Model Based Statistics in Biology.

Part V. The Generalized Linear Model.

Chapter 16 Introduction

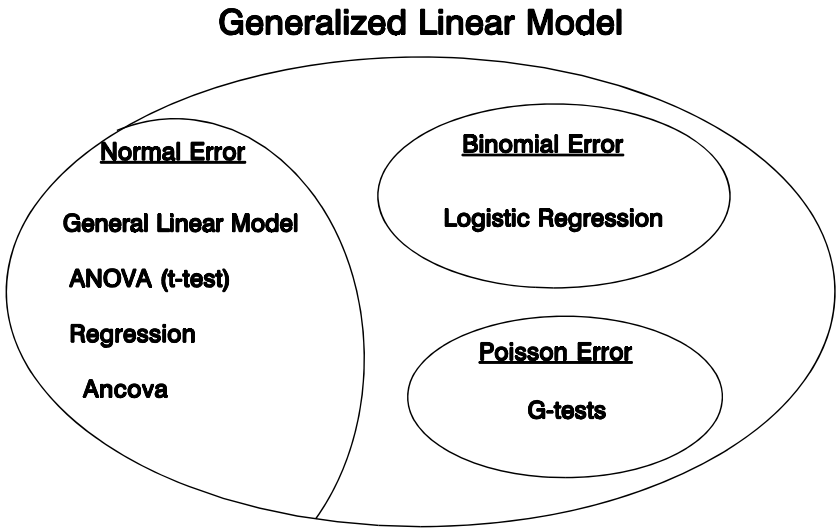
on chalk board

ReCap Part I (Chapters 1,2,3,4) Quantitative reasoning
ReCap Part II (Chapters 5,6,7) Hypothesis testing and estimation
ReCap (Ch 9, 10,11) The General Linear Model with a single explanatory variable.
ReCap (Ch 12,13,14,15) GLM with more than one explanatory variable

Today: The Generalized Linear Model

Wrap-up.

Introduction to the Generalized Linear Model.



Advantages

Assumptions more evident.

Carryover.

Improves the quality of statistical analyses.

Decouples assumptions about errors from assumptions about the structure of the model.

Use of modeling approach leads to greater flexibility in analysis

Biology 4605/7220.
Generic Recipe for Data Analysis with the Generalized Linear Model.

1. Construct model. Begin with verbal and graphical model.
   Distinguish response from explanatory variables
   Assign symbols, state units and type of measurement scale for each.
   Write out structural model (explanatory variables)
2. Execute model Place data in model format, code model statement.
   Specify error structure and link function.
   Compute fitted values from parameter estimates.
   Compute residuals and plot against fitted values.
3. Evaluate the model, using residuals.
   If straight line inappropriate, revise the model (back to step 1).
   If errors not homogeneous, revise error structure and link (step 2)
4. State population and whether the sample is representative
5. Decide on mode of inference. Is hypothesis testing appropriate?
   If yes step 6, otherwise, skip to step 9.
6. State H_o/H_A pair (some analyses may require several pairs).
   State test statistic, its distribution (Chisquared), and tolerance of Type I error.
7. ANODEV: Partition df according to model.
   Table Source,df, ΔG, p-value from Chisquared distribution.
8. As needed, evaluate sensitivity to deviations from assumptions, or compute p-values and estimates by randomization.
9. Declare decision about model terms: If $p < \alpha$ then reject H_o and accept H_A
   If $p \geq \alpha$ then accept H_o and reject H_A
   Report conclusion with evidence: Either the ANODEV table or
   p-value (not α) for terms of interest.
10. Report and interpret parameters of biological interest (means, slopes)
    along with one measure of uncertainty (st. error, st. dev., or conf. intervals).
    Use appropriate distribution to compute confidence limits.

This is a slight modification of the generic recipe for applying the General Linear Model