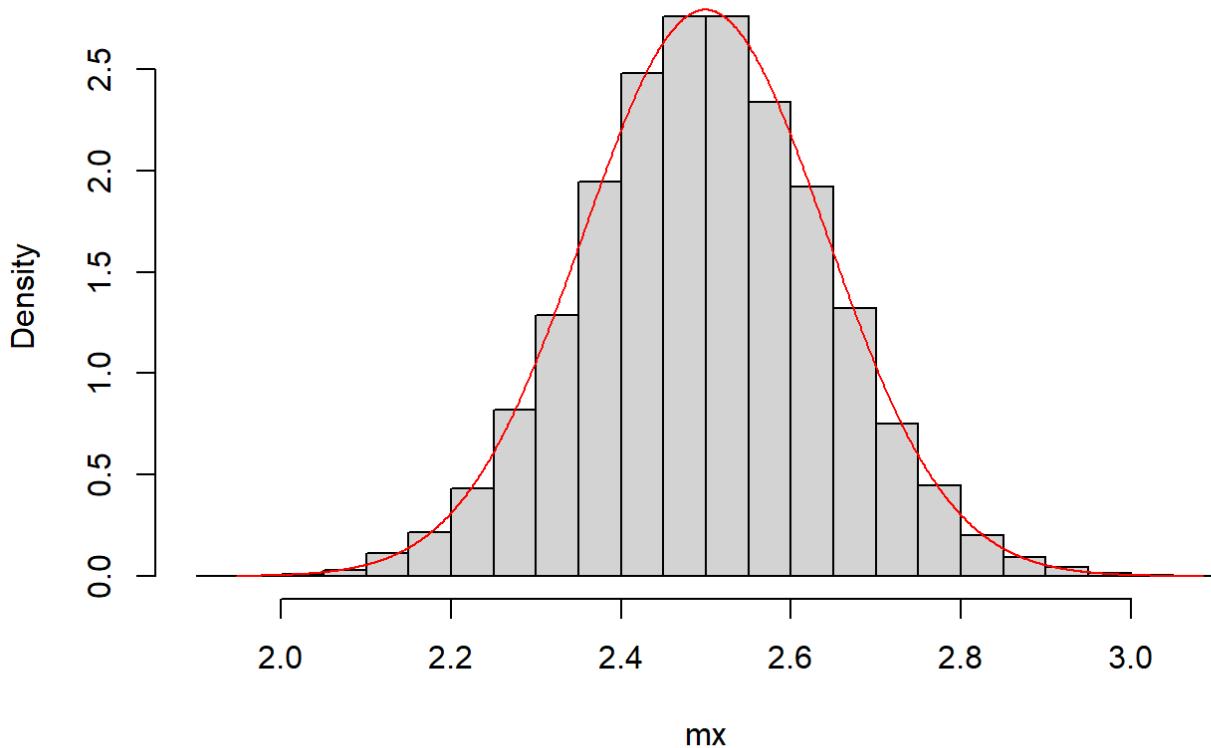


# fifthlab2

2025-11-02

```
ntrials=10000
nsamples=100
mx=numeric(ntrials)
for(i in 1:ntrials){
  x=numeric(nsamples)
  for(j in 1:nsamples){
    x[j]=runif(1,min=0,max=5)
  }
  mx[i]=mean(x)
}
k=seq(min(mx),max(mx),by=0.001)
gpdf=dnorm(k,mean=mean(mx),sd=sd(mx))
hist(mx,breaks=40,freq=FALSE)
lines(k,gpdf,col="red")
```

Histogram of mx

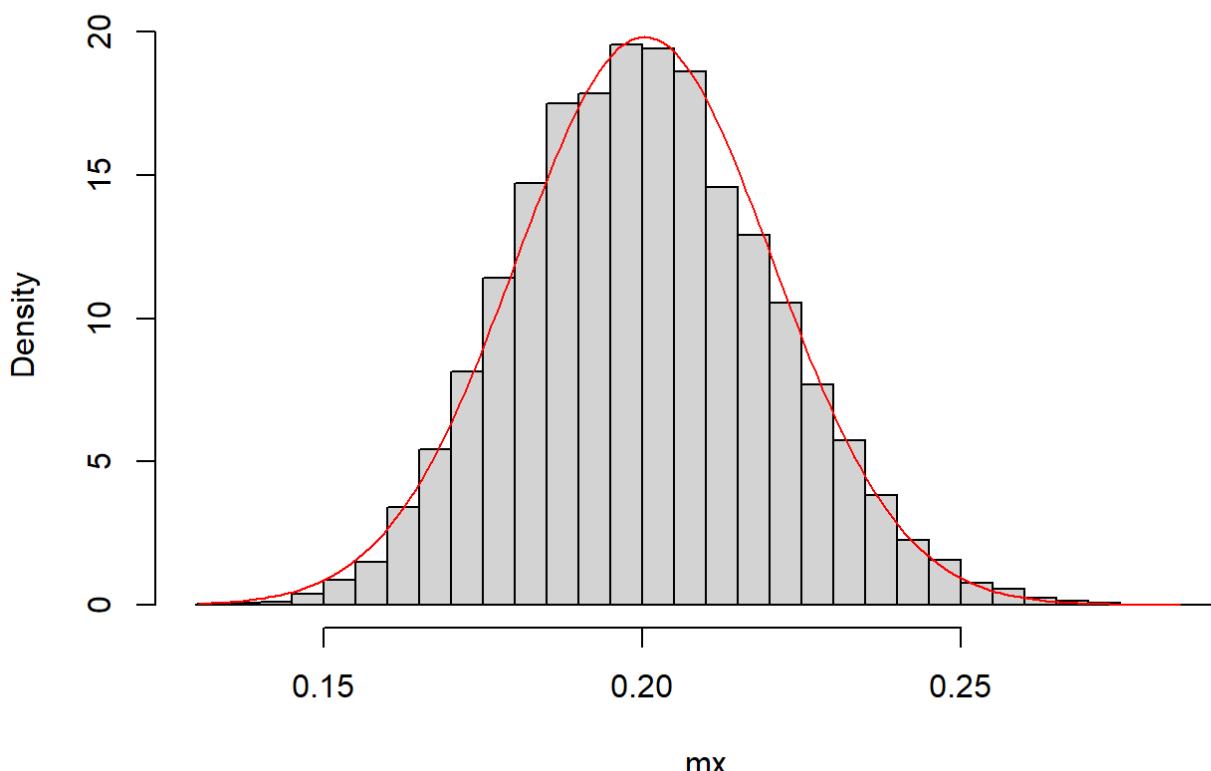


```

ntrials=10000
nsamples=100
mx=numeric(ntrials)
for(i in 1:ntrials){
  x=numeric(nsamples)
  for(j in 1:nsamples){
    x[j]=rexp(1,rate=5)
  }
  mx[i]=mean(x)
}
k=seq(min(mx),max(mx),by=0.001)
gpdf=dnorm(k,mean=mean(mx),sd=sd(mx))
hist(mx,breaks=40,freq=FALSE)
lines(k,gpdf,col="red")

```

**Histogram of mx**

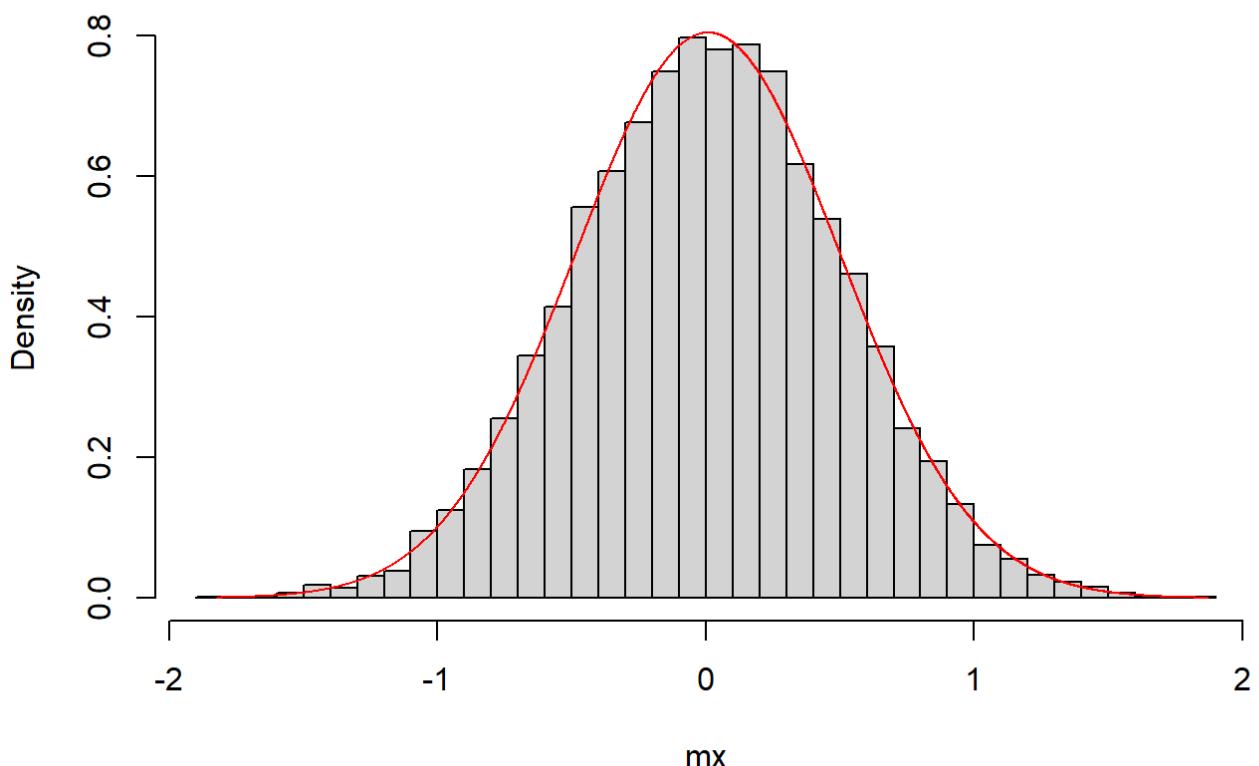


```

ntrials=10000
nsamples=100
mx=numeric(ntrials)
for(i in 1:ntrials){
  x=numeric(nsamples)
  for(j in 1:nsamples){
    x[j]=rnorm(1,mean=0,sd=5)
  }
  mx[i]=mean(x)
}
k=seq(min(mx),max(mx),by=0.001)
gpdf=dnorm(k,mean=mean(mx),sd=sd(mx))
hist(mx,breaks=40,freq=FALSE)
lines(k,gpdf,col="red")

```

**Histogram of mx**

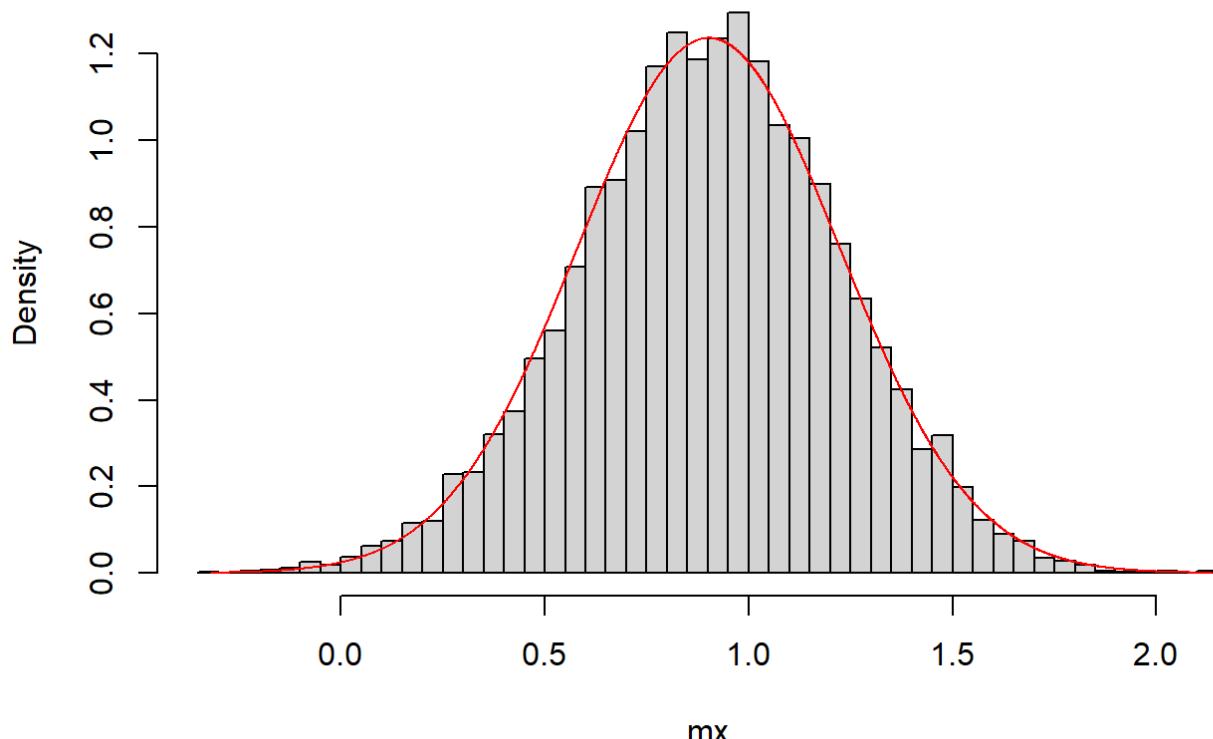


```

ntrials=10000
nsamples=100
mx=numeric(ntrials)
for(i in 1:ntrials){
  x=numeric(nsamples)
  for(j in 1:nsamples){
    s=sample(1:3,size=1)
    if(s==1){
      x[j]=runif(1,min=0,max=5)
    }else if(s==2){
      x[j]=rexp(1,rate=5)
    }else{
      x[j]=rnorm(1,mean=0,sd=5)
    }
  }
  mx[i]=mean(x)
}
k=seq(min(mx),max(mx),by=0.001)
gpdf=dnorm(k,mean=mean(mx),sd=sd(mx))
hist(mx,breaks=40,freq=FALSE)
lines(k,gpdf,col="red")

```

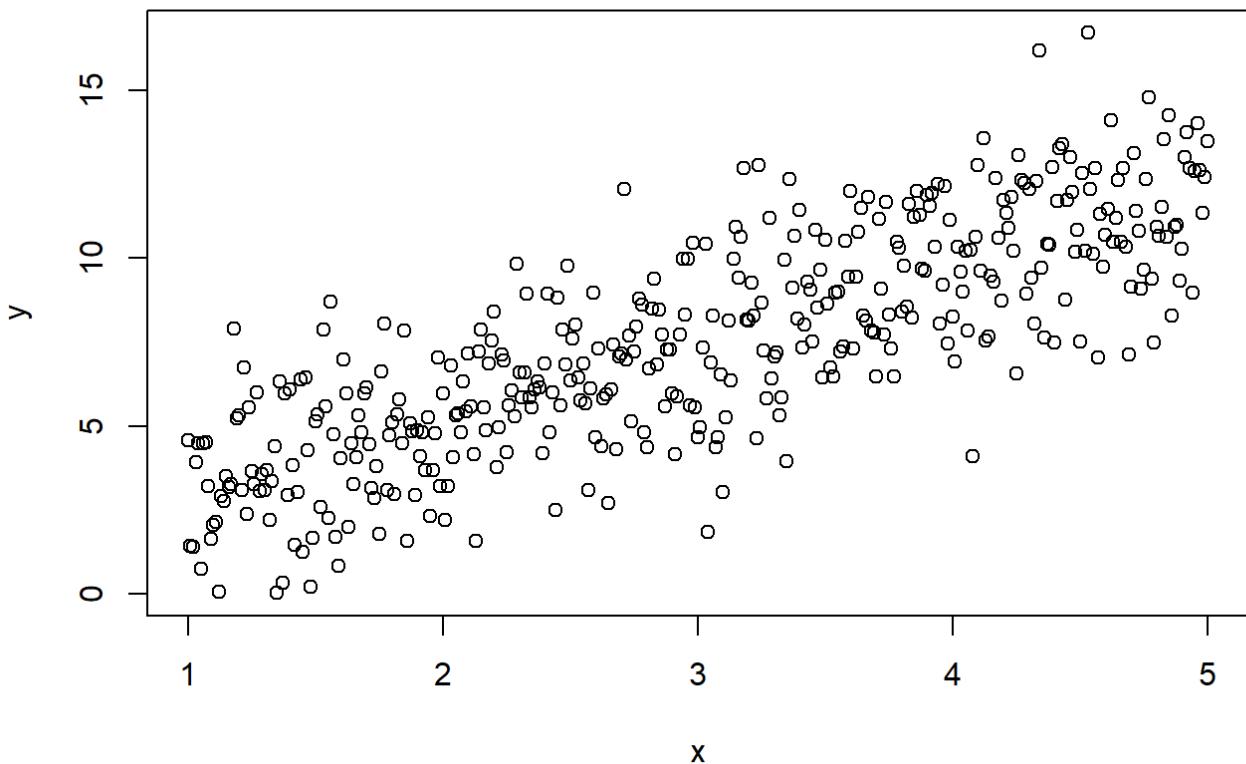
**Histogram of mx**



```

a=1.2
b=2.1
x=seq(1,5,by=0.01)
y=numeric(length(x))
for(i in 1:length(x)){
y[i]=a+b*x[i]+rnorm(1,mean=0,sd=2)
}
plot(x,y)

```



```

train=as.data.frame(cbind(x,y))
mymod=lm(y~x,data=train)
ypred=predict(mymod,data=train)
me=mean(y-ypred)
ea=mymod$coefficients[1]
eb=mymod$coefficients[2]

```

```

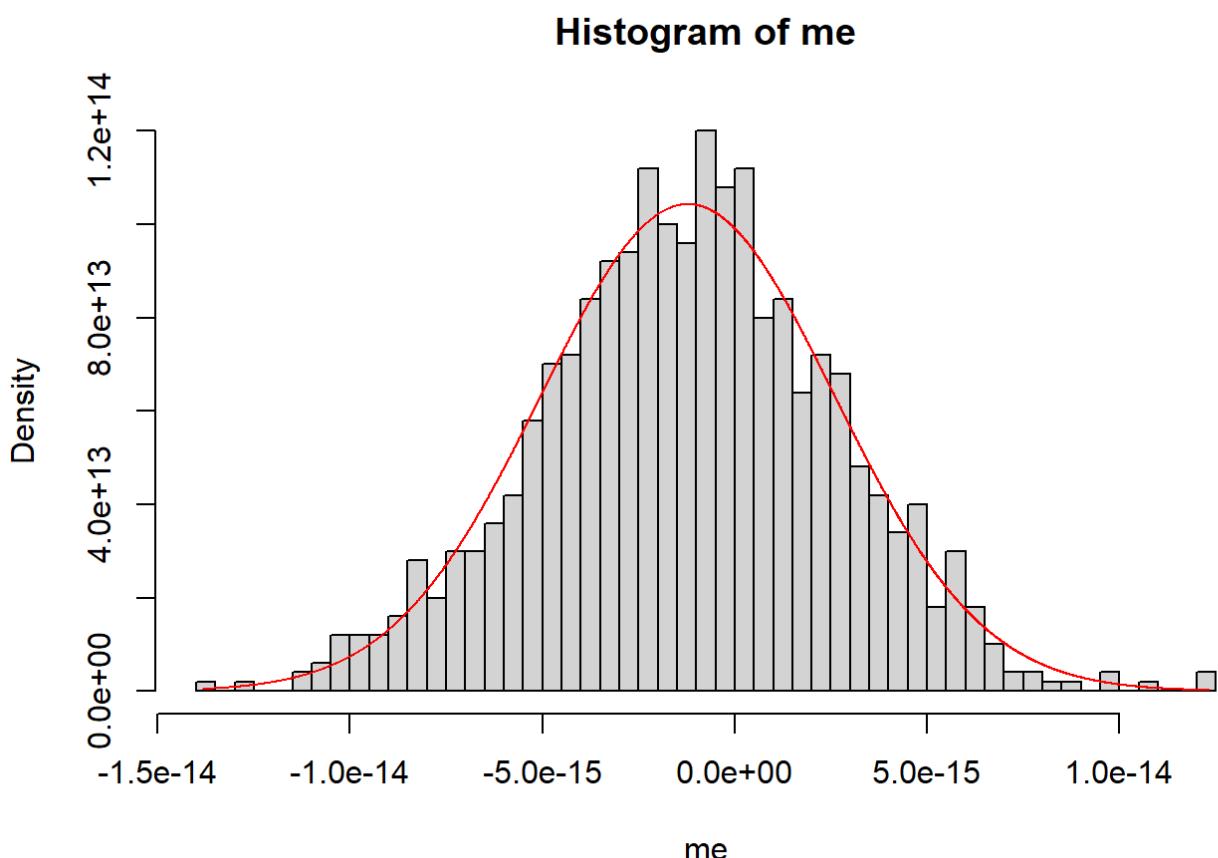
ntrials=1000
me=numeric(ntrials)
ea=numeric(ntrials)
eb=numeric(ntrials)
for(j in 1:ntrials){
a=1.2
b=2.1
x=seq(1,5,by=0.01)
y=numeric(length(x))
for(i in 1:length(x)){
y[i]=a+b*x[i]+rnorm(1,mean=0,sd=2)
}
train=as.data.frame(cbind(x,y))
mymod=lm(y~x,data=train)
ypred=predict(mymod,data=train)
me[j]=mean(y-ypred)
ea[j]=mymod$coefficients[1]
eb[j]=mymod$coefficients[2]
}

```

```

library(moments)
k=seq(min(me),max(me),by=1e-17)
gpdf=dnorm(k,mean=mean(me),sd=sd(me))
hist(me,breaks = 40,freq=FALSE)
lines(k,gpdf,col="red")

```



```
sprintf("skewness:%f",skewness(me))
```

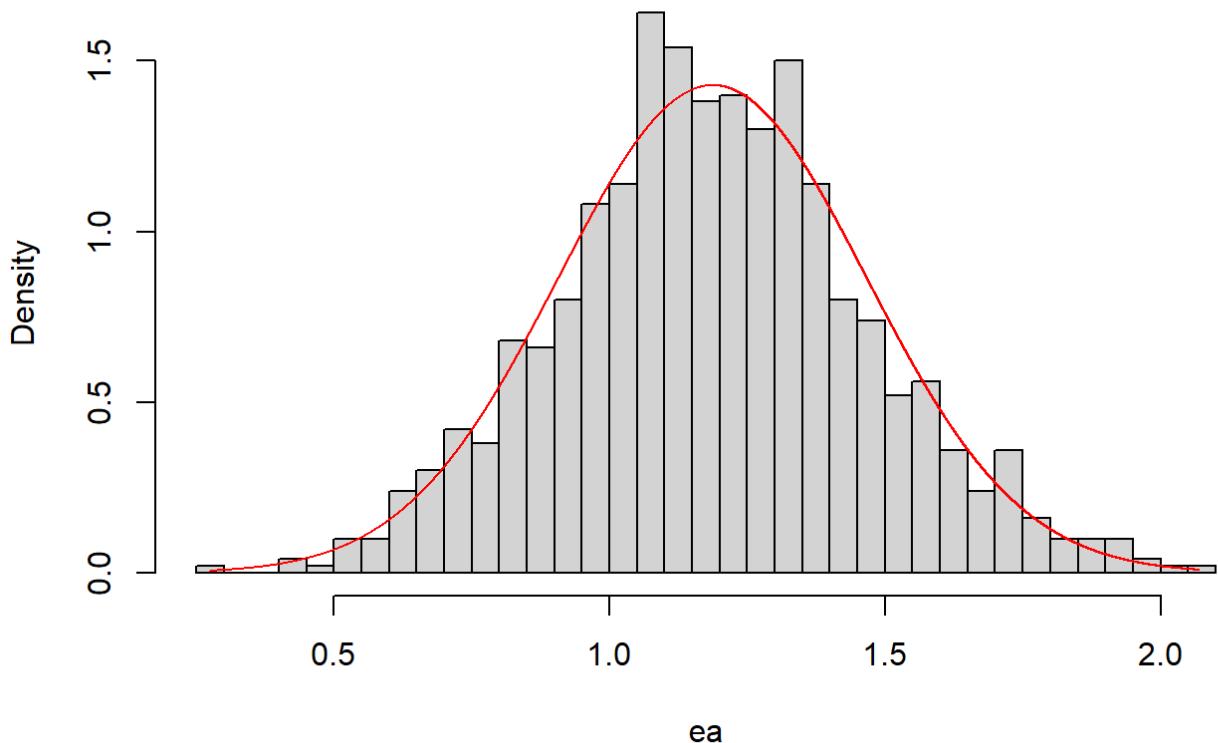
```
## [1] "skewness:-0.021989"
```

```
sprintf("kurtosis:%f",kurtosis(me))
```

```
## [1] "kurtosis:3.153196"
```

```
k=seq(min(ea),max(ea),by=1e-4)
gpdf=dnorm(k,mean=mean(ea),sd=sd(ea))
hist(ea,breaks = 40,freq=FALSE)
lines(k,gpdf,col="red")
```

Histogram of ea



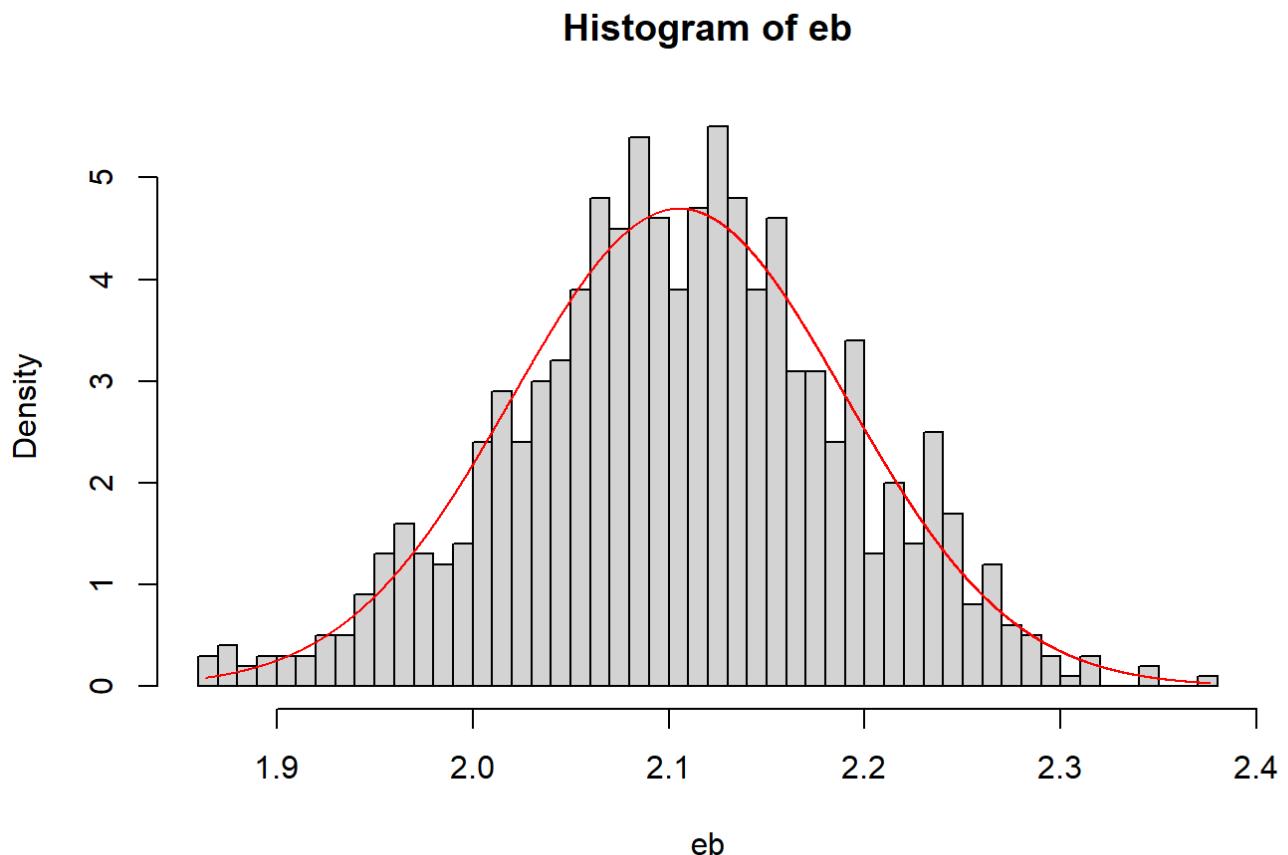
```
sprintf("skewness:%f",skewness(ea))
```

```
## [1] "skewness:0.121335"
```

```
sprintf("kurtosis:%f",kurtosis(ea))
```

```
## [1] "kurtosis:3.085019"
```

```
k=seq(min(eb),max(eb),by=1e-4)
gpdf=dnorm(k,mean=mean(eb),sd=sd(eb))
hist(eb,breaks = 40,freq=FALSE)
lines(k,gpdf,col="red")
```



```
 sprintf("skewness:%f",skewness(eb))
```

```
## [1] "skewness:-0.083511"
```

```
 sprintf("kurtosis:%f",kurtosis(eb))
```

```
## [1] "kurtosis:2.951473"
```

```

ntrials=1000
me=numeric(ntrials)
ea=numeric(ntrials)
eb=numeric(ntrials)
for(j in 1:ntrials){
a=1.2
b=2.1
x=seq(1,5,by=0.01)
y=numeric(length(x))
for(i in 1:length(x)){
y[i]=a+b*x[i]+rt(1,df=3)
}
train=as.data.frame(cbind(x,y))
mymod=lm(y~x,data=train)
ypred=predict(mymod,data=train)
me[j]=mean(y-ypred)
ea[j]=mymod$coefficients[1]
eb[j]=mymod$coefficients[2]
}

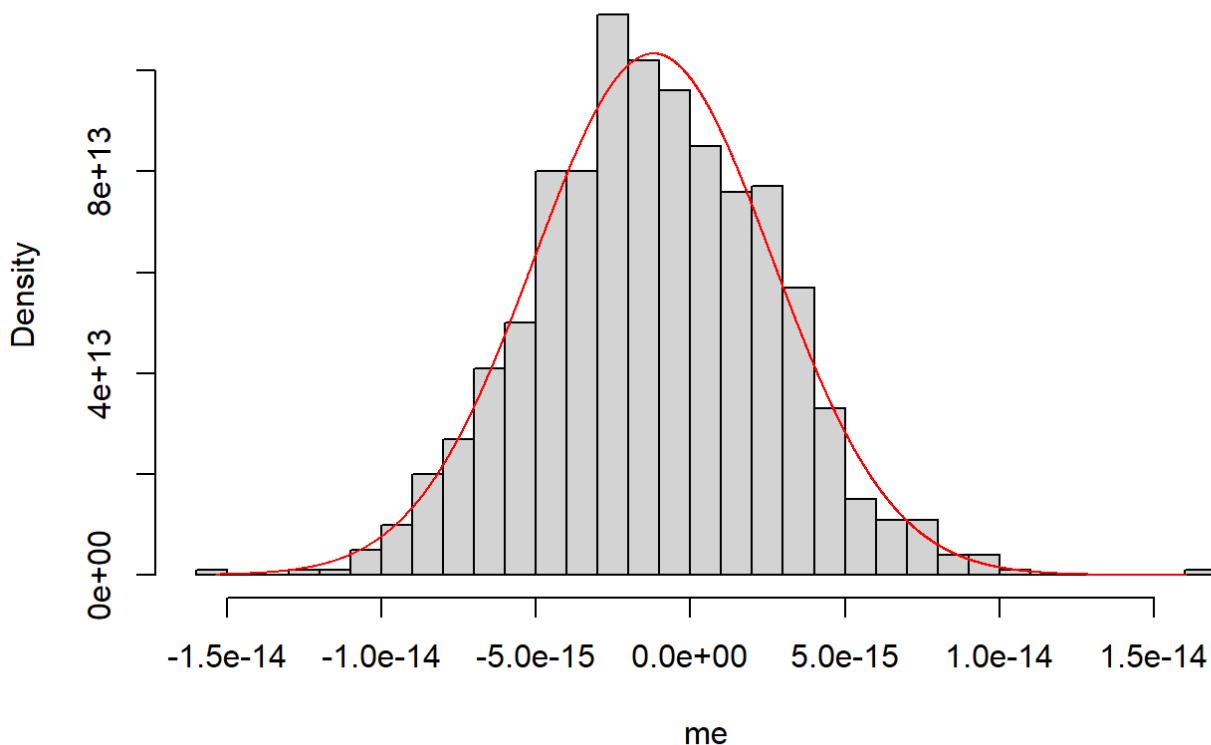
```

```

k=seq(min(me),max(me),by=1e-17)
gpdf=dnorm(k,mean=mean(me),sd=sd(me))
hist(me,breaks = 40,freq=FALSE)
lines(k,gpdf,col="red")

```

**Histogram of me**



```
sprintf("skewness:%f",skewness(me))
```

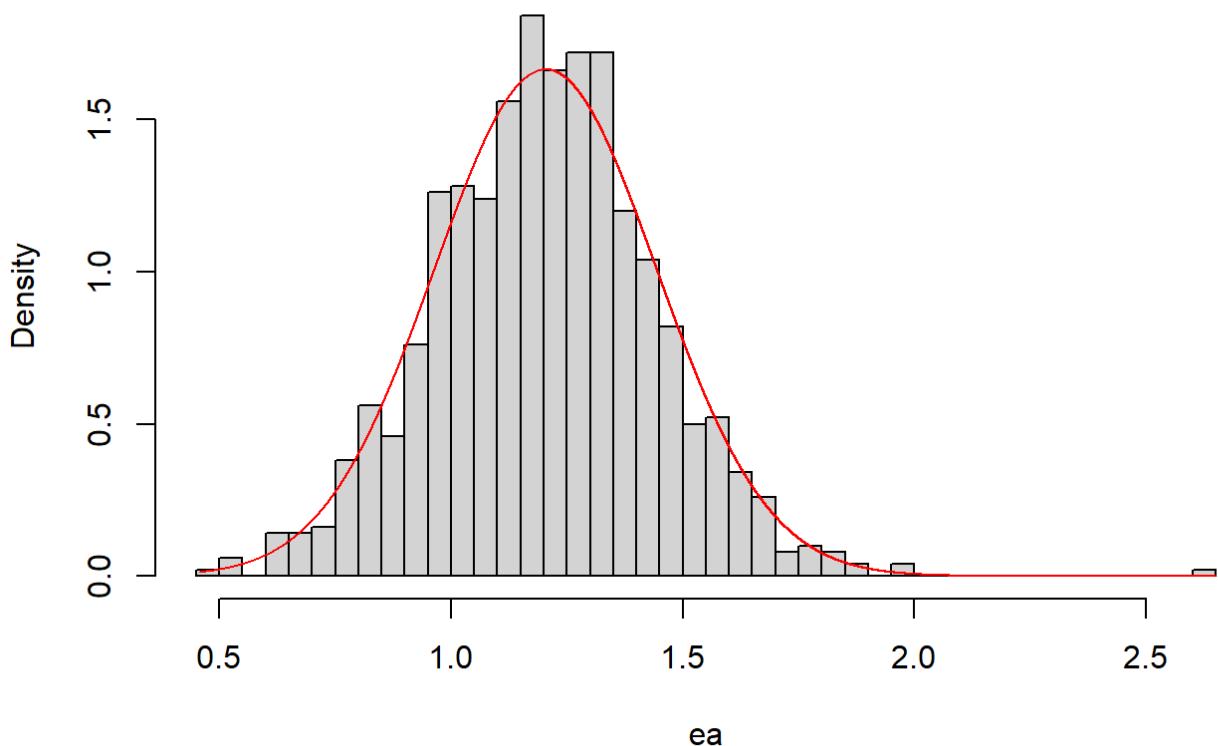
```
## [1] "skewness:0.095624"
```

```
sprintf("kurtosis:%f",kurtosis(me))
```

```
## [1] "kurtosis:3.247392"
```

```
k=seq(min(ea),max(ea),by=1e-4)
gpdf=dnorm(k,mean=mean(ea),sd=sd(ea))
hist(ea,breaks = 40,freq=FALSE)
lines(k,gpdf,col="red")
```

## Histogram of ea



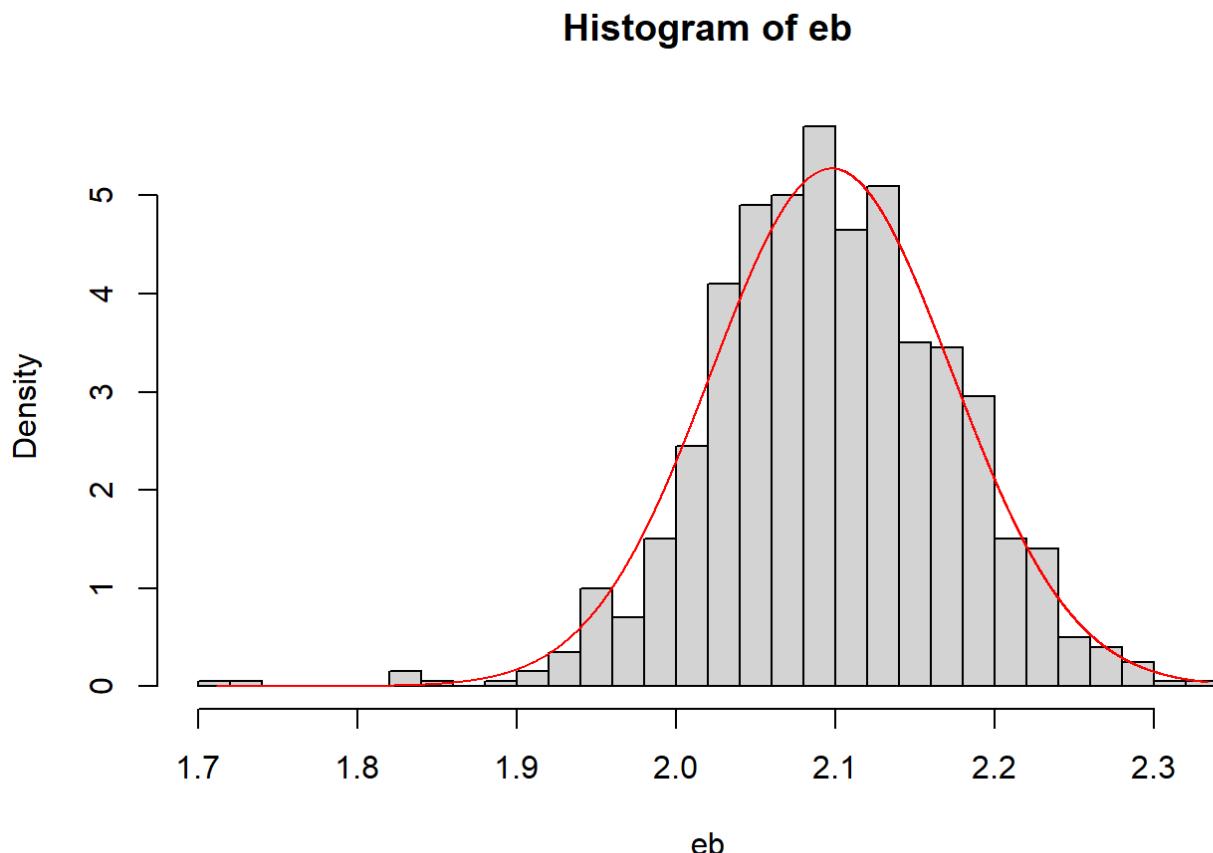
```
sprintf("skewness:%f",skewness(ea))
```

```
## [1] "skewness:0.236755"
```

```
sprintf("kurtosis:%f",kurtosis(ea))
```

```
## [1] "kurtosis:4.237477"
```

```
k=seq(min(eb),max(eb),by=1e-4)
gpdf=dnorm(k,mean=mean(eb),sd=sd(eb))
hist(eb,breaks = 40,freq=FALSE)
lines(k,gpdf,col="red")
```



```
 sprintf("skewness:%f",skewness(eb))
```

```
## [1] "skewness:-0.282290"
```

```
 sprintf("kurtosis:%f",kurtosis(eb))
```

```
## [1] "kurtosis:4.150301"
```