HW9

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Homework 9

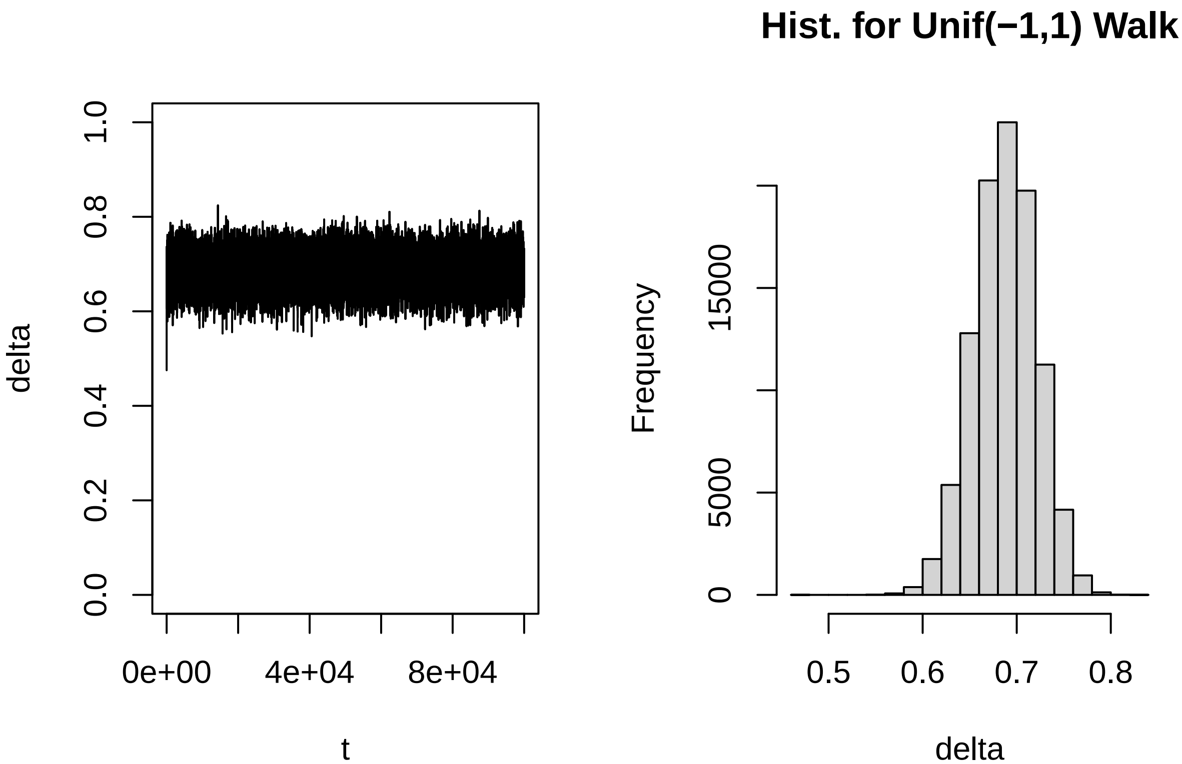
7.1

(d.)

```
set.seed(0)
n <- 200
func <- sample(1:2,prob=c(0.7,0.3),size=n,replace=TRUE)
mu <- c(7,10)
sd <- c(.5,.5)
x <- rnorm(n,mean=mu[func],sd=sd[func])

num.its = 100000
u=rep(0,num.its)
u[1]= runif(1,-1,1)
p=rep(0,num.its)
p[1]=exp(u[1])/(1+exp(u[1]))

log.like<-function(p,x) {
  sum(log(p*dnorm(x,7,.5)+(1-p)*dnorm(x,10,.5)))
}

for (i in 1:(num.its-1)) {
    u[i+1]=u[i]+runif(1,-1,1)
    p[i+1]=exp(u[i+1])/(1+exp(u[i+1]))
    R=exp(log.like(p[i+1],x)-log.like(p[i],x))*exp(u[i+1])/(1+exp(u[i+1]))^2/exp(u[i])*(1+exp(u[i]))^2

    if (R<1){
         if(rbinom(1,1,R)==0)   {p[i+1]=p[i]; u[i+1]=u[i]}
}}


burn.in=1:1000
delta <- mean(p[-burn.in])
delta
```

```
## [1] 0.6877013
```

```
par(mfrow=c(1,2))
plot(p,ylim=c(0,1),type="l",ylab="delta",xlab="t")
hist(p,breaks=20,xlab="delta",
      main="Hist. for Unif(-1,1) Walk")
```



The expectation of $\delta = 0.6877013$.

(e.)

It is close to the result of MCMC: 0.6879803(which is calculated in HW 8). However, after plotting ACF, we find Random walk converges faster than MCMC.