JAFUNO PROJET Controle Qualité 16/12/2019

Qualite-JAFUNO.csv

In [3]:

```
data1<- read.table('//home/jafuno/Téléchargements/Controle Qualité/Qualite-JAFUNO.csv', header = TRUE,sep=",")
data<- data1[,2:109]
```

In [4]:

```
head(data)
```

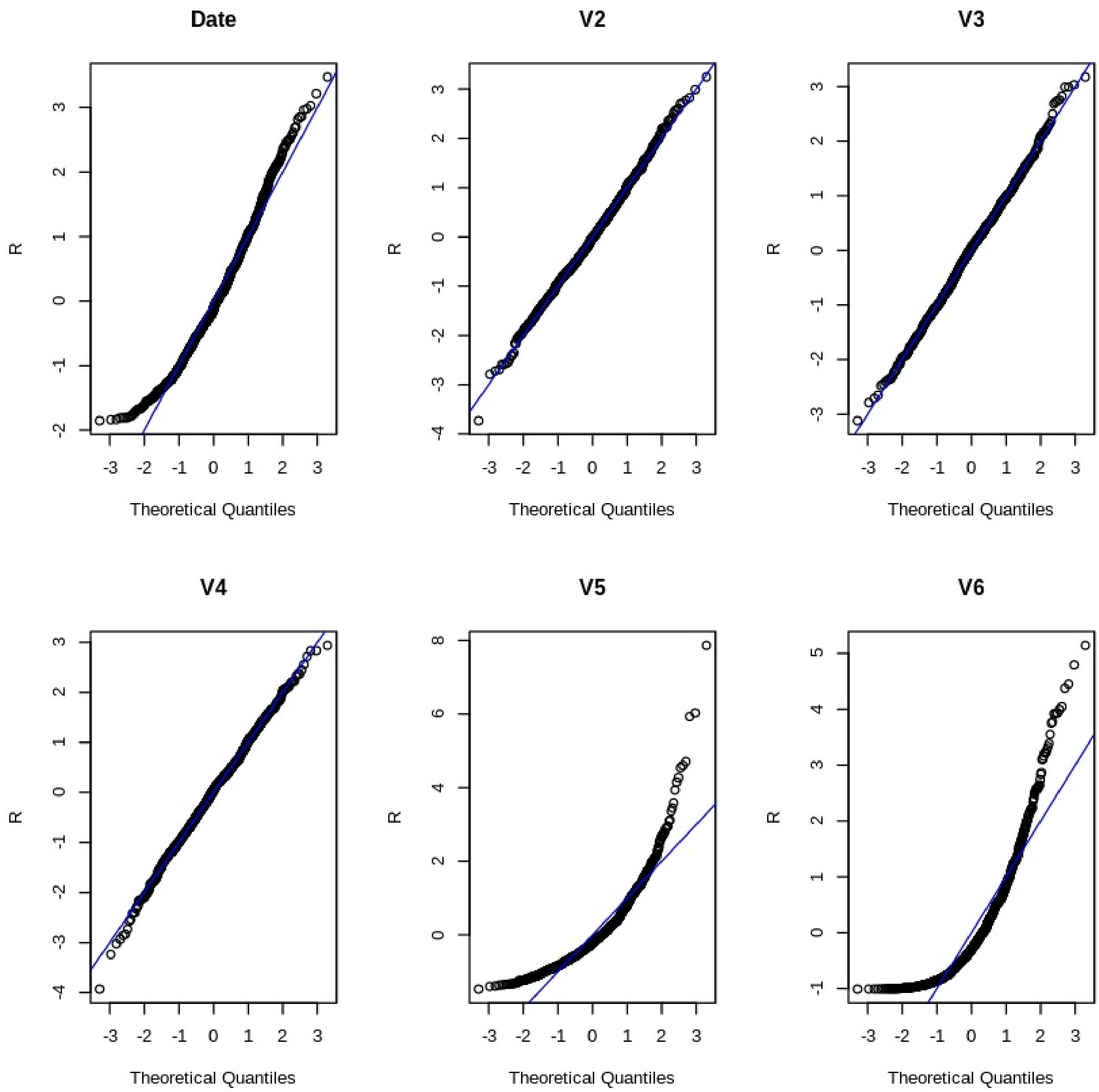
Date	V2	V3	V4	V5	V6	V7	V8	V9	V10	...	V99	V100	
6885.434	8620.503	8903.216	13130.45	11131.088	6519.5178	0.3901023	2.305189	1.766009	1.7789040	...	8.501358	6.655823	4.3
10934.471	8707.748	8762.200	13149.41	2607.214	5335.8661	2.1960414	2.298841	1.922416	2.6567498	...	4.982161	12.031019	8.2
6907.490	8527.289	9006.014	13144.05	4374.358	25737.3092	1.3247141	1.901779	1.364063	1.0512042	...	6.593759	7.484890	8.6
7136.301	8699.658	8652.489	13087.37	3050.461	256.2939	2.9486380	1.817420	1.923744	0.7579353	...	6.069911	7.446334	4.5
18597.949	8905.560	8802.194	13131.98	4323.867	13894.3131	1.6346265	1.393835	2.258834	1.9948030	...	6.060440	6.253521	8.5
6272.575	8742.773	8599.898	13145.13	5574.604	22.5561	2.0612067	2.057807	1.874150	2.8658075	...	9.680542	6.630408	7.3

1) Loi des 6 premières colonnes

qqplot

In [5]:

```
par(mfrow=c(2,3))
for(i in 1:6){

    data2 <- (data[,i]- mean(data[,i]))/sd(data[,i])
#Xbar <- (Xbar- mean(Xbar))/sd(Xbar)
qqnorm(data2,ylab='R', main = names(data[i]))
#distribution normales de R
abline(0, 1, col='blue')
}
```



Toutes les variables semblent suivre une loi **Normale** sauf Date, V5 et V6 faisons un test de Shapiro pour confirmer cela

In [6]:

```
shapiro.test(data[,1])
```

```
        Shapiro-Wilk normality test

data:  data[, 1]
W = 0,9745, p-value = 3,012e-12
```

In [7]:

```
shapiro.test(data[,5])
```

```
        Shapiro-Wilk normality test

data:  data[, 5]
W = 0,85041, p-value < 2,2e-16
```

In [8]:

```
shapiro.test(data[,6])
```

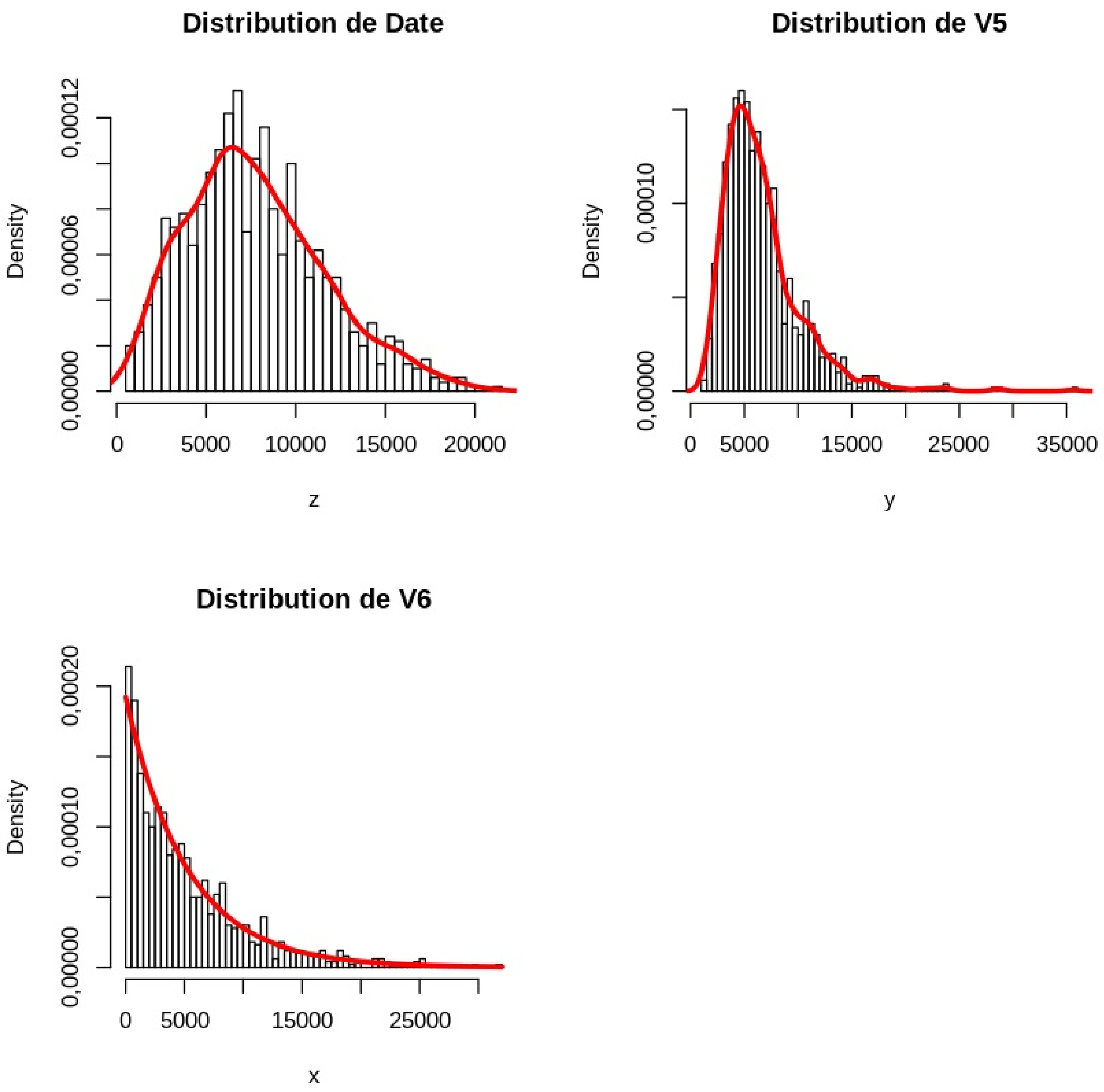
```
        Shapiro-Wilk normality test

data:  data[, 6]
W = 0,83382, p-value < 2,2e-16
```

Les 3 pvalues sont significatives et donc Date V5 et V6 ne suivent pas une loi normale

Histogrammes de Date, V5 et V6

In [9]:

```
par(mfrow=c(2,2))
z=data[,1]
hist(z, breaks =50, freq= F,main= "Distribution de Date")
lines(density(z), col= 'red',lwd=3)

y=data[,5]
hist(y, breaks =50, freq= F,main= "Distribution de V5")
lines(density(y), col= 'red',lwd=3)

x<-data[,6]
hist(x, breaks =50, freq= F,main= "Distribution de V6")
curve(dexp(x,1/mean(data[,6])), col = "red",lwd=3, add = TRUE)  ## Bonne adéquation à une loi exponentielle
##,ylim=c(0,0.00015) ,xlim=c(0,30000)
```



On voit que V6 semblent suivre une loi **exponnentielle**, que Date une loi de type **Weibull** et V5 une loi de type **Log Normal**

2) Carte de Controle

In [10]:

```
datachart<- data[,7:106]
head(datachart)
```

V7	V8	V9	V10	V11	V12	V13	V14	V15	V16	...	V97	V98	V99
0,3901023	2,305189	1,766009	1,7789040	1,435421	2,742302	1,708236	2,525970	1,7922025	2,565676	...	7,397260	11,192278	8,501358
2,1960414	2,298841	1,922416	2,6567498	2,247887	1,594490	2,003579	1,894161	2,5414300	2,299044	...	10,463558	6,834040	4,98216
1,3247141	1,901779	1,364063	1,0512042	1,774624	2,741821	2,032588	1,830209	2,3713170	2,213992	...	6,135284	7,191626	6,593759
2,9486380	1,817420	1,923744	0,7579353	2,387034	1,300430	2,046088	2,099705	2,4016411	1,832437	...	4,488158	6,000473	6,06991
1,6346265	1,393835	2,258834	1,9948030	1,675601	1,847252	2,266560	2,137983	1,7101801	1,673991	...	8,372307	8,884302	6,06044
2,0612067	2,057807	1,874150	2,8658075	1,951794	1,776818	1,680203	1,946843	0,9566565	2,137658	...	8,420229	5,249355	9,68054

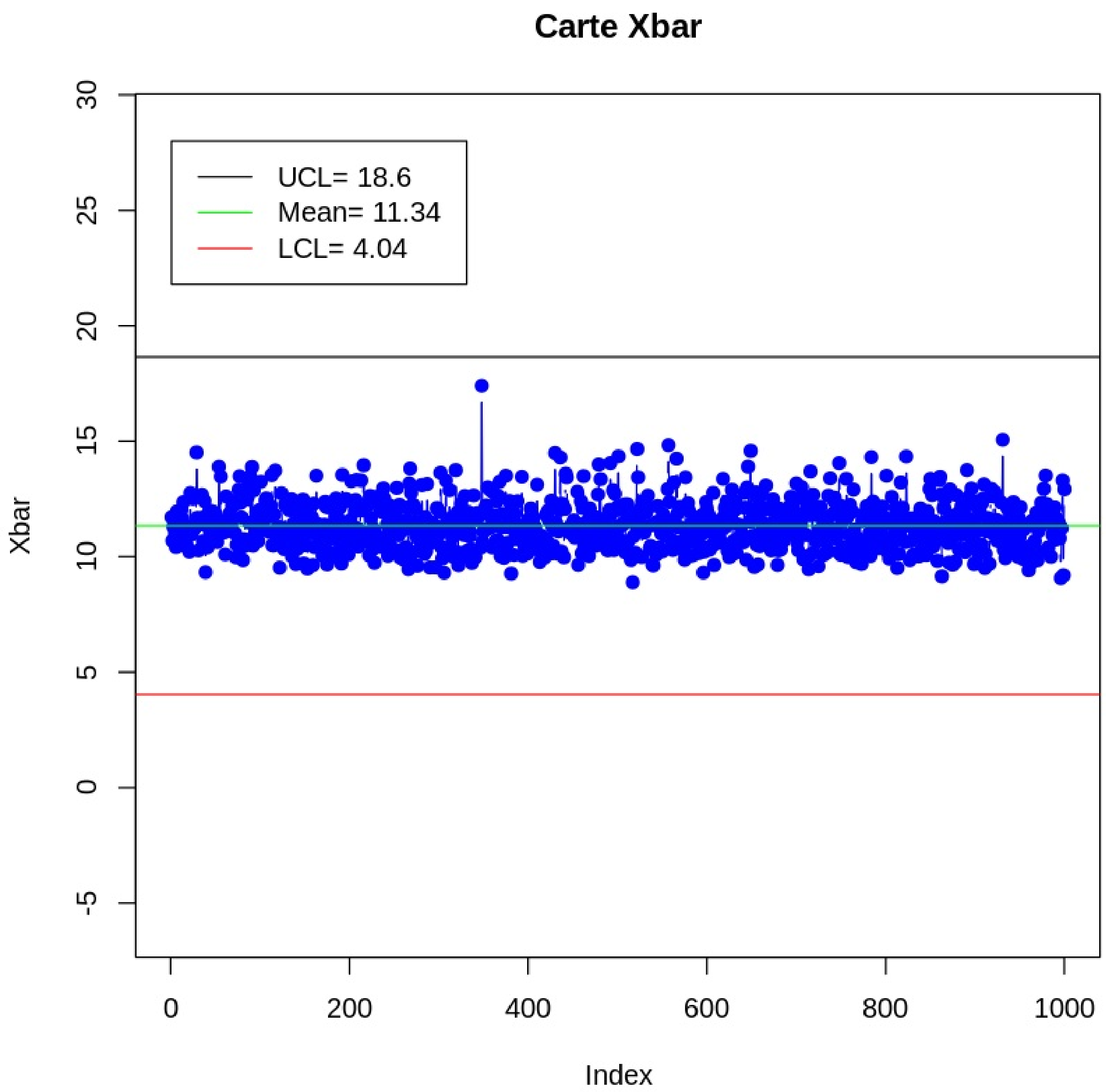
In [11]:

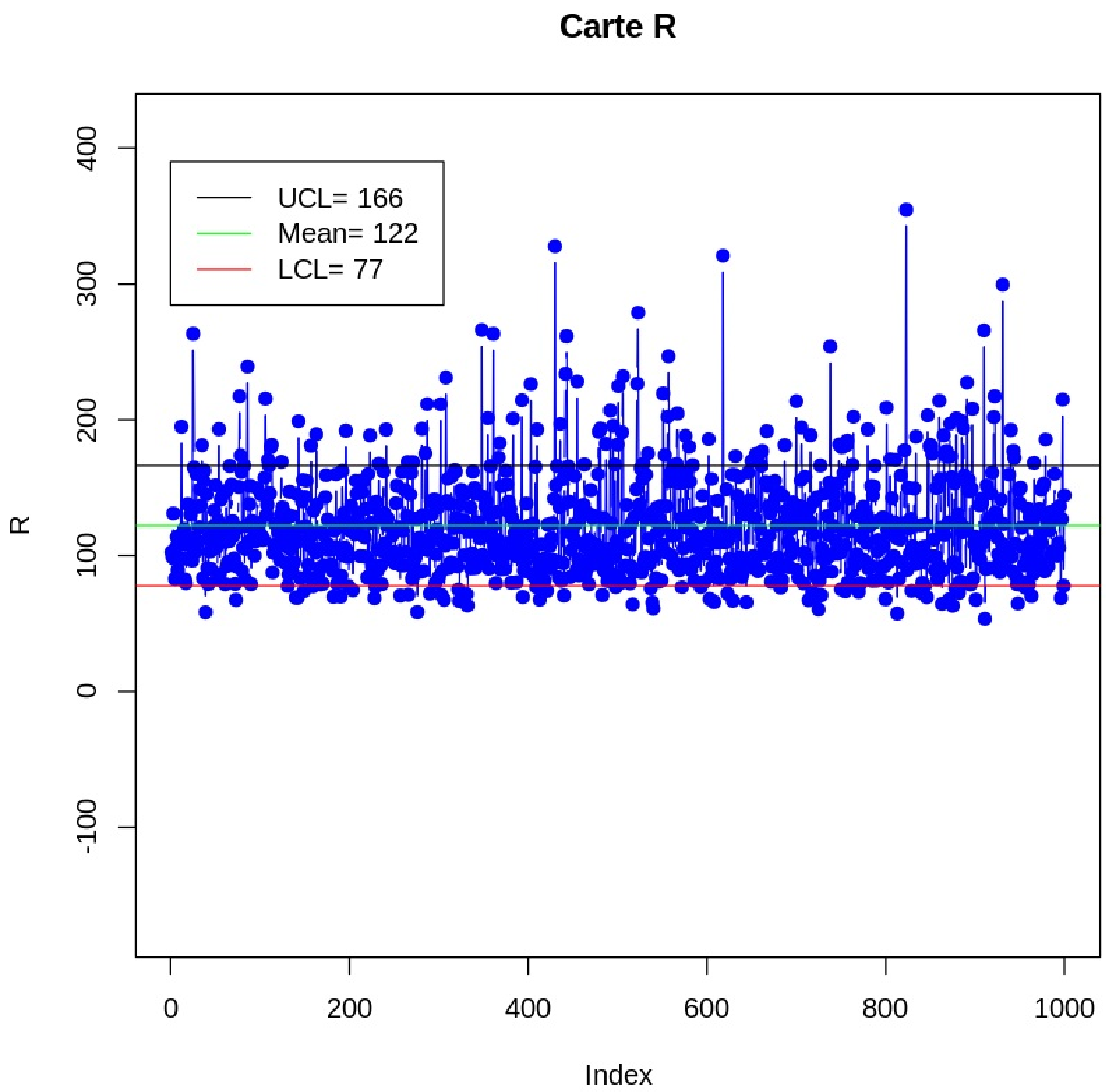
```
library(SixSigma)# pour les coefficients
n=100
d2<-ss.cc.getd2(n=100)
d3<-ss.cc.getd3(n=100)
A2<-3/(d2*sqrt(n))
D4=1+(3*d3/d2)
D3=1-(3*d3/d2)
c4<-4*(n-1)/(4*n-3)
A3<-3/(c4*sqrt(n))
B3<-1-(3/(c4*sqrt(2*(n-1))))
B4<-1+(3/(c4*sqrt(2*(n-1))))
```

Carte Xbar, R colonne 7 à 106

In [12]:

```
Xbar<-apply(datachart, 1,mean)
w<-apply(datachart, 1,range)
R<-w[2,]-w[1,]
Xbarbar = mean(Xbar)

Rbar= mean(R)

lcl = Xbarbar - A2*Rbar
ucl = Xbarbar + A2*Rbar

lclR=D3*Rbar
uclR=D4*Rbar

#par(mfrow=c(2,1))
plot(Xbar, col= 'blue', ylim=c(lcl-10,ucl+10),type="b",pch=19, main ='Carte Xbar')
abline(Xbarbar,0, col ='green')
abline(ucl,0, col ='black')
abline(lcl,0, col ='red')
legend(1,28,c("UCL= 18.6","Mean= 11.34","LCL= 4.04"),col=c('black','green','red'),lty = 1)

plot(R, col= 'blue', ylim=c(lclR-250,uclR+250),type="b",pch=19, main = 'Carte R')
abline(Rbar,0, col ='green')
abline(uclR,0, col ='black')
abline(lclR,0, col ='red')
legend(0,390,c("UCL= 166","Mean= 122","LCL= 77"),col=c('black','green','red'),lty = 1)
```


Carte Xbar
UCL= 18.6
Mean= 11.34
LCL= 4.04
Xbar
Index
30
25
20
15
10
5
0
-5
0
200
400
600
800
1000

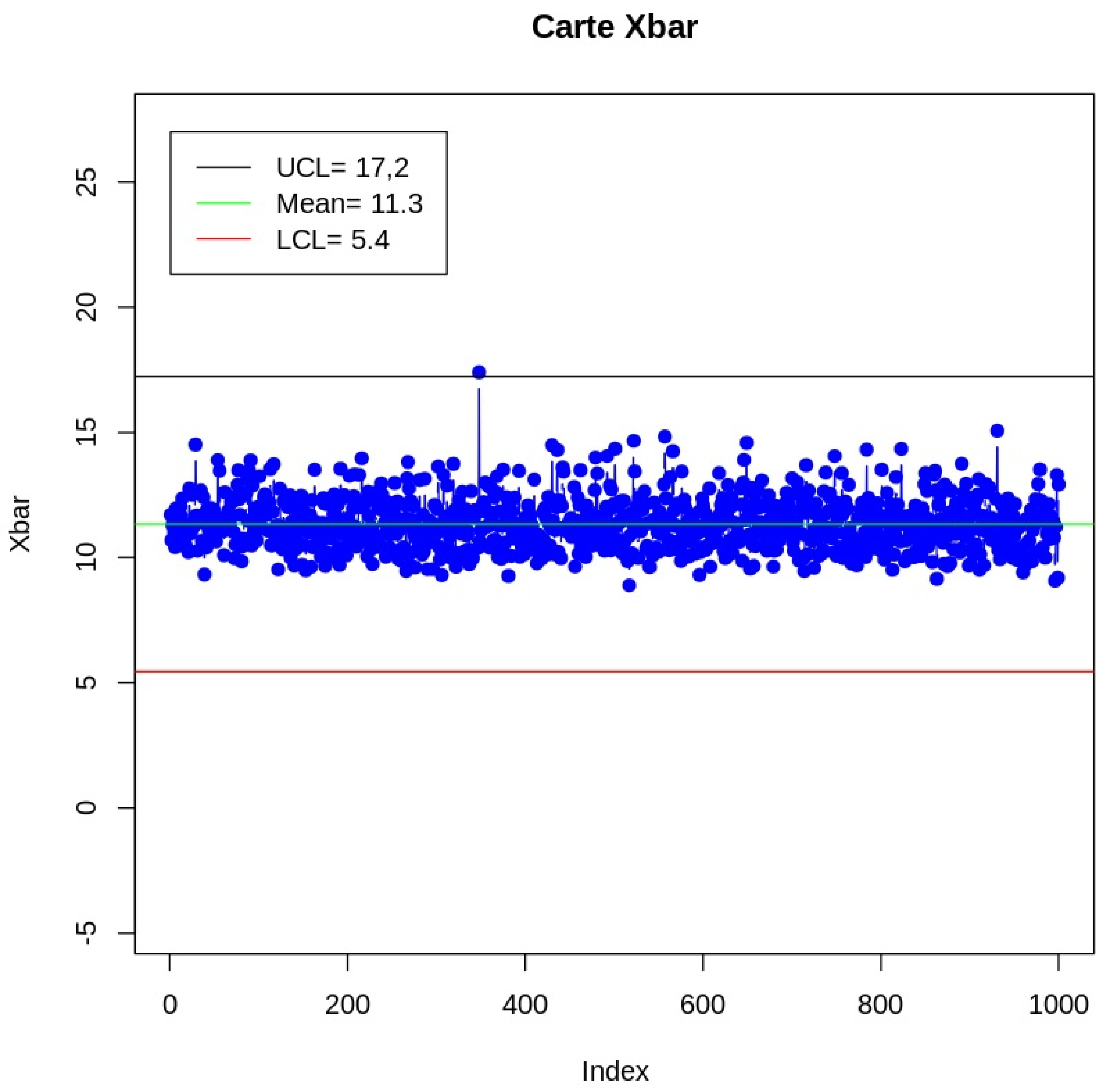


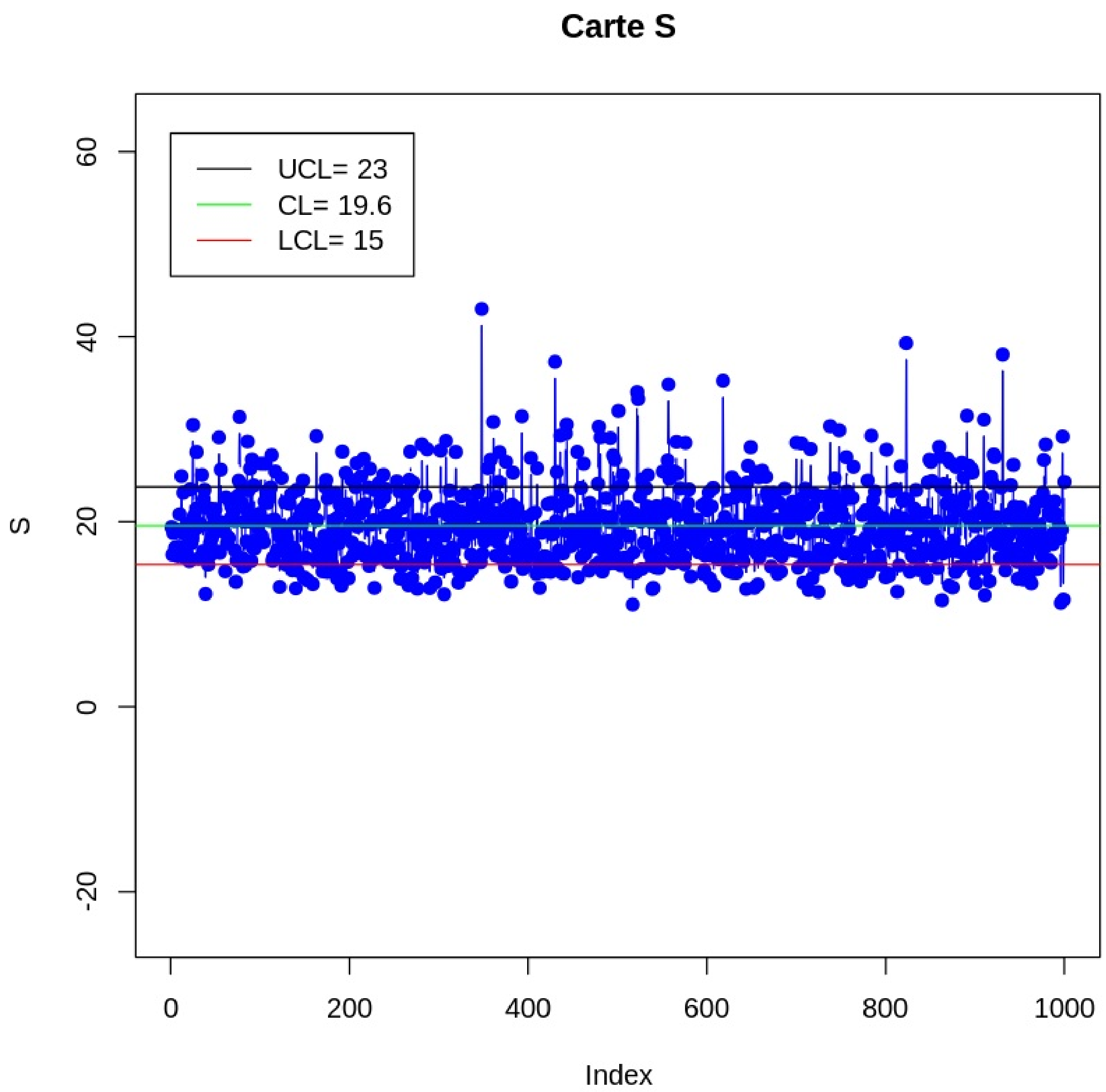
Le signal du processus est sous controle pour Xbar mais pas pour R ou l'on voit plusieurs points en dessous ou au dela des valeurs de controles

Carte Xbar, S colonne 7 à 106

In [13]:

```
S<-apply(datachart, 1,sd)
Sbar= mean(S)
A3=3/(c4*sqrt(n))
B3=1-(3/(c4*sqrt(2*(n-1))))
B4=1+(3/(c4*sqrt(2*(n-1))))
Sbar= mean(S)
lcl = Xbarbar - A3*Sbar
ucl = Xbarbar + A3*Sbar


uclS=B4*Sbar
lclS=B3*Sbar


plot(Xbar, col= 'blue', ylim=c(lcl-10,ucl+10),type="b",pch=19, main ='Carte Xbar')
abline(Xbarbar,0, col ='green')
abline(ucl,0, col ='black')
abline(lcl,0, col ='red')
legend(1,27,c("UCL= 17,2 ","Mean= 11.3","LCL= 5.4"),col=c('black','green','red'),lty = 1)

plot(S, col= 'blue', ylim=c(lclS-39,uclS+39),type="b",pch=19, main = 'Carte S')
abline(Sbar,0, col ='green')
abline(uclS,0, col ='black')
abline(lclS,0, col ='red')
legend(0,62,c("UCL= 23","CL= 19.6","LCL= 15"),col=c('black','green','red'),lty = 1)
```





Le signal du processus n'est pas sous controle pour les 2 cartes, pour Xbar on a un point hors de controle

Carte Cusum pour V107

In [14]:

```
d107<- data[,107]
head(d107)
```

1,22103618990448   0,705211271989488   2,1485851185165   2,75644427832987   1,77376522175792   1,24669699863262

Estimation de sigma

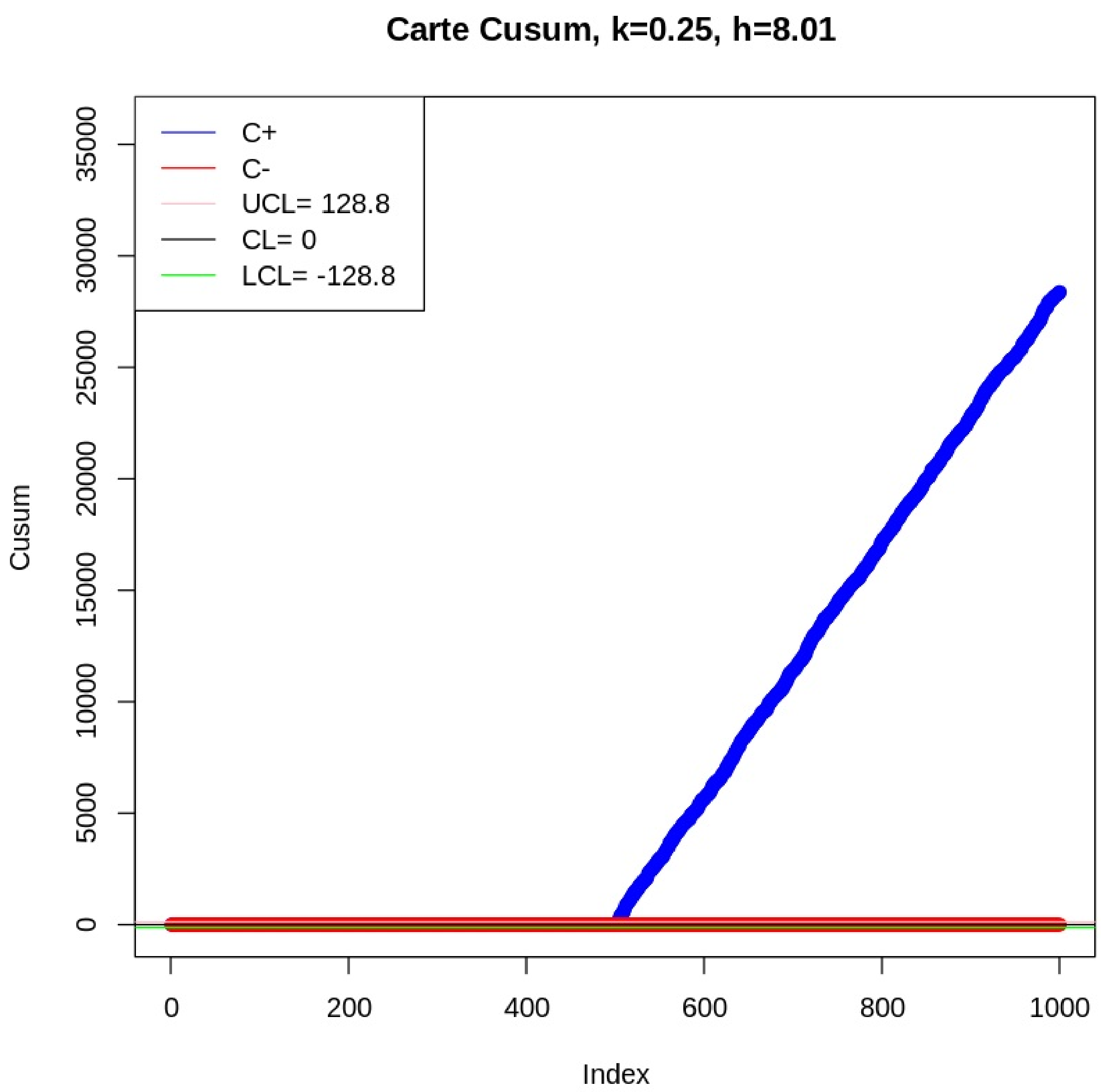
In [15]:

```
#Estimation de sigma
MR<-c() # CQ3 page 29

for( i in 1:999){
  MR[i]<- abs(d107[i+1]-d107[i])
}
MRbar= mean(MR)
sigma= MRbar/ 1.128
```

On prend donc pour la suite k= 0.25 et H= 8.01 et sigma= 16,08597

In [27]:

```
d107<- data[,107]
#mean(d107[1:2])
mu0 =2# On veut detecter un changement par rapportà une moyenne égal à 2
k=0.25
K=k*sigma

h=8.01
H=h*sigma
UCL=H
Cusum<-c()
Cusum[1]=0
for(i in 2:1000){
  Cusum[i] = max(0,d107[i]-(mu0+K)+ Cusum[i-1])
}

D<-c()
D[1]=0
for(i in 2:1000){
  D[i] = max(0,(mu0-K)-d107[i]+ D[i-1])
}
plot(Cusum,ylim=c(-10,35700),xlim=c(0,1000), col= 'blue',type="b",pch=19,main='Carte Cusum, k=0.25, h=8.01 ')
lines(D,ylim=c(-0.5,0.5),xlim=c(0,26), col= 'red',type="b",pch=19)
abline(0,0,col='black')
abline(H,0,col='pink',lty = 1)
abline(-H,0,col='green',lty = 1)
legend("topleft",c("C+","C-","UCL= 128.8 ","CL= 0","LCL= -128.8"),col=c('blue','red','pink','black','green'),lty
= 1)
```



In [18]:

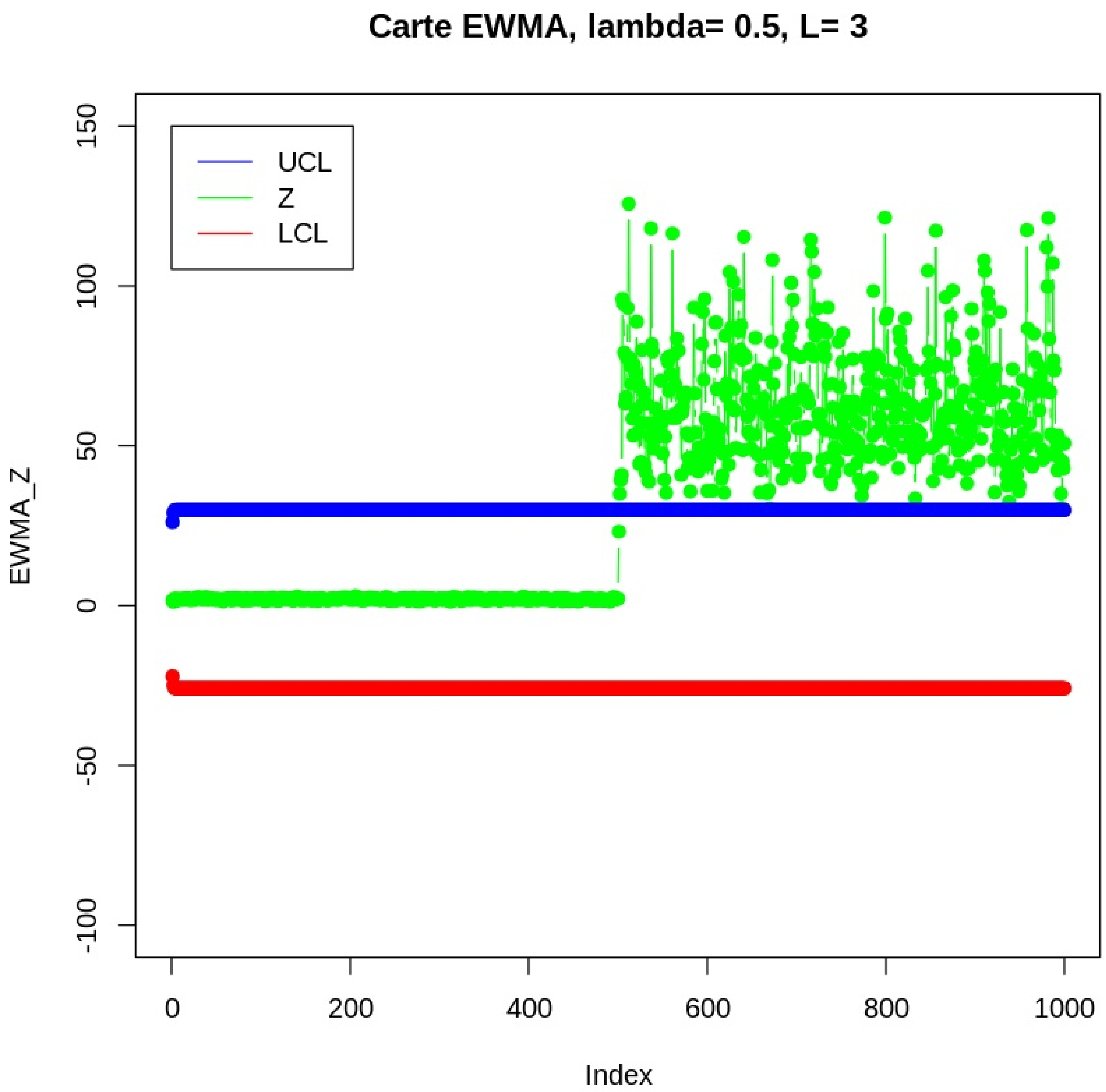
```
a<-c()
for(i in 1:1000){
    a[i]<-(Cusum[i]<H)
}
n=sum(a)
print(paste("Le signal du processus n'est pas sous controle, les pts après le",as.character(n),'ème dépassent les
limites de controle'))
```

```
[1] "Le signal du processus n'est pas sous controle, les pts après le 503 ème dépassent les limites
de controle"
```

Carte EWMA pour V107

In [19]:

```
#EWMA
lambda=0.5
mu0=2
L=3
EWMA_Z<-c()
EWMA_Z[1]=lambda*d107[1]+(1-lambda)*mu0
for(i in 2:1000){
  EWMA_Z[i]=lambda*d107[i]+(1-lambda)*EWMA_Z[i-1]
}
LCL<-c()
for(i in 1:1000){
  LCL[i]<- mu0 -L*sigma*sqrt((lambda/(2-lambda))*(1-(1-lambda)^(2*i)))
}

#LCl<- mu0 -L*sigma*sqrt((lambda/(2-lambda)))


UCL<-c()
for(i in 1:1000){
  UCL[i]<- mu0 +L*sigma*sqrt((lambda/(2-lambda))*(1-(1-lambda)^(2*i)))
}


plot(EWMA_Z,ylim=c(-100,150),xlim=c(0,1000), col= 'green',type="b",pch=19, main = 'Carte EWMA, lambda= 0.5, L= 3'
)
lines(UCL,ylim=c(7.96,8.13),xlim=c(0,1000), col= 'blue',type="b",pch=19)
lines(LCL,ylim=c(7.96,8.13),xlim=c(0,1000),col= 'red',type="b",pch=19)
legend(0,150,c("UCL","Z","LCL"),col=c('blue','green','red'),lty = 1)
```



In [20]:

```
for(i in 1:1000){
    a[i]<-(EWMA_Z[i]<max(UCL))
}
n=sum(a)
print(paste("Le signal du processus n'est pas sous controle, les pts après le",as.character(n),"ème dépassent les limites de controle"))
```

```
[1] "Le signal du processus n'est pas sous controle, les pts après le 501 ème dépassent les limites
de controle"
```

Carte Cusum pour V108

In [21]:

```
d108<- data[,108]
head(d108)
```

1,88925844040468   2,17774115719765   2,9050647109671   1,01134820032409   1,02860176569436   1,63956370643374

Estimation de sigma

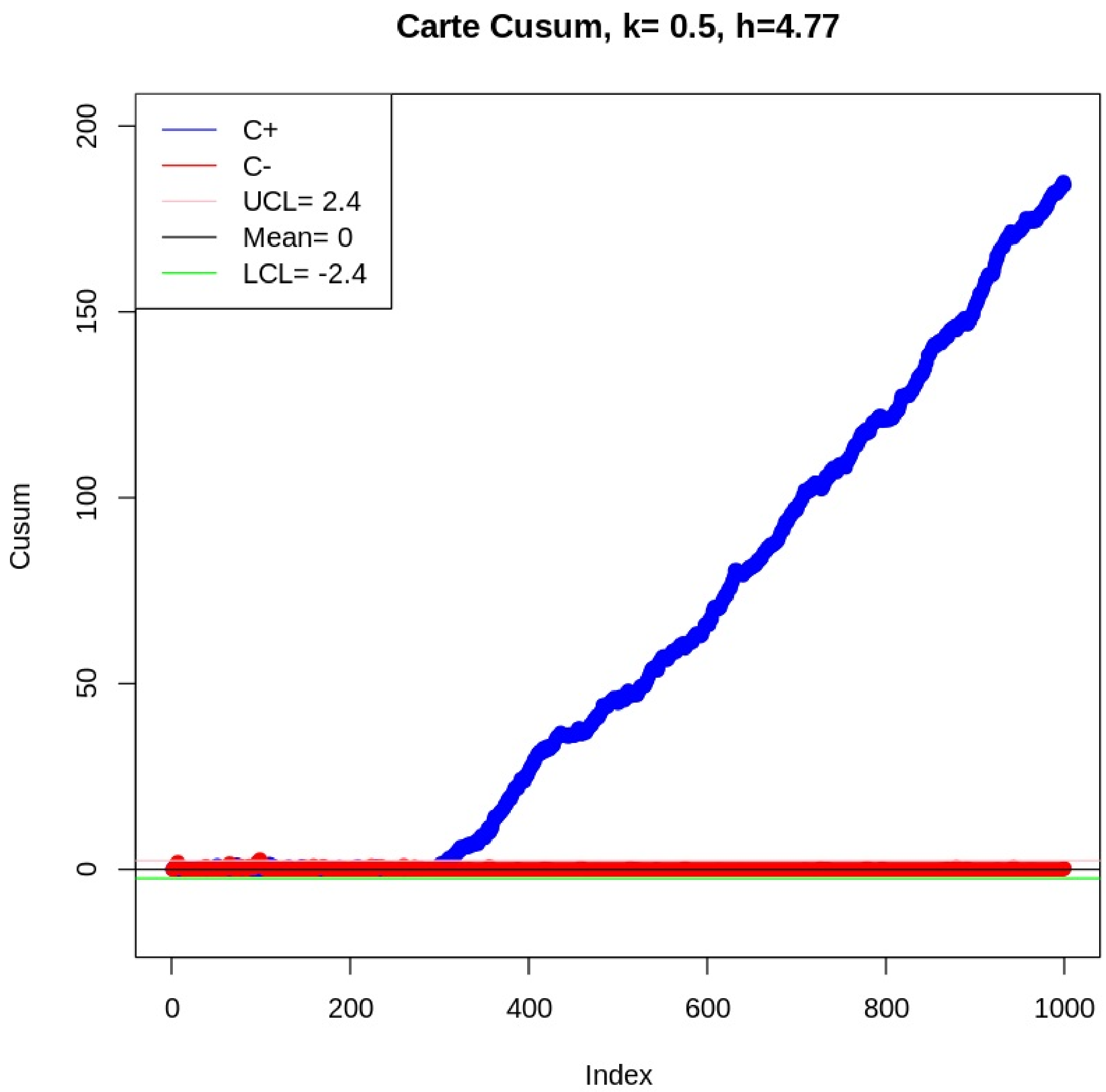
In [22]:

```
MR<-c() # CQ3 page 29

for( i in 1:999){
  MR[i]<- abs(d108[i+1]-d108[i])
}
MRbar= mean(MR)
sigma2= MRbar/ 1.128
```

On prend donc pour la suite k= 0.5 et H= 4.77 et sigma= 0,505158885367955

In [23]:

```
d108<- data[,108]
mu0 =2# On veut detecter un changement par rapport à une moyenne égal à 2
k=0.5
K=k*sigma2
h=4.77
H=h*sigma2
UCL=H
UCL=H
Cusum<-c()
Cusum[1]=0
for(i in 2:1000){
  Cusum[i] = max(0,d108[i]-(mu0+K)+ Cusum[i-1])
}
D<-c()
D[1]=0
for(i in 2:1000){
  D[i] = max(0,(mu0-K)-d108[i]+ D[i-1])
}
plot(Cusum,ylim=c(-15,200),xlim=c(0,1000), col= 'blue',type="b",pch=19,main='Carte Cusum, k= 0.5, h=4.77')
lines(D,ylim=c(-0.5,0.5),xlim=c(0,26), col= 'red',type="b",pch=19)
abline(0,0,col='black')
abline(H,0,col='pink')
abline(-H,0,col='green')
legend("topleft",c("C+","C-","UCL= 2.4 ","Mean= 0","LCL= -2.4"),col=c('blue','red','pink','black','green'),lty =
1)
```



In [24]:

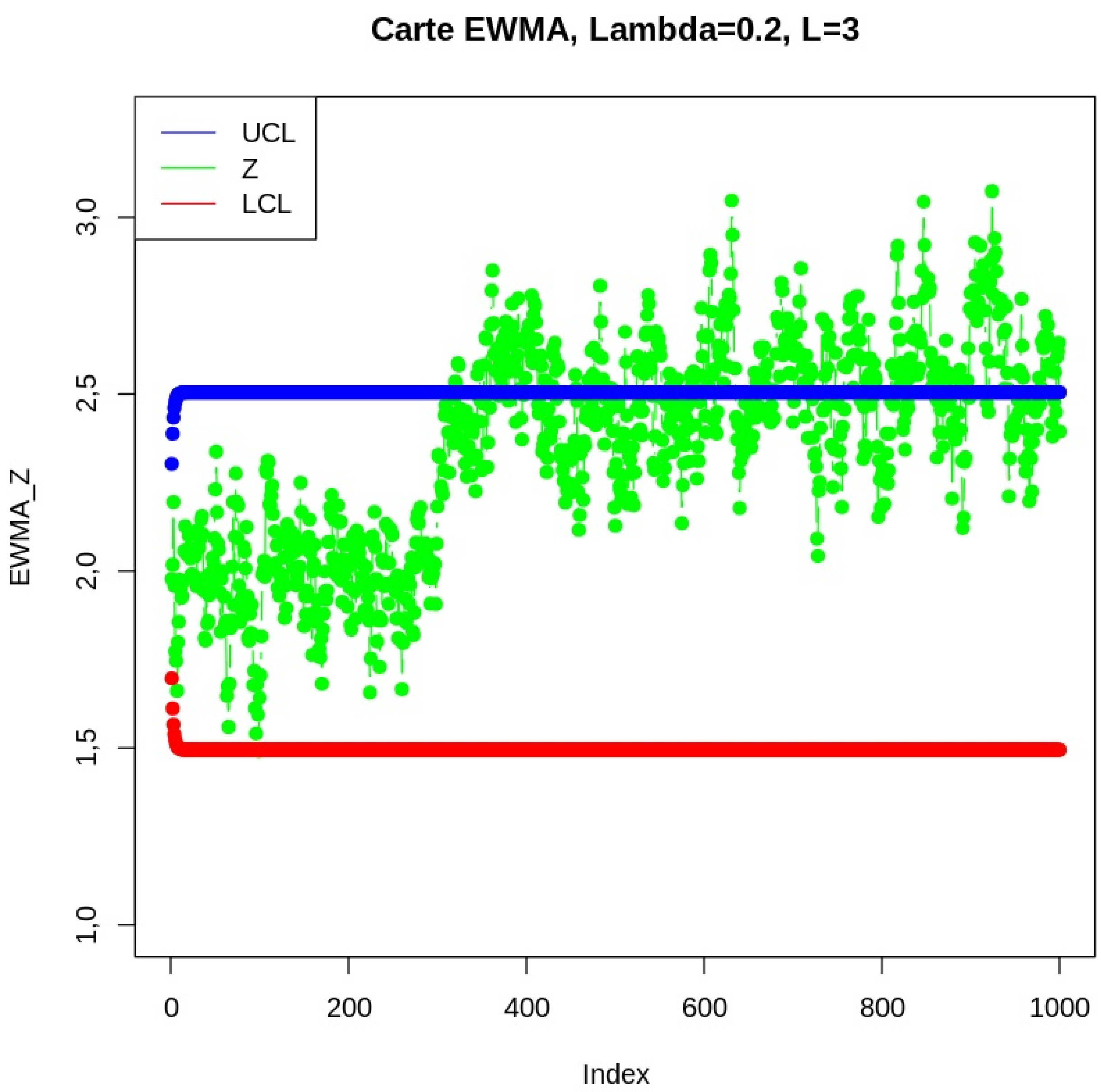
```
for(i in 1:1000){
    a[i]<-(Cusum[i]<H)
    if(D[i]>H){m=i}
}
n=sum(a)

print(paste("Le signal du processus n'est pas sous controle, Pour C+ les points après le",as.character(n),'ème dé
passent les limites de controle'))
print(paste("pour C- seul le",as.character(m),"ème point est hors des limites de controle"))
```

```
[1] "Le signal du processus n'est pas sous controle, Pour C+ les points après le 308 ème dépassent l
es limites de controle"
[1] "pour C- seul le 99 ème point est hors des limites de controle"
```

Carte EWMA pour V108

In [25]:

```
#EWMA
lambda=0.2
mu0=2
L=3
EWMA_Z<-c()
EWMA_Z[1]=lambda*d108[1]+(1-lambda)*mu0
for(i in 2:1000){
  EWMA_Z[i]=lambda*d108[i]+(1-lambda)*EWMA_Z[i-1]
}
LCL<-c()
for(i in 1:1000){
  LCL[i]<- mu0 -L*sigma2*sqrt((lambda/(2-lambda))*(1-(1-lambda)^(2*i)))
}


UCL<-c()
for(i in 1:1000){
  UCL[i]<- mu0 +L*sigma2*sqrt((lambda/(2-lambda))*(1-(1-lambda)^(2*i)))
}

plot(EWMA_Z,ylim=c(1,3.25),xlim=c(0,1000), col= 'green',type="b",pch=19, main = 'Carte EWMA, Lambda=0.2, L=3')
lines(UCL,ylim=c(7.96,8.13),xlim=c(0,24), col= 'blue',type="b",pch=19)
lines(LCL,ylim=c(7.96,8.13),xlim=c(0,24),col= 'red',type="b",pch=19)
legend("topleft",c("UCL","Z","LCL"),col=c('blue','green','red'),lty = 1)
```



le signal du processus n'est pas sous controle