Contrasts, Plots and Simulation

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Three Topics

1. Contrasts in R
2. Plots
3. Simulation

Contrasts in R

- Estimable functions used in R are encoded by so-called `contrasts`
- Use `getOption("contrasts")` to find which contrasts are used
- Use `options(contrasts = c("<contast_unordered>", "<contrast_ordered")))` to change contrasts

Contrasts and Estimable Functions

▶ Relationship between contrasts and estimable functions via
contrasts matrix

```
(cm_treat <- contrasts(as.factor(tbl_bwbr$Breed)))
```

```
##           Limousin Simmental
## Angus            0         0
## Limousin         1         0
## Simmental        0         1
```

Estimable Functions

▶ Extend contrast matrix

```
(cm_treat <- cbind(matrix(1,
                    nrow = nrow(cm_treat),
                    ncol = 1),
                  cm_treat))
```

```
##               Limousin Simmental
## Angus     1         0         0
## Limousin  1         1         0
## Simmental 1         0         1
```

Estimable Functions II

▶ Invert extended contrast matrix

```
(em_treat <- solve(cm_treat))
```

```
##           Angus Limousin Simmental
##              1        0        0
## Limousin    -1        1        0
## Simmental   -1        0        1
```

Intercept

- First row of `em_treat` shows computation of estimate for intercept
- Define vector m as the vector of the mean values for `Body Weight` for all breeds

$$m = \begin{bmatrix} E(y_{1.}) \\ E(y_{2.}) \\ E(y_{3.}) \end{bmatrix} = \begin{bmatrix} 468 \\ 520 \\ 489.333 \end{bmatrix}$$

```
em_treat[1,] %*% m
```

```
##      [,1]
## [1,]  468
```

Effects

▶ Vector α from solution b^0 of least-squares normal equations

$$\alpha = \begin{bmatrix} \alpha_1 \\ \alpha_2 \\ \alpha_3 \end{bmatrix} = \begin{bmatrix} 98.667 \\ 150.667 \\ 120 \end{bmatrix}$$

```
em_treat[2,] %*% mat_b0[2:(nrow(mat_b0)),]
```

```
##      [,1]
## [1,]   52
```

```
em_treat[3,] %*% mat_b0[2:(nrow(mat_b0)),]
```

```
##           [,1]
## [1,] 21.33333
```