

Answers to Exercise 18

Key Factor Analysis

1. The *stage with the steepest slope* will be the key factor (or key stage). Answers will vary depending upon the random numbers drawn in the **BETA****IN****V** functions and the values for $\bar{\mu}$ and standard deviation entered as population parameters.
2. The key stage often changes as new data sets are generated, making it difficult to determine which stage really is most closely correlated with K . For this reason, it is necessary to run at least 100 trials in order to get a better grip on which k factor is the “real” key factor.
3. You should see that k_3 (pupae survival) had, on average, the greatest correlation with K . Thus pupae survival is the key factor in this case—but keep in mind that the analysis does not indicate what is causing the mortality in that stage.
4. Because the results from each key factor simulation vary so widely, developing management guidelines for our hypothetical insect population is difficult. However, this analysis does show that adult emigration has little effect on the population, since it was not identified as a key factor in any simulation.
5. You should see that when the population parameters have low standard deviations and hence do not change from generation to generation, the key stage or key factor will be the *stage with the highest mortality*. With generation-to-generation variation in the model, the key stage can be a different stage than that with the highest average mortality. This cautions against using key factor analysis for highly unstable populations.
6. When all survival probabilities are equal, the key stage or key factor will tend to be *the factor that is most variable from generation to generation*.