

Obs	no2	sheep	time	y
1	1	1	time1	2.197
2	1	1	time2	2.442
3	1	1	time3	2.542
4	1	1	time4	2.241
5	1	1	time5	1.960
6	1	1	time6	1.988
7	1	2	time1	1.932
8	1	2	time2	2.526
9	1	2	time3	2.526
10	1	2	time4	2.152
11	1	2	time5	1.917
12	1	2	time6	1.917
13	1	3	time1	1.946
14	1	3	time2	2.251
15	1	3	time3	2.501
16	1	3	time4	1.988
17	1	3	time5	1.686
18	1	3	time6	1.841
19	1	4	time1	1.758
20	1	4	time2	2.054
21	1	4	time3	2.588
22	1	4	time4	2.197
23	1	4	time5	2.140
24	1	4	time6	1.686
25	2	5	time1	2.230
26	2	5	time2	3.086
27	2	5	time3	3.357
28	2	5	time4	3.219
29	2	5	time5	2.827
30	2	5	time6	2.534

RM-ANOVA analysis of sheep data assuming circularity

The Mixed Procedure

Model Information

Data Set	WORK.SHEEP
Dependent Variable	y
Covariance Structure	Variance Components
Estimation Method	Type 3
Residual Variance Method	Factor
Fixed Effects SE Method	Model-Based
Degrees of Freedom Method	Satterthwaite

Class Level Information

Class	Levels	Values
no2	3	1 2 3
sheep	12	1 2 3 4 5 6 7 8 9 10 11 12

```

time          6    time1 time2 time3 time4 time5
                time6

```

Dimensions

```

Covariance Parameters          2
Columns in X                   28
Columns in Z                   12
Subjects                       1
Max Obs Per Subject           72

```

Number of Observations

```

Number of Observations Read      72
Number of Observations Used      72
Number of Observations Not Used  0

```

Type 3 Analysis of Variance

Source	DF	Sum of Squares	Mean Square
no2	2	23.519956	11.759978
time	5	8.950930	1.790186
no2*time	10	4.495607	0.449561
sheep(no2)	9	8.588497	0.954277
Residual	45	3.601928	0.080043

RM-ANOVA analysis of sheep data assuming circularity 3

The Mixed Procedure

Type 3 Analysis of Variance

Source	Expected Mean Square	Error Term	Error DF
no2	Var(Residual) + 6 Var(sheep(no2)) + Q(no2,no2*time)	MS(sheep(no2))	9
time	Var(Residual) + Q(time,no2*time)	MS(Residual)	45
no2*time	Var(Residual) + Q(no2*time)	MS(Residual)	45
sheep(no2)	Var(Residual) + 6 Var(sheep(no2))	MS(Residual)	45
Residual	Var(Residual)	.	.

Type 3 Analysis of Variance

Source	F Value	Pr > F
no2	12.32	0.0026
time	22.37	<.0001
no2*time	5.62	<.0001
sheep(no2)	11.92	<.0001
Residual	.	.

Covariance Parameter Estimates

Cov Parm	Estimate
sheep(no2)	0.1457
Residual	0.08004

Fit Statistics

-2 Res Log Likelihood	64.1
AIC (smaller is better)	68.1
AICC (smaller is better)	68.4
BIC (smaller is better)	69.1

Type 3 Tests of Fixed Effects

Effect	Num DF	Den DF	F Value	Pr > F
no2	2	9	12.32	0.0026
time	5	45	22.37	<.0001
no2*time	10	45	5.62	<.0001

RM-ANOVA analysis of sheep data assuming circularity

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The Mixed Procedure

Least Squares Means

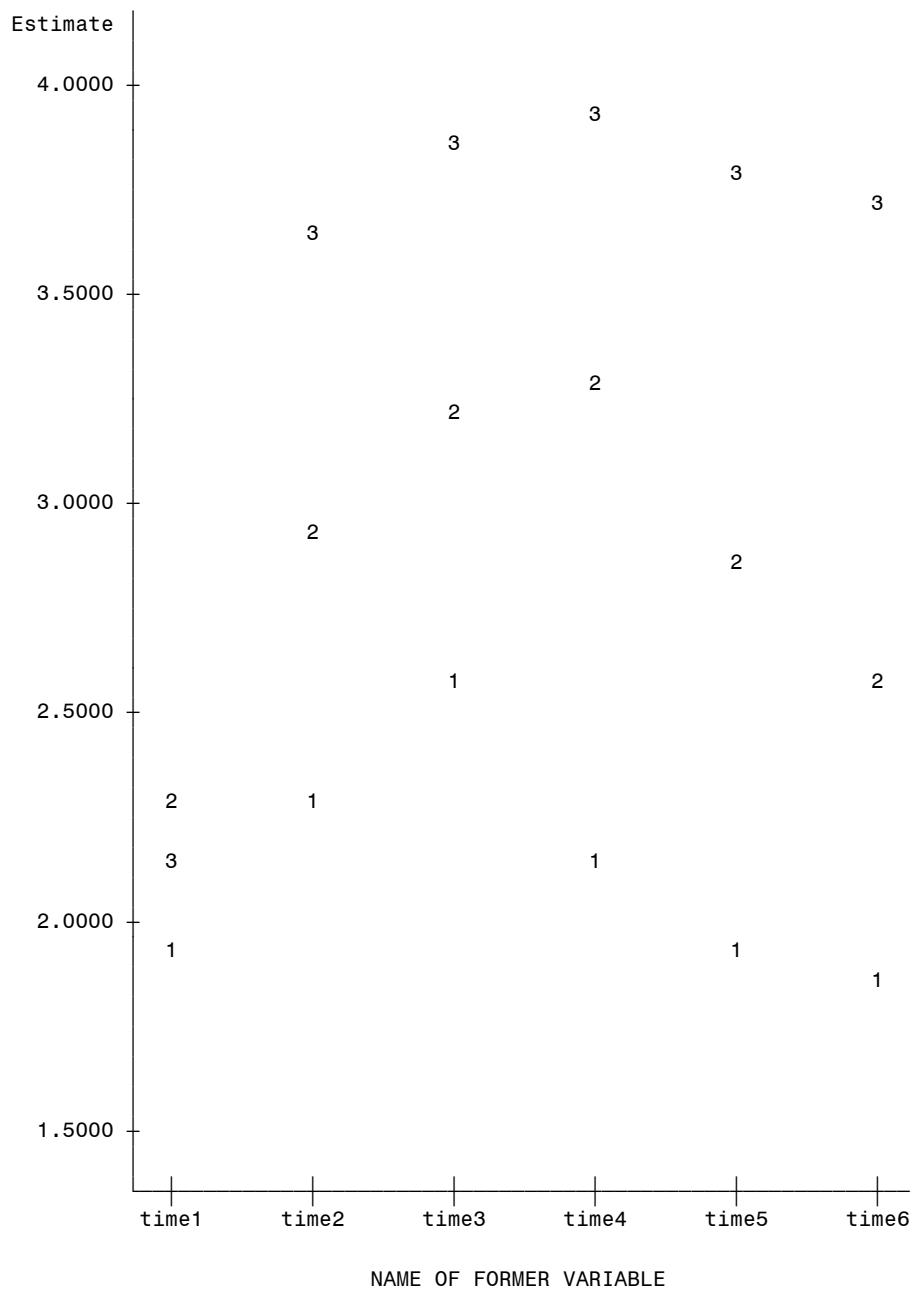
Effect	NAME OF FORMER VARIABLE	no2	Estimate	Standard Error	DF	t Value	Pr > t
no2		1	2.1240	0.1994	9	10.65	<.0001
no2		2	2.8610	0.1994	9	14.35	<.0001
no2		3	3.5233	0.1994	9	17.67	<.0001
time	time1		2.1403	0.1372	17.5	15.60	<.0001
time	time2		2.9438	0.1372	17.5	21.46	<.0001
time	time3		3.2203	0.1372	17.5	23.48	<.0001
time	time4		3.1298	0.1372	17.5	22.82	<.0001
time	time5		2.8698	0.1372	17.5	20.92	<.0001
time	time6		2.7128	0.1372	17.5	19.78	<.0001
no2*time	time1	1	1.9583	0.2376	17.5	8.24	<.0001
no2*time	time2	1	2.3183	0.2376	17.5	9.76	<.0001
no2*time	time3	1	2.5393	0.2376	17.5	10.69	<.0001
no2*time	time4	1	2.1445	0.2376	17.5	9.03	<.0001
no2*time	time5	1	1.9258	0.2376	17.5	8.11	<.0001
no2*time	time6	1	1.8580	0.2376	17.5	7.82	<.0001
no2*time	time1	2	2.2980	0.2376	17.5	9.67	<.0001
no2*time	time2	2	2.9010	0.2376	17.5	12.21	<.0001
no2*time	time3	2	3.2338	0.2376	17.5	13.61	<.0001
no2*time	time4	2	3.2875	0.2376	17.5	13.84	<.0001

no2*time	time5	2	2.8725	0.2376	17.5	12.09	<.0001
no2*time	time6	2	2.5735	0.2376	17.5	10.83	<.0001
no2*time	time1	3	2.1648	0.2376	17.5	9.11	<.0001
no2*time	time2	3	3.6123	0.2376	17.5	15.21	<.0001
no2*time	time3	3	3.8880	0.2376	17.5	16.37	<.0001
no2*time	time4	3	3.9573	0.2376	17.5	16.66	<.0001
no2*time	time5	3	3.8110	0.2376	17.5	16.04	<.0001
no2*time	time6	3	3.7068	0.2376	17.5	15.60	<.0001

Low-res profile plot

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Plot of Estimate*time. Symbol is value of no2.



RM-ANOVA done in PROC GLM
Includes G-G, H-F adjustments for non-circularity

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The GLM Procedure

Class Level Information

Class	Levels	Values
no2	3	1 2 3
sheep	12	1 2 3 4 5 6 7 8 9 10 11 12

Number of Observations Read 12
Number of Observations Used 12

RM-ANOVA done in PROC GLM
Includes G-G, H-F adjustments for non-circularity

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The GLM Procedure

Repeated Measures Analysis of Variance

Repeated Measures Level Information

Dependent Variable	time1	time2	time3	time4	time5	time6
Level of time	1	2	3	4	5	6

Partial Correlation Coefficients from the Error SSCP Matrix / Prob > |r|

DF = 9	time1	time2	time3	time4	time5	time6
time1	1.000000	-0.200510 0.5786	-0.386653 0.2697	-0.249370 0.4872	-0.425522 0.2202	-0.240827 0.5027
time2	-0.200510 0.5786	1.000000	0.919632 0.0002	0.891510 0.0005	0.872318 0.0010	0.928678 0.0001
time3	-0.386653 0.2697	0.919632 0.0002	1.000000	0.963830 <.0001	0.975116 <.0001	0.966032 <.0001
time4	-0.249370 0.4872	0.891510 0.0005	0.963830 <.0001	1.000000	0.973536 <.0001	0.965484 <.0001
time5	-0.425522 0.2202	0.872318 0.0010	0.975116 <.0001	0.973536 <.0001	1.000000	0.941470 <.0001
time6	-0.240827 0.5027	0.928678 0.0001	0.966032 <.0001	0.965484 <.0001	0.941470 <.0001	1.000000

E = Error SSCP Matrix

time_N represents the contrast between the nth level of time and the last

	time_1	time_2	time_3	time_4	time_5
time_1	4.320376	1.885925	1.602230	0.920828	-0.065308
time_2	1.885925	1.010731	0.800396	0.420413	0.055265
time_3	1.602230	0.800396	0.778532	0.436894	0.194458
time_4	0.920828	0.420413	0.436894	0.363834	0.217016
time_5	-0.065308	0.055265	0.194458	0.217016	0.436088

RM-ANOVA done in PROC GLM 8
Includes G-G, H-F adjustments for non-circularity

The GLM Procedure
Repeated Measures Analysis of Variance

Partial Correlation Coefficients from the Error SSCP Matrix of the
Variables Defined by the Specified Transformation / Prob > |r|

DF = 9	time_1	time_2	time_3	time_4	time_5
time_1	1.000000	0.902497 0.0004	0.873627 0.0010	0.734456 0.0156	-0.047579 0.8962
time_2	0.902497 0.0004	1.000000	0.902295 0.0004	0.693278 0.0262	0.083242 0.8192
time_3	0.873627 0.0010	0.902295 0.0004	1.000000	0.820892 0.0036	0.333734 0.3460
time_4	0.734456 0.0156	0.693278 0.0262	0.820892 0.0036	1.000000	0.544820 0.1034
time_5	-0.047579 0.8962	0.083242 0.8192	0.333734 0.3460	0.544820 0.1034	1.000000

Sphericity Tests

Variables	DF	Mauchly's Criterion	Chi-Square	Pr > ChiSq
Transformed Variates	14	0.0001334	63.346399	<.0001
Orthogonal Components	14	0.0005776	52.941886	<.0001

RM-ANOVA done in PROC GLM 9
Includes G-G, H-F adjustments for non-circularity

The GLM Procedure
Repeated Measures Analysis of Variance
Tests of Hypotheses for Between Subjects Effects

Source	DF	Type III SS	Mean Square	F Value	Pr > F
no2	2	23.51995558	11.75997779	12.32	0.0026
Error	9	8.58849679	0.95427742		

The GLM Procedure
Repeated Measures Analysis of Variance
Univariate Tests of Hypotheses for Within Subject Effects

Source	DF	Type III SS	Mean Square	F Value	Pr > F
time	5	8.95093013	1.79018603	22.37	<.0001
time*no2	10	4.49560742	0.44956074	5.62	<.0001
Error(time)	45	3.60192796	0.08004284		

Source	Adj Pr > F	
	G - G	H - F
time	0.0003	<.0001
time*no2	0.0147	0.0062
Error(time)		

Greenhouse-Geisser Epsilon 0.2610
Huynh-Feldt Epsilon 0.3551

Profile plot of estimated joint treatment means

