

# Linear Mixed Effects Models

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## Dataset

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Animal	Body Weight
2	463.0000
2	468.8940
2	467.8753
5	496.0000
5	495.0033
5	493.6563
7	518.0000
7	509.3221
7	506.5958
10	541.0000
10	547.3609
10	533.9288

---

# ANOVA

```
aov_bw_no_breed_rep <- aov(`Body Weight` ~ Error(Animal), c  
summary(aov_bw_no_breed_rep)
```

```
##
```

```
## Error: Animal
```

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

```
## Residuals  3   8658     2886
```

```
##
```

```
## Error: Within
```

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

```
## Residuals  8  183.8     22.98
```

## lme4

```
lme_bw_no_breed_rep <- lme4::lmer(`Body Weight` ~ (1|Animal)
                                   data = tbl_rep_obs_no_breed)
summary(lme_bw_no_breed_rep)
```

```
## Linear mixed model fit by REML ['lmerMod']
## Formula: `Body Weight` ~ (1 | Animal)
##   Data: tbl_rep_obs_no_breed
##
## REML criterion at convergence: 82.7
##
## Scaled residuals:
##      Min       1Q   Median       3Q      Max
## -1.36360 -0.50301  0.06086  0.26850  1.43838
##
## Random effects:
##   Groups   Name                Variance Std.Dev.
##   Animal   (Intercept)         954.34   30.892
##   Residual                    22.98    4.794
## Number of obs: 10, groups: Animal, 4
```

## With Breed

Animal	Body Weight	Breed
2	463.0000	Angus
2	468.8940	Angus
2	467.8753	Angus
5	496.0000	Simmental
5	495.0033	Simmental
5	493.6563	Simmental
7	518.0000	Limousin
7	509.3221	Limousin
7	506.5958	Limousin
10	541.0000	Limousin
10	547.3609	Limousin
10	533.9288	Limousin

# ANOVA

```
aov_bw_breed_rep <- aov(`Body Weight` ~ Breed +  
                        Error(Animal),  
                        data = tbl_rep_obs_breed)  
summary(aov_bw_breed_rep)
```

```
##
```

```
## Error: Animal
```

##		Df	Sum Sq	Mean Sq	F value	Pr(>F)
##	Breed	2	7356	3678	2.826	0.388
##	Residuals	1	1302	1302		

```
##
```

```
## Error: Within
```

##		Df	Sum Sq	Mean Sq	F value	Pr(>F)
##	Residuals	8	183.8	22.98		

## lme4

```
lme_bw_breed_rep <- lme4::lmer(`Body Weight` ~ Breed +  
                               (1|Animal),  
                               data = tbl_rep_obs_breed)  
  
summary(lme_bw_breed_rep)
```

```
## Linear mixed model fit by REML ['lmerMod']  
## Formula: `Body Weight` ~ Breed + (1 | Animal)  
## Data: tbl_rep_obs_breed  
##  
## REML criterion at convergence: 61.8  
##  
## Scaled residuals:  
##      Min       1Q   Median       3Q      Max  
## -1.3714 -0.5383  0.0640  0.3213  1.4305  
##  
## Random effects:  
## Groups   Name                Variance Std.Dev.  
## Animal  (Intercept)  426.21   20.645  
## Residual                    22.22    4.704
```