

Birth Death Processes

Birth death processes are commonly used to simulate natural processes (eg. microsatellites, gene copies, and biodiversity) . Today we are going to examine the inherently stochastic nature and high variance that is the hallmark of birth death processes.

hint: when running code that has stochastic function you can use the command `set.seed(N)` to make your code repeatable.

Part 1 simulate 10 birth death trees under a constant rate of your choice plot them and see what kind of variance there is under this equal rates model. This should illustrate to you why diversification rate is such a hard thing to find significant shifts in.

hint: phytools is a convenient package to use for this exercise

part 2 modify your code to produce at least 50 trees and make a histogram showing the distribution of extant lineages among your 50 trees.

part 3 make two sets of 50 trees with the same extinction rate but a speciation (birth) rate that is 50% higher. Make a density plot for each set of trees to see how much overlap there is.

part 4 come up with some other way of looking at the characteristics of these trees that you think might be more informative than simply the number of tips graph something cool to show me why you are right.