Giovana Ortiz Barrera

> lm(mortality~race+sex+year+race:sex+race:year+race:sex:year)->ancovamodel

> ancovamodel

Call:

lm(formula = mortality ~ race + sex + year + race:sex + race:year +

race:sex:year)

Coefficients:

(Intercept) raceWhite sexMale

48086.306 -14767.096 -6173.656

year raceWhite:sexMale raceWhite:year

-23.703 4087.893 7.330

raceBlack:sexMale:year raceWhite:sexMale:year

3.370 1.259

> anova(ancovamodel)

Analysis of Variance Table

Response: mortality

Df Sum Sq Mean Sq F value Pr(>F)

race 1 22697659 22697659 677.9871 < 2.2e-16 \*\*\*

sex 1 18145164 18145164 542.0025 < 2.2e-16 \*\*\*

year 1 176025898 176025898 5257.9559 < 2.2e-16 \*\*\*

race:sex 1 51029 51029 1.5242 0.2176

race:year 1 4860942 4860942 145.1981 < 2.2e-16 \*\*\*

race:sex:year 2 798964 399482 11.9327 8.934e-06 \*\*\*

Residuals 448 14998148 33478

---

Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

> residuals(ancovamodel)->ancovaresids

> shapiro.test(ancovaresids)

Shapiro-Wilk normality test

data: ancovaresids

W = 0.98907, p-value = 0.001761

> bptest(ancovamodel)

studentized Breusch-Pagan test

data: ancovamodel

BP = 92.897, df = 7, p-value < 2.2e-16

> lm(mortality~race+sex+year+race:year+race:sex:year)->ancovamodel2

> ancovamodel2

Call:

lm(formula = mortality ~ race + sex + year + race:year + race:sex:year)

Coefficients:

(Intercept) raceWhite sexMale

47064.333 -12723.149 -4129.710

year raceWhite:year raceBlack:sexMale:year

-23.181 6.286 2.326

raceWhite:sexMale:year

2.304

> anova(ancovamodel2)

Analysis of Variance Table

Response: mortality

Df Sum Sq Mean Sq F value Pr(>F)

race 1 22697659 22697659 673.452 < 2.2e-16 \*\*\*

sex 1 18145164 18145164 538.377 < 2.2e-16 \*\*\*

year 1 176025898 176025898 5222.787 < 2.2e-16 \*\*\*

race:year 1 4860942 4860942 144.227 < 2.2e-16 \*\*\*

race:sex:year 2 715296 357648 10.612 3.141e-05 \*\*\*

Residuals 449 15132845 33703

---

> residuals(ancovamodel2)->ancova2resids

> shapiro.test(ancova2resids)

Shapiro-Wilk normality test

data: ancova2resids

W = 0.98958, p-value = 0.00253

> bptest(ancovamodel2)

studentized Breusch-Pagan test

data: ancovamodel2

BP = 90.274, df = 6, p-value < 2.2e-16

> log(lm(Mortality$Mortality~Race+Sex+Year+Race:Sex+Race:Year+Race:Sex:Year))->ancovamodel2

Error in log(lm(Mortality$Mortality ~ Race + Sex + Year + Race:Sex + Race:Year + :

non-numeric argument to mathematical function

> log(lm(Mortality$Mortality~Race+Sex+Year+Race:Sex+Race:Year+Race:Sex:Year))

Error in log(lm(Mortality$Mortality ~ Race + Sex + Year + Race:Sex + Race:Year + :

non-numeric argument to mathematical function

> loglm(Mortality$Mortality~Race+Sex+Year+Race:Sex+Race:Year+Race:Sex:Year)->logmodel

> shapiro.test(logmodel)

Error: is.numeric(x) is not TRUE

> residuals(logmodel)->residslog

Re-fitting to get frequencies and fitted values

> shapiro.test(residslog)

Shapiro-Wilk normality test

data: residslog

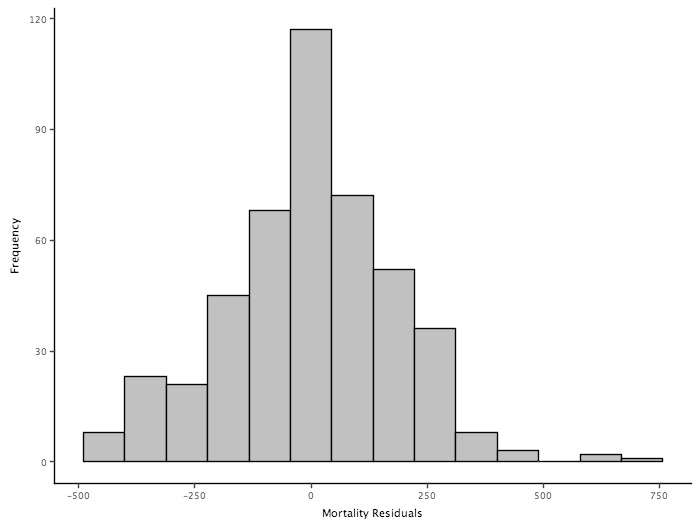
W = 0.2639, p-value < 2.2e-16

> bptest(logmodel)

studentized Breusch-Pagan test

data: logmodel

BP = 92.897, df = 7, p-value < 2.2e-16



> set.seed(1234)

> boot.anova(formula ="mortality~Race\*Year\*Sex",data=Mortality,reps=1500,dec=2)

BCa Bootstrap Anova Table (Type III tests)

Response: mortality

Sum Sq Df F value SE LB UB Crit F z Pr(>|z|)

(Intercept) 74552150.21 1 2226.90 297.18 1648.21 2836.13 3.86 7.49 6.71e-14 \*\*\*

Race 3515422.48 1 105.01 24.55 63.00 160.73 3.86 4.28 1.89e-05 \*\*\*

Year 69358684.97 1 2071.77 274.80 1531.17 2622.76 3.86 7.54 4.73e-14 \*\*\*

Sex 614429.79 1 18.35 11.01 2.64 42.88 3.86 1.67 0.0957 .

Race:Year 3316899.32 1 99.08 23.68 58.27 152.69 3.86 4.18 2.87e-05 \*\*\*

Race:Sex 134696.56 1 4.02 4.22 0.03 15.02 3.86 0.95 0.34

Year:Sex 701096.95 1 20.94 11.71 3.65 46.93 3.86 1.79 0.0738 .

Race:Year:Sex 137538.39 1 4.11 4.24 0.04 15.04 3.86 0.97 0.333

Residuals 14998148.34 448

---

Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1)

> boot.anova(formula ="mortality~Race+Year+Sex+Race:Year+Race:Sex+Year:Sex+Race:Year:Sex",data=Mortality,reps=1500,dec=2)

BCa Bootstrap Anova Table (Type III tests)

Response: mortality

Sum Sq Df F value SE LB UB Crit F z Pr(>|z|)

(Intercept) 74552150.21 1 2226.90 288.93 1697.94 2828.52 3.86 7.71 1.28e-14 \*\*\*

Race 3515422.48 1 105.01 25.08 61.39 159.58 3.86 4.19 2.83e-05 \*\*\*

Year 69358684.97 1 2071.77 267.14 1581.15 2618.13 3.86 7.76 8.81e-15 \*\*\*

Sex 614429.79 1 18.35 11.24 3.25 46.23 3.86 1.63 0.103

Race:Year 3316899.32 1 99.08 24.21 57.04 152.00 3.86 4.09 4.26e-05 \*\*\*

Race:Sex 134696.56 1 4.02 4.34 0.06 16.07 3.86 0.93 0.354

Year:Sex 701096.95 1 20.94 11.97 4.50 50.50 3.86 1.75 0.0802 .

Race:Year:Sex 137538.39 1 4.11 4.38 0.06 16.28 3.86 0.94 0.348

Residuals 14998148.34 448

---

Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1)

> boot.anova(formula ="mortality~Race+Year+Sex+Race:Year+Race:Sex+Year:Sex",data=Mortality,reps=1500,dec=2)

BCa Bootstrap Anova Table (Type III tests)

Response: mortality

Sum Sq Df F value SE LB UB Crit F z Pr(>|z|)

(Intercept) 95170794.68 1 2823.24 312.35 2228.78 3427.89 3.86 9.04 1.59e-19 \*\*\*

Race 5200417.34 1 154.27 26.24 107.90 211.03 3.86 5.88 4.12e-09 \*\*\*

Year 88405952.53 1 2622.56 287.93 2079.28 3183.71 3.86 9.11 8.37e-20 \*\*\*

Sex 544091.9 1 16.14 8.63 3.74 35.40 3.86 1.87 0.0614 .

Race:Year 4860942.32 1 144.20 25.19 99.86 199.21 3.86 5.72 1.04e-08 \*\*\*

Race:Sex 51028.61 1 1.51 2.96 0.00 11.29 3.86 0.51 0.609

Year:Sex 661425.98 1 19.62 9.46 5.64 40.38 3.86 2.07 0.0381 \*

Residuals 15135686.73 449

---

Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1)

> boot.anova(formula ="mortality~Race+Year+Sex+Race:Year+Year:Sex",data=Mortality,reps=1500,dec=2)

BCa Bootstrap Anova Table (Type III tests)

Response: mortality

Sum Sq Df F value SE LB UB Crit F z Pr(>|z|)

(Intercept) 95222567.77 1 2821.56 312.75 2257.44 3500.51 3.86 9.02 1.85e-19 \*\*\*

Race 5219231.57 1 154.65 25.68 106.44 209.17 3.86 6.02 1.71e-09 \*\*\*

Year 88405952.53 1 2619.57 288.68 2087.01 3233.64 3.86 9.07 1.15e-19 \*\*\*

Sex 549865.41 1 16.29 8.52 4.22 38.25 3.86 1.91 0.0558 .

Race:Year 4860942.32 1 144.04 24.50 98.41 196.20 3.86 5.88 4.11e-09 \*\*\*

Year:Sex 661425.98 1 19.60 9.31 5.96 43.11 3.86 2.10 0.0354 \*

Residuals 15186715.35 450

---

Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1)

Reporting

Add code as appendix!!

What is the hypothesis?

Do I have to boot.ci?

10,000 Sample Boot Strap Test

> boot.anova(formula ="mortality~Race+Year+Sex+Race:Year+Race:Sex+Year:Sex+Race:Year:Sex",data=Mortality,reps=10000,dec=2)

BCa Bootstrap Anova Table (Type III tests)

Response: mortality

Sum Sq Df F value SE LB UB Crit F z Pr(>|z|)

(Intercept) 74552150.21 1 2226.90 301.58 1673.78 2858.18 3.86 7.38 1.53e-13 \*\*\*

Race 3515422.48 1 105.01 24.88 61.70 159.85 3.86 4.22 2.43e-05 \*\*\*

Year 69358684.97 1 2071.77 278.74 1561.57 2656.50 3.86 7.43 1.06e-13 \*\*\*

Sex 614429.79 1 18.35 11.33 3.14 45.89 3.86 1.62 0.105

Race:Year 3316899.32 1 99.08 24.00 57.29 152.02 3.86 4.13 3.67e-05 \*\*\*

Race:Sex 134696.56 1 4.02 4.45 0.04 16.36 3.86 0.90 0.366

Year:Sex 701096.95 1 20.94 12.05 4.27 49.79 3.86 1.74 0.0822 .

Race:Year:Sex 137538.39 1 4.11 4.48 0.04 16.51 3.86 0.92 0.359

Residuals 14998148.34 448

---

Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1)

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Sum of Squares** | **Df** | **F-value** | **SE** | **Lower Bound** | **Upper Bound** | **Crit F** | **z** | **Pr(>|z|)** |
| Intercept | 74552150.21 | 1 | 2226.90 | 301.58 | 1673.78 | 2858.18 | 3.86 | 7.38 | 1.53e-13 |
| Race | 3515422.48 | 1 | 105.01 | 24.88 | 61.70 | 159.85 | 3.86 | 4.22 | 2.43e-05 |
| Year | 69358684.97 | 1 | 2071.77 | 278.74 | 1561.57 | 2656.50 | 3.86 | 7.43 | 1.06e-13 |
| Sex | 614429.79 | 1 | 18.35 | 11.33 | 3.14 | 45.89 | 3.86 | 1.62 | 0.105 |
| Race:Year | 3316899.32 | 1 | 99.08 | 24.00 | 57.29 | 152.02 | 3.86 | 4.13 | 3.67e-05 |
| Race:Sex | 134696.56 | 1 | 4.02 | 4.45 | 0.04 | 16.36 | 3.86 | 0.90 | 0.366 |
| Year:Sex | 701096.95 | 1 | 20.94 | 12.05 | 4.27 | 49.79 | 3.86 | 1.74 | 0.0822 |
| Race:Yr:Sex | 137538.39 | 1 | 4.11 | 4.48 | 0.04 | 16.51 | 3.86 | 0.92 | 0.359 |
| Residuals | 14998148.34 | 448 |  |  |  |  |  |  |  |

> boot.anova(formula ="mortality~Race+Year+Sex+Race:Year+Race:Sex+Year:Sex",data=Mortality,reps=10000,dec=2)

BCa Bootstrap Anova Table (Type III tests)

Response: mortality

Sum Sq Df F value SE LB UB Crit F z Pr(>|z|)

(Intercept) 95170794.68 1 2823.24 308.68 2267.03 3471.26 3.86 9.15 5.9e-20 \*\*\*

Race 5200417.34 1 154.27 25.99 107.83 210.58 3.86 5.94 2.93e-09 \*\*\*

Year 88405952.53 1 2622.56 284.56 2107.63 3221.25 3.86 9.22 3.08e-20 \*\*\*

Sex 544091.9 1 16.14 8.43 3.78 35.72 3.86 1.92 0.0554 .

Race:Year 4860942.32 1 144.20 24.92 99.59 198.30 3.86 5.79 7.21e-09 \*\*\*

Race:Sex 51028.61 1 1.51 3.00 0.00 10.40 3.86 0.50 0.614

Year:Sex 661425.98 1 19.62 9.23 5.63 40.68 3.86 2.13 0.0334 \*

Residuals 15135686.73 449

---

Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1)

> boot.anova(formula ="mortality~Race+Year+Sex+Race:Year+Year:Sex",data=Mortality,reps=10000,dec=2)

BCa Bootstrap Anova Table (Type III tests)

Response: mortality

Sum Sq Df F value SE LB UB Crit F z Pr(>|z|)

(Intercept) 95222567.77 1 2821.56 310.84 2272.74 3494.67 3.86 9.08 1.11e-19 \*\*\*

Race 5219231.57 1 154.65 25.82 107.19 208.69 3.86 5.99 2.1e-09 \*\*\*

Year 88405952.53 1 2619.57 287.12 2112.01 3239.36 3.86 9.12 7.27e-20 \*\*\*

Sex 549865.41 1 16.29 8.48 4.06 36.42 3.86 1.92 0.0548 .

Race:Year 4860942.32 1 144.04 24.62 98.72 195.52 3.86 5.85 4.88e-09 \*\*\*

Year:Sex 661425.98 1 19.60 9.27 5.80 41.28 3.86 2.11 0.0345 \*

Residuals 15186715.35 450

---

Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1)

The null is that the difference between groups is equal to 0. There is no difference between groups.

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Sum of Squares** | **Df** | **F-value** | **SE** | **Lower Bound** | **Upper Bound** | **Crit F** | **z** | **Pr(>|z|)** |
| Intercept | 95222567.77 | 1 | 2821.56 | 310.84 | 2272.74 | 3494.67 | 3.86 | 9.08 | 1.11e-19 |
| Race | 5219231.57 | 1 | 154.65 | 25.82 | 107.19 | 208.69 | 3.86 | 5.99 | 2.1e-09 |
| Year | 88405952.53 | 1 | 2619.57 | 287.12 | 2112.01 | 3239.36 | 3.86 | 9.12 | 7.27e-20 |
| Sex | 549865.41 | 1 | 16.29 | 8.48 | 4.06 | 36.42 | 3.86 | 1.92 | 0.0548 |
| Race:Year | 4860942.32 | 1 | 144.04 | 24.62 | 98.72 | 195.52 | 3.86 | 5.85 | 4.88e-09 |
| Year:Sex | 661425.98 | 1 | 19.60 | 9.27 | 5.80 | 41.28 | 3.86 | 2.11 | 0.0345 |
| Residuals | 15186715.35 | 450 |  |  |  |  |  |  |  |

