Projet_controle_qualite

Controle de Qualité

Ousmane LO

27 décembre 2018

Consignes

Les résultats à envoyer avant le 10 janvier.

Questions

1. Vous devez faire un test adéquation pour chacune des 6 colonnes pour définir la loi des données.
2. Construire des cartes de controle sur la moyenne, la variance et l'étendu pour les colonnes 7 à 107.
3. CUMSUM EWMA pour chaque colonne 108 et 109 pour détecter un changement par rapport à une moyenne égale à 2.

Chargeons sous R les données **QualiteOusmane.csv** dans un tibble appelé **ousman**.

```
library(readr)

ousman <- read_csv(file="QualiteOusmane.csv")
```

```
## Parsed with column specification:
## cols(
##   .default = col_double(),
##   X1 = col_integer()
## )
```

```
## See spec(...) for full column specifications.
```

```
ousman
```

```
## # A tibble: 1,000 x 109
##       X1   Date    V2    V3     V4    V5     V6    V7    V8    V9   V10
##    <int>  <dbl> <dbl> <dbl>  <dbl> <dbl>  <dbl> <dbl> <dbl> <dbl> <dbl>
##  1     1  5510. 8664. 8410. 13124. 8030.   32.0 2.88   3.25  2.08 2.49
##  2     2  2836. 8878. 8666. 13137. 2663.   15.0 2.97   1.42  1.42 2.52
##  3     3  5463. 8712. 8664. 13203. 2830. 2894.  2.23   1.60  2.97 1.83
##  4     4 13360. 8588. 8768. 13167. 5841. 1224.  1.83   2.54  1.34 0.961
##  5     5 13686. 8904. 8689. 13110. 7503.  447.  2.37   2.09  2.05 2.88
##  6     6  8372. 8652. 8853. 13116. 6312.  438.  0.828  2.49  2.37 2.67
##  7     7  7103. 8811. 8883. 13172. 8984. 4213.  1.59   2.03  1.48 1.59
##  8     8 12172. 8874. 8764. 13086. 7818. 9070.  1.86   1.53  2.11 2.67
##  9     9  7178. 8798. 8643. 13180. 5389. 6302.  2.20   1.81  1.46 1.18
## 10    10  4953. 9089. 8618. 13157. 3218. 9802.  1.98   2.03  1.64 1.29
## # ... with 990 more rows, and 98 more variables: V11 <dbl>, V12 <dbl>,
## #   V13 <dbl>, V14 <dbl>, V15 <dbl>, V16 <dbl>, V17 <dbl>, V18 <dbl>,
## #   V19 <dbl>, V20 <dbl>, V21 <dbl>, V22 <dbl>, V23 <dbl>, V24 <dbl>,
## #   V25 <dbl>, V26 <dbl>, V27 <dbl>, V28 <dbl>, V29 <dbl>, V30 <dbl>,
## #   V31 <dbl>, V32 <dbl>, V33 <dbl>, V34 <dbl>, V35 <dbl>, V36 <dbl>,
## #   V37 <dbl>, V38 <dbl>, V39 <dbl>, V40 <dbl>, V41 <dbl>, V42 <dbl>,
## #   V43 <dbl>, V44 <dbl>, V45 <dbl>, V46 <dbl>, V47 <dbl>, V48 <dbl>,
## #   V49 <dbl>, V50 <dbl>, V51 <dbl>, V52 <dbl>, V53 <dbl>, V54 <dbl>,
## #   V55 <dbl>, V56 <dbl>, V57 <dbl>, V58 <dbl>, V59 <dbl>, V60 <dbl>,
## #   V61 <dbl>, V62 <dbl>, V63 <dbl>, V64 <dbl>, V65 <dbl>, V66 <dbl>,
## #   V67 <dbl>, V68 <dbl>, V69 <dbl>, V70 <dbl>, V71 <dbl>, V72 <dbl>,
## #   V73 <dbl>, V74 <dbl>, V75 <dbl>, V76 <dbl>, V77 <dbl>, V78 <dbl>,
## #   V79 <dbl>, V80 <dbl>, V81 <dbl>, V82 <dbl>, V83 <dbl>, V84 <dbl>,
## #   V85 <dbl>, V86 <dbl>, V87 <dbl>, V88 <dbl>, V89 <dbl>, V90 <dbl>,
## #   V91 <dbl>, V92 <dbl>, V93 <dbl>, V94 <dbl>, V95 <dbl>, V96 <dbl>,
## #   V97 <dbl>, V98 <dbl>, V99 <dbl>, V100 <dbl>, V101 <dbl>, V102 <dbl>,
## #   V103 <dbl>, V104 <dbl>, V105 <dbl>, V106 <dbl>, V107 <dbl>, V108 <dbl>
```

span style="color:red"> 1) Faisons un **test adéquation** pour chacune des 6 premières colonnes pour définir la loi des données.

a) Test adéquation pour la première variable :

```
library(MASS)
z1 <- ousman$Date
fitdistr(z1, "weibull")
```

```
##       shape          scale
##   2.129726e+00   8.652357e+03
##  (5.241165e-02) (1.365680e+02)
```

TEST POUR Date

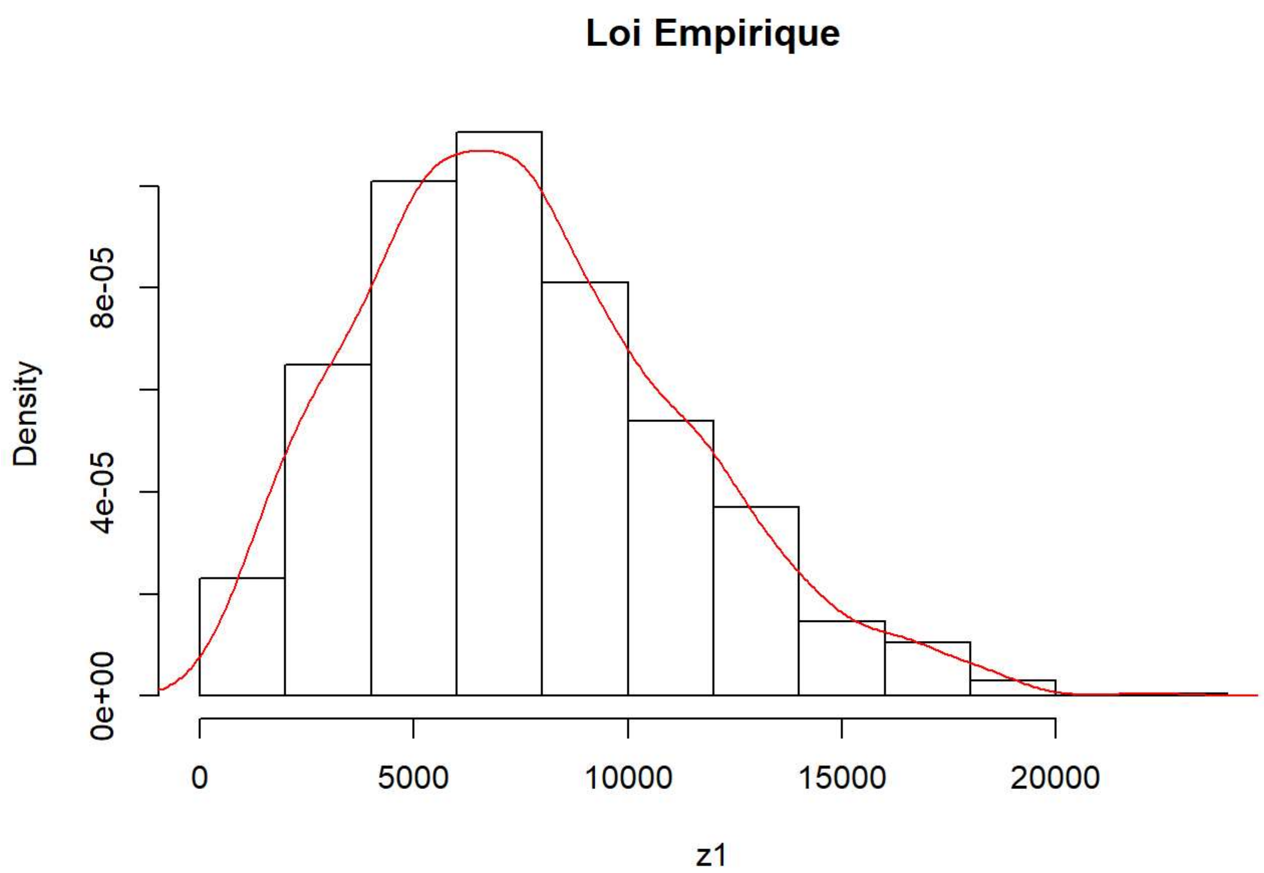
```
## TESTS

## 1) Adequation de la loi Empirique avec une loi weibull
ks.test(z1,"pweibull",shape=2.129726e+00,scale=8.652357e+03 )
```

```
##
##  One-sample Kolmogorov-Smirnov test
##
## data:  z1
## D = 0.030589, p-value = 0.3067
## alternative hypothesis: two-sided
```

```
## GRAPHIQUES

hist(z1, probability=T, main='Loi Empirique')
lines(density(z1), col='red')
```



D'après le test de Kolmogorov Smirnov, la variable aléatoire Date semble suivre une loi de weibull.

b) Test adéquation pour la deuxième variable :

```
library(MASS)
z2 <- ousman$V2
fitdistr(z2, "normal")
```

```
##       mean          sd
##   8760.983742    136.386400
##  (   4.312917) (   3.049693)
```

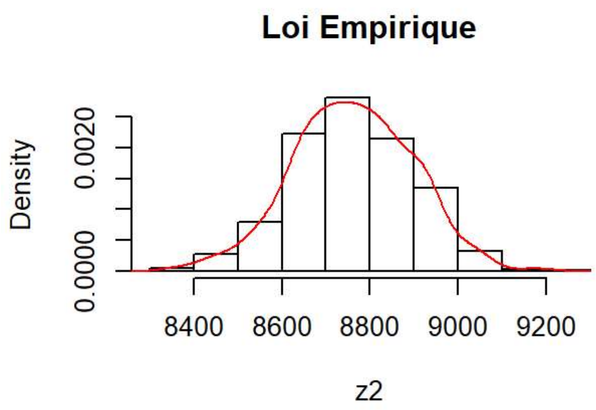
TEST POUR V2

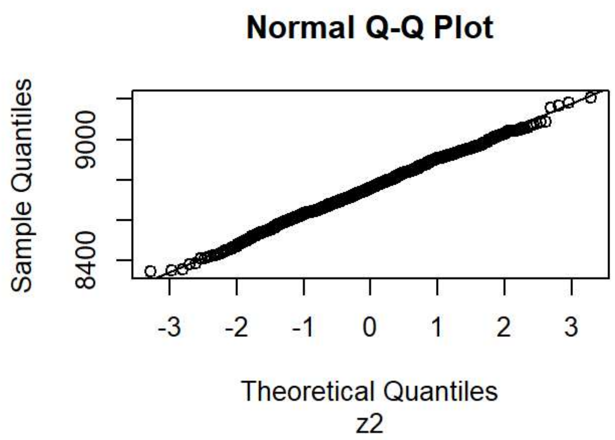
```
## 1) Adequation de la loi Empirique avec une loi normale
ks.test(z2,"pnorm",mean=8760.983742 ,sd=136.386400 )
```

```
##
##  One-sample Kolmogorov-Smirnov test
##
## data:  z2
## D = 0.019766, p-value = 0.8295
## alternative hypothesis: two-sided
```

```
## GRAPHIQUES
op <- par(mfrow=c(2,2))
hist(z2, probability=T, main='Loi Empirique')
lines(density(z2), col='red')

##  Normale qqplot
qqnorm(z2,sub="z2")
qqline(z2)
par(op)
```





D'après le test de Kolmogorov Smirnov, la variable aléatoire V2 semble suivre une loi normale car la p-value = 0.8295>0.05.

c) Test adéquation pour la troisième variable :

```
library(MASS)
z3 <- ousman$V3
fitdistr(z3, "normal")
```

```
##       mean          sd
##   8760.186086    132.250239
##  (    4.182120) (    2.957205)
```

TEST POUR V3

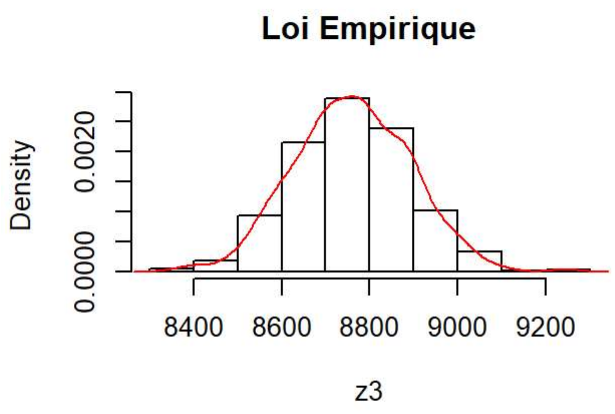
```
## 1) Adequation de la loi Empirique avec une loi normale
ks.test(z3,"pnorm",mean= 8760.186086 ,sd=  132.250239)
```

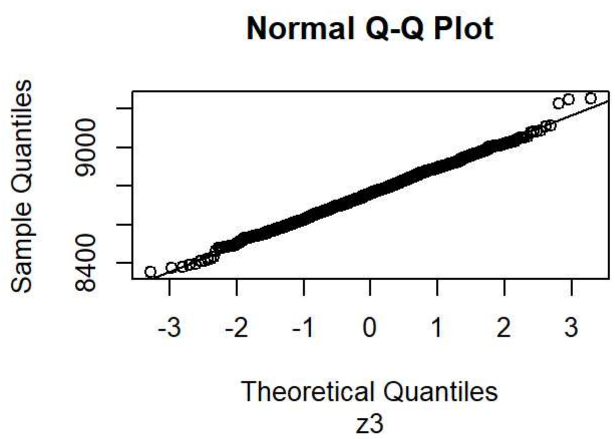
```
##
##  One-sample Kolmogorov-Smirnov test
##
## data:  z3
## D = 0.018152, p-value = 0.8967
## alternative hypothesis: two-sided
```

```
## GRAPHIQUES

op <- par(mfrow=c(2,2))
hist(z3, probability=T, main='Loi Empirique')
lines(density(z3), col='red')

qqnorm(z3,sub="z3")
qqline(z3)
par(op)
```





La variable V3 suit approximativement une loi normale car sa p_value=0.8967>0.05.

d) Test adéquation pour la variable V4 :

```
library(MASS)
z4 <- ousman$V4
fitdistr(z4, "normal")
```

```
##        mean            sd
##   1.314039e+04   3.134952e+01
##  (9.913589e-01) (7.009966e-01)
```

TEST POUR V4

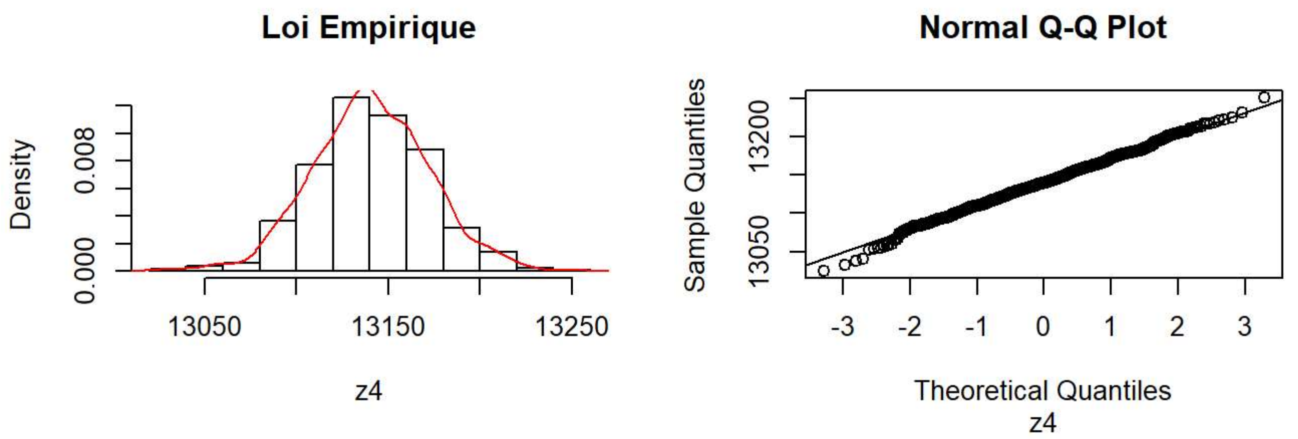
```
## 1) Adequation de la loi Empirique avec une loi normale
ks.test(z4,"pnorm",mean= 1.314039e+04 ,sd= 3.134952e+01)
```

```
##
##  One-sample Kolmogorov-Smirnov test
##
## data:  z4
## D = 0.018753, p-value = 0.8734
## alternative hypothesis: two-sided
```

```
## GRAPHIQUES

op <- par(mfrow=c(2,2))
hist(z4, probability=T, main='Loi Empirique')
lines(density(z4), col='red')

qqnorm(z4,sub="z4")
qqline(z4)
par(op)
```



La variable V4 ressemble à la distribution d'une loi normale.

e) Test adéquation pour la variable V5 :

```
library(MASS)
z5 <- ousman$V5
fitdistr(z5, "log-normal")
```

```
##     meanlog       sdlog
##   8.68018494   0.50438789
##  (0.01595015) (0.01127846)
```

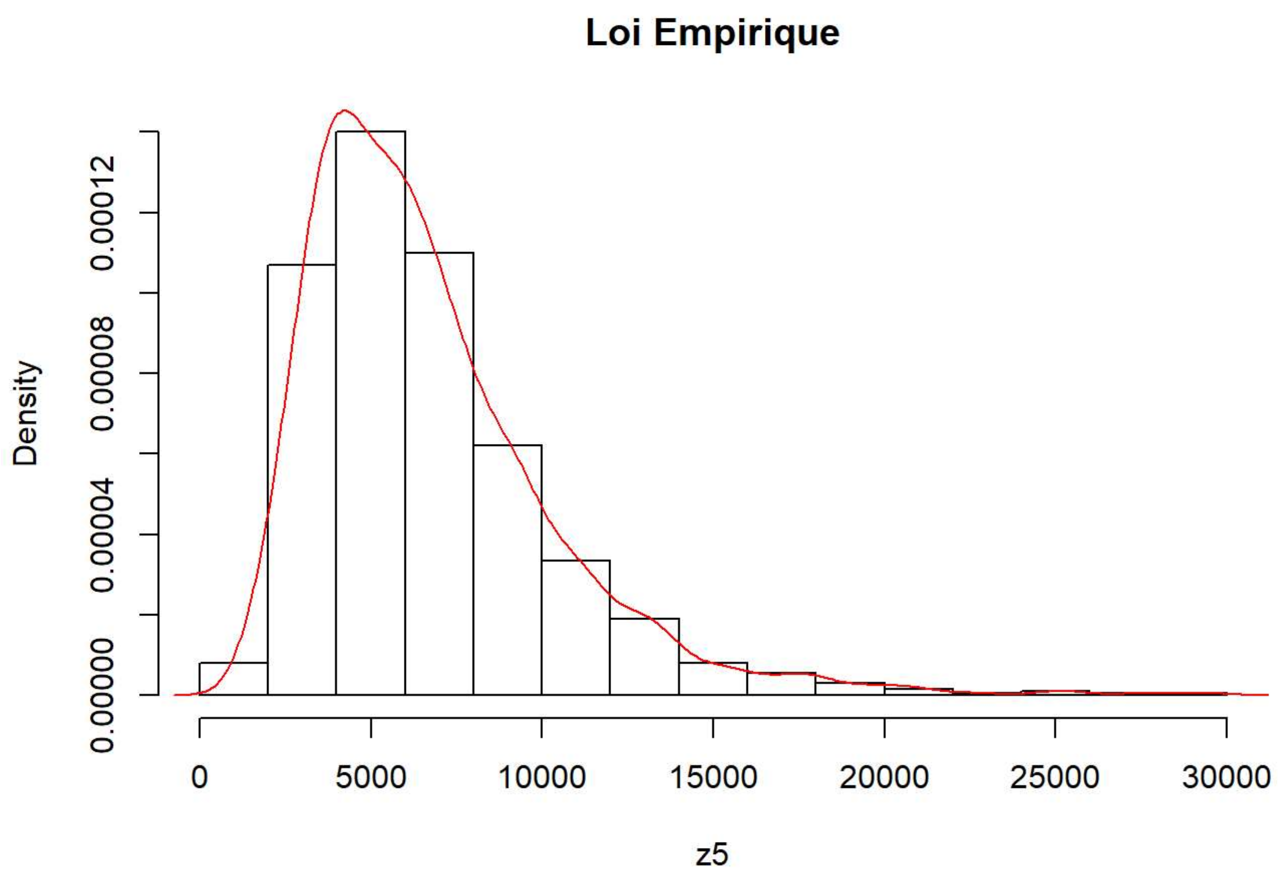
TEST POUR V5

```
## 1) Adequation de la loi Empirique avec une loi normale
ks.test(z5,"plnorm",meanlog=8.68018494, sdlog=0.50438789 )
```

```
##
##  One-sample Kolmogorov-Smirnov test
##
## data:  z5
## D = 0.017984, p-value = 0.9028
## alternative hypothesis: two-sided
```

```
## GRAPHIQUES

hist(z5, probability=T, main='Loi Empirique')
lines(density(z5), col='red')
```



On constate que V5 suis une loi log-normale car sa p-value = 0.9028 > 0.05.

e) Test adéquation pour la variable V5 :

```
library(MASS)
z6 <- ousman$V5
fitdistr(z6, "log-normal")
```

```
##     meanlog       sdlog
##   8.68018494   0.50438789
##  (0.01595015) (0.01127846)
```

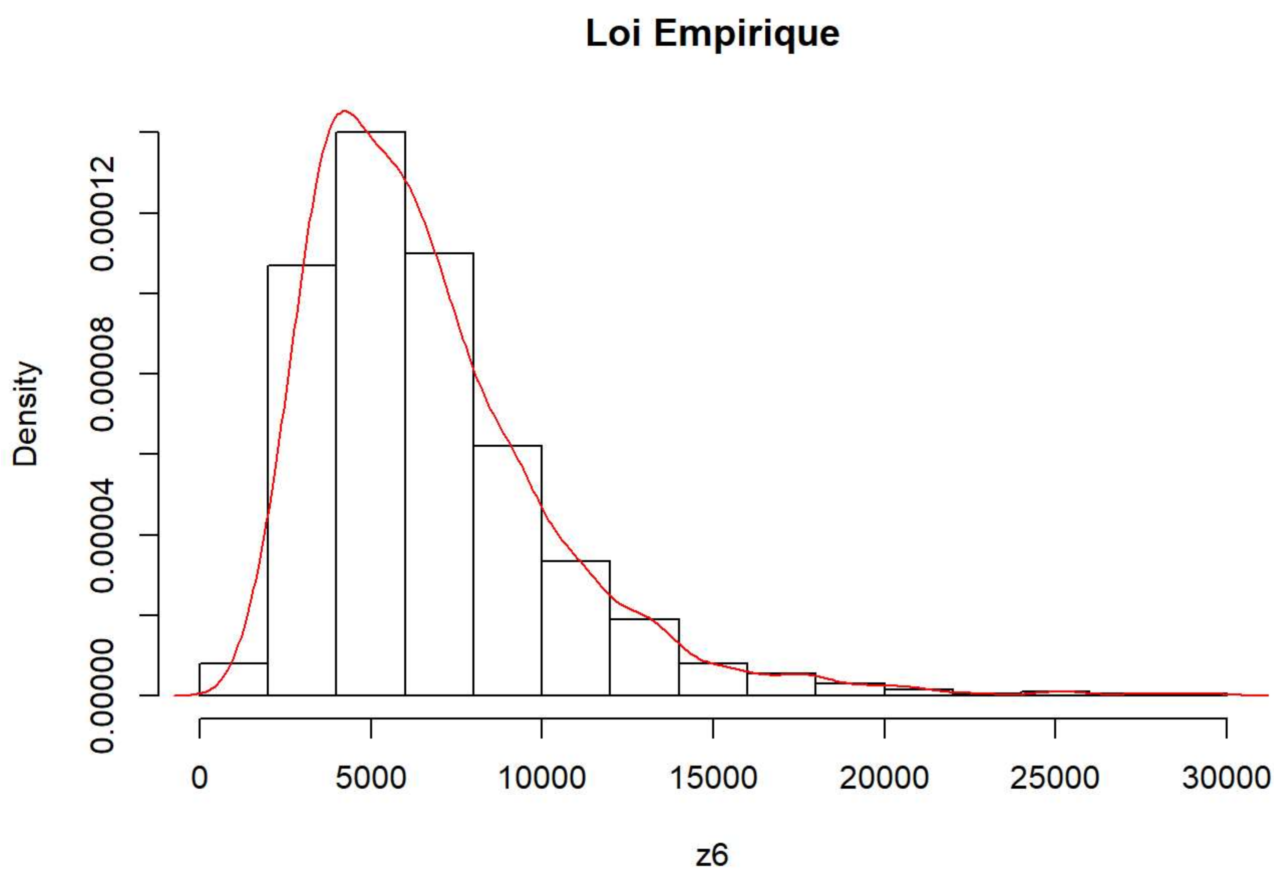
** TEST POUR V5**

```
## 1) Adequation de la Loi Empirique avec une Loi normale
ks.test(z6,"plnorm",meanlog=8.68018494,sdlog=0.50438789 )
```

```
##
##  One-sample Kolmogorov-Smirnov test
##
## data:  z6
## D = 0.017984, p-value = 0.9028
## alternative hypothesis: two-sided
```

```
## GRAPHIQUEs

hist(z6, probability=T, main='Loi Empirique')
lines(density(z6), col='red')
```



La variable aléatoire ressemble à une loi log-normale car sa p-value = 0.9028 > 0.05.

2) Construisons des cartes de controle sur la moyenne,la variance et l'étendu pour les colonnes 7 à 107.

Récupération de colonnes 7 à 107

```
ousman_1 <-ousman[,8:108]
ousman_1
```

```
## # A tibble: 1,000 x 101
##       V7    V8    V9   V10   V11   V12   V13   V14   V15   V16   V17   V18
##    <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl>
##  1 2.88   3.25  2.08 2.49   1.79  2.17  2.04  1.82  1.35  2.42  2.45 1.52
##  2 2.97   1.42  1.42 2.52   2.50  2.03  2.27  1.93  2.76  1.35  1.63 2.28
##  3 2.23   1.60  2.97 1.83   1.67  2.39  1.69  2.24  2.31  2.39  1.72 0.925
##  4 1.83   2.54  1.34 0.961  1.88  2.25  2.04  2.17  1.10  3.11  1.86 2.72
##  5 2.37   2.09  2.05 2.88   2.30  1.86  1.62  1.76  1.88  1.92  1.56 1.80
##  6 0.828  2.49  2.37 2.67   2.63  1.92  1.39  1.97  1.60  1.12  1.95 1.62
##  7 1.59   2.03  1.48 1.59   1.96  2.31  2.50  2.63  1.71  1.78  1.92 1.98
##  8 1.86   1.53  2.11 2.67   1.79  2.20  1.77  2.01  2.53  1.87  2.00 2.21
##  9 2.20   1.81  1.46 1.18   1.50  1.56  2.36  2.16  1.49  1.29  1.19 2.24
## 10 1.98   2.03  1.64 1.29   1.31  2.04  1.75  1.92  2.07  1.80  2.28 1.60
## # ... with 990 more rows, and 89 more variables: V19 <dbl>, V20 <dbl>,
## #   V21 <dbl>, V22 <dbl>, V23 <dbl>, V24 <dbl>, V25 <dbl>, V26 <dbl>,
## #   V27 <dbl>, V28 <dbl>, V29 <dbl>, V30 <dbl>, V31 <dbl>, V32 <dbl>,
## #   V33 <dbl>, V34 <dbl>, V35 <dbl>, V36 <dbl>, V37 <dbl>, V38 <dbl>,
## #   V39 <dbl>, V40 <dbl>, V41 <dbl>, V42 <dbl>, V43 <dbl>, V44 <dbl>,
## #   V45 <dbl>, V46 <dbl>, V47 <dbl>, V48 <dbl>, V49 <dbl>, V50 <dbl>,
## #   V51 <dbl>, V52 <dbl>, V53 <dbl>, V54 <dbl>, V55 <dbl>, V56 <dbl>,
## #   V57 <dbl>, V58 <dbl>, V59 <dbl>, V60 <dbl>, V61 <dbl>, V62 <dbl>,
## #   V63 <dbl>, V64 <dbl>, V65 <dbl>, V66 <dbl>, V67 <dbl>, V68 <dbl>,
## #   V69 <dbl>, V70 <dbl>, V71 <dbl>, V72 <dbl>, V73 <dbl>, V74 <dbl>,
## #   V75 <dbl>, V76 <dbl>, V77 <dbl>, V78 <dbl>, V79 <dbl>, V80 <dbl>,
## #   V81 <dbl>, V82 <dbl>, V83 <dbl>, V84 <dbl>, V85 <dbl>, V86 <dbl>,
## #   V87 <dbl>, V88 <dbl>, V89 <dbl>, V90 <dbl>, V91 <dbl>, V92 <dbl>,
## #   V93 <dbl>, V94 <dbl>, V95 <dbl>, V96 <dbl>, V97 <dbl>, V98 <dbl>,
## #   V99 <dbl>, V100 <dbl>, V101 <dbl>, V102 <dbl>, V103 <dbl>, V104 <dbl>,
## #   V105 <dbl>, V106 <dbl>, V107 <dbl>
```

```
length(ousman_1)
```

```
## [1] 101
```

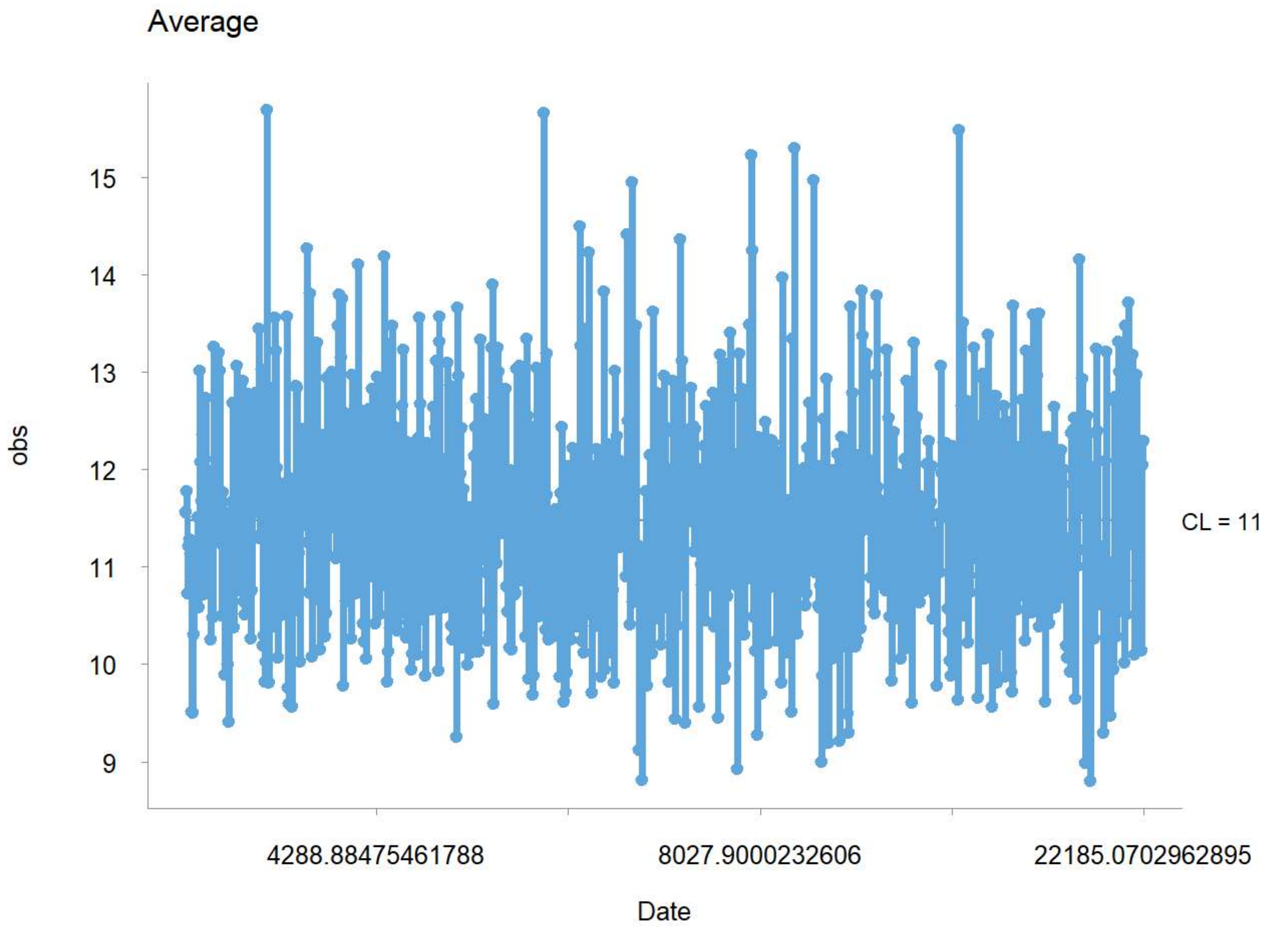
a) Carte de controle sur la moyenne pour les colonnes 7 à 107 :

```
# Construction des cartes
# install.packages("qicharts")
library(qicharts)
```

```
## Warning: package 'qicharts' was built under R version 3.5.2
```

```
## qicharts will no longer be maintained. Please consider moving to qicharts2: https://anhoe
j.github.io/qicharts2/.
```

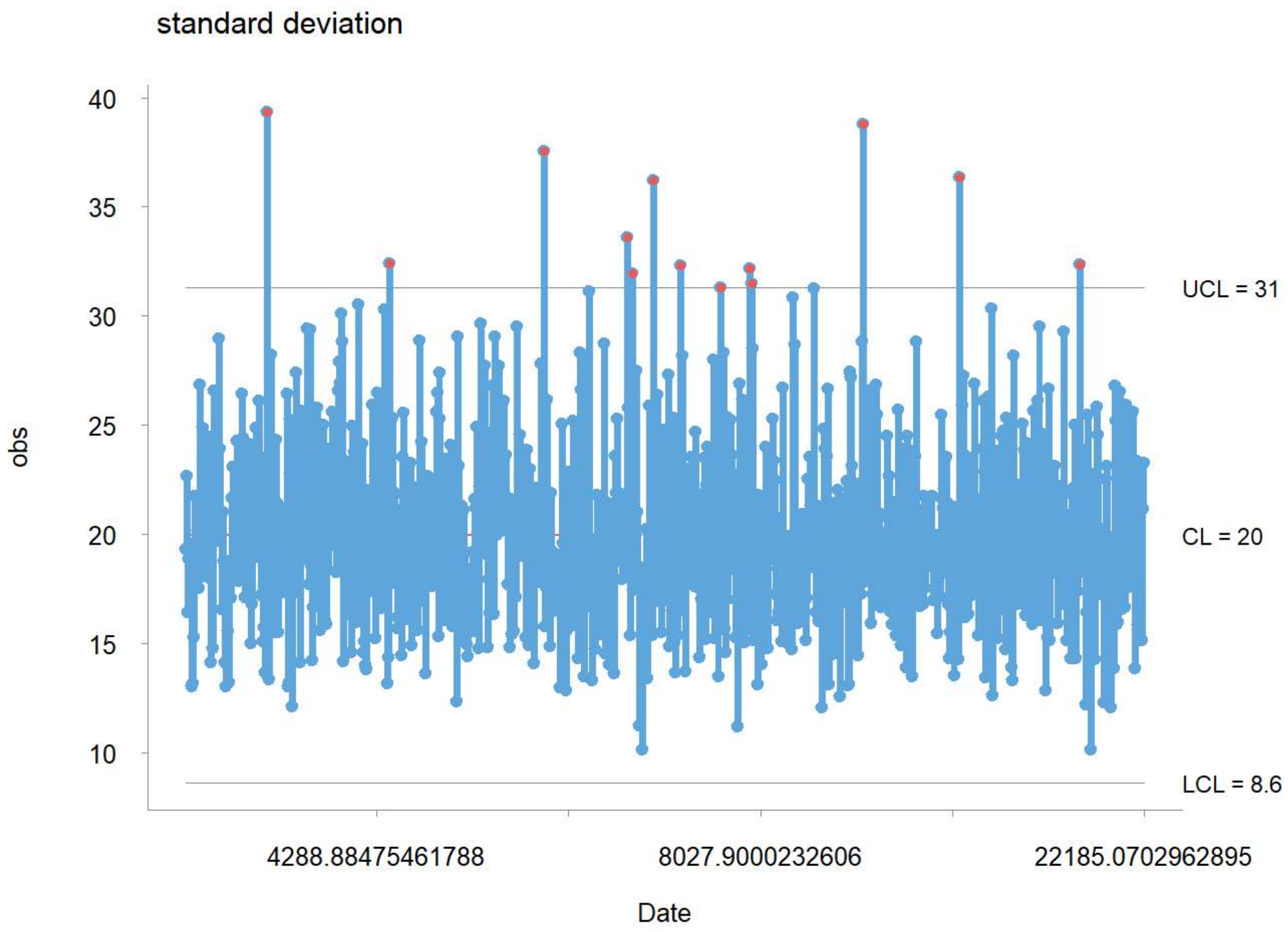
```
data_extract = ousman[8:109]
average = apply(data_extract,1,mean)
control_chart = data.frame(time =ousman$Date , values =average )
qic(values,
    x     = time,
    data  = control_chart,
    chart = 'xbar',
    main  = 'Average ',
    ylab  = 'obs',
    xlab  = 'Date')
```



On constate à partir de la carte de controle sur la moyenne obtenue que le processus est **hors controle**.

a) Carte de controle sur la variance pour les colonnes 7 à 107 :

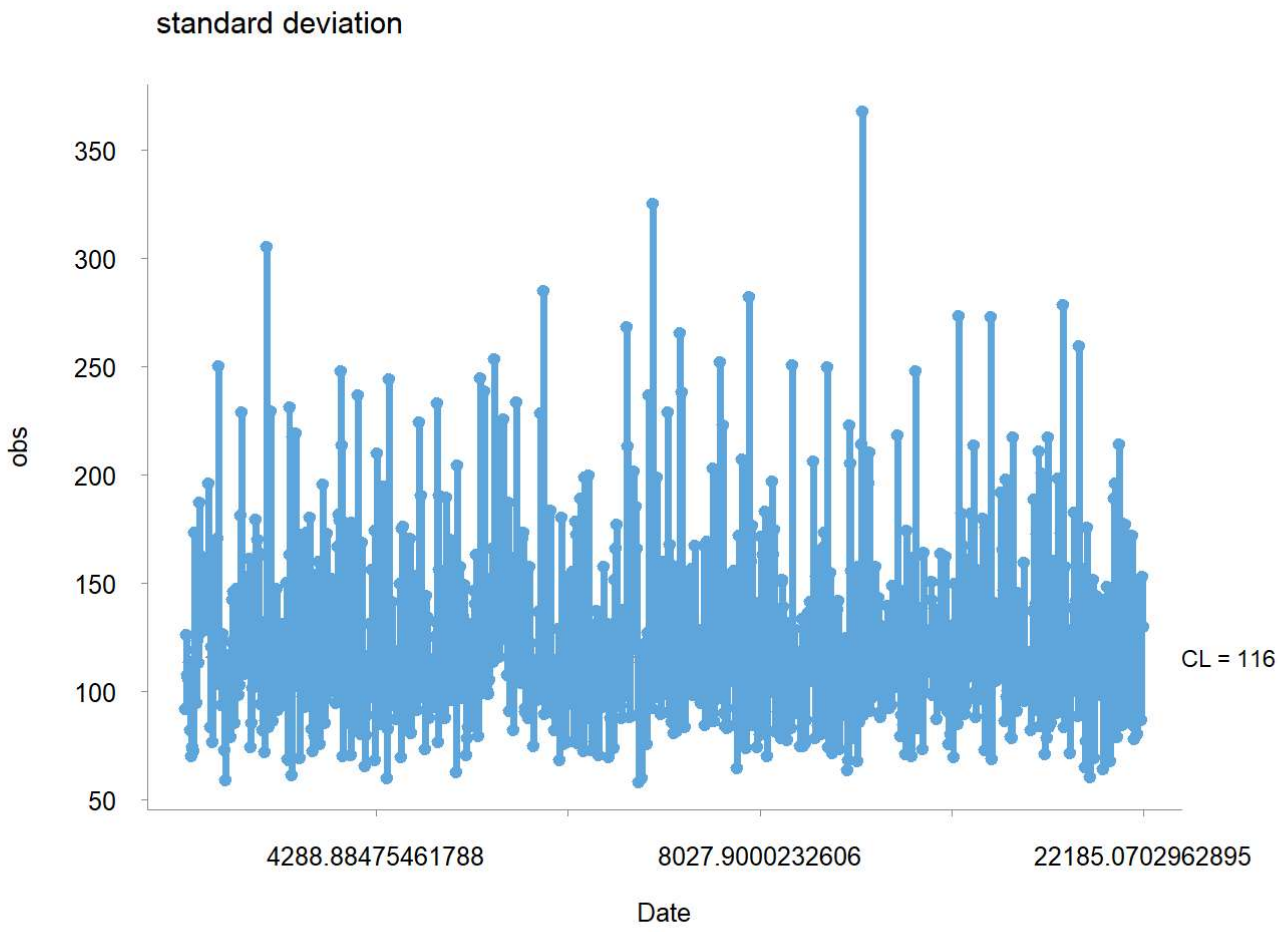
```
# Construction des cartes
# install.packages("qicharts")
library(qicharts)
data_extract = ousman[8:109]
stan_dev = apply(data_extract,1,sd)####### vecteur variance
control_chart = data.frame(time = ousman$Date , values =stan_dev  )
qic(values,
    x     = time,
    data  = control_chart,
    chart = 'i',
    main  = ' standard deviation ',
    ylab  = 'obs',
    xlab  = 'Date')
```



On constate à partir de la carte de controle sur la Variance obtenue que le processus est **hors controle**.

c) Carte de controle sur l'étendu pour les colonnes 7 à 107 :

```
# Construction des cartes
# install.packages("qicharts")
library(qicharts)
data_extract = ousman[8:109]
stan_dev = apply(data_extract,1,max) - apply(data_extract,1,min)
control_chart = data.frame(time = ousman$Date , values = stan_dev )
qic(values,
    x     = time,
    data  = control_chart,
    chart = 'r',
    main  = ' standard deviation ',
    ylab  = 'obs',
    xlab  = 'Date')
```



On constate à partir de la carte de controle sur l'étendu obtenue que le processus est **hors controle**.

3) CUMSUM EWMA pour chaque colonne 108 et 109 pour détecter un changement par rapport à une moyenne égale à 2.

a) CUMSUM EWMA pour la colonne 108 :

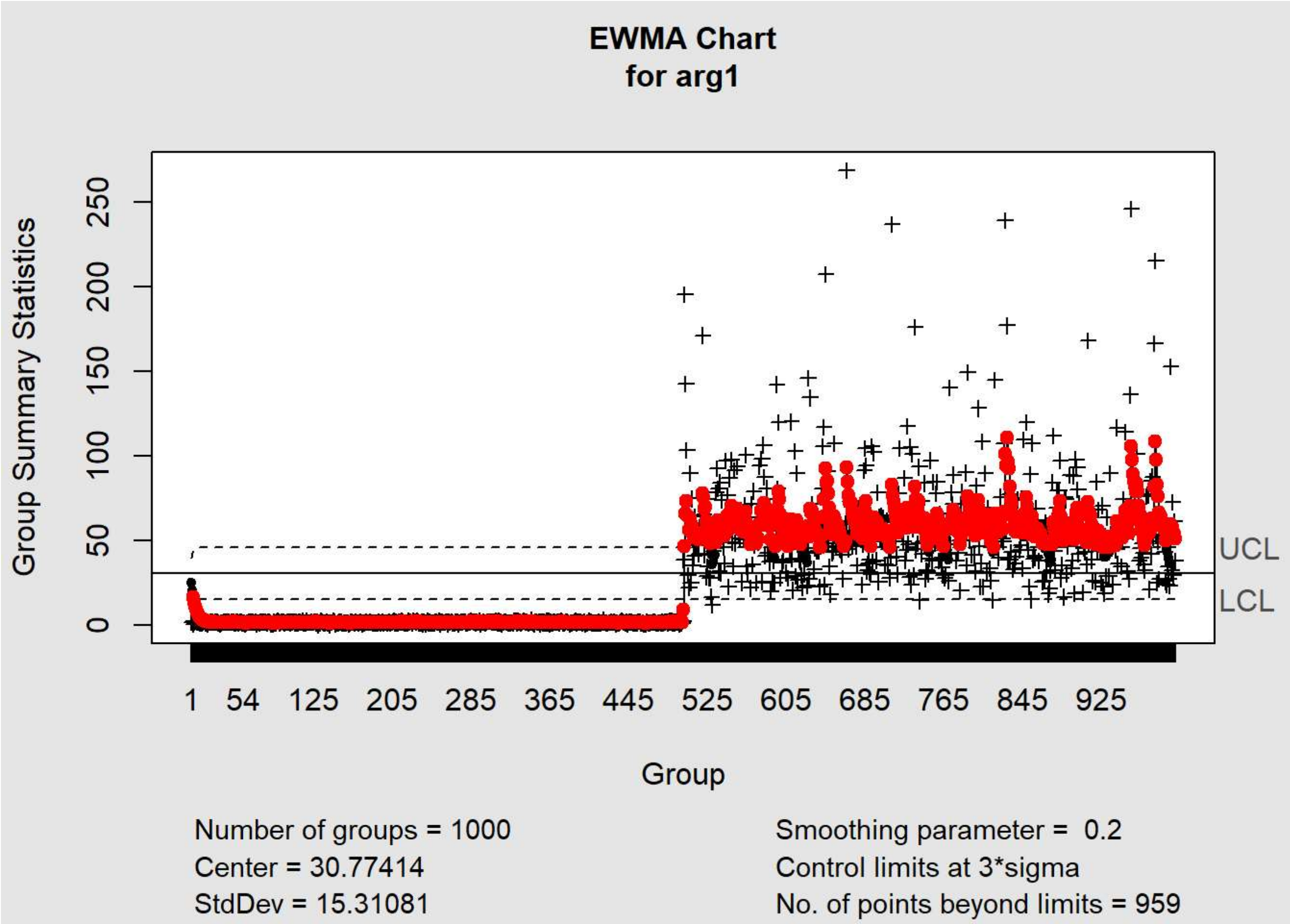
```
# Construction des cartes
#install.packages("qcc")
library(qcc)
```

```
## Warning: package 'qcc' was built under R version 3.5.2
```

```
## Package 'qcc' version 2.7
```

```
## Type 'citation("qcc")' for citing this R package in publications.
```

```
arg1 = ousman$V107
q1 = ewma(arg1, lambda=0.2, nsigmas=3)
```

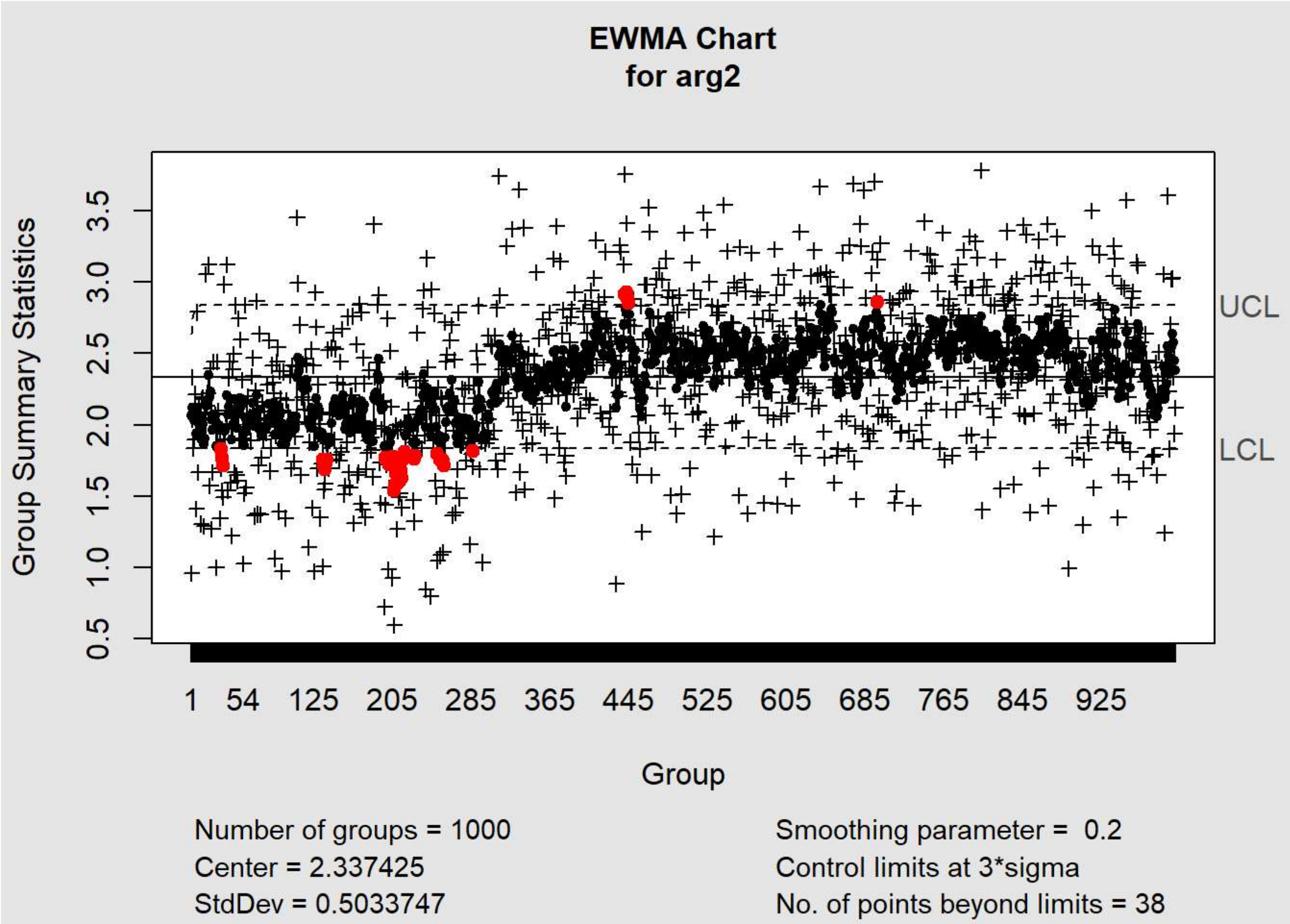


On constate à partir de la carte CUSUM EWMA obtenue que le processus est **hors controle**.

a) CUMSUM EWMA pour la colonne 109 :

```
# Construction des cartes

library(qcc)
arg2 = ousman$V108
q2 = ewma(arg2, lambda=0.2, nsigmas=3,col="")
```



On constate à partir de la carte CUSUM EWMA obtenue que le processus est **hors controle**.