

Assignment 4: Variance Components in Program Excel

Objectives: This assignment will give you an opportunity to apply variance components procedures to another data set. Conducting these analyses in Program Excel allow you to apply these procedures to any time-series of demographic data, whether they are estimates of survival as for the mule deer fawns, estimates of population counts as in this assignment, or estimates of fecundity or some other demographic rates. Decomposing total variance into process variance of biological interest and sampling variance is particularly important when estimating parameters for use in matrix models that are aimed at modeling population viability.

This assignment is based on 16 years of survey data for a population of Spotted Owls. These data are available as an Excel spreadsheet *spotted.xls* on the course webpage.

| Year | Population Count (N) | SE(N) |
|------|--------------------------|-----------|
| 1980 | 40.04 | 5.926 |
| 1981 | 50.51 | 11.004 |
| 1982 | 61.36 | 15.278 |
| 1983 | 47.60 | 11.062 |
| 1984 | 95.95 | 18.988 |
| 1985 | 33.81 | 8.803 |
| 1986 | 34.39 | 5.804 |
| 1987 | 38.52 | 11.168 |
| 1988 | 84.57 | 21.312 |
| 1989 | 30.04 | 6.918 |
| 1990 | 20.29 | 7.529 |
| 1991 | 68.42 | 17.969 |
| 1992 | 45.51 | 13.225 |
| 1993 | 27.01 | 6.137 |
| 1994 | 71.12 | 14.511 |
| 1995 | 51.45 | 8.054 |

The goal of this assignment is to apply the methods that you used in the mule deer lab exercise to calculate the process variance for the time series of population counts for this population of Spotted Owls.

Hand in a short paragraph that addresses the following questions:

1. What is the naive estimate of population size for this population of Spotted Owls?
2. If you assume that sampling variances are equal, what are your naive estimates of total variance, sampling variance and process variance?
3. If you use the formulae presented by White (2000), what is your weighted estimate of: population size and the process variance for this parameter?
4. What χ^2 -values correspond to the lower and upper CI for the process variance? Using χ^2 -values as reference values, what are the 90%CI and 95%CI for your weighted estimate of the process variance?