

Setting up models Part 2

NITP 2011

How this works

- Model setups based on FSL list questions!
- I'll pose the problem and you work out the design matrix and contrasts

Model 1

- You have estimated successful stop pre and post training (2 runs) for each subject. At the group level you have 8 subjects with 2 measures each, what is the appropriate model?
 - How do you test post-pre training?

Model 2

- You have 9 subjects and all but one subject have complete pairs of data (one subject missed the second scan)
 - Can you still use a paired t test?
 - Other options?

Model 2

- Suggestions
 - If there is high within subject correlation (like in the tire example earlier) you need a paired test
 - Toss the subject with incomplete data
 - If there isn't a high correlation, a two-sample t-test may be okay
 - Be careful or else you'll be losing power
 - Use complete data to compare paired t test to 2 sample t test

Model 3

- You have 5 subjects scanned under 3 conditions (A, B & C) and you want to make all pairwise comparisons in one model
 - You must account for repeated measures
 - Construct 3 contrasts: A-B, B-C, A-C

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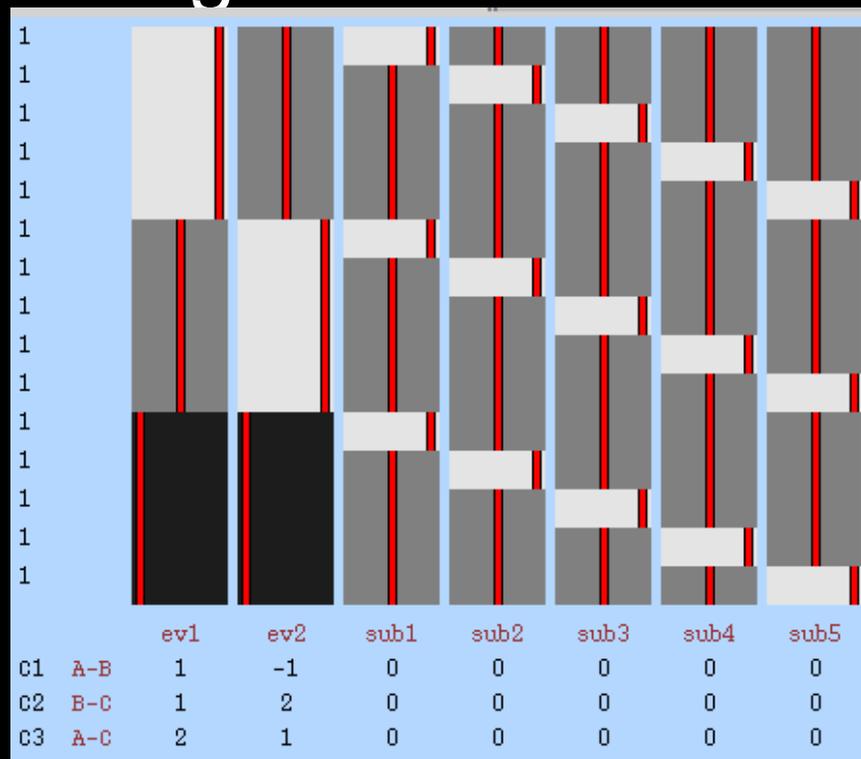
If you're totally stuck, set up a factor effects ANOVA model and I'll show you how to build off that in a second...

Triple paired t test

	ev1	ev2	sub1	sub2	sub3	sub4	sub5
A1	1	0	1	0	0	0	0
A2	1	0	0	1.0	0	0	0
A3	1	0	0	0	1.0	0	0
A4	1	0	0	0	0	1.0	0
A5	1	0	0	0	0	0	1.0
B1	0.0	1.0	1	0	0	0	0
B2	0.0	1.0	0	1.0	0	0	0
B3	0.0	1.0	0	0	1.0	0	0
B4	0.0	1.0	0	0	0	1.0	0
B5	0.0	1.0	0	0	0	0	1.0
C1	-1.0	-1.0	1	0	0	0	0
C2	-1.0	-1.0	0	1.0	0	0	0
C3	-1.0	-1.0	0	0	1.0	0	0
C4	-1.0	-1.0	0	0	0	1.0	0
C5	-1.0	-1.0	0	0	0	0	1.0

Triple paired t test

- Really just a repeated measures ANOVA using factor effects



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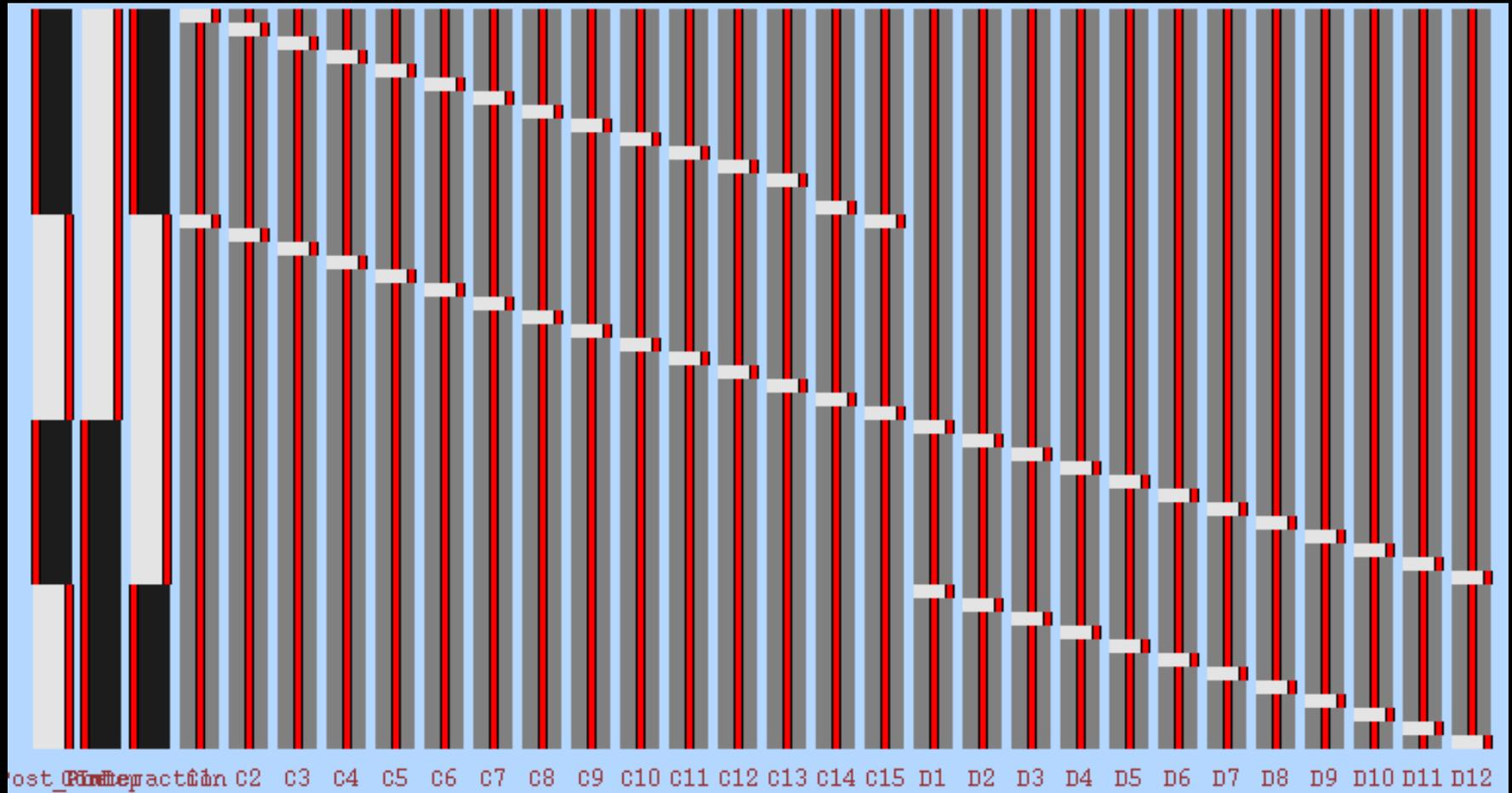
Note on repeated measures ANOVA

- As long as each subject has repeated measures for all cells of the ANOVA use factor effects and split up the intercept into subject-specific means
- Won't work if you do not have repeated across both factors
 - Eg. 2x2 ANOVA
 - Factor 1: Pre/post training (everybody has both)
 - Factor 2: control/patient (each subject only in one group or the other)

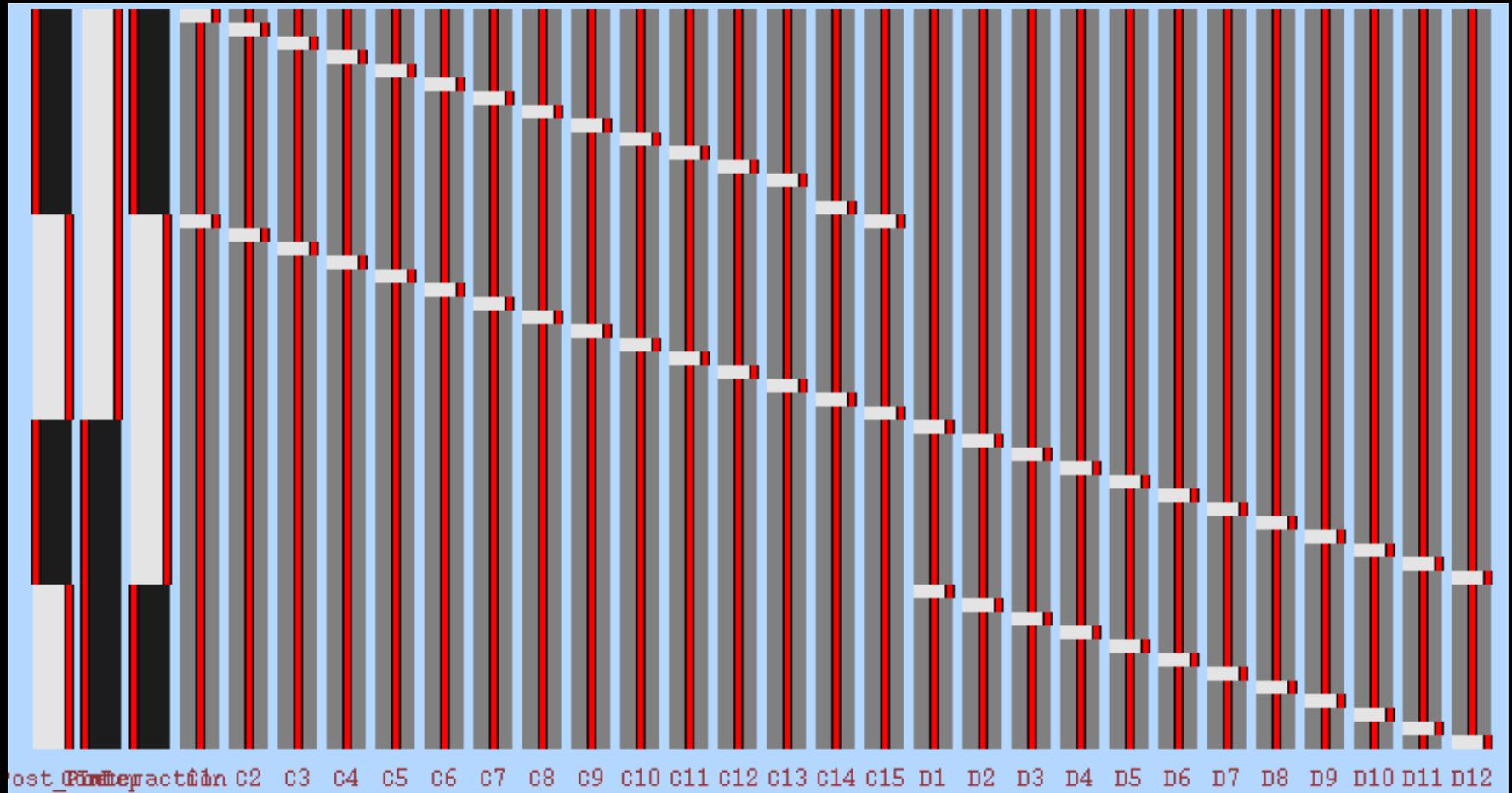
Model 4

- Goal: Set up an 2 way ANOVA where
 - Repeated measure on first factor (Time two levels: time 1 and time2)
 - Not repeated on second factor (Group, 2 groups patients and controls)
- Contrast of interest
 - Test whether the difference in activation between the two times differs between groups

What is wrong with this?



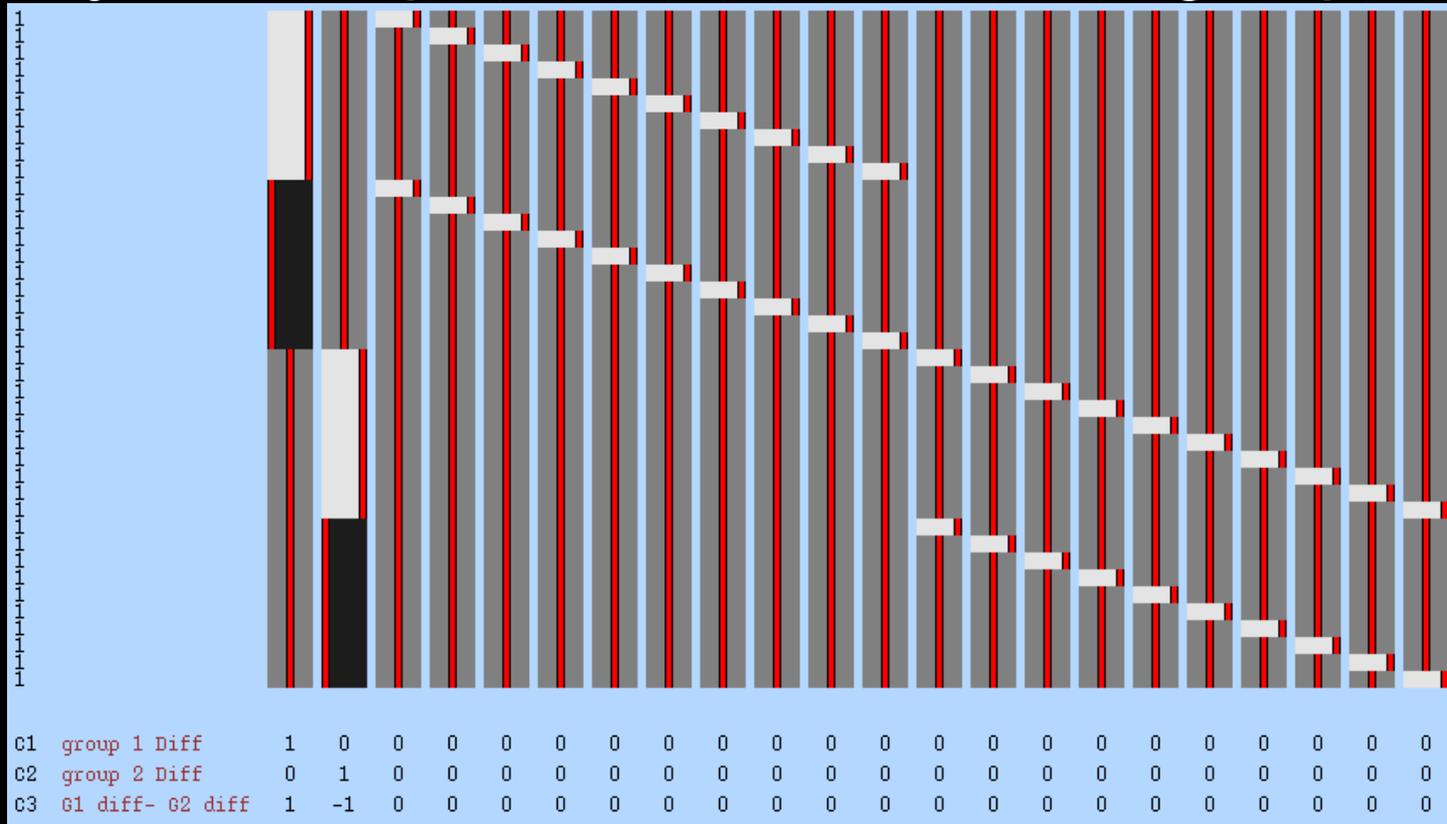
What is wrong with this?



Rank deficient...but a good effort!

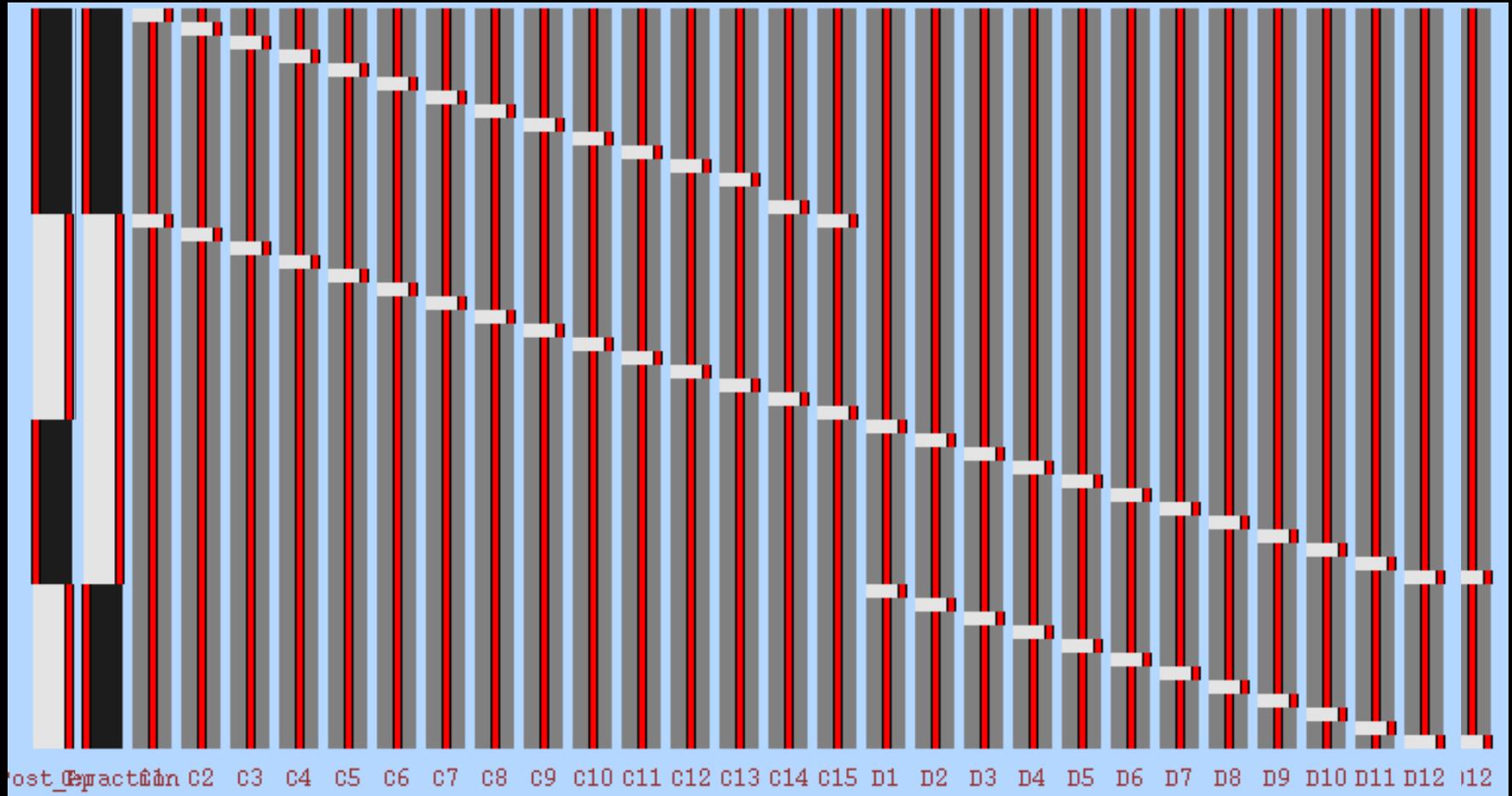
Suggested model

- Extension of the paired t test
- Adjust for repeated measure within group



$$c = [1 \ -1 \ 0 \ 0 \ \dots \ 0]$$

Another model



$c = [0 \ 1 \ 0 \ 0 \ \dots \ 0]$

Model 5

- I would like to run a higher level repeated measures analysis on a group of 8 subjects scanned twice including a covariate (time between 1st and 2nd scan). I'm interested in the difference between the 1st and 2nd scan and the effect of the time between the 2 scans. I'm not sure how to set up the design.

Model 5

- Summary
 - Sort of like a paired t-test
 - Want to compare scan 1 to scan 2
 - BUT, second scan occurred at a different time for each subject, so they also want to adjust for this effect
- Construct design for 3 subjects where second scans occurred at 2, 5, and 3 months, respectively

Model 5

$$\begin{pmatrix} 1 & 0 & 1 & 0 & 0 \\ 1 & 0 & 0 & 1 & 0 \\ 1 & 0 & 0 & 0 & 1 \\ -1 & 2 & 1 & 0 & 0 \\ -1 & 5 & 0 & 1 & 0 \\ -1 & 3 & 0 & 0 & 1 \end{pmatrix}$$

Model 5

$$\begin{pmatrix} 1 & 0 & 1 & 0 & 0 \\ 1 & 0 & 0 & 1 & 0 \\ 1 & 0 & 0 & 0 & 1 \\ -1 & 2 & 1 & 0 & 0 \\ -1 & 5 & 0 & 1 & 0 \\ -1 & 3 & 0 & 0 & 1 \end{pmatrix}$$

Note: It isn't likely that the parameter corresponding to the first regressor would be significant, in the presence of the 2nd regressor.

Questions?