ANOVA – Chapter 3

Outline

- ANOVA – what is it…
- How to compute ANOVA
  - Examples
- Assumption checking
- Extensions (next class):
  - Unbalanced samples
  - Differing variances
  - Regression / fitted models

ANOVA

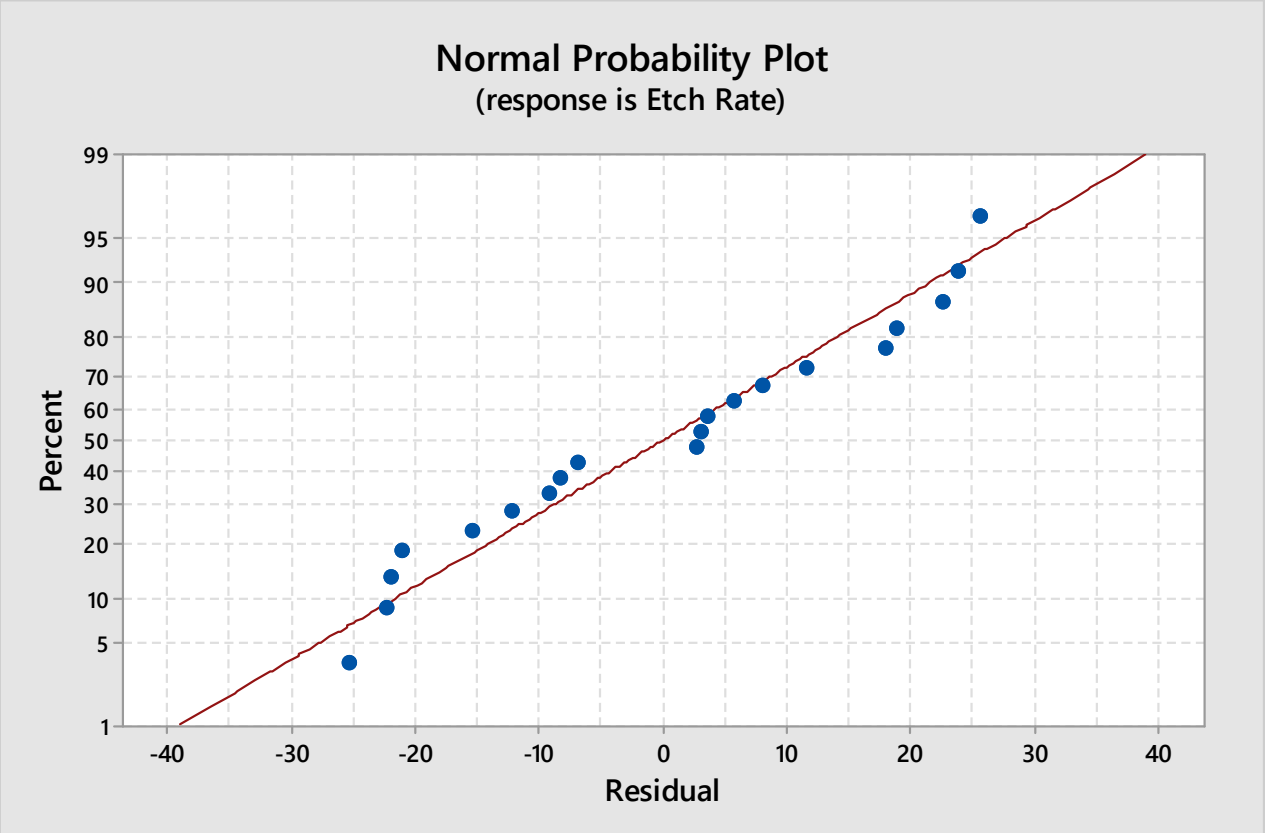
- Assume *a* set of samples
  - Each experiment has *n* replicants
  - Want to see if any of the sets are "significantly" different from the others
- Compute:
  - The overall mean
  - The mean for each set
  - The total sum of squares (SS_T)
  - The sum of squares of just the means (times *n*) ($SS_{Treatments}$)
  - The sum of squares of the errors = SS_T - $SS_{Treatments}$

Examples:

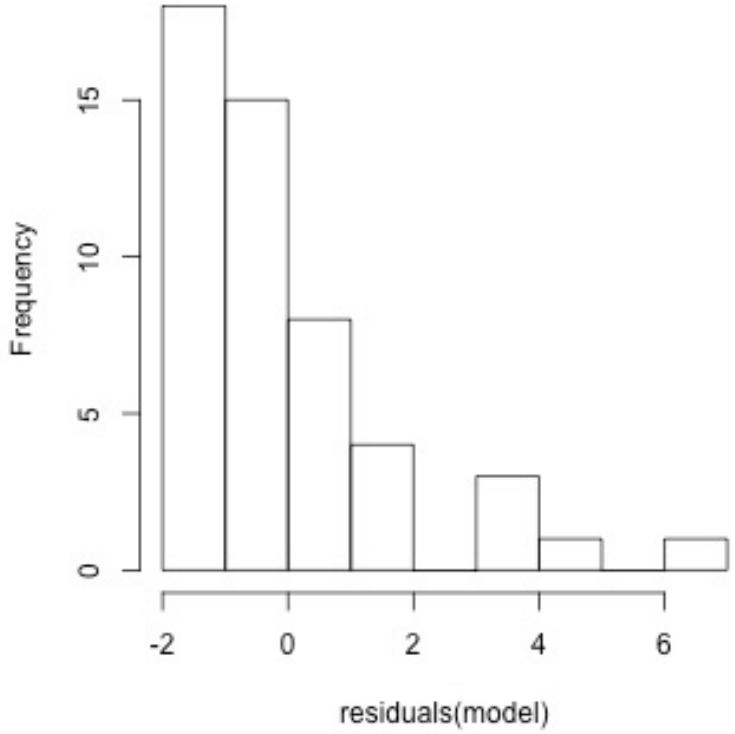
- 3.17
- 3.29

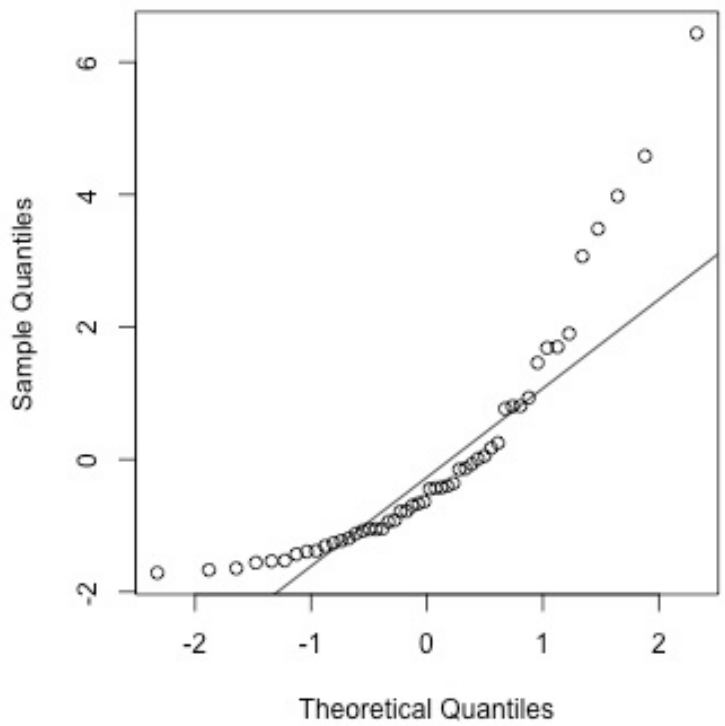
3.4.1. Normal probability plot of residuals

- NPP of residuals combine observations in *a* treatments in one plot
  - Chapter 2 for t-test: NPP of raw data at 2 conditions.
  - In ANOVA, it is usually more effective to work with residuals
- No evidence of a violation of the normality assumption

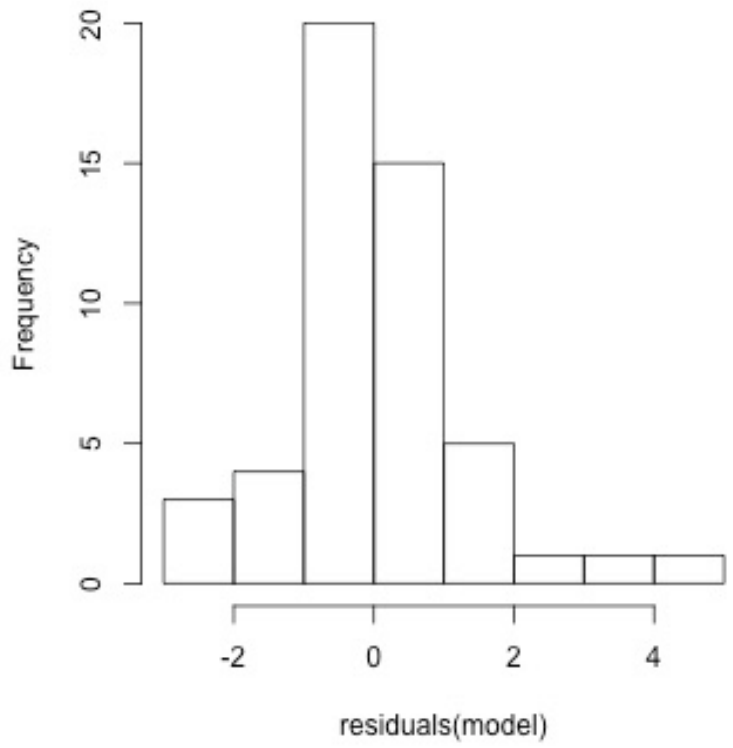


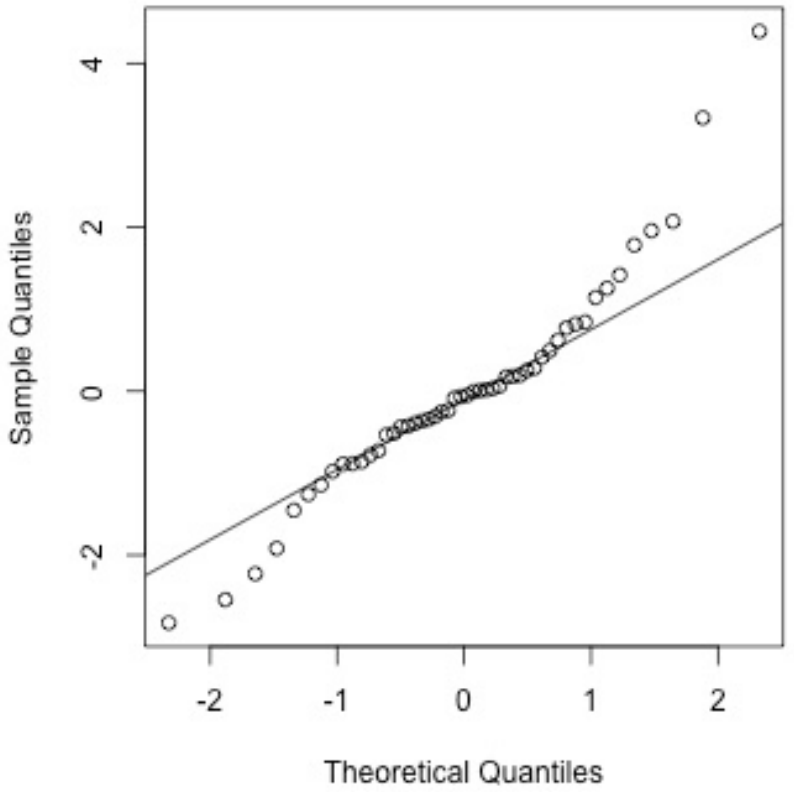
Departures from normality - Skewed residuals





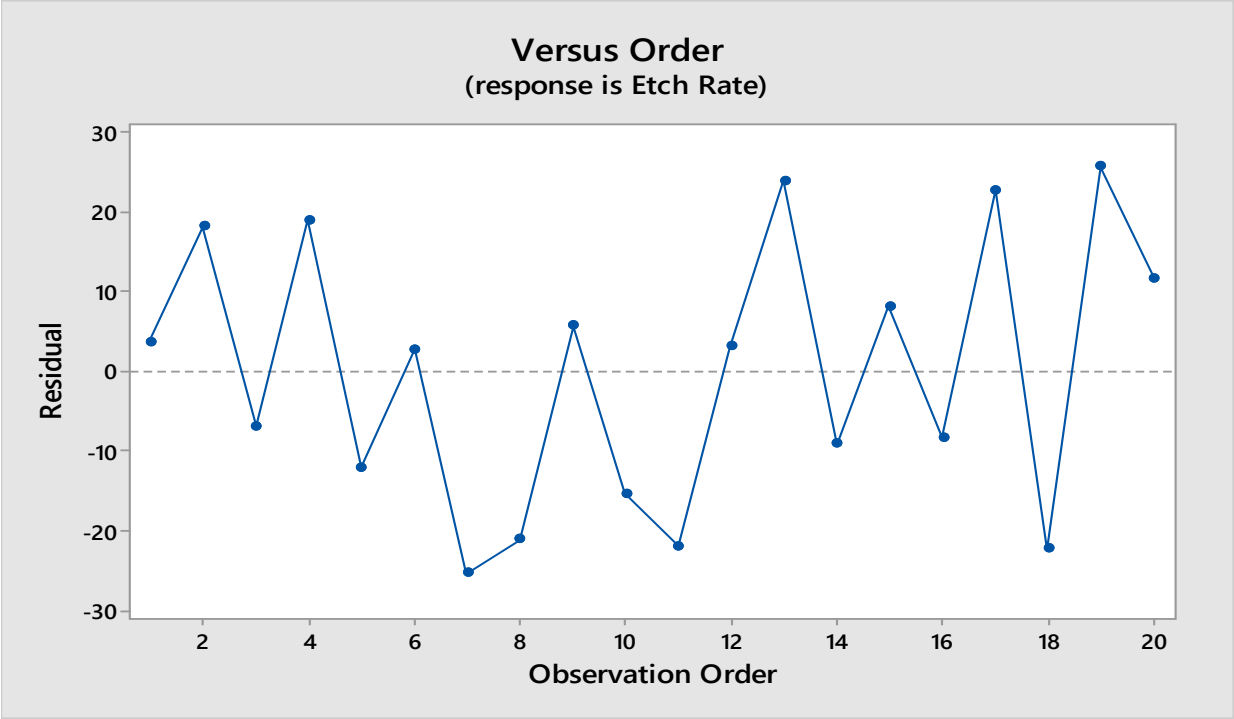
Departures from normality - Heavy tailed residuals





3.4.2. Check for independence

- Residuals versus run order: To satisfy independence assumption, there should not be strong correlation between residuals
  - Tendency to have “runs” of positive or negative residuals indicates strong correlation and indicates that the observations are not independent
  - In this experiment there is no indication of correlation between residuals



3.4.3. Check for constant variance

- Residuals versus fitted values $\hat{y}_{ij}$
  - To satisfy the constant variance assumption at all treatments plot should look like a "parallel band" centered about zero
  - In this experiment there is no indication of non-constant variation at different treatments