

Repeated measures

Stat 526
4-30-15

(1)

generalizes matched pairs

$$Y_{ijk} = \mu + \tau_i + \beta_j + \tau\beta_{ij} + \varepsilon_{(ij)k}$$

\swarrow Factor \swarrow person

$$i=1, \dots, a \quad j=1, \dots, n \quad k=1$$

This is a special case of the RCBD

Case 1:

Consider the factor A fixed.

df		$\frac{a}{F}$ i	$\frac{n}{R}$ j	$\frac{1}{R}$ k	EMS	denom (2)
a-1	τ_i	0	n	1	$n \frac{\sum \tau_i^2}{a-1} + \sigma_p^2 + \sigma^2$	MSAB
n-1	β_j	a	1	1	$a \sigma_p^2 + \sigma^2$	MSB
$\frac{(a-1)(n-1)}{(a-1)}$	$\tau\beta_{ij}$	0	1	1	$\sigma_p^2 + \sigma^2$	MSB
0	$\varepsilon_{(ij)k}$	1	1	1	σ^2	

ANOVA	Source	SS	df
	Between subjects	SSB	n-1
	Within subjects	SSA	a-1
		SSAB	(a-1)(n-1)

Case 2: Consider the factor to be random

(3)

df		α	β	γ	EMS	denom
		R_i	R_j	R_k		
$a-1$	μ_i	1	n	1	$n\sigma_e^2 + \sigma_{\tau\beta}^2 + \sigma^2$	MSAB
$n-1$	β_j	a	1	1	$a\sigma_\beta^2 + \sigma_{\tau\beta}^2 + \sigma^2$	MSAB
$(a-1)(n-1)$	μ_{ij}	1	1	1	$\sigma_{\tau\beta}^2 + \sigma^2$	MSAB
0	$\varepsilon_{(ij)k}$	1	1	1	σ^2	

Midterm exam:

(4)

1 problem to be handed out today, due Thursday,
May 5 class time

In-class part on Tuesday May 5

Includes: Fixed/Random effects
Nested/Crossed effects
Randomization restrictions

Midterm Exam (Take-home)

Stat 4/566**Spring 2015****due May 5**

Suppose you have a nested design (B nested within A), but the number of levels of B can change, depending on the level of A. In addition, the sample sizes may differ. So, for the i^{th} level of A, there are b_i levels of B, and n_{ij} replicates in the ij^{th} cell.

- (a) Write down the model and find the least-squares estimates of the parameters.
- (b) Find the formulas for the sums of squares and degrees of freedom, and construct the ANOVA table.
- (c) Analyze the following data, using the results in part (b).

Factor A	1		2		
Factor B	1	2	1	2	3
	6	-3	5	2	1
	2	1	7	5	0
	8		9	3	-3
			6		