Statistics One

Lecture 14

ANOVA

Three segments

- The General Linear Model (GLM)
- One-way ANOVA
- Factorial ANOVA

Lecture 14
Segment 1
GLM

GLM

- GLM is the mathematical framework used in many common statistical analyses, including multiple regression and ANOVA
  - ANOVA is typically presented as distinct from multiple regression but it IS a multiple regression

Characteristics of GLM

- Linear: pairs of variables are assumed to have linear relations
- Additive: if one set of variables predict another variable, the effects are thought to be additive

Characteristics of GLM

- BUT! This does not preclude testing non-linear or non-additive effects
  - GLM can accommodate such tests, for example,
    - Transformation of variables
      - Transform so non-linear becomes linear
    - Moderation analysis
      - Fake the GLM into testing non-additive effects

GLM example

- Simple regression
  - $Y = B_0 + B_1X_1 + e$

  - Y = faculty salary
  - X1 = years since PhD

GLM example

- Multiple regression
  - $Y = B_0 + B_1X_1 + B_2X_2 + B_3X_3 + e$

  - Y = faculty salary
  - X1 = years since PhD
  - X2 = # of publications
  - X3 = (years x pubs)

GLM example

- One-way ANOVA
  - $Y = B_0 + B_1X_1 + e$
  - Y = faculty salary
  - X1 = gender

GLM example

- Factorial ANOVA
  - $Y = B_0 + B_1X_1 + B_2X_2 + B_3X_3 + e$

  - Y = faculty salary
  - X1 = gender
  - X2 = race
  - X3 = interaction (gender x race)

Analysis of Variance (ANOVA)

- Appropriate when the predictors (IVs) are all categorical and the outcome (DV) is continuous
  - Most common application is to analyze data from randomized experiments

Analysis of Variance (ANOVA)

- More specifically, randomized experiments that generate more than 2 means
  - If only 2 means then use:
    - Independent t-test
    - Dependent t-test

Analysis of Variance (ANOVA)

- If more than 2 means then use:
  - Between groups ANOVA
  - Repeated measures ANOVA

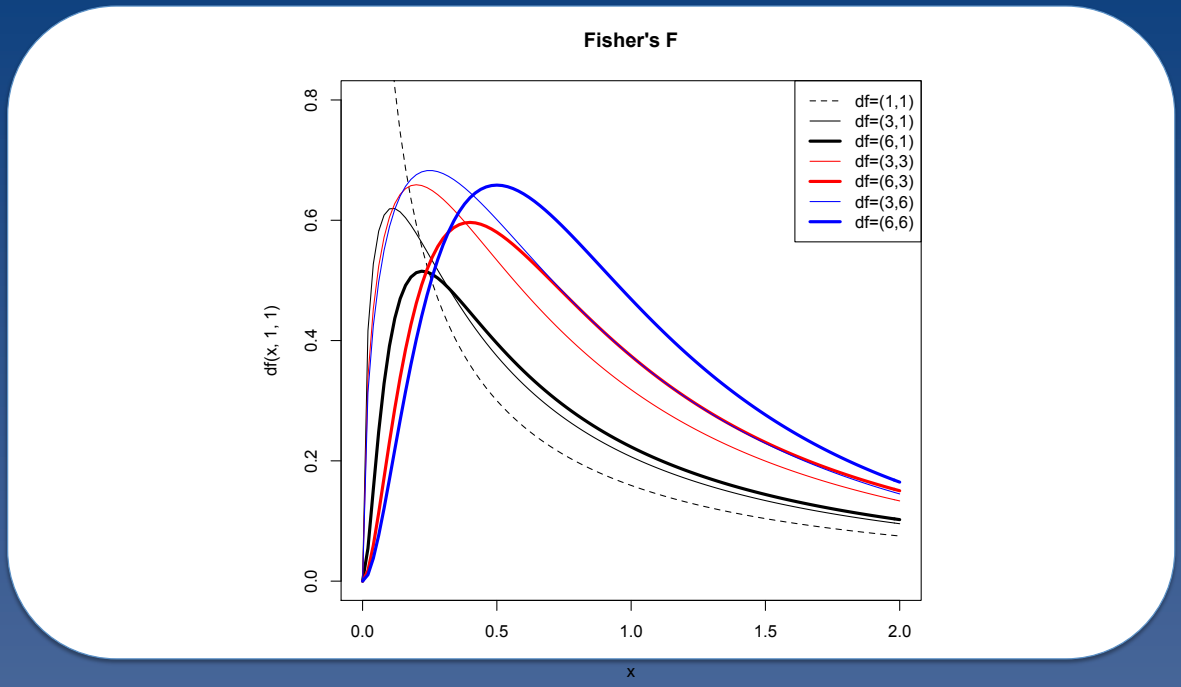
Analysis of Variance (ANOVA)

- NHST may accompany ANOVA
- The test statistic is the F-test
  - F = systematic variance / unsystematic variance

Analysis of Variance (ANOVA)

- Like the t-test and it's family of t distributions
- The F-test has a family of F distributions
  - The distribution to assume depends on
    - Number of subjects per group
    - Number of groups

Analysis of Variance (ANOVA)



GLM ~ ANOVA summary

- GLM is the mathematical framework used in many common statistical analyses, including multiple regression and ANOVA
- ANOVA is multiple regression!
- What's new?
  - F-test
  - Experimental designs