MCMC Algorithm

Consider a Poisson distribution with parameter lambda = 3 conditioned to be nonzeros, Implement an MCMC algorithm to simulate from this distribution, using a proposal distribution that is geometric with parameter p =1/3. Use your simulation to estimate the mean and variance.

```r
N<-50000
p<-1/3
lamda<- 3
X<-rep(0,N)
X[1]<-0
for(istep in 2:N){
#the current state
i<-X[istep-1]
#sample from proposal density
#since we want to generate from p(i-p)^(i-1)
#the proposed state
j<-rgeom(1,p) +1
#calculate the acceptance probability
#al <- (lamda^j)*factorial(i) *((1-p)^(j-i))/((lamda^i) * factorial(j))
accept<-min(1,(dpois(j,lamda)*dgeom(i,p))/(dpois(i,lamda)*dgeom(j,p)))
dgeom(i,p)
u<-runif(1)
if(u < accept){
X[istep]<-j
}else{
X[istep]<-i
}
}
mean(X)
```

```
## [1] 3.14512
```

```r
var(X)
```

```
## [1] 2.625873
```