Statistical Computing and Simulation

Spring 2017

Assignment 5, Due June 13/2017

1. Try at least three different methods to find the estimates of B and C for the Gompertz model,  using the Taiwan data in 2016. You may count “nlminb”, “nls” or “opt” as one of the method (for replacing Newton’s method). Also, similar to what we saw in the class, discuss the influence of starting points to the number of iterations. You may choose the male data or female data. (Bonus: Compare the results of different counties.)
2. Evaluate the CDF of standard normal distribution *Φ(x)* using the method of Important Sampling and other Variance Reduction Methods (at least two different methods). Consider *x* = −6, −5, −4, −3.5, −3, −2.5, −2.
3. Let  be independent exponential random variables each with mean 1, and consider the quantity  defined by  Propose at least three simulation methods to estimate  and compare their variances.
4. Evaluate the following quantity by both numerical and Monte Carlo integration, and compare their errors with respect to the numbers of observations used. Also, propose at least two simulation methods to reduce the variance of Monte Carlo integration and compare their variances.



1. First, simulate 100 observations from a mixed distribution of N(−2,1) and N(2,1), each with probability 0.5. Then, use at least 3 density estimating methods to smooth the observations. You need to specify the parameters in the smoothing methods, and compare the results.
2. Visit the webpage of Department of Statistics, Ministry of Interior of the Taiwan Government ([www.moi.gov.tw/stat](http://www.moi.gov.tw/stat)) and download the age-specific death records of year 2015. Use the smoothing techniques introduced in class to revise the age-specific mortality rates and compare with the values from 2015 Taiwan abridged life table. You only need to consider the case of the male or female.