

WILD 7250 - Wildlife Population Analysis

www.auburn.edu/~grandjb/wildpop

Lab 3 – Analysis of Animal Populations: Introduction to MARK and Kaplan-Meier/Known-fate Analyses

Resources:

Chapters 1-4. Cooch and White. Program MARK: A gentle introduction.
<http://www.phidot.org/software/mark/docs/book>

Program MARK help files
<http://www.cnr.colostate.edu/~gwhite/mark/markhelp/index.htm>

Kaplan-Meier Survival Estimates

Download the lab_03.xls spreadsheet containing the data from Pollock et al. 1989.

1. (15%) On worksheets "Sample 1" and "Sample 2" complete the tables by entering the appropriate formulas from the notes or the manuscript.
2. (15%) On the "Combined" worksheet enter the formulas or values for the combined datasets and complete the tables.
3. (5%) Plot the three survival functions on the Chart.

Your worksheets should include estimates of the weekly survival rates, the product-limit survival rates, the variance, and the 95% CLs for the first sample, the second sample and the combined data.

Known fate models

1. (15%) On the worksheet labeled "Likelihood," the data in cells A6:F21 are the same used in the Kaplan-Meier worksheet. Enter the correct formulas for the log-likelihoods for the model $S(g)$ in H7:H15 and I7:I24 and calculate the MLE of the mean weekly survival rates in Groups 1 & 2 using the solver.

Take some time to examine and understand the log-likelihood formulas use to generate the other estimates. Excel and the solver provide great power for generating MLEs, but it sometimes takes a great deal of work to specify the model correctly.

2. (15%) On the worksheet labeled "Covariates," complete the tables by entering the correct formulas for the logit, $S(i)$, likelihood and log-likelihood, then use the solver to calculate the MLEs for the models (S, S_t, S_{t+g}) from the example in the lecture, and the model S_{t*g} . Use the log-likelihood of each model to complete the model selection tables.

Use the notepad or wordpad to examine the sample mark data sets km2.inp provided with MARK. **Note:** The format of the data is the same as the "at-risk" and "dead" columns in the K-M spreadsheet.

WILD 7250 - Wildlife Population Analysis

www.auburn.edu/~grandjb/wildpop

Welcome to MARK and the design matrix

1. (15%) Create a new MARK results file using KM3.inp. View the file in the notepad. This file includes the same data as the KM2.inp results. Specify known fate data type with 9 occasions and 2 groups. Use Run/Pre-Defined Models to run the models (S ., $S(g)$, $S(t)$, $S(g*t)$, and $S(g+t)$) with **design matrix coding**.

Note: In the results table, MARK doesn't count model parameters that can't be estimated, and this is determined by whether the standard error of the parameter is estimable. In some cases this occurs because there is insufficient data (more on this later). In this case, the parameters are estimated, but they are near the boundaries of the link function (0.0 and 1.0). Adjust the parameter counts in the results table to correspond with the number of β s (columns) in the design matrix; this is the correct number of parameters in the model.

Export the results table to an Excel spreadsheet and cut and paste it on the worksheet labeled MARK.

2. (20%) Examine the full output from the $S(g)$ and $S(g+t)$. Using what you know about AIC, parsimony, bias, and precision explain why $S(g)$ is a better model than $S(g+t)$ in the text box at the bottom of the MARK worksheet.