1. t-test for observational data (bumpusI.pdf) "...[O]n February 1 of the present year (1898), ...after an uncommonly severe storm of snow, rain, and sleet, a number of English sparrows were brought to the Anatomical Laboratory of Brown University. Seventy-two of these birds revived; sixty-four perished..." This was taken to be a "natural experiment" suitable for testing Darwin's theory of "survival of the fittest." Birds were characterized by gender, and for males, by adult vs. juvenile. Multiple measurements were taken on each bird, including the length of first wing bone (humerus).

2. Breakout

3. Summary of Multiple Regression

   (a) Structural Model

   (b) Structural Assumptions and Variations
       i. "Fixed-x"
       ii. Linearity
       iii. Extrapolation vs. interpolation
       iv. Categorical variable codings
       v. Arbitrary transformations of X or Y
       vi. Polynomials
       vii. Interactions

(c) Error Model

(d) Error Assumptions and Variations
  i. IID errors
  ii. Arbitrary transformations of Y

(e) Likelihood

(f) Matrix form and estimation

(g) Distributions of estimates

4. Causality