

ANALYSIS OF VARIANCE WITH STRUCTURAL ZEROES

Table 2.2: SAS's Parameter Estimates

	True Value	Refer.	Horiz. Flip	R1,R2 switch	R3,R4 switch
	Parameter Estimates				
μ	5	9.96	4.54	9.96	6.81
α_1	-2	-2.55	0.00	-5.56	-2.55
α_2	-1	-3.50	-0.94	-2.60	-3.50
α_3	1	-2.87	2.56	-2.87	1.29
α_4	2	0.00	5.42	0.00	0.00
β_1	-2	-4.38	-4.52	-4.38	-1.22
β_2	-1	-4.52	-1.65	-4.52	-1.37
β_3	1	-3.16	1.00	-3.16	0.00
β_4	2	0.00	0.00	0.00	3.16
$\alpha\beta_{11}$	-1	-3.01	0.00	0.00	-3.01
$\alpha\beta_{12}$	1	0.00	0.00	3.01	0.00
$\alpha\beta_{21}$	1	0.89	3.90	0.00	0.89
$\alpha\beta_{22}$	-1	0.00	0.00	-0.89	0.00
$\alpha\beta_{31}$	-.5	0.76	0.90	0.76	-3.40
$\alpha\beta_{32}$.5	2.87	0.00	2.87	-1.29
$\alpha\beta_{33}$	1	4.16	0.00	4.16	0.00
$\alpha\beta_{34}$	-1	0.00	0.00	0.00	-4.16
$\alpha\beta_{41}$.5	0.00	0.14	0.00	0.00
$\alpha\beta_{42}$	-.5	0.00	-2.87	0.00	0.00
$\alpha\beta_{43}$	-1	0.00	-4.16	0.00	0.00

now different as a result of the missing cells, we will need to impose additional constraints to keep the design matrix X nonsingular. Using Figure 1.2, we see that we do not need to adjust the constraints for the main

2. Freund, R.J. (1980), "The Case of the Missing Cell." *The American Statistician*, **34**, 94-98.
3. Kirk, R. (1968), *Experimental Design: Procedures for the Behavioral Sciences*. Belmont: Brooks/Cole Publishing Company.
4. Littell, R.C., Freund, R.J. and Spector, P.C. (1991), *SAS System for Linear Models*. Cary: SAS Institute, Inc.
5. Schluchter, M.D., *BMDP 5V -- Unbalanced Repeated Measures Models with Structured Covariance Matrices*. Tech Report 86. Los Angeles: BMDP Statistical Software, Inc.
6. Searle, S.R. (1987), *Linear Models for Unbalanced Data*. New York: John Wiley and Sons, Inc.