

ST 506 Homework Set 10 2008  
 Due Tuesday November 4, 2008

Q1. Program MARK provides AIC model comparisons for an alligator population at Lake Ellis Simon, North Carolina, subject to capture-recapture from 1976 to 1979 by Manley Fuller a former Ph D student of Dr. Phil Doerr. There was just one capture period each year. Four models are fitted using varying assumptions about constancy of survival and capture probabilities over time. Then the parameter estimates and SEs for each model are also given. Here we just consider survival and capture probability estimation based on the recaptures.

Model	AICc	Delta AICc	# Parameters
$\phi(\cdot) p(\cdot)$	185.83	0.00	2
$\phi(\cdot) p(t)$	188.54	2.71	4
$\phi(t) p(\cdot)$	189.21	3.37	4
$\phi(t) p(t)$	190.62	4.78	5

Real Function Parameters of  $\{\Phi(t) p(t) \text{ PIM}\}$

Parameter	Estimate	Standard Error	95% Confidence Interval	
			Lower	Upper
1:Phi	0.7352941	0.1455371	0.3908088	0.9232408
2:Phi	0.8175824	0.1550904	0.3686232	0.9717563
3:Phi	0.5927490	232.70495	0.2021374E-10	1.0000000
4:p	0.7200000	0.1595594	0.3527872	0.9238422
5:p	0.5358423	0.1208847	0.3081002	0.7495562
6:p	0.5927490	232.70494	0.2021374E-10	1.0000000

Real Function Parameters of  $\{\Phi(t) p(\cdot) \text{ PIM}\}$

Parameter	Estimate	Standard Error	95% Confidence Interval	
			Lower	Upper
1:Phi	0.7855523	0.1498374	0.3905479	0.9544207
2:Phi	0.7539437	0.1169131	0.4711652	0.9133294
3:Phi	0.6175588	0.1316335	0.3513308	0.8280107
4:p	0.5972312	0.0977566	0.4006899	0.7668259

Real Function Parameters of  $\{\Phi(\cdot) p(t) \text{ PIM}\}$

Parameter	Estimate	Standard Error	95% Confidence Interval	
			Lower	Upper
1:Phi	0.7763123	0.0945402	0.5441921	0.9098149
2:p	0.6972303	0.1528817	0.3577103	0.9049608
3:p	0.5560607	0.1060756	0.3504571	0.7441041

4:p                    0.4653489      0.1287048      0.2399885      0.7058034

Real Function Parameters of {Phi(.) p(.) PIM}				
95% Confidence Interval				
Parameter	Estimate	Standard Error	Lower	Upper
1:Phi	0.7257951	0.0830339	0.5388314	0.8570676
2:p	0.5827875	0.0970619	0.3897915	0.7533655

- a) Based on the information given you need to decide which model to use. I would then like you to write a brief report on what you have learned from this study about survival and capture rates and the assumptions behind the sampling method and model.
- b) If there were 20, 51, 41, and 25 total animals captured each year (marked and unmarked) use the above estimates to obtain a population size estimate in each year. Don't worry about getting SEs for the estimates.

Q2. Input the following two artificial data sets into MARK and then fit the CJS model  $\{\phi(t), p(t)\}$  and then the restricted version  $\{\phi(\cdot), p(\cdot)\}$  for each data set.

Phoenix1

111 518;

101 130;

110 202;

100 150;

Phoenix2

111 32;

101 130;

110 148;

100 690;

Comment on the important points for the models within a data set and then compare the estimates and precisions between data sets. What is going on here?

Q3. I strongly advise you to play around with the dipper data yourself so that you see how to manipulate PIMS and use predefined model sets for multiple groups using the recaptures option in MARK. If you do create a new test data set by copying the one you have so that you do not lose Gary's example analyses.