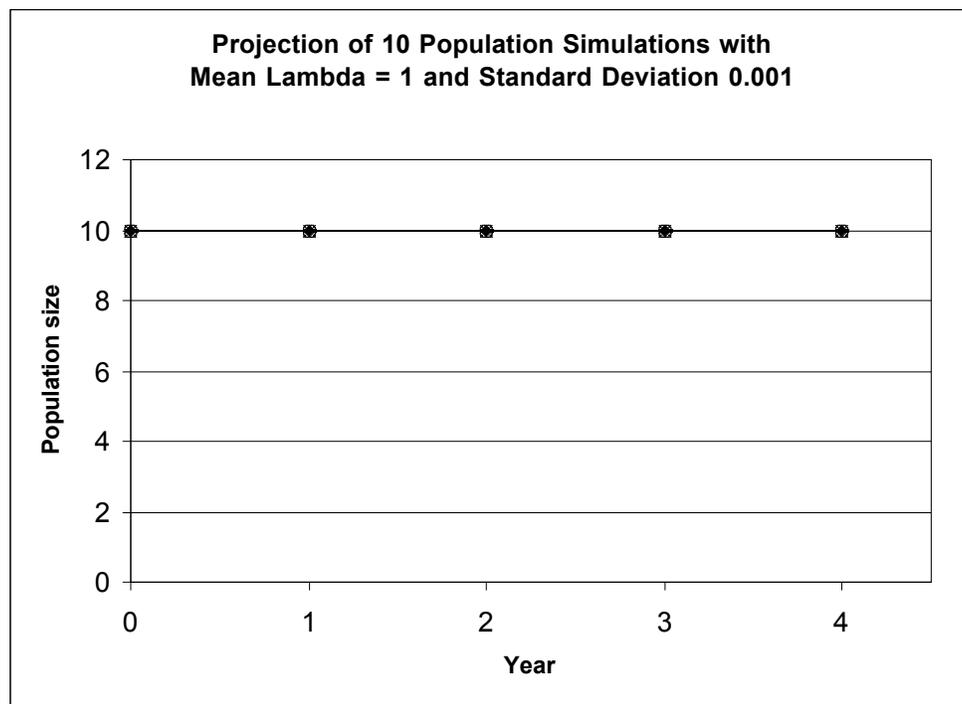


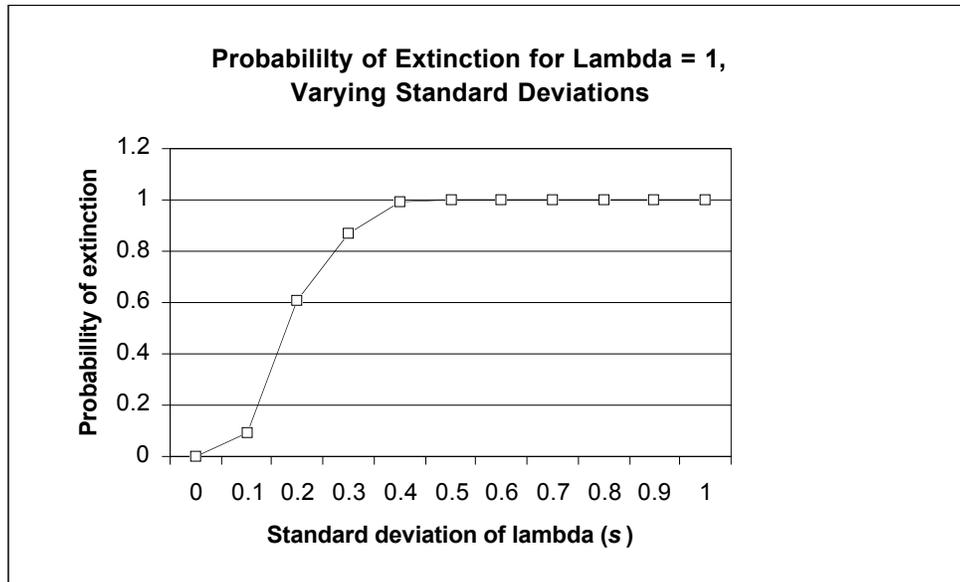
Answers to Exercise 28

Population Viability Analysis

1. Given a mean $\lambda = 1$ and $\sigma = 0.5$, our population had a 100% probability of extinction. The variation, σ , was so high that eventually over the 100 year trial the population dipped below 0 at some point in time.
2. There appears to be a risk in running the model for too short a period. For example, given a mean $\lambda = 1$ and $\sigma = 0.5$, our risk of extinction was only 0.2 when the model was run for 4 years. The risk for running the model for extended periods of time is that the conditions in the model (mean λ and σ) are specified for the duration of the modeling period. If for some reason the mean and σ change, your model results will not reflect these changes. Note, however, that you could easily restructure the spreadsheet to draw from a mean λ that perhaps changed deterministically over time.
3. As σ decreases to nearly 0, your model becomes a deterministic model. Since λ is set to 1, the population size remains constant over time, with no change. The only way to change this outcome is to change λ in cell C4. With no variance in σ , and a fixed λ value, the population will increase geometrically, decrease geometrically, or remain stable over time.



4. The population changes in size due to the stochasticity incorporated into the model. Our model results from 100 trials and 100 years show that the probability of extinction increases as s increases. When $s > 0.4$, the probability of extinction was 1, indicating that 100% of our trial simulations went extinct within 100 years.



5. For a fixed parameters, $\lambda = 1$, $\sigma = 0.25$, risk of extinction decreases as the initial population size increases. This relationship is not linear. The extinction probability changes more slowly when the population size was 500 or greater in our model (your results may be different).

