1.20 Complete Randomized Block Designs

A randomized block design is called complete if each block contains every level of the treatment. Table 1.20 is an example of a complete randomized block design with four treatments, A, B, C, and D, and three blocks.

Table 1.20

	Block		
	1	2	3
	A	D	A
	B	B	C
	C	A	B
	D	C	D

Let Y, TRT, and BLK be the response, treatment, and block variables respectively. The MANOVA commands needed to perform the analysis of this design are

```
MANOVA          Y BY BLK(1,3) TRT(1,4)/
                DESIGN=BLK,TRT/
```

In most applications the significance of the block differences is assumed, and treatment effects are corrected for the block effects. (Although it does not make any difference here since the design is balanced and complete, in general the treatment effects should be adjusted.)

1.21 Balanced Incomplete (Randomized) Block Designs (BIB)

In some randomized block designs it may not be possible to apply all treatments in every block. If the block size is less than the number of treatments, the design is called incomplete. An incomplete block design is called balanced if

- Each block contains exactly k treatments
- Each treatment appears in r blocks
- Any pair of treatments appears together λ times

Thus a BIB can be described in terms of the parameters t (number of treatments), b (number of blocks), k, r, and λ.

Table 1.21 is an example of a BIB design with $t = 4$, $b = 4$, $k = 3$, $r = 3$, and $\lambda = 2$.

Table 1.21

	Block			
	1	2	3	4
	A	D	A	B
	B	B	D	C
	C	A	C	D

The following example is taken from Cochran and Cox (1957, p. 443). It is a BIB design with $t = 6$, $b = 15$, $k = 2$, $r = 5$, and $\lambda = 1$. The blocks are grouped into 5 replications.

The SPSS commands for this analysis are given in Figure 1.21a. The first design model specification requests the blocks within replications adjusted for treatment effects. The second model asks for the treatment effects adjusted for the blocks.