Statistical Computing: Simulating Random Variables

Direct Method

1. Simulate 1000 variables using the direct method for

   (a) The Weibull Distribution ($a = 0.5$, $b = 2$) CDF: $F(x) = 1 - e^{-(x/b)^a}$

   (b) The Logistic Distribution CDF: $F(x) = (1 + e^{-x})^{-1}$

   You must work out and code up the inverse cdf function yourself

2. Do the same using the R functions *rweibull* and *rlogis*. Compare the results to your answer in Question 1 by looking at summary statistics using the *summary* function in R.

Indirect Method

1. Use the Accept/Reject algorithm to simulate from the standard lognormal distribution which has density $f(x) = (2\pi x^2)^{-1/2} e^{-log(x)^2/2}$. Issues to think about: What can be used as a proposal? How to select M.

2. Use the Accept/Reject algorithm to simulate from a $N(0, 1)$. You can use the function *dnorm*. Try the following proposals.

   (a) Logistic Distribution (use *rlogis* and *dlogis* functions).

   (b) Cauchy distribution (use *rcauchy* and *dcauchy* functions).

   (c) Student t distribution 5 df (use *rt* and *dt* functions).

   (d) Student t distribution 20 df (use *rt* and *dt* functions).

   (e) A N(1,2) distribution (use *rnorm* and *dnorm* functions)

3. For each proposal record the percentage of iterates that are accepted. Which is the best proposal in Question 2? Why?