

**Description**

Here are the F-ratios used in the various ANOVA designs supported by f\_npManova.

**References**

Zar, J. H. 1999. Biostatistical analysis. 4th ed. Prentice Hall, Upper Saddle River, NJ.

This program uses a GLM-approach to (M)ANOVA, so for mixed models (when there are both fixed and random factors) an unrestricted model is used.

### Two-way ANOVA's:

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A = fixed, B = fixed:

[ *f\_npManova2* ]

<u>Source</u>	<u>F-ratio</u>
A	$MS_A/MS_{error}$
B	$MS_B/MS_{error}$
AB	$MS_{AB}/MS_{error}$

A = fixed, B = random:

A = random, B = random:

[ *f\_npManova2* ]

<u>Source</u>	<u>F-ratio</u>
A	$MS_A/MS_{AB}$
B	$MS_B/MS_{AB}$
AB	$MS_{AB}/MS_{error}$

### Two-way Nested ANOVA's:

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A = fixed, B = nested in A

A = random, B = nested in A:

[ *f\_npManova2n* ]

<u>Source</u>	<u>F-ratio</u>
A	$MS_A/MS_B$
B	$MS_B/MS_{error}$

### Three-way ANOVA's:

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A = fixed, B = fixed, C = fixed:

[ *f\_npManova3* ]

<u>Source</u>	<u>F-ratio</u>
A	$MS_A/MS_{error}$
B	$MS_B/MS_{error}$
C	$MS_C/MS_{error}$
AB	$MS_{AB}/MS_{error}$
AC	$MS_{AC}/MS_{error}$
BC	$MS_{BC}/MS_{error}$
ABC	$MS_{ABC}/MS_{error}$

A = fixed, B = fixed, C = random:

[ *f\_npManova3* ]

<u>Source</u>	<u>F-ratio</u>
A	$MS_A/MS_{AC}$
B	$MS_B/MS_{BC}$
C	$MS_C/(MS_{AC} + MS_{BC} - MS_{ABC})$
AB	$MS_{AB}/MS_{ABC}$

AC	$MS_{AC}/MS_{ABC}$
BC	$MS_{BC}/MS_{ABC}$
ABC	$MS_{ABC}/MS_{error}$

A = fixed, B = random, C = random:

A = random, B = random, C = random:

[ *f<sub>npManova3</sub>*]

<u>Source</u>	<u>F-ratio</u>
A	$MS_A / (MS_{AB} + MS_{AC} - MS_{ABC})$
B	$MS_B / (MS_{AB} + MS_{BC} - MS_{ABC})$
C	$MS_C / (MS_{AC} + MS_{BC} - MS_{ABC})$
AB	$MS_{AB}/MS_{ABC}$
AC	$MS_{AC}/MS_{ABC}$
BC	$MS_{BC}/MS_{ABC}$
ABC	$MS_{ABC}/MS_{error}$

### Three-way Cross-Nested ANOVA's:

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A = fixed, B = fixed, C = nested in A:

[ *f<sub>npManova3Nest1</sub>*]

<u>Source</u>	<u>F-ratio</u>
A	$MS_A/MS_C$
B	$MS_B/MS_{BC}$
C	$MS_C/MS_{BC}$
AB	$MS_{AB}/MS_{BC}$
BC	$MS_{BC}/MS_{error}$

A = fixed, B = random, C = nested in A

A = random, B = fixed, C = nested in A

A = fixed, B = fixed, C = nested in A:

[ *f<sub>npManova3Nest1</sub>*]

<u>Source</u>	<u>F-ratio</u>
A	$MS_A/MS_C + MS_{AB} - MS_{BC}$
B	$MS_B/MS_{AB}$
C	$MS_C/MS_{BC}$
AB	$MS_{AB}/MS_{BC}$
BC	$MS_{BC}/MS_{error}$

### Three-way Fully-Nested ANOVA's:

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A = fixed, B = nested in A, C = nested in B:

A = random, B = nested in A, C = nested in B:

[ *f<sub>npManova3Nest2</sub>*]

<u>Source</u>	<u>F-ratio</u>
A	$MS_A/MS_B$
B	$MS_B/MS_C$
C	$MS_C/MS_{error}$