SAS MACRO

FOR ANALYSING UNREPLICATED DESIGNS

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March, 2000

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INTRODUCTION

Augmented or unreplicated experiment designs have two type of treatments, the replicated checks and the unreplicated new entries. The latter are usually considered to be random effects while the checks treatments are considered as fixed effects. Augmented designs have several advantages over the systematic check arrangement such as more than one check can be included and standard errors of differences between unreplicated entries and between unreplicated entries and checks are available.

The SAS macro presented in this manual analyzes unreplicated design when the repeated checks are arranged in incomplete blocks. Usually 4-6 different checks are repeated several times throughout the experiment and 2-3 checks are arranged in each incomplete block. The incomplete block has plots for checks and plots for the unreplicated genotypes.

The model considered is

$$\mathbf{Y = mu + check + block + entry + error}$$

where block, entry, and error are considered random effects and checks are fixed effects.

Depending on the values of the variance components for block and entry, different models are fitted. When a random effect has zero variance component, then it is considered as a fixed effect.

Adjusted and unadjusted means for entry and check are computed as well as their correlations.

Users who need to access data, programs, and outputs contained in this document, please visit our website www.cimmyt.cgiar.org/biometrics, and download the file UNREP.EXE.

DATA FILE

For the data file to be analyzed, it must have three identification variables: BLOCK, ENTRY, and CHECK. Different names are allowed. The identification of ENTRY and CHECK must be alpha numeric, whereas BLOCK does not have that restriction.

More than one response variable can be in the file, however only one at a time can be analyzed.

HOW TO RUN THE SAS MACRO

1. Compile the macro.

Open the SAS code file (UNREP.SAS) in SAS program editor and run it with ***F8***.

2. Call the macro

In program editor write ***%unrep*** and press ***F8***.

3. Give instructions for the analysis

When a new window is opened, several questions must be answered. You will need to provide the following information:

- folder where the data file is located
- name of the file
- name of file where results will be store
- name (one) of the response variable
- name of block variable
- name of check variable
- name of entry variable
- identifier of entries in check variable
- identifier of checks in entry variable

When all the information is supplied, the program run automatically.

The user should identify the entries in the check variable and the checks in the entry variable. This must be provided in exact form using uppercase and/or lowercase letters.

OUTPUT

Two analyses are presented in the output. The first output considers entry and block as random effect, while the second analysis considers one or both of them with variance components equal to zero, so that the effect is entered into the model as fixed. Solutions for random and fixed effects are printed.

If entry effect has a zero variance component, a WARNING window message appears.

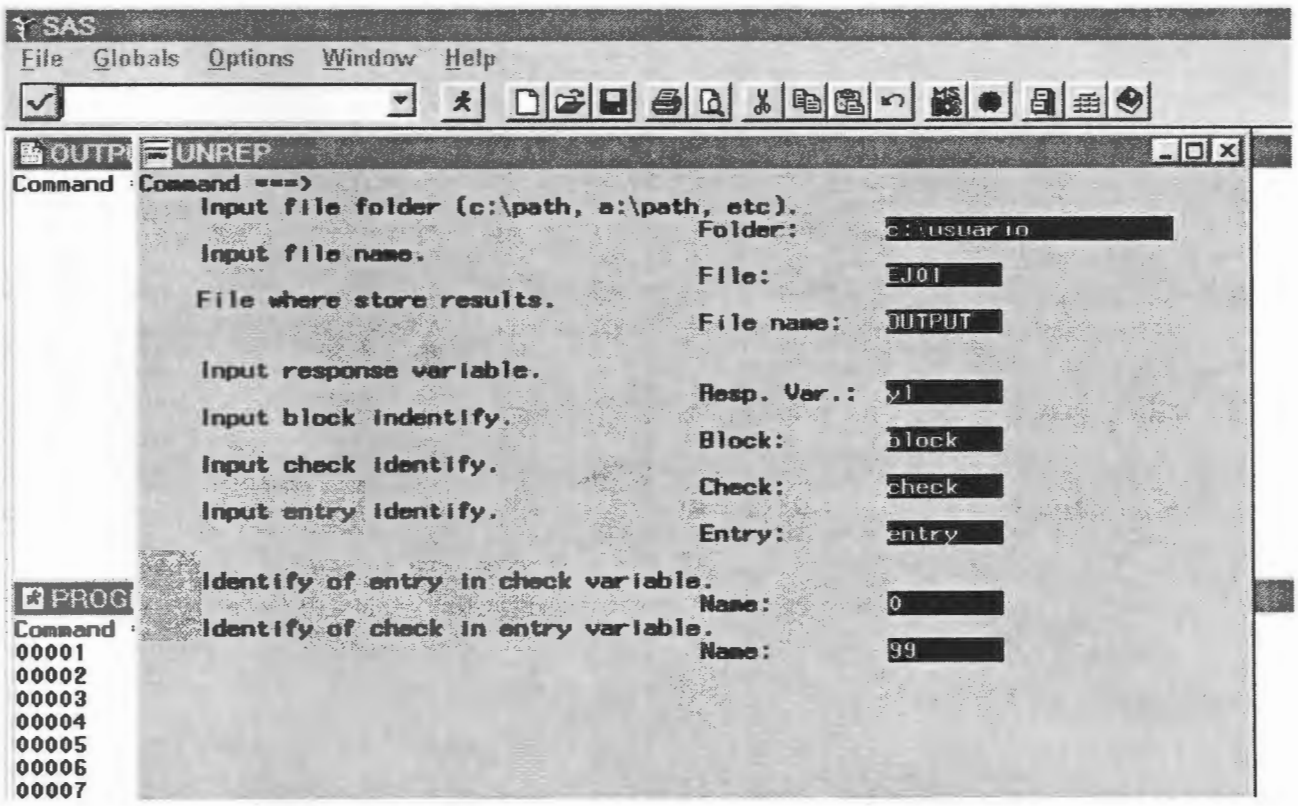
A file with adjusted and unadjusted means for entries and checks is stored and printed. Also the standard error of the effects is printed. The estimate of the random effect is stored but not printed.

The correlation between unadjusted and unadjusted mean for entries is computed and printed. Note that the correlation between the adjusted and unadjusted means should be high.

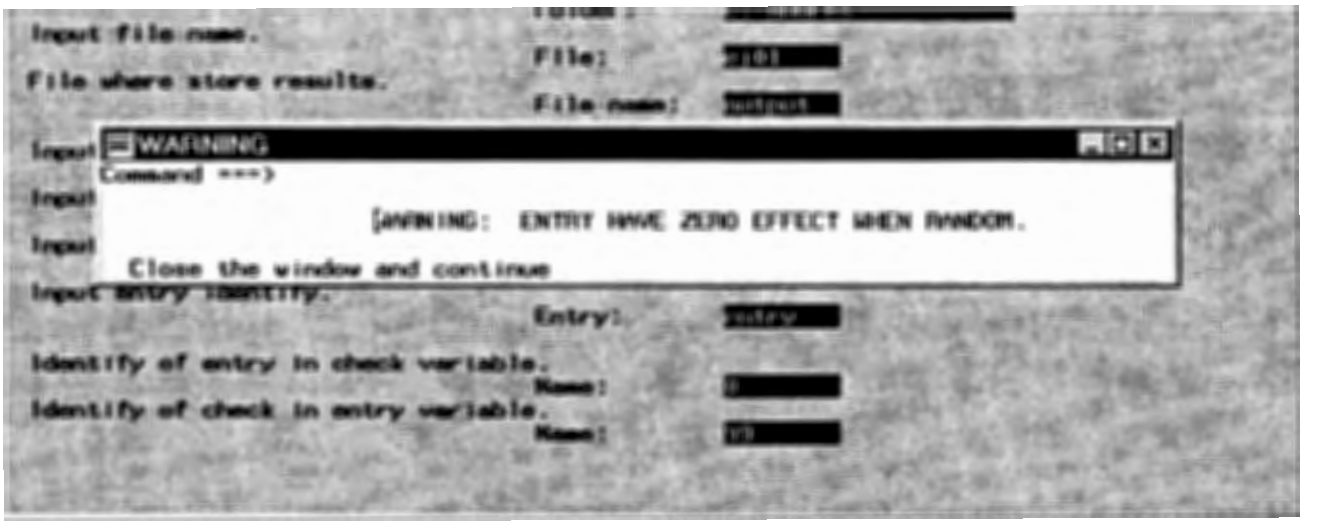
EXAMPLE

The file ***EJ01.SAS*** contains some artificial data on 4 variables (y1-y4) arranged in a design with three blocks and with 3 checks and 18 entries. Note that entry is identified in "check variable" as 0 and check in the "entry variable" as 99.

The file ***UNREP.SAS*** has the SAS macro commands to perform the analysis. After compiling the macro, a window is displayed where information must be provided.



The message when the random effect of entry has zero variance component is the following:



DATA FROM EXAMPLE EJ01

```
DATA ej01;

INPUT PLOT   BLOCK     ENTRY$    CHECK$    y1 y2 y3 y4;
CARDS;
   1         1         99        1         1  3  5 96
   2         1         99        2         2  4  8  7
   3         1         99        3         3  3  9 58
   4         1         1         0         5  4  8 46
   5         1         2         0         1  3  4  9
   6         1         3         0         3  3  5 74
   7         1         4         0         2  3  1 34
   8         1         5         0         2  4  2 67
   9         1         6         0         1  3  3 25
  10         2         99        1         3  1  5 60
  11         2         99        2         4  2  4 77
  12         2         99        3         3  3  8 58
  13         2         7         0         2  2  9 74
  14         2         8         0         5  2  8 23
  15         2         9         0         3  1  7 26
  16         2         10        0         4  2  4 62
  17         2         11        0         3  2  5 43
  18         2         12        0         2  1  1 16
  19         3         99        1         2  6  2  8
  20         3         99        2         2  5  9 83
  21         3         99        3         1  4  6 61
  22         3         13        0         2  6  3 39
  23         3         14        0         3  5  5 40
  24         3         15        0         5  5  1  7
  25         3         16        0         2  5  2 25
  26         3         17        0         4  6  6 36
  27         3         18        0         2  5  8 49
;
RUN;
```

Note that in the column of entries, checks are identified as 99 and in the columns of checks, entries are identified as 0. Any other number of letter can be used to represent these two situations.

RESULTS OBTAINED FOR VARIABLE y3

The SAS System 11:56 Friday, March 10, 2000
9

The MIXED Procedure

Class Level Information

Class	Levels	Values
BLOCK	3	1 2 3
ENTRY	19	1 10 11 12 13 14 15 16 17 18 2 3 4 5 6 7 8 9 99
CHECK	4	0 1 2 3

REML Estimation Iteration History

Iteration	Evaluations	Objective	Criterion
0	1	71.55233551	
1	2	70.95398970	0.00000117
2	1	70.95394807	0.00000000

Convergence criteria met.

Covariance Parameter Estimates (REML)

Cov Parm	Estimate	
BLOCK	0.00000000	**variance component of block**
ENTRY(CHECK)	2.97374114	**variance component of entry**
Residual	4.11118266	**error variance**

Model Fitting Information for Y3

Description	Value
Observations	27.0000
Res Log Likelihood	-56.6126
Akaike's Information Criterion	-59.6126
Schwarz's Bayesian Criterion	-61.3158
-2 Res Log Likelihood	113.2251

Tests of Fixed Effects

Source	NDF	DDF	Type III F	Pr > F	
CHECK	3	17	1.09	0.3808	**F test for checks**

Since variance component for blocks=0, a new analysis considering blocks as fixed effect is computed.

The MIXED Procedure

Class Level Information

Class	Levels	Values
BLOCK	3	1 2 3
ENTRY	19	1 10 11 12 13 14 15 16 17 18 2 3 4 5 6 7 8 9 99
CHECK	4	0 1 2 3

REML Estimation Iteration History

Iteration	Evaluations	Objective	Criterion
0	1	70.38812624	
1	2	70.13350620	0.00000000

Convergence criteria met.

Covariance Parameter Estimates (REML)

Cov Parm	Estimate
ENTRY(CHECK)	2.40686958
Residual	4.89396550

Model Fitting Information for Y3

Description	Value
Observations	27.0000
Res Log Likelihood	-54.3645
Akaike's Information Criterion	-56.3645
Schwarz's Bayesian Criterion	-57.4090
-2 Res Log Likelihood	108.7289

Solution for Fixed Effects

Effect	BLOCK	CHECK	Estimate	Std Error	DF	t	Pr > |t|
INTERCEPT			7.20657276	2.12198600	17	3.40	0.0034
BLOCK	1		0.52112685	1.18063523	4	0.44	0.6817
BLOCK	2		0.85915486	1.18063523	4	0.73	0.5071
BLOCK	3		0.00000000	.	.	.	.
CHECK		0	-3.11111111	2.10803068	17	-1.48	0.1583
CHECK		1	-3.66666667	2.84189775	17	-1.29	0.2142
CHECK		2	-0.66666667	2.84189775	17	-0.23	0.8173
CHECK		3	0.00000000	.	.	.	.

Solution for Random Effects

Effect	ENTRY	CHECK	Estimate	SE Pred	DF	t	Pr > |t|
ENTRY(CHECK)	1	0	1.11541079	1.30689526	4	0.85	0.4415
ENTRY(CHECK)	10	0	-0.31470886	1.30689526	4	-0.24	0.8215
ENTRY(CHECK)	11	0	0.01496159	1.30689526	4	0.01	0.9914
ENTRY(CHECK)	12	0	-1.30372020	1.30689526	4	-1.00	0.3749
ENTRY(CHECK)	13	0	-0.36114133	1.30689526	4	-0.28	0.7960
ENTRY(CHECK)	14	0	0.29819956	1.30689526	4	0.23	0.8307
ENTRY(CHECK)	15	0	-1.02048223	1.30689526	4	-0.78	0.4785
ENTRY(CHECK)	16	0	-0.69081178	1.30689526	4	-0.53	0.6251
ENTRY(CHECK)	17	0	0.62787001	1.30689526	4	0.48	0.6560
ENTRY(CHECK)	18	0	1.28721091	1.30689526	4	0.98	0.3804
ENTRY(CHECK)	2	0	-0.20327101	1.30689526	4	-0.16	0.8839
ENTRY(CHECK)	3	0	0.12639944	1.30689526	4	0.10	0.9276
ENTRY(CHECK)	4	0	-1.19228236	1.30689526	4	-0.91	0.4132
ENTRY(CHECK)	5	0	-0.86261191	1.30689526	4	-0.66	0.5453
ENTRY(CHECK)	6	0	-0.53294146	1.30689526	4	-0.41	0.7043
ENTRY(CHECK)	7	0	1.33364339	1.30689526	4	1.02	0.3652
ENTRY(CHECK)	8	0	1.00397294	1.30689526	4	0.77	0.4852
ENTRY(CHECK)	9	0	0.67430249	1.30689526	4	0.52	0.6331
ENTRY(CHECK)	99	1	0.00000000	1.55140890	4	0.00	1.0000
ENTRY(CHECK)	99	2	0.00000000	1.55140890	4	0.00	1.0000
ENTRY(CHECK)	99	3	0.00000000	1.55140890	4	0.00	1.0000

Tests of Fixed Effects

Source	NDF	DDF	Type III F	Pr > F
BLOCK	2	4	0.27	0.7771
CHECK	3	17	1.16	0.3545

Following are the adjusted (MEAN) and unadjusted (ADJMEAN) means of entry and checks, as well as their standard error. Adjusted means are sorted in ascending order. The column of observations (OBS) has the observation 11 (with no entry number) that denotes the mean of the adjusted entries (4.09546). Standard error of the adjusted means are shown in the last column (SE).

OBS	ENTRY	CHECK	ADJMEAN	MEAN	_SE_
1	12	0	2.79174	1.00000	1.30689526
2	4	0	2.90318	1.00000	1.30689526
3	15	0	3.07498	1.00000	1.30689526
4	5	0	3.23285	2.00000	1.30689526
5	16	0	3.40465	2.00000	1.30689526
6	99	1	3.53991	4.00000	2.84189775
7	6	0	3.56252	3.00000	1.30689526
8	13	0	3.73432	3.00000	1.30689526
9	10	0	3.78075	4.00000	1.30689526
10	2	0	3.89219	4.00000	1.30689526
11		0	4.09546	.	2.10803068
12	11	0	4.11042	5.00000	1.30689526
13	3	0	4.22186	5.00000	1.30689526
14	14	0	4.39366	5.00000	1.30689526
15	17	0	4.72333	6.00000	1.30689526
16	9	0	4.76976	7.00000	1.30689526
17	8	0	5.09943	8.00000	1.30689526
18	1	0	5.21087	8.00000	1.30689526
19	18	0	5.38267	8.00000	1.30689526
20	7	0	5.42911	9.00000	1.30689526
21	99	2	6.53991	7.00000	2.84189775
22	99	3	7.20657	7.66667	.

Correlation Analysis

1 'WITH' Variables: MEAN
1 'VAR' Variables: ADJMEAN

Pearson Correlation Coefficients / Prob > |R| under Ho: Rho=0 / N = 18

	ADJMEAN
MEAN	0.99068
	0.0001

Note that this correlation is between adjusted and unadjusted means but excluding the values corresponding to checks.