

Multiple Comparison Procedures To A Control

For AN(C)OVA Models

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Contributors*

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Contents

| | |
|---|-----------|
| Basic Information | 2 |
| Descriptive Plots | 3 |
| Histogram and Boxplot for dependent Variable | 3 |
| Boxplot for categorical independent Variables | 5 |
| References | 10 |

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Basic Information

Automatic statistics for the file:

| File |
|----------------|
| warpbreaks.csv |

Your selection for the encoding: UTF-8

Your selection for the decimal character: .

Observations (rows with at least one non-missing value): 54

Variables (columns with at least one non-missing value): 3

Variables considered continuous: 1

| Variables considered continuous |
|---------------------------------|
| breaks |

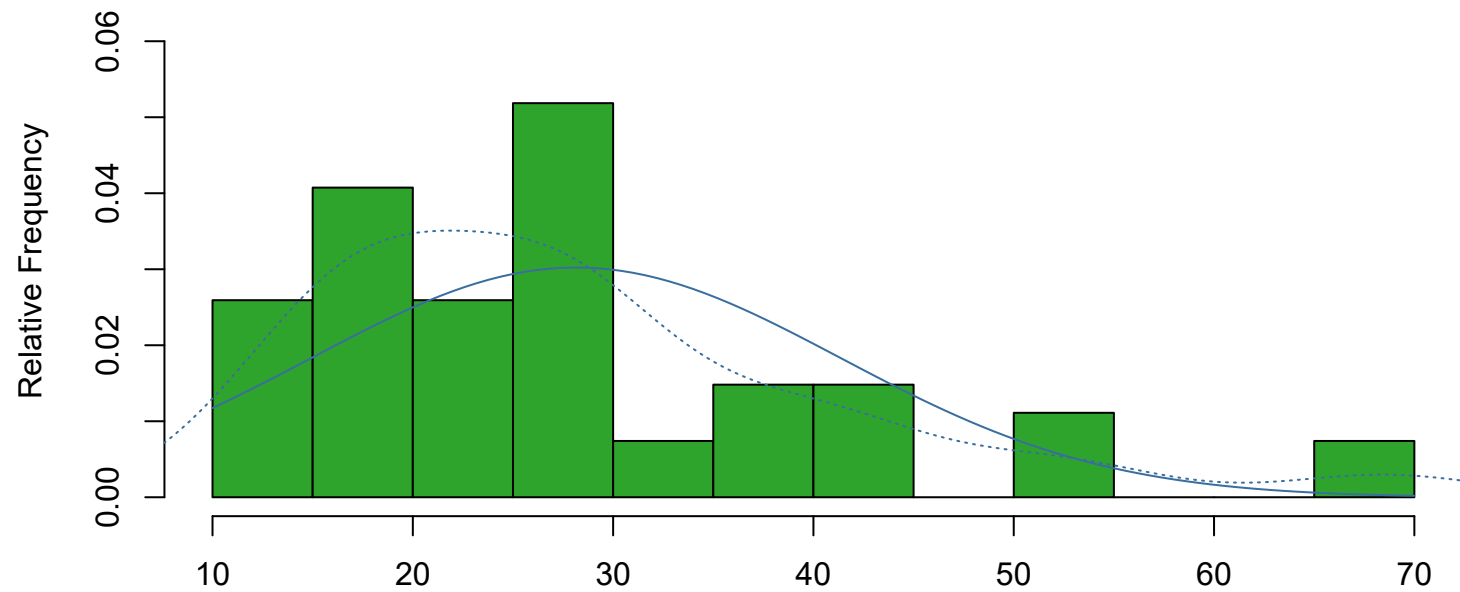
Variables considered categorical: 2

| Variables considered categorical |
|----------------------------------|
| wool |
| tension |

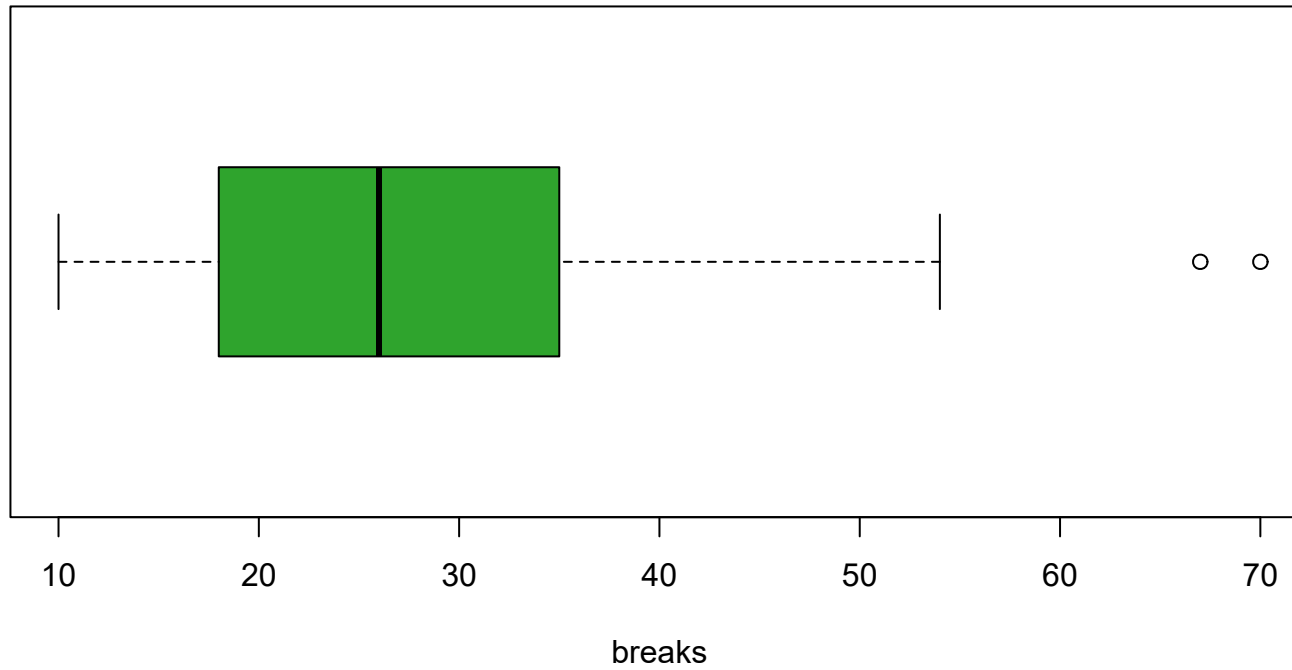
Descriptive Plots

Histogram and Boxplot for dependent Variable

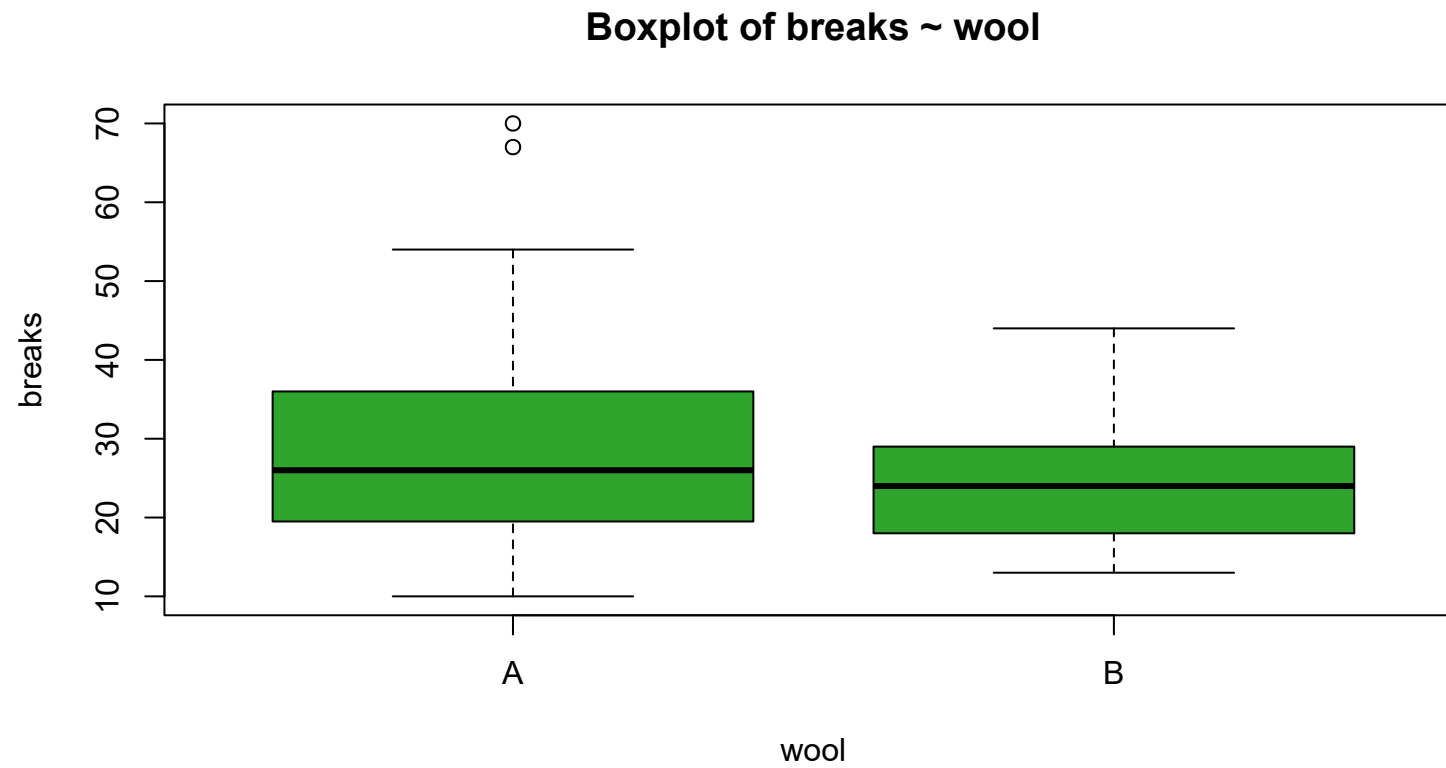
Histogram of breaks



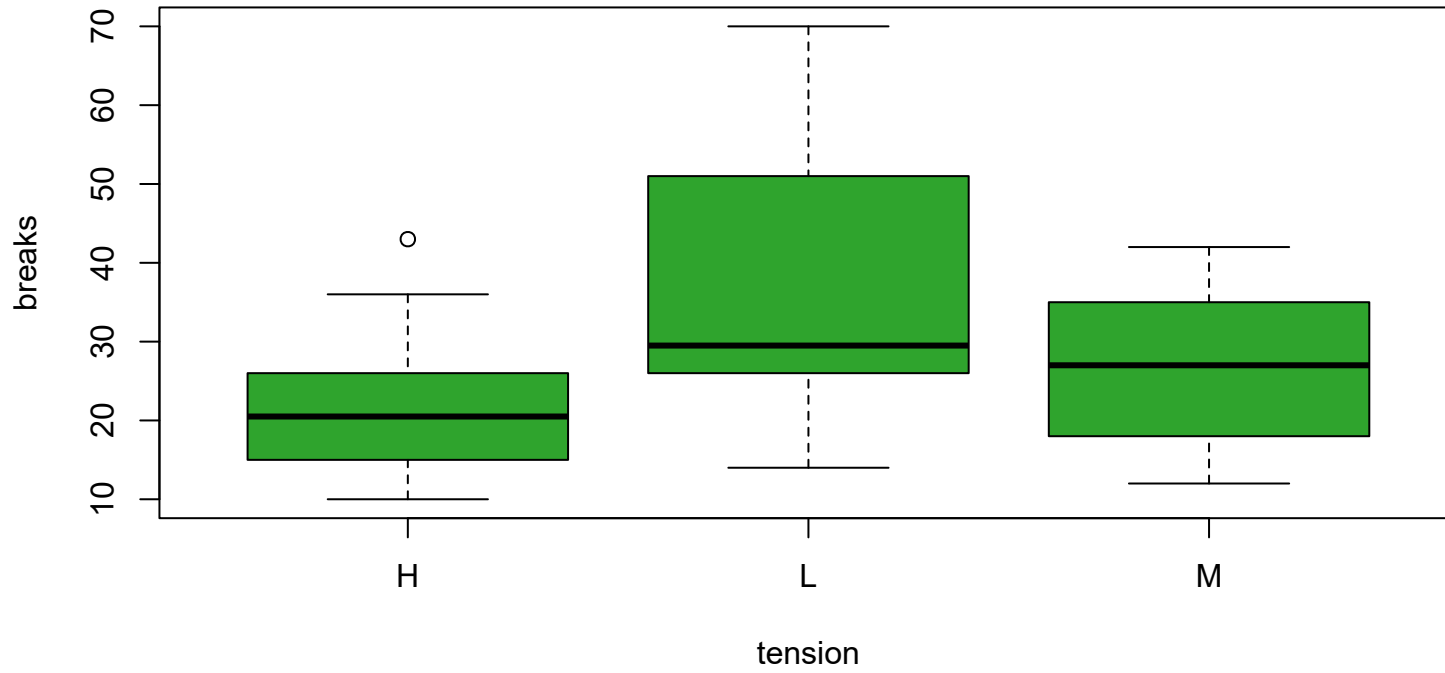
Boxplot of breaks



Boxplot for categorical independent Variables



Boxplot of breaks ~ tension

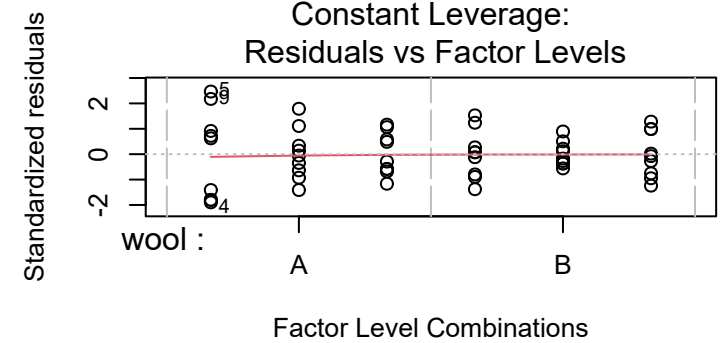
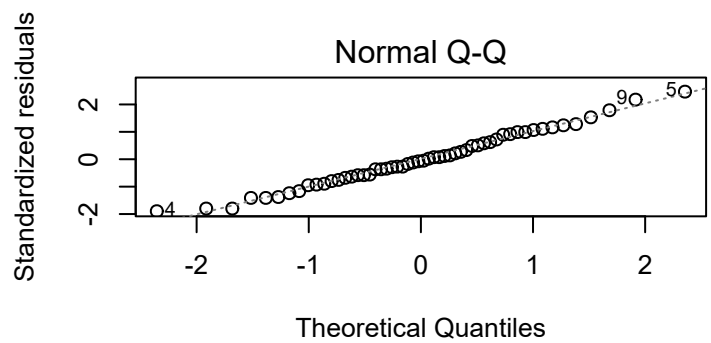
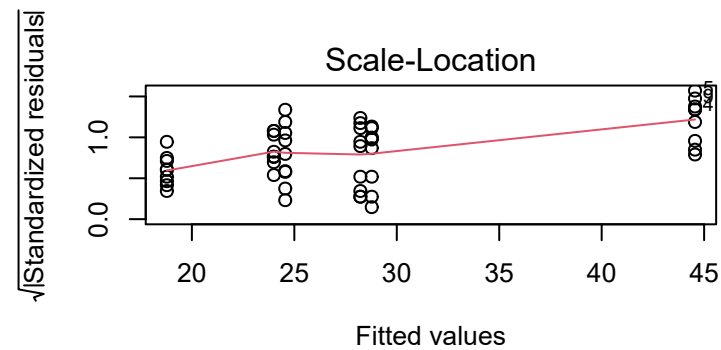
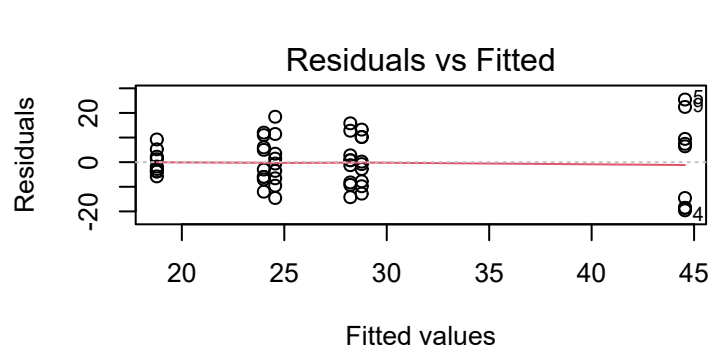


Anova Table (Type III tests)

Response: breaks

| | Sum Sq | Df | F value | Pr(>F) |
|--------------|---------|----|----------|---------------|
| (Intercept) | 17866.8 | 1 | 149.2757 | 2.426e-16 *** |
| wool | 1200.5 | 1 | 10.0301 | 0.0026768 ** |
| tension | 2468.5 | 2 | 10.3121 | 0.0001881 *** |
| wool:tension | 1002.8 | 2 | 4.1891 | 0.0210442 * |
| Residuals | 5745.1 | 48 | | |

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1



Simultaneous Tests for General Linear Hypotheses

Multiple Comparisons of Means: Dunnett Contrasts

Fit: lm(formula = modelfunction, data = df_factorized)

Linear Hypotheses:

| | Estimate | Std. Error | t value | Pr(<t) |
|------------|----------|------------|---------|--------------|
| H - L >= 0 | -20.000 | 5.157 | -3.878 | 0.000313 *** |
| M - L >= 0 | -20.556 | 5.157 | -3.986 | 0.000224 *** |

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
(Adjusted p values reported -- single-step method)

Simultaneous Confidence Intervals

Multiple Comparisons of Means: Dunnett Contrasts

Fit: lm(formula = modelfunction, data = df_factorized)

Quantile = 1.9613
95% family-wise confidence level

Linear Hypotheses:

| | Estimate | lwr | upr |
|------------|----------|------|----------|
| H - L >= 0 | -20.0000 | -Inf | -9.8849 |
| M - L >= 0 | -20.5556 | -Inf | -10.4405 |

Simultaneous Tests for General Linear Hypotheses

Multiple Comparisons of Means: Dunnett Contrasts

Fit: lm(formula = modelfunction, data = df_factorized)

Linear Hypotheses:

| | Estimate | Std. Error | t value | Pr(<t) |
|------------|----------|------------|---------|--------------|
| H - L >= 0 | -20.000 | 5.157 | -3.878 | 0.000224 *** |
| M - L >= 0 | -20.556 | 5.157 | -3.986 | 0.000224 *** |

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
(Adjusted p values reported -- free method)

Simultaneous Tests for General Linear Hypotheses

Multiple Comparisons of Means: Dunnett Contrasts

Fit: lm(formula = modelfunction, data = df_factorized)

Linear Hypotheses:

| | Estimate | Std. Error | t value | Pr(<t) |
|------------|----------|------------|---------|------------|
| H - L >= 0 | -20.000 | 6.540 | -3.058 | 0.00311 ** |
| M - L >= 0 | -20.556 | 6.305 | -3.260 | 0.00177 ** |

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
(Adjusted p values reported -- single-step method)

Simultaneous Confidence Intervals

Multiple Comparisons of Means: Dunnett Contrasts

Fit: lm(formula = modelfunction, data = df_factorized)

Quantile = 1.8928
95% family-wise confidence level

Linear Hypotheses:

| | Estimate | lwr | upr |
|------------|----------|------|---------|
| H - L >= 0 | -20.0000 | -Inf | -7.6209 |
| M - L >= 0 | -20.5556 | -Inf | -8.6208 |

Simultaneous Tests for General Linear Hypotheses

Multiple Comparisons of Means: Dunnett Contrasts

Fit: lm(formula = modelfunction, data = df_factorized)

Linear Hypotheses:

| | Estimate | Std. Error | t value | Pr(<t) |
|------------|----------|------------|---------|------------|
| H - L >= 0 | -20.000 | 6.540 | -3.058 | 0.00182 ** |

```

M - L >= 0   -20.556      6.305   -3.260 0.00177 **
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
(Adjusted p values reported -- free method)

```

References

- Fox, John, and Sanford Weisberg. 2019. *An R Companion to Applied Regression*. Third. Thousand Oaks CA: Sage. <https://socialsciences.mcmaster.ca/jfox/Books/Companion/>.
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