Exercise2.11 montecarlo in r

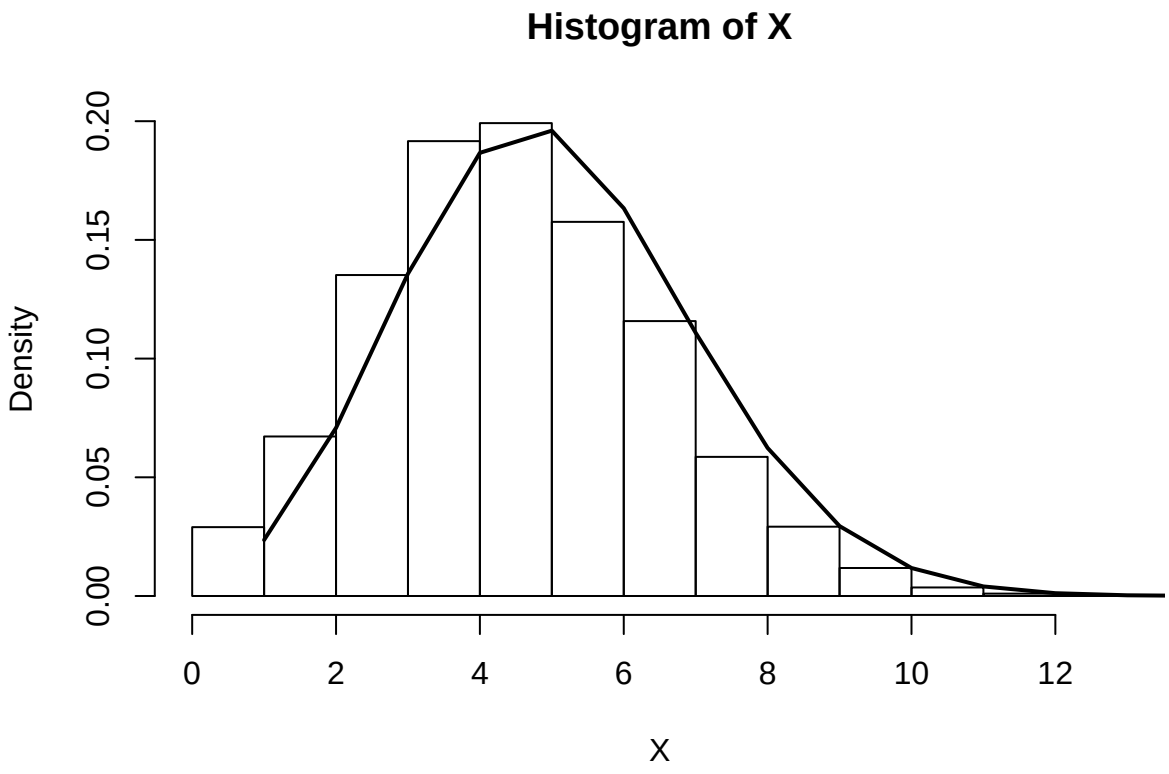
Maria

30-04-2016

Exercise 2.11 a

I should generate a binomial $Bin(n, p)$ random variable with $n = 25$ and $p = .2$. After that I should plot a histogram for a simulated sample and compare it with the binomial mass function. This is done in the following R-code:

```
#Exercise 2.11 a

nsim<-5000 #number of random numbers
n=25;p=.2; #parametre to binomial
y=seq(0,n,by=1) #sequence used to generate the binomial
cp=pbinom(y,n,p) #make cdf of binomial
X=rep(0,nsim) # A vector to store in
for(i in 1:nsim){
  u=runif(1)
  X[i]=sum(cp<u) #checks to see what interval the uniform random variable fell in and
  #assigns the correct Poisson value to X
}
hist(X,freq=F) #histogram
lines(1:n,dbinom(1:n,n,p),lwd=2) #Density function
```



```
system.time(rbinom(5000,25,.2))  #Calculate time
```

```
##    user  system elapsed
##   0.002   0.001   0.002
```

```
# Generate binomial from a function
MYbinom<-function(s0,n0,p0){
  cp=pbinom(seq(0,n0,by=1),n0,p0) #make cdf of binomial
  X=rep(0,s0) #Vector to store
  for (i in 1:s0){
    u=runif(1)
    X[i]=sum(cp<u) #checks to see what interval the uniform random variable fell in and
    #assigns the correct Poisson value to X
  }
  return(X)
}
system.time(MYbinom(5000,25,.2)) #calculate time
```

```
##    user  system elapsed
##   0.138   0.000   0.139
```

It is seen that the histogram and line looks ok but not perfect. When the time is calculated it can be seen that the first method is better than the other method

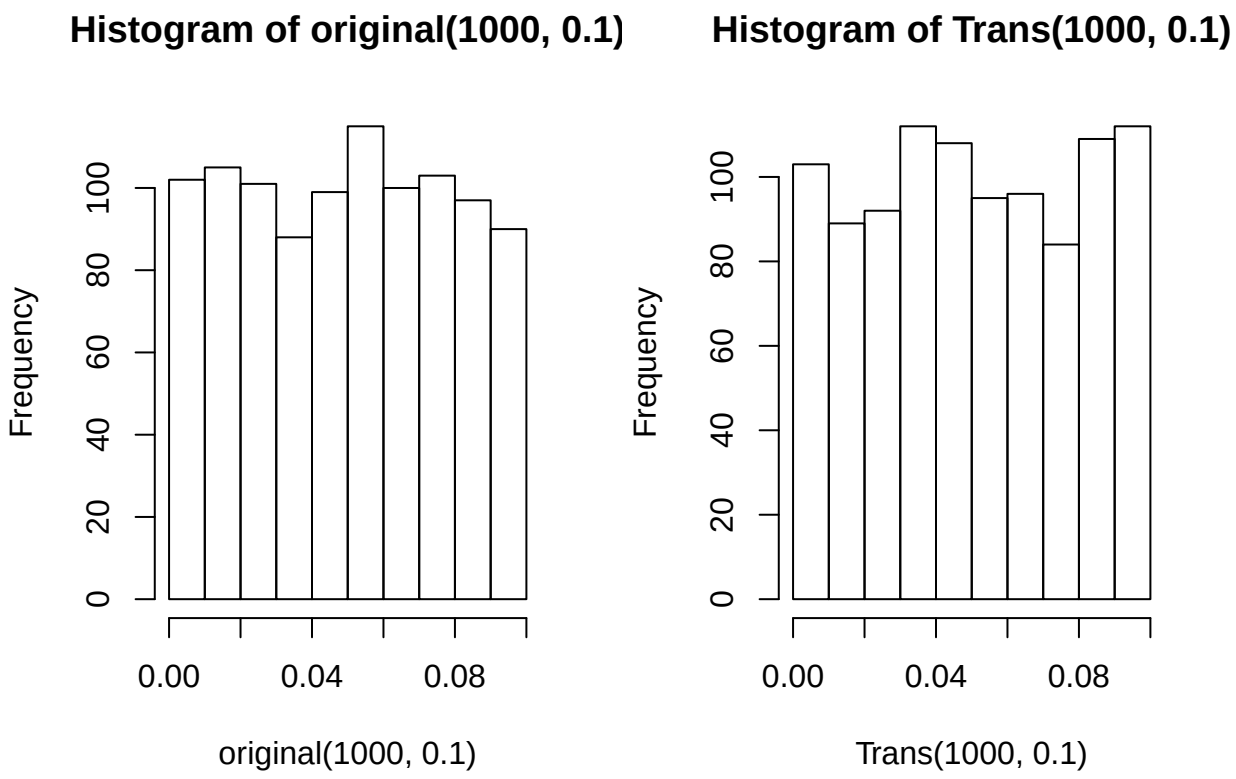
Exercise 2.11 b

In this exricse there shall be shown that the code below (the function original) produces a random variable U from $U([0, a])$.
This shall be compared with the transform αU ,$U \sim U(0, 1)$ for values of α close to 0 and close to 1, and with runif(1,max=alpha). There is used the following R-code:

```
original<-function(s0,alpha){  #Make function
  U=rep(0,s0) #Vector to store in
  for (i in 1:s0){
    u=runif(1)
    while (u > alpha) u=runif(1)
    U[i]=u #Takes the u in a vector
  }
    return(U) #Return u



}
par(mfrow=c(1,2))
hist(original(1000,.1)) #Make histogram

system.time(original(1000,.1)) #calculate time
```

```
##    user  system elapsed
##   0.158   0.000   0.159
```

```
Trans<-function(s0,alpha){ #Funcrtion there made the transoform alpha*u
  U=rep(0,s0) #Vector to store in
  for (i in 1:s0) {
    U[i]=alpha*runif(1) #The transform alpha*u
}
return(U)
}
hist(Trans(1000,.1)) #Make histogram
```




```
system.time(Trans(1000,.1)) #Calculate the time
```

```
##    user  system elapsed
##   0.021   0.000   0.021
```

It can be seen that when α is small when the first program is very slow.