to fit an orthogonal polynomial model. Test if the linear, quadratic and cubic effects are significant ($\alpha = 5\%$).

c)(Optional). Use the polynomial model obtained in b), which only includes the significant terms, to find the temperature that produces the lowest density.