STAT3015/4030/7030 Generalised Linear Modelling

Tutorial 6

1. (Ramsey and Schafer, 2013, Chap 20, Ex 11). The file `oring.csv` contains data on the launch temperatures (degrees Farenheit) and an indicator of O-ring failure for 24 space shuttle launches prior to the space shuttle `Challenger` disaster of Jan 27, 1986. The night before the disaster, scientists warned the shuttle should not be launched because of predicted cold weather. Fuel seal problems, which had been encountered in earlier flights, were suspected of being associated with low temperatures.
   (a) Fit the logistic regression model of `Failure` (1 for failure) on `Temperature`. Report the estimated coefficients and their standard errors.
   (b) Test whether the coefficient of `Temperature` is 0, using Wald's test. Report a one-sided p-value (the alternative hypothesis is that the coefficient is negative; odds of failure decrease with increasing temperature).
   (c) Test whether the coefficient of `Temperature` is 0, using the drop in deviance test.
   (d) Give a 95% confidence interval for the coefficient of `Temperature`.
   (e) What is the estimated logit of failure probability at 31°F? What is the estimated probability of failure?
   (f) Why must the answer to part (e) be treated cautiously?
2. (Ramsey and Schafer, 2013, Chap 20, Data Problem 15). A study examined the association between nesting locations of the Northern Spotted Owl and availability of mature forests. Wildlife biologists identified 30 nest sites. The researchers selected 30 other sites at random coordinates in the same forest. On the basis of aerial photographs, the percentage of mature forests was measured in various rings around each of the 60 sites. The data is in the file `owl.csv`.
   (a) Apply two-sample t-tools to these data to see whether the percentage of mature forest is larger at nest sites than at random sites.
   (b) Construct a binary response variable that indicates whether a site is a nest site. Use a logistic regression to investigate how large an area about the site has importance in distinguishing nest sites from random sites on the basis of mature forest.

References

F. L. Ramsey and D. W. Schafer. The statistical sleuth: a course in methods of data analysis. Brooks/Cole, 2013.