

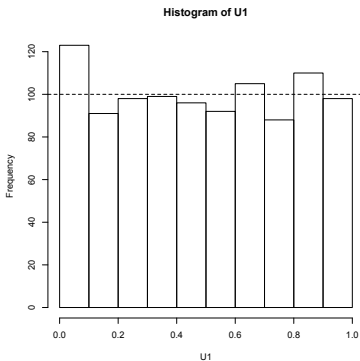
PLSC 503 – Spring 2021

“Exercise Zero” “Key”

February 15, 2021

Generate 1000 i.i.d. $u_j \sim U(0,1)$

```
seed<-07222009  
set.seed(seed)  # always set a random-number seed  
U1<-runif(1000)  
hist(U1)  
abline(h=100,lty=2)  
# etc.
```



Repeat 999 more times, saving each set of draws

```
listU<-paste("U",1:1000,sep="")
U<-sapply(listU, function(U) U<-runif(1000)) # using -apply-

# or

U<-data.frame(matrix(nrow=1000,ncol=1000))
colnames(U)<-paste("U",1:1000,sep="")
for (i in 1:1000) { # using a for-loop
  U[,i]<-runif(1000)
}
```

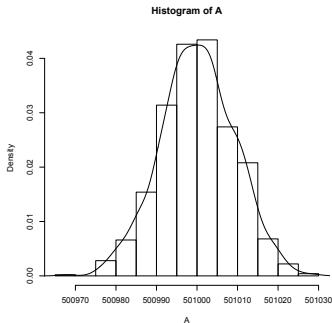
Create V_i by adding the integer corresponding to the order of the observation to the value of u_{ij} .

```
Seq<-seq(1,1000,1)  
V<-U+Seq
```

Generate an object A ...where the i th entry is

$$A_i = \sum_{j=1}^{1000} V_{ij}$$

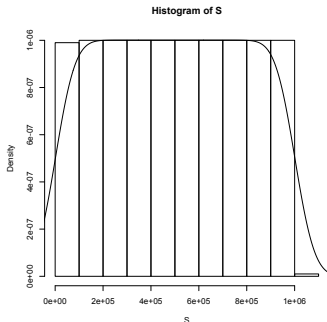
```
A<-numeric(1000)
for(i in 1:1000) {
  A[i]<-sum(V[,i]) }
hist(A,freq=FALSE)
lines(density(A))
```



Create a second object S ...where the j th entry is

$$S_j = \sum_{i=1}^{1000} V_{ij}.$$

```
S<-numeric(1000)
for(i in 1:1000) {
  S[i]<-sum(V[i,]) }
hist(S,freq=FALSE)
lines(density(S))
```

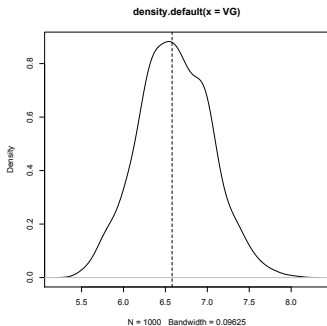


Transform your 1000 bundles of $U(0, 1)$ draws into 1000 bundles G_{ij} of draws from a Gumbel(1,2) distribution.

```
G <- 1-2*(log(-log(U)))
```

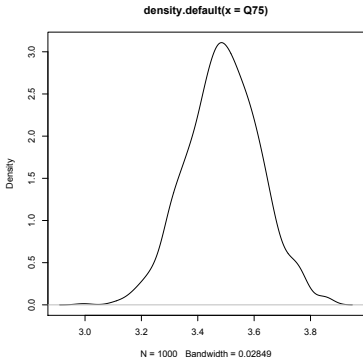
Plot the empirical variances of $G...$

```
VG<-numeric(1000)
for(i in 1:1000) {
  VG[i]<-var(G[,i]) }
plot(density(VG))
abline(v=((3.14159265^2) / 6) * 4,lty=2)
```



Plot the density of the values of the 75th percentiles...

```
Q75<-numeric(1000)
for(i in 1:1000) {
  Q75[i]<-quantile(G[,i], .75)
}
plot(density(Q75))
```



Generate 1000 draws $Y_{ij} = -2G_{ij} + \epsilon_{ij}$, $\epsilon_{ij} \sim N(0, 4)$.

```
Y<-(-2*G)+(rnorm(1000,mean=0,sd=2))
```

Plot...the distribution of the 1000 Pearson correlations between Y and G

```
Corrs<-numeric(1000)
for(i in 1:1000){
  Corrs[i]<-cor(G[,i],Y[,i])
}
plot(density(Corrs))
abline(v=mean(Corrs),lty=2)
```

