

DISCUSSION 4

Review: two types of designs

1. Fully randomized design:

- Treatments are randomized among all the subjects.
- Model assumptions: Addictive Model, error IID, Normality, and Common variance.

The analysis of the data in Table 4.1 implies tentative acceptance of the underlying additive model

$$y_{it} = \eta + \tau_t + \varepsilon_{it}$$

where y_{it} is the i th observation in the t th column of the table, η is the overall mean, τ_t is the deviation produced by treatment t , and ε_{it} is the associated error.

2. randomized block design

- Treatments are randomized with the blocks
- Model assumptions: similarly except that there are block effects:

The decomposition of the observations shown in Table 4.6, which leads to the ANOVA table and its graphical counterpart, is a purely algebraic process motivated by a model of the form

$$y_{it} = \eta + \beta_i + \tau_t + \varepsilon_{it}$$

Thus the underlying *expected* response model

$$\eta_{it} = \eta + \beta_i + \tau_t$$

Exercies:

1. Question 1

- 1. Paint used for marking lanes on highways must be very durable. In one trial paint from four different suppliers, labeled GS, FD, L, and ZK, were tested on six different highway sites, denoted 1, 2, 3, 4, 5, 6. After a considerable**

length of time, which included different levels of traffic and weather, the average wear for the samples at the six sites was as follows:

		Paint suppliers			
		GS	FD	L	ZK
	1	69	59	55	70
	2	83	65	65	75
Sites	3	74	64	59	74
	4	61	52	59	62
	5	78	71	67	74
	6	69	64	58	74

The objective was to compare the wear of the paints from the different suppliers.

- What kind of an experimental design is this?
- Make a graphical analysis and an ANOVA.
- Obtain confidence limits for the supplier averages.
- Make checks that might indicate departures from assumptions.
- Do you think these data contain bad values?
- What can you say about the relative resistance to wear of the four paints?
- Do you think this experimental arrangement was helpful?

2. Question 2

- 27.** Possibly meaningful signals have been obtained from outer space. The data take the form of the number of pulses y received in each sequence of 127 minutes. A skeptic suggests that the variation in the frequencies observed, y_1, y_2, \dots, y_{127} , might be ascribed to chance causes alone. Describe any test you might make to test the skeptic's hypothesis.