

Simulations R

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```
devtools::install_github("Qrtsaad/CHANGEPOINT", force = TRUE)

## Downloading GitHub repo Qrtsaad/CHANGEPOINT@HEAD
##      checking for file '/private/var/folders/6x/nyv8q3451p597z813lzdgxvr0000gn/T/RtmpsXRd50/remotesb
## - preparing 'CHANGEPOINT':
##      checking DESCRIPTION meta-information ... v checking DESCRIPTION meta-information
## - checking for LF line-endings in source and make files and shell scripts
## - checking for empty or unneeded directories
## - building 'CHANGEPOINT_0.1.0.tar.gz'
##
##
library(CHANGEPOINT)
library("parallel")
library(ggplot2)
library(lattice)

cores <- detectCores()
cores

## [1] 4

#rep <- replicate(1, seq(100,1000,50))
seq <- seq(100,1000,100)
```

Initialisation de la séquence

1. Sans changepoint :

1.a) Gaussien

```
resOPg <- NULL
resPELTg <- NULL

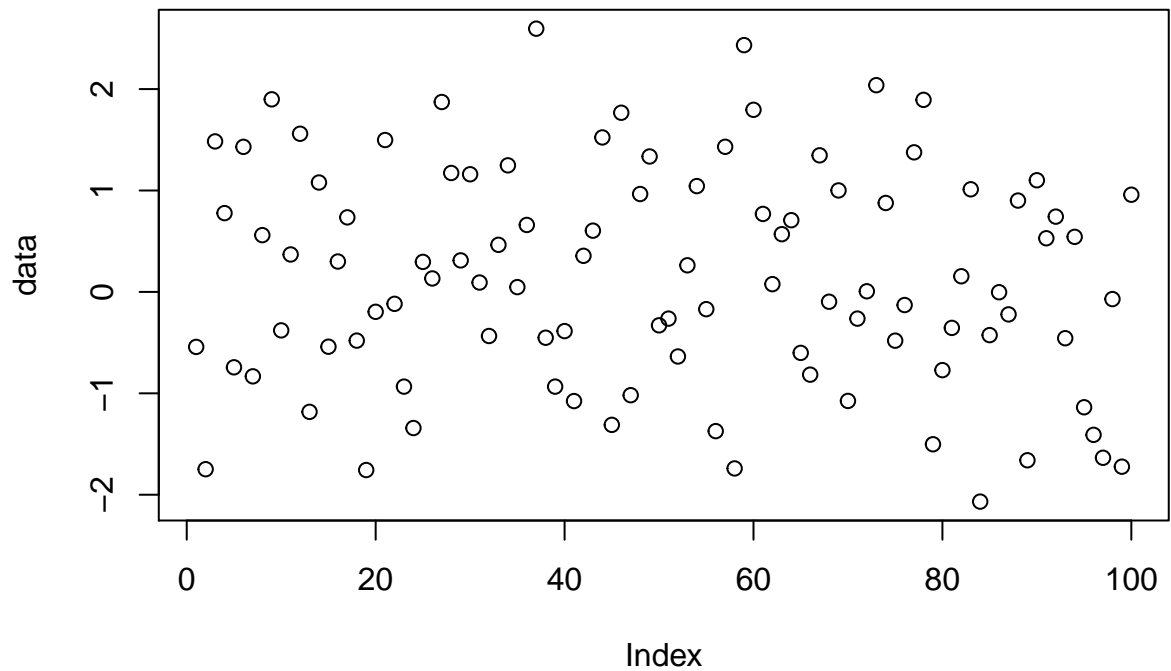
for(i in seq)
{
  print(i)
  data <- data_generator(n = i, type = "gauss")
  plot(data)
  tOP <- system.time(myOP(data, cost = "gauss"))[3]
  print(tOP)
  resOPg <- c(resOPg, tOP)
```

```

tPELT <- system.time(myPELT(data, cost = "gauss"))[3]
print(tPELT)
resPELTg <- c(resPELTg, tPELT)
}

```

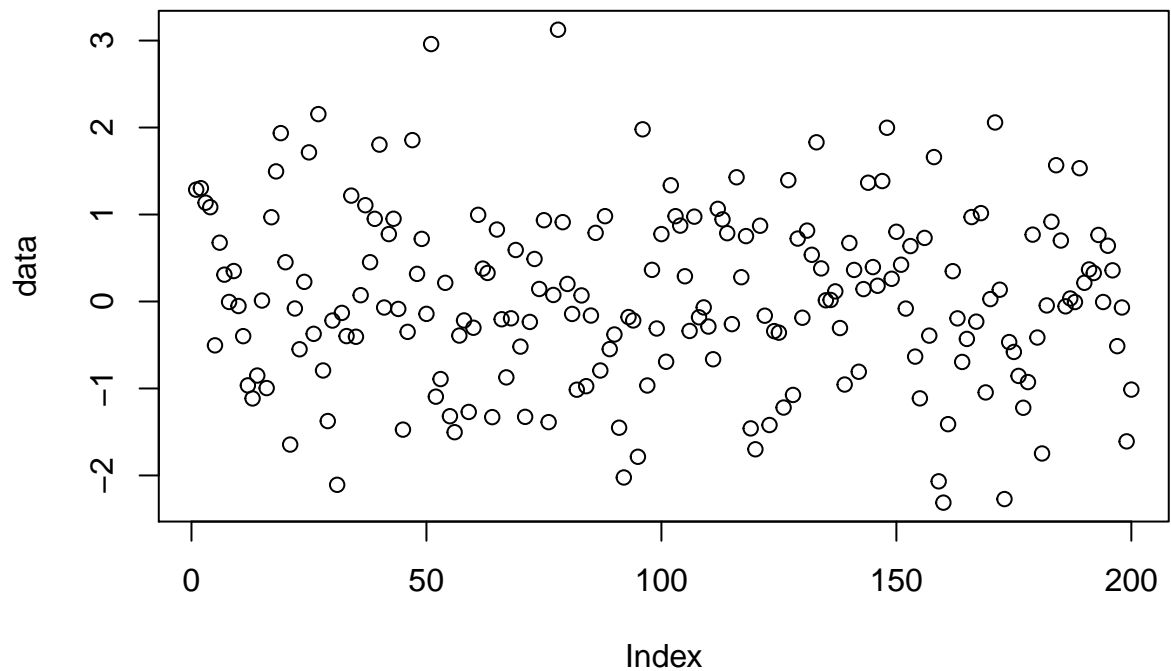
```
## [1] 100
```



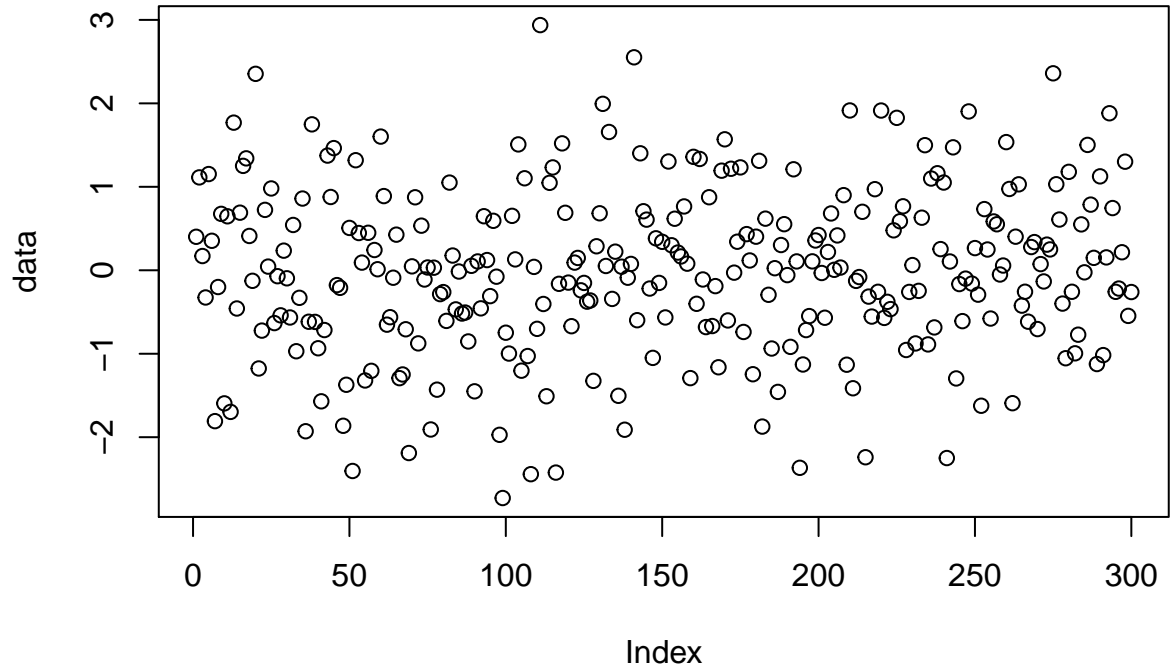
```

## elapsed
## 0.084
## elapsed
## 0.162
## [1] 200

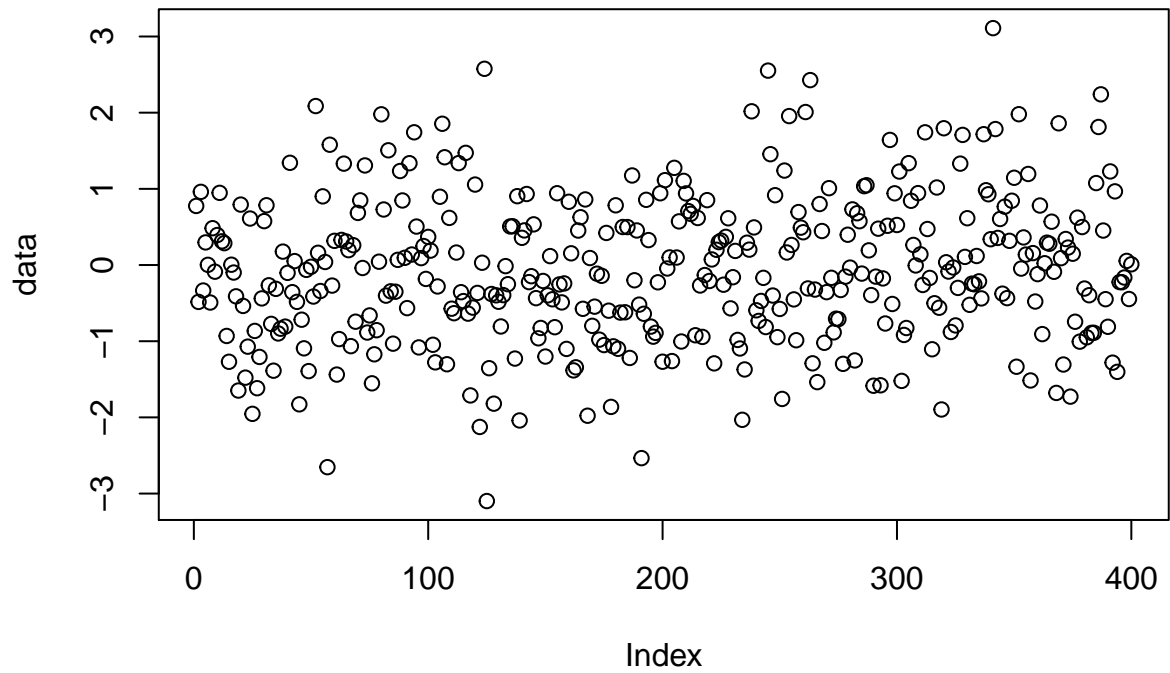
```



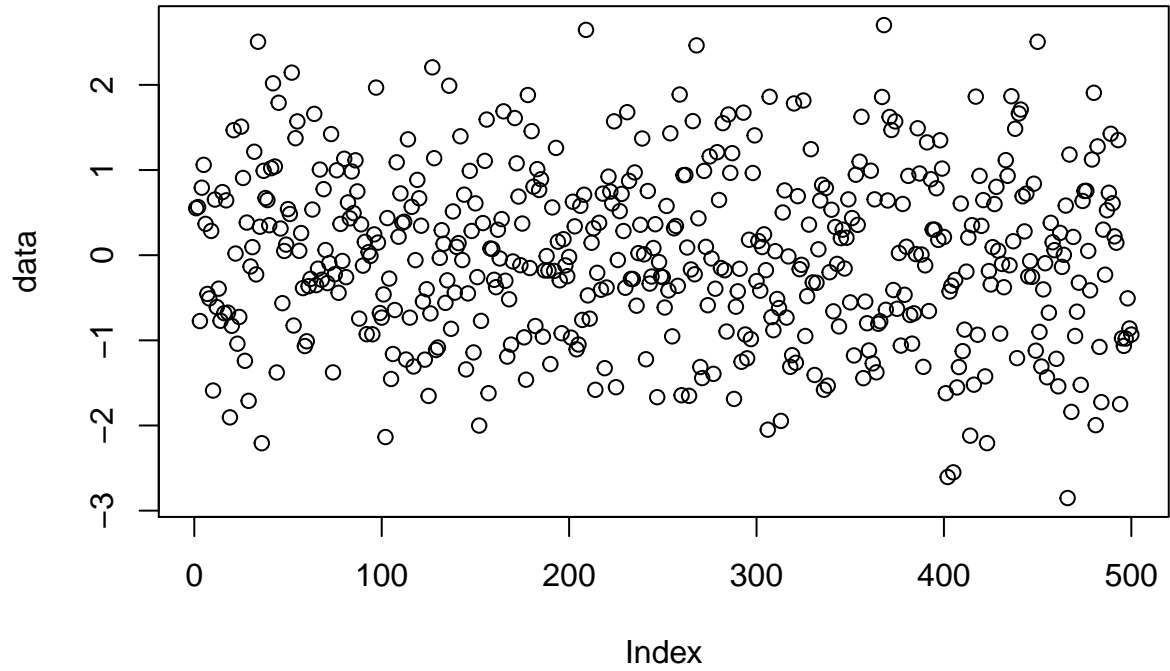
```
## elapsed
## 0.443
## elapsed
## 0.524
## [1] 300
```



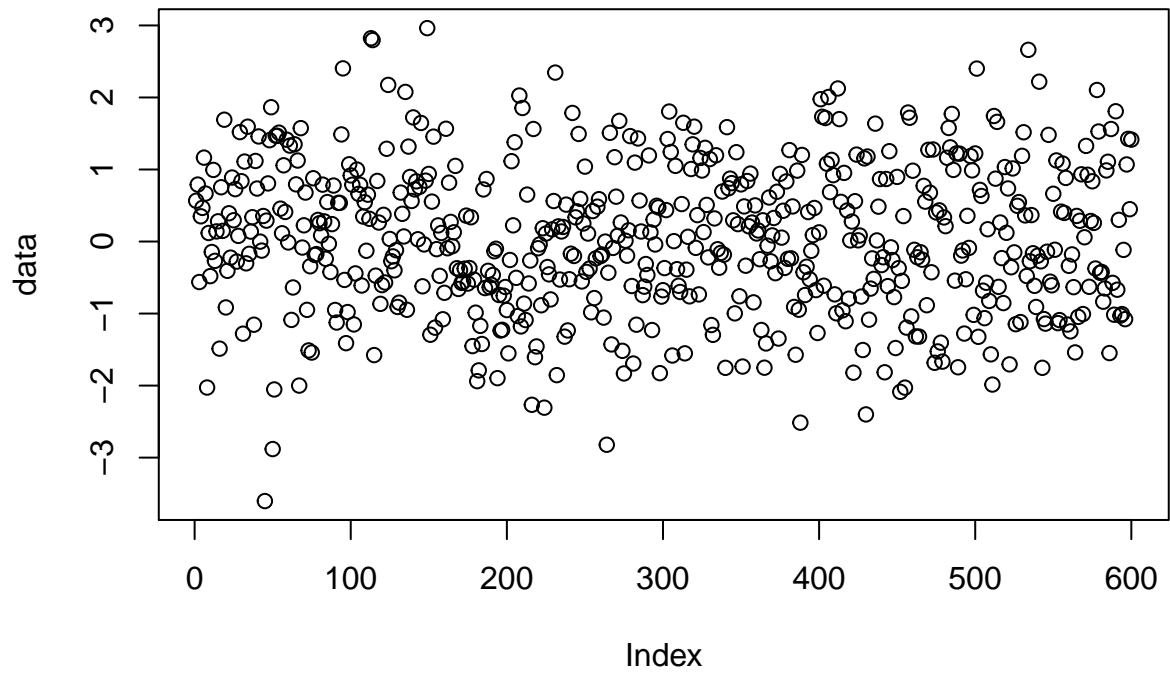
```
## elapsed
## 0.919
## elapsed
## 1.918
## [1] 400
```



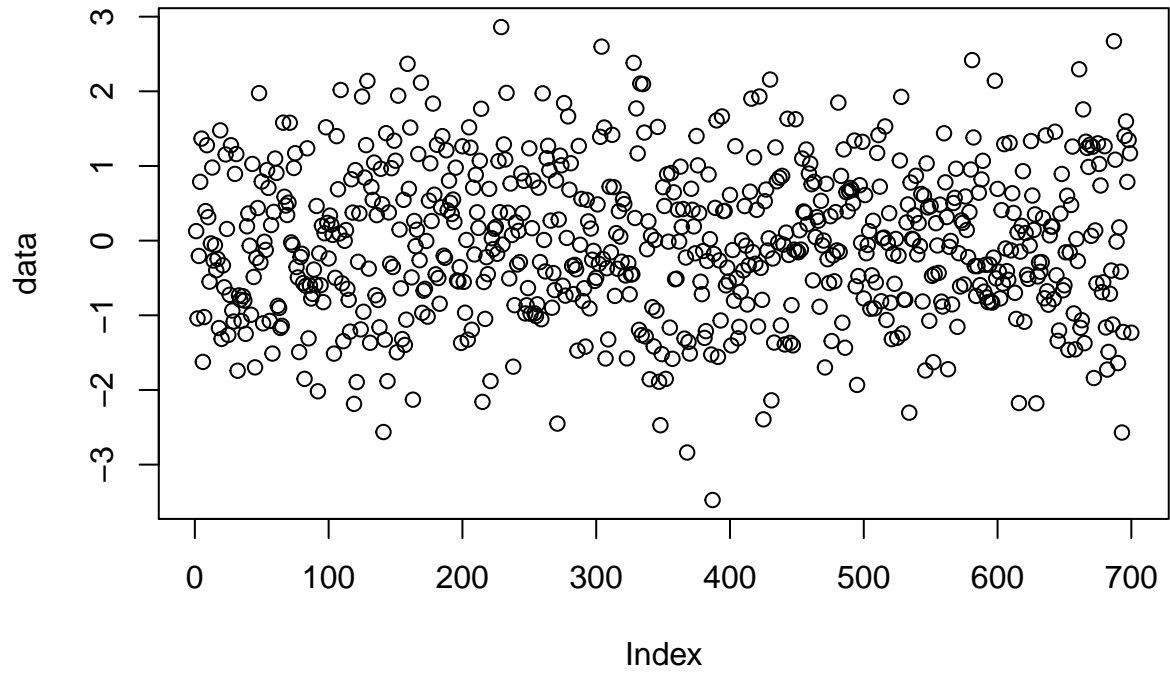
```
## elapsed
## 1.875
## elapsed
## 3.528
## [1] 500
```



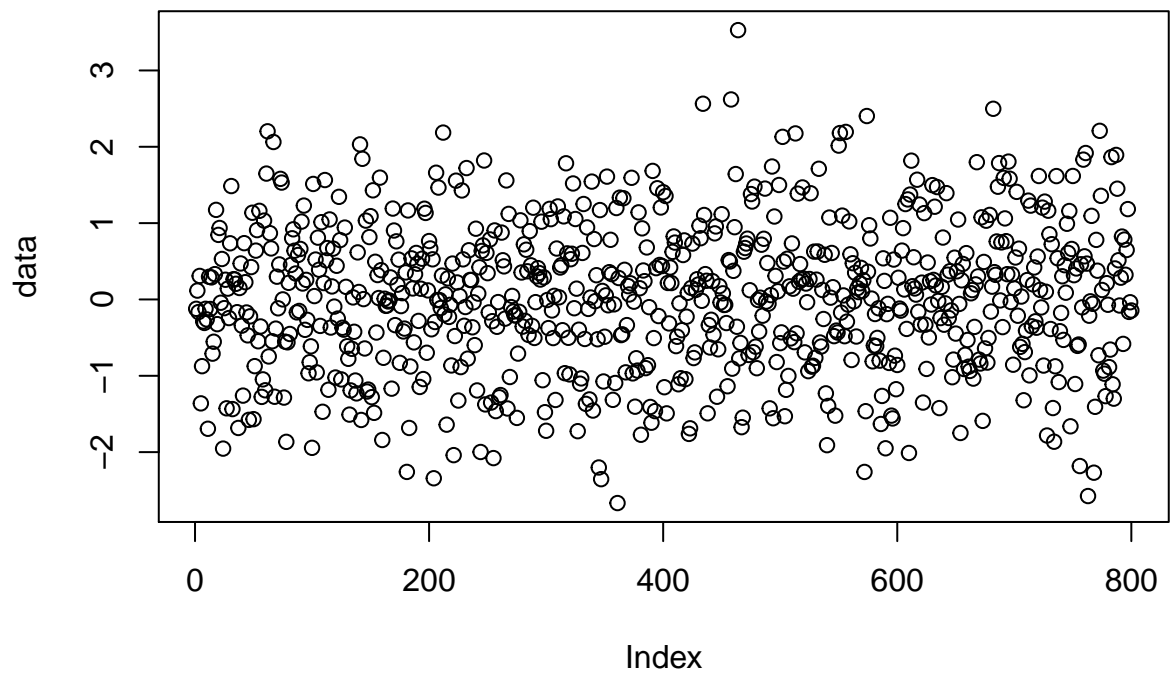
```
## elapsed
## 2.585
## elapsed
## 3.64
## [1] 600
```



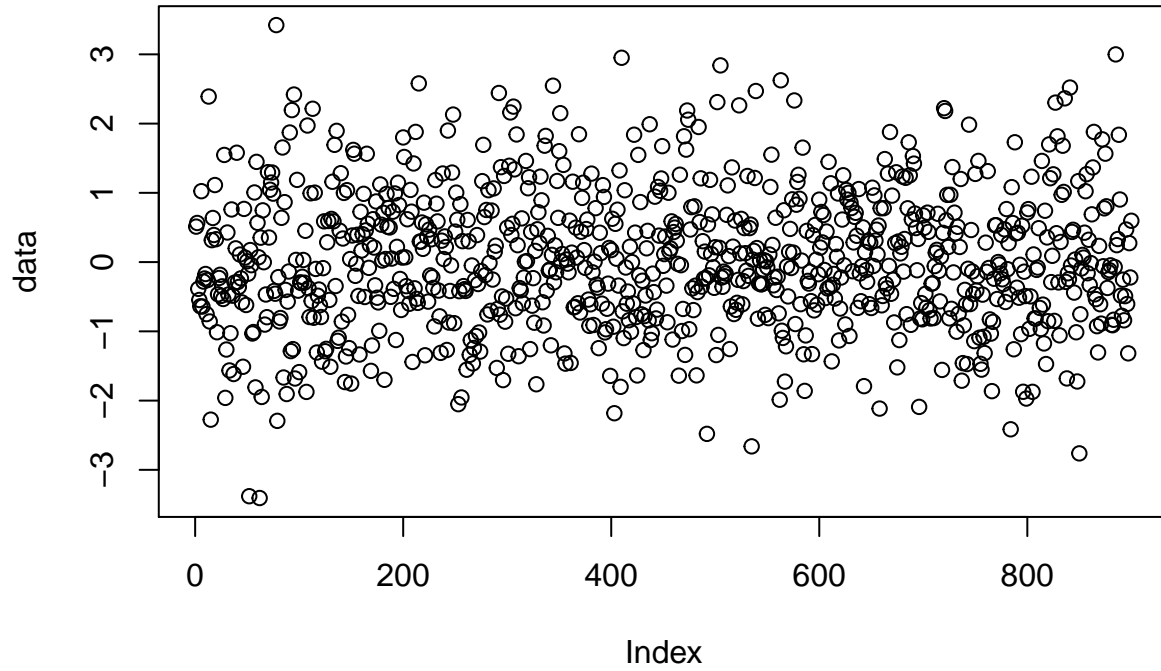
```
## elapsed
## 4.207
## elapsed
## 3.981
## [1] 700
```



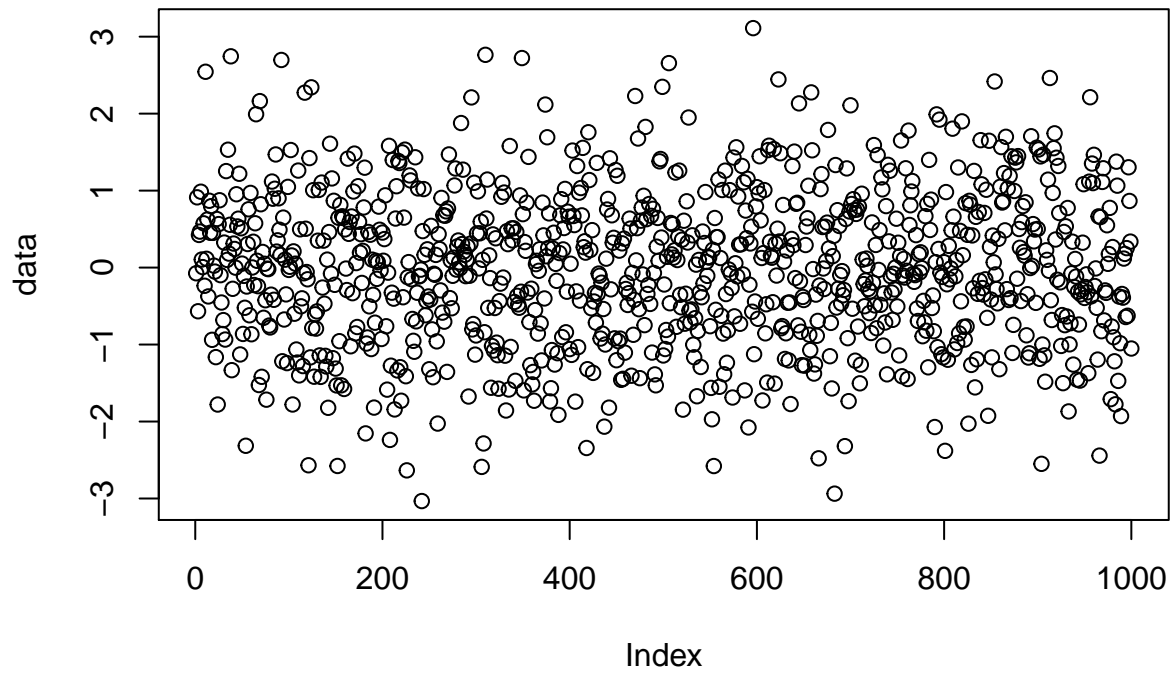
```
## elapsed
## 4.63
## elapsed
## 8.956
## [1] 800
```



```
## elapsed
## 7.316
## elapsed
## 9.946
## [1] 900
```



```
## elapsed
## 8.199
## elapsed
## 17.655
## [1] 1000
```



```
## elapsed
## 11.946
## elapsed
## 24.659
```

```
seq
```

```
## [1] 100 200 300 400 500 600 700 800 900 1000
```

```
resOPg
```

```
## elapsed elapsed elapsed elapsed elapsed elapsed elapsed elapsed elapsed elapsed
## 0.084 0.443 0.919 1.875 2.585 4.207 4.630 7.316 8.199 11.946
```

```
resPELTg
```

```
## elapsed elapsed elapsed elapsed elapsed elapsed elapsed elapsed elapsed elapsed
## 0.162 0.524 1.918 3.528 3.640 3.981 8.956 9.946 17.655 24.659
```

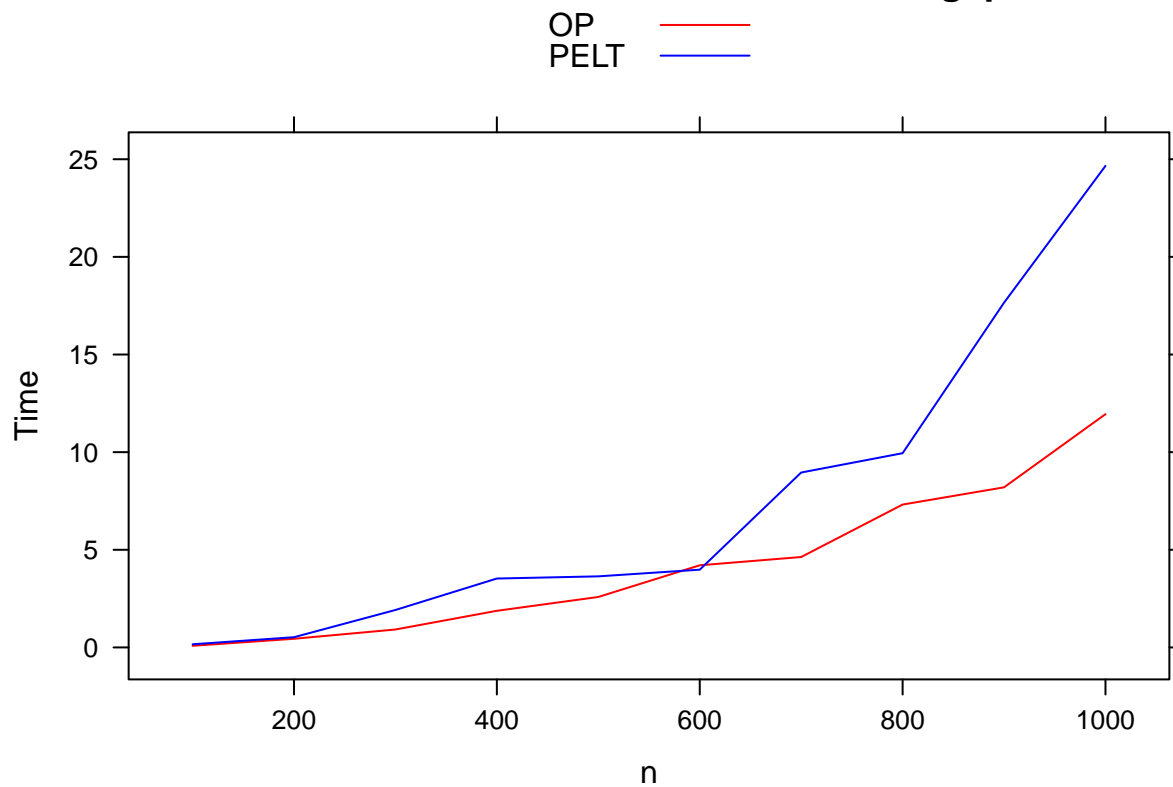
```
n <- seq
```

```
OP <- resOPg
```

```
PELT <- resPELTg
```

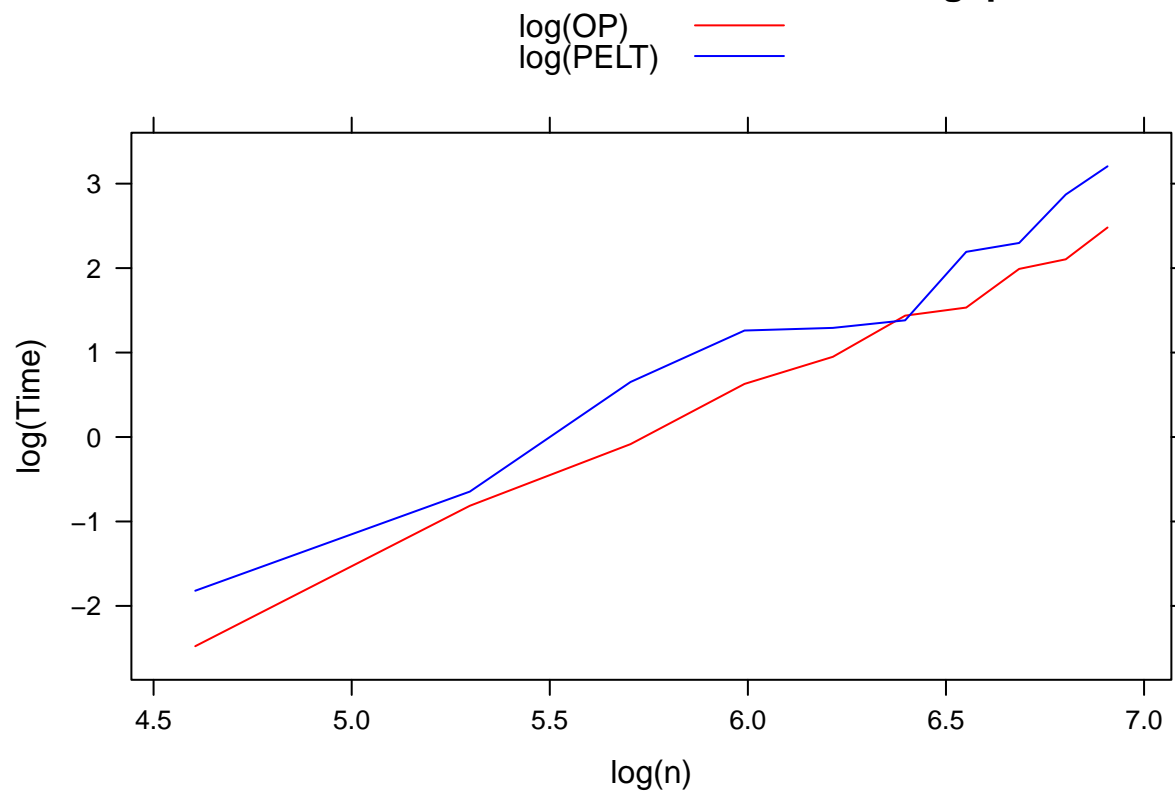
```
xyplot(OP + PELT ~ n, ylab = "Time", main = "OP vs PELT : Gaussian model without changepoint", type = "l")
```

OP vs PELT : Gaussian model without changepoint



```
xyplot(log(OP) + log(PELT) ~ log(n), ylab = "log(Time)", main = "OP vs PELT : Gaussian model without changepoint", type = "l")
```

OP vs PELT : Gaussian model without changepoint

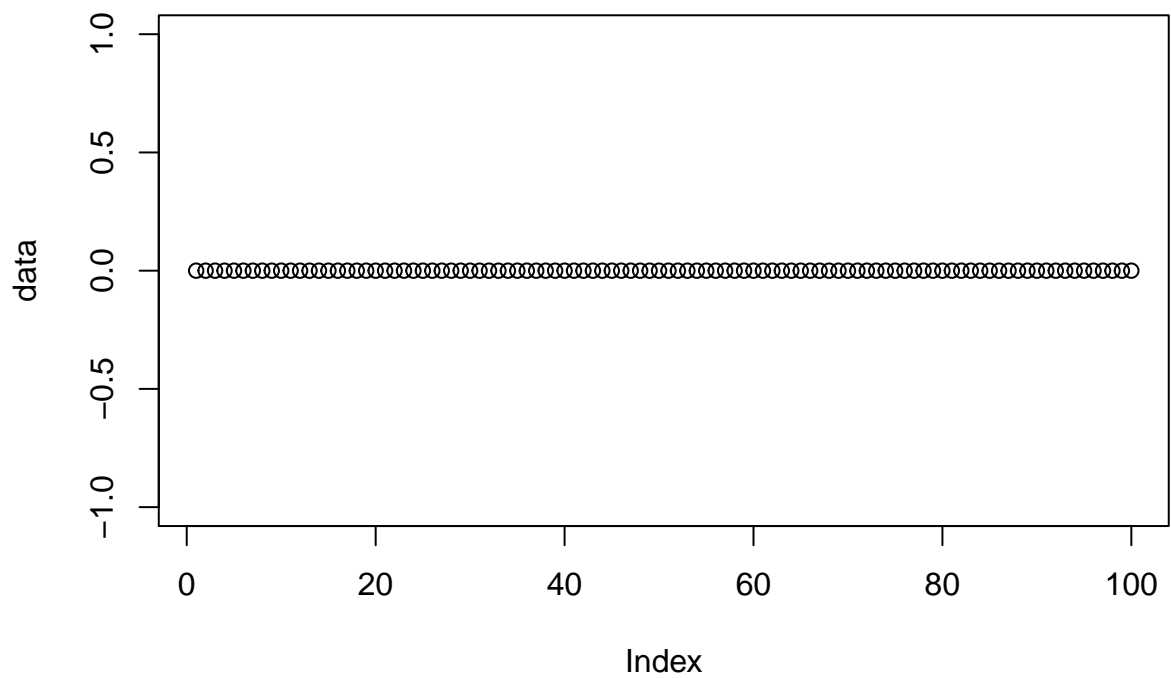


1.b) Poisson

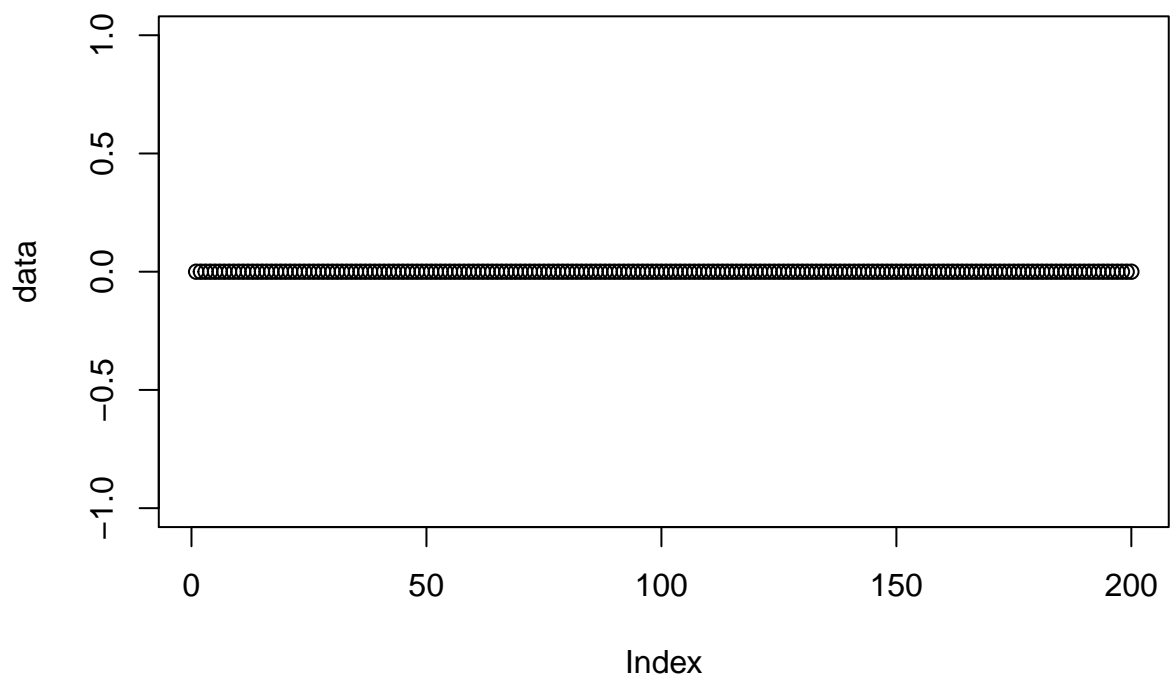
```
resOPp <- NULL
resPELTp <- NULL

for(i in seq)
{
  print(i)
  data <- data_generator(n = i, type = "poisson" )
  plot(data)
  tOP <- system.time(myOP(data, cost = "poisson"))[3]
  print(tOP)
  resOPp <- c(resOPp, tOP)
  tPELT <- system.time(myPELT(data, cost = "poisson"))[3]
  print(tPELT)
  resPELTp <- c(resPELTp, tPELT)
}
```

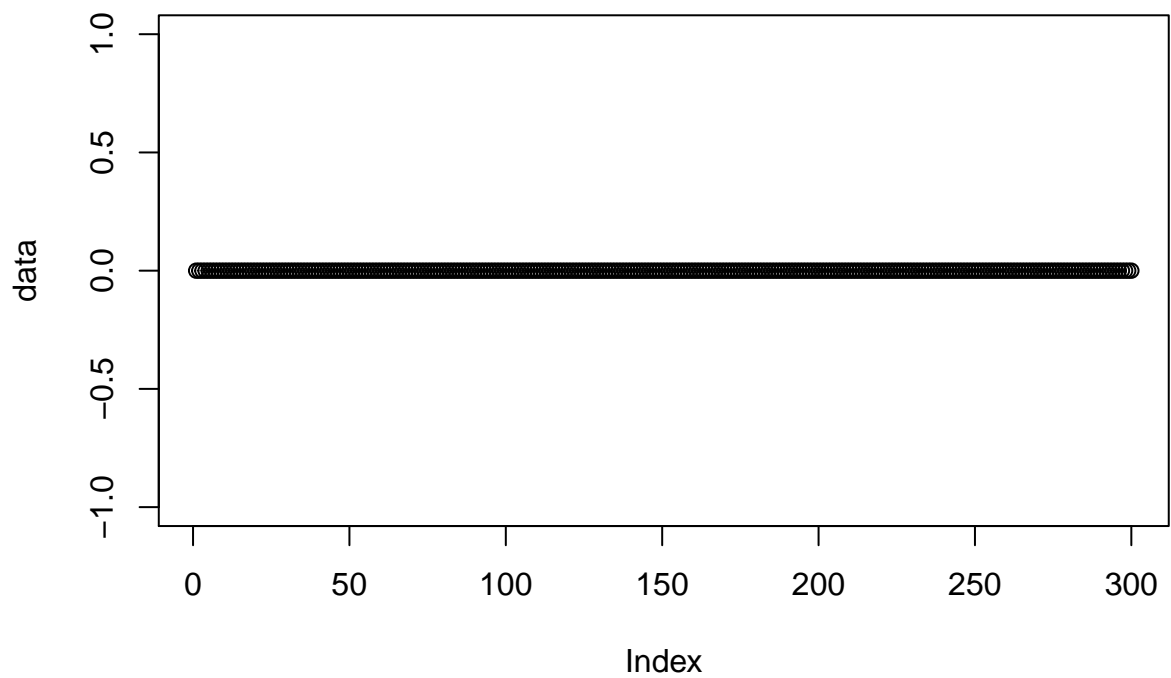
```
## [1] 100
```

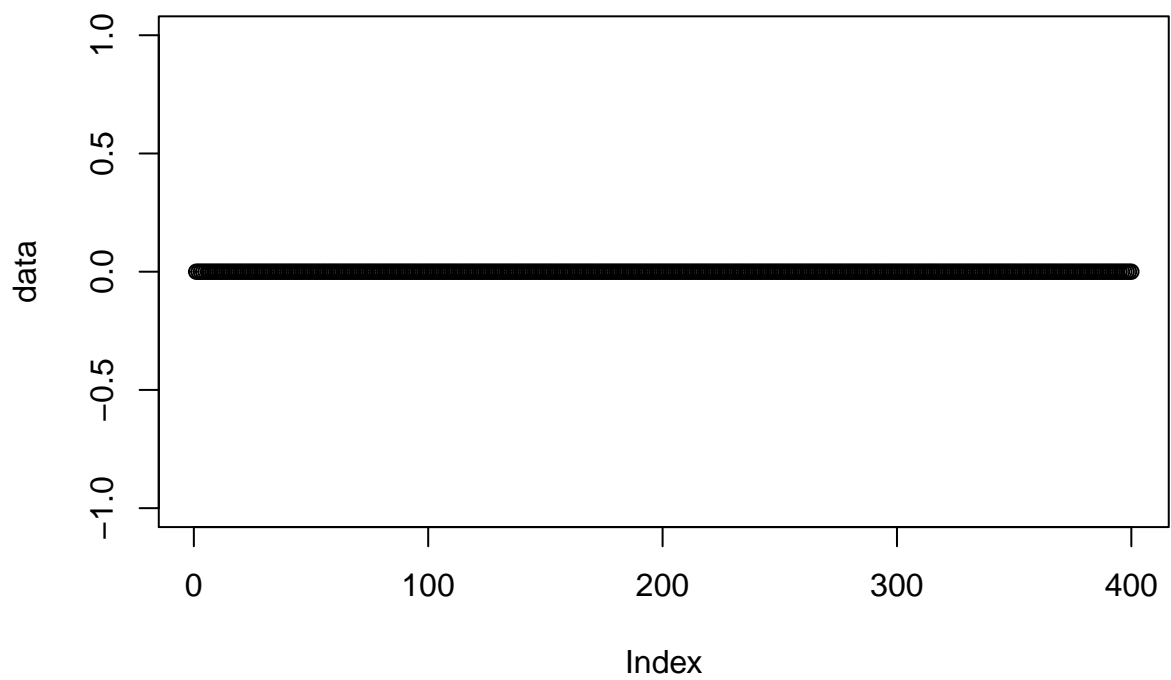
```
## elapsed  
## 0.085  
## elapsed  
## 0.003  
## [1] 200
```



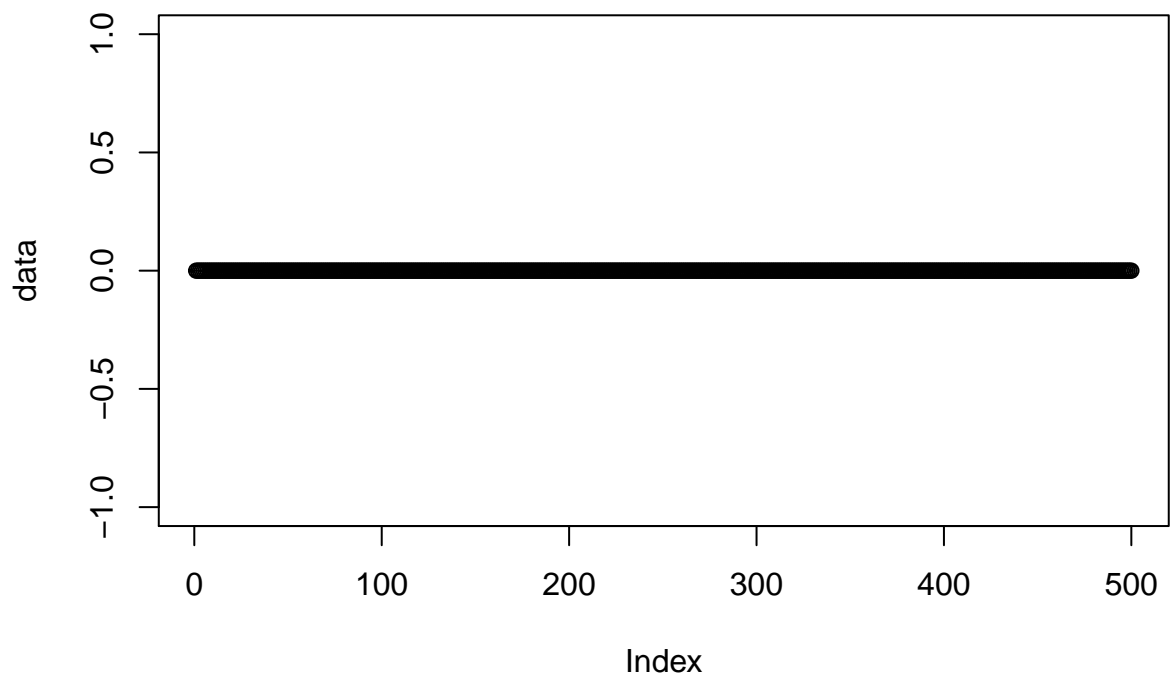
```
## elapsed  
## 0.587  
## elapsed  
## 0.007  
## [1] 300
```



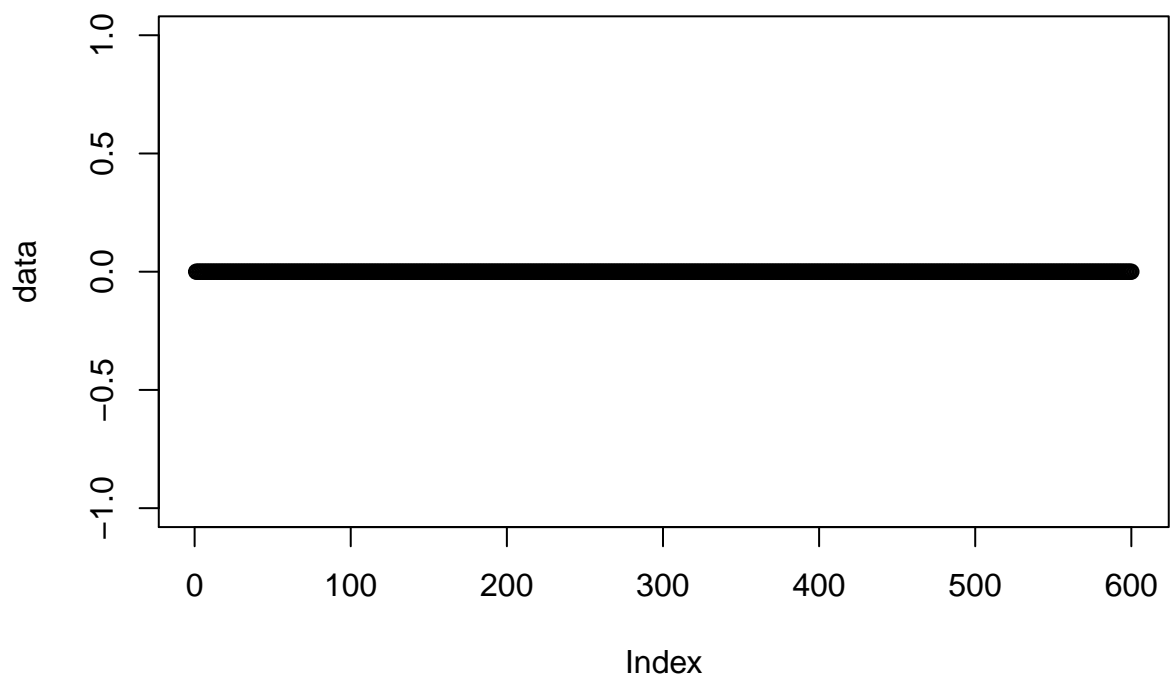
```
## elapsed  
## 0.99  
## elapsed  
## 0.014  
## [1] 400
```



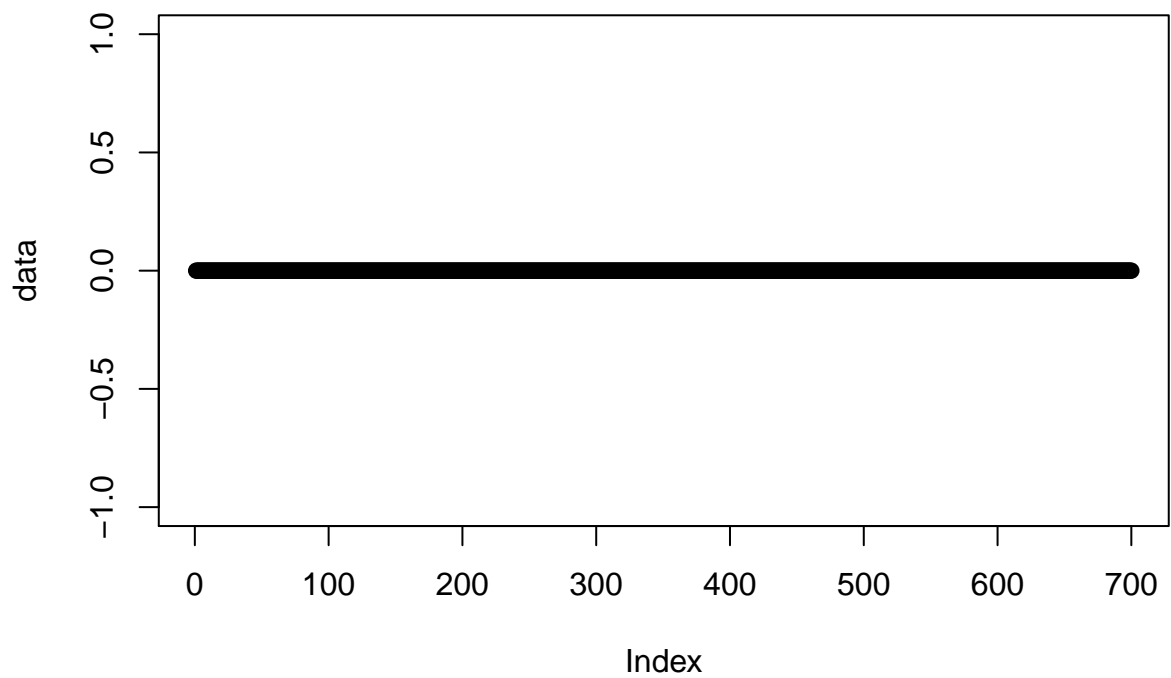
```
## elapsed  
## 1.889  
## elapsed  
## 0.022  
## [1] 500
```



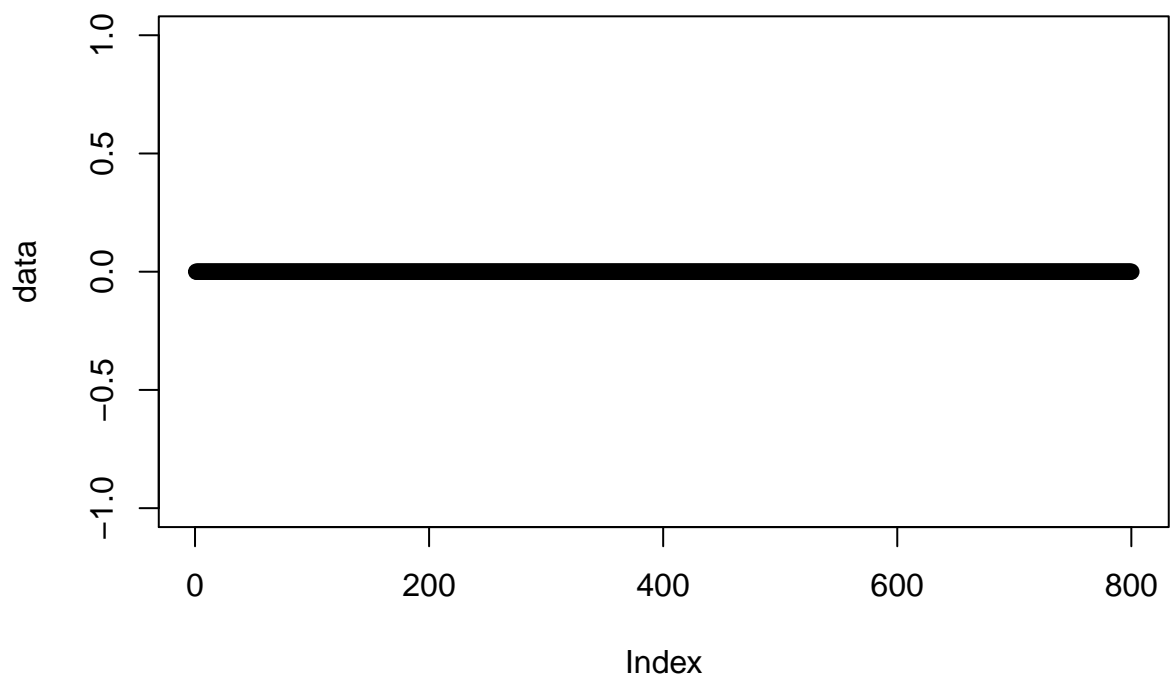
```
## elapsed  
## 3.721  
## elapsed  
## 0.036  
## [1] 600
```



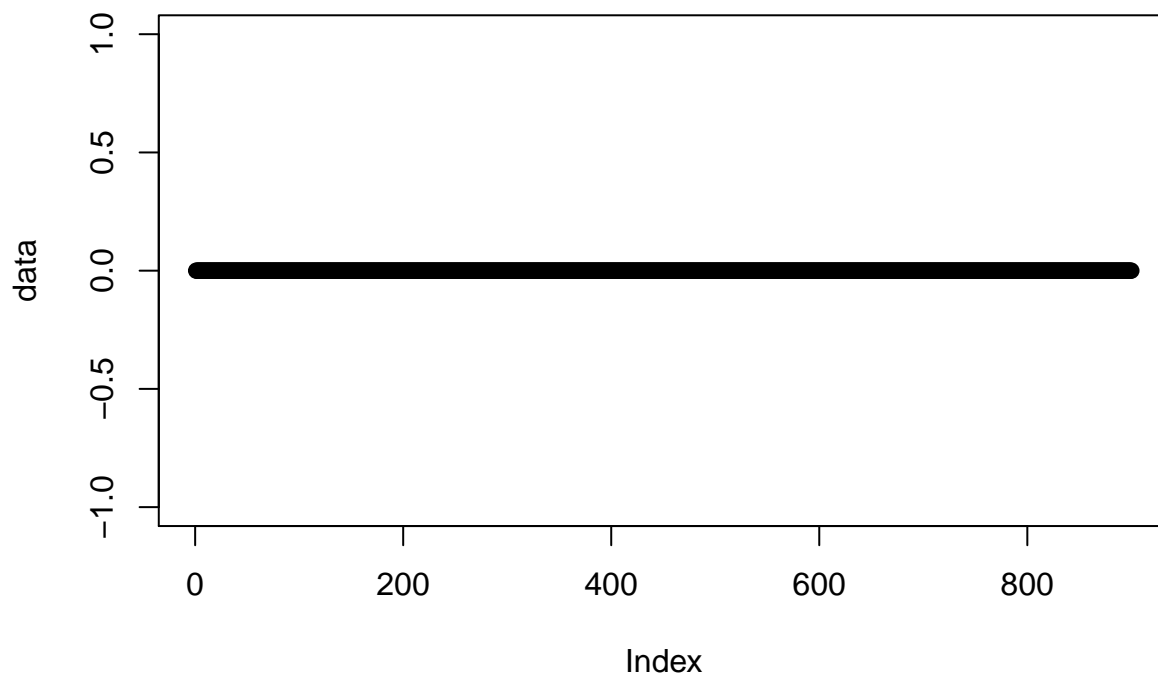
```
## elapsed  
## 5.56  
## elapsed  
## 0.029  
## [1] 700
```



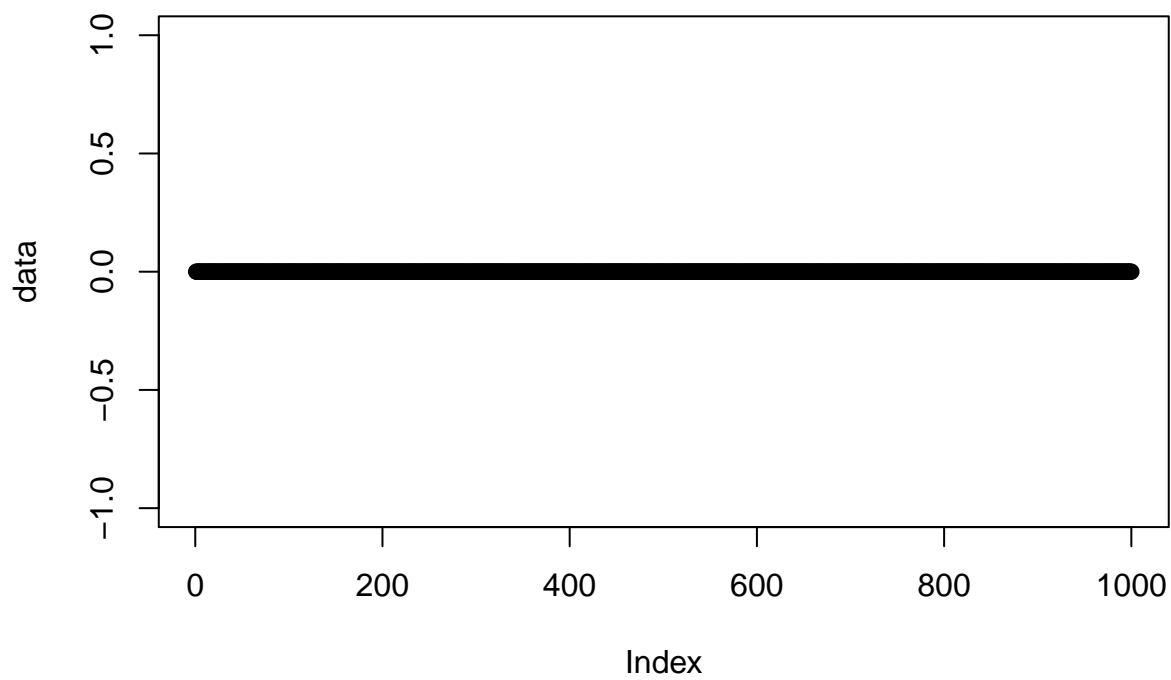
```
## elapsed  
## 7.153  
## elapsed  
## 0.041  
## [1] 800
```



```
## elapsed  
## 13.392  
## elapsed  
## 0.057  
## [1] 900
```



```
## elapsed  
## 18.672  
## elapsed  
## 0.056  
## [1] 1000
```



```
## elapsed  
## 23.988  
## elapsed  
## 0.064
```

```
seq
```

```
## [1] 100 200 300 400 500 600 700 800 900 1000
```

```
resOPp
```

```
## elapsed elapsed elapsed elapsed elapsed elapsed elapsed elapsed elapsed elapsed  
## 0.085 0.587 0.990 1.889 3.721 5.560 7.153 13.392 18.672 23.988
```

```
resPELTp
```

```
## elapsed elapsed elapsed elapsed elapsed elapsed elapsed elapsed elapsed elapsed  
## 0.003 0.007 0.014 0.022 0.036 0.029 0.041 0.057 0.056 0.064
```

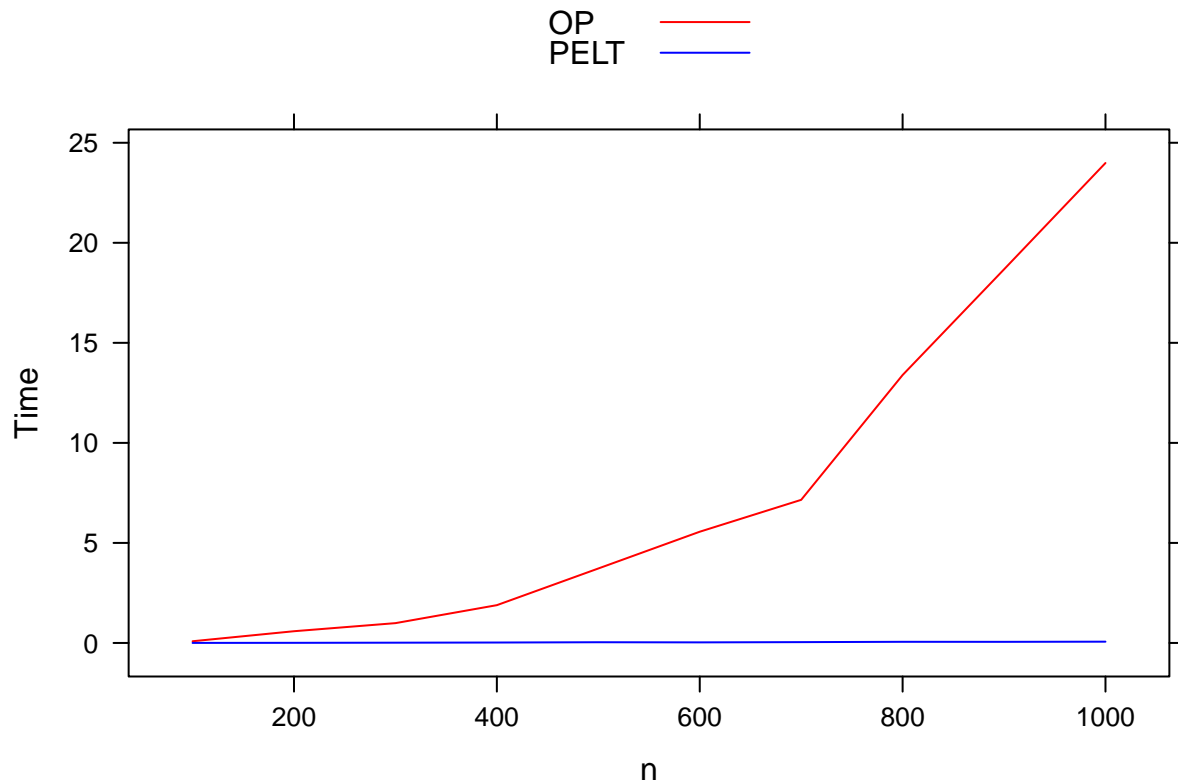
```
n <- seq
```

```
OP <- resOPp
```

```
PELT <- resPELTp
```

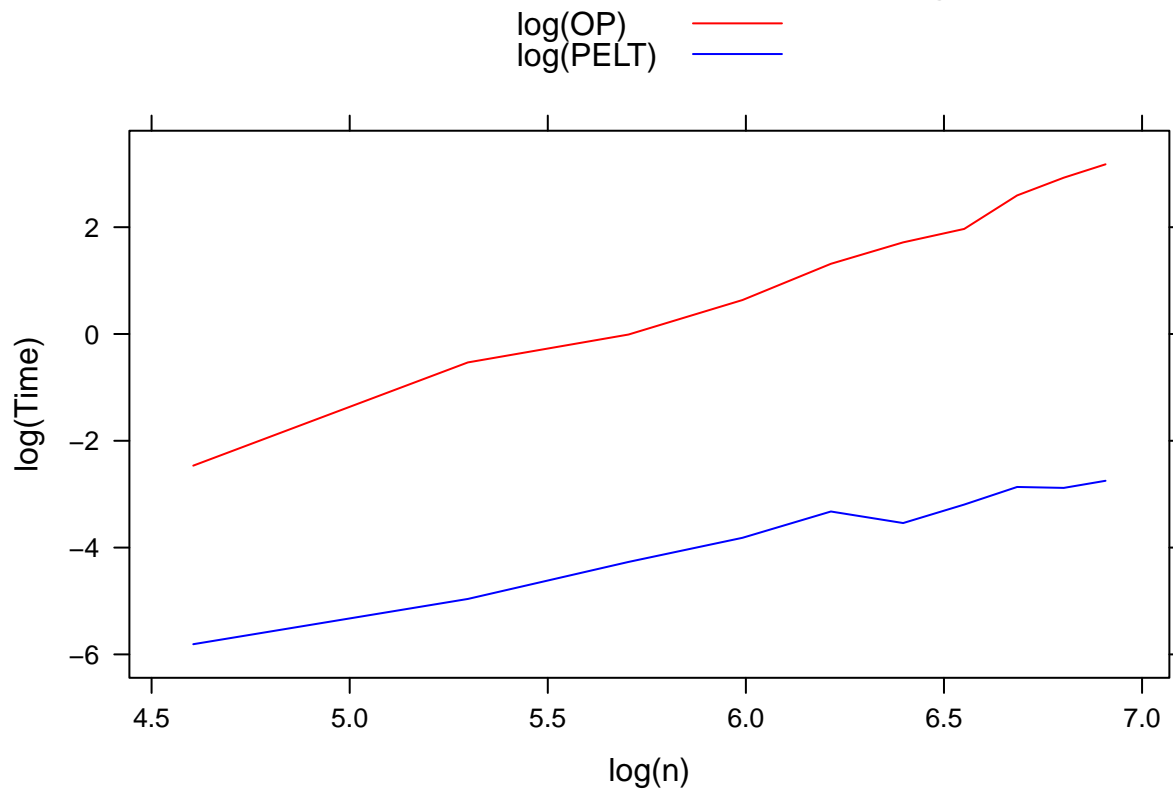
```
xyplot(OP + PELT ~ n, ylab = "Time", main = "OP vs PELT : Poisson model without changepoint", type = "l")
```

OP vs PELT : Poisson model without changepoint



```
xyplot(log(OP) + log(PELT) ~ log(n), ylab = "log(Time)", main = "OP vs PELT : Poisson model without changepoint", type = "l")
```

OP vs PELT : Poisson model without changepoint



2. Avec changepoint :

FUNCTIONS TO CREATE VECTORS FOR DATA_GENERATOR PARAMS

```
make_chpts <- function(n)
{
  if (n<0){stop('n must be non-negative')}
  else if (n <= 100){res <- seq(from = 0, to = n-1, by = n/2)}
  else if (n <= 200){res <- seq(from = 0, to = n-1, by = n/4)}
  else if (n <= 500){res <- seq(from = 0, to = n-1, by = n/5)}
  else if (n <= 1000){res <- seq(from = 0, to = n-1, by = n/10)}
  else {res <- seq(from = 0, to = n-1, by = n/20)}
  return (res)
}

make_means <- function(n)
{
  res <- NULL
  tmp <- 0
  for (i in 1:(n+1)){
    rand <- sample(0:10, 1)
    while (rand == tmp){rand <- sample(1:10, 1)}
    tmp <- rand
    res <- c(res,rand)
  }
}
```

```

    return (res)
}

```

2.a) Gaussien

```

reschgtOPg <- NULL
reschgtPELTg <- NULL

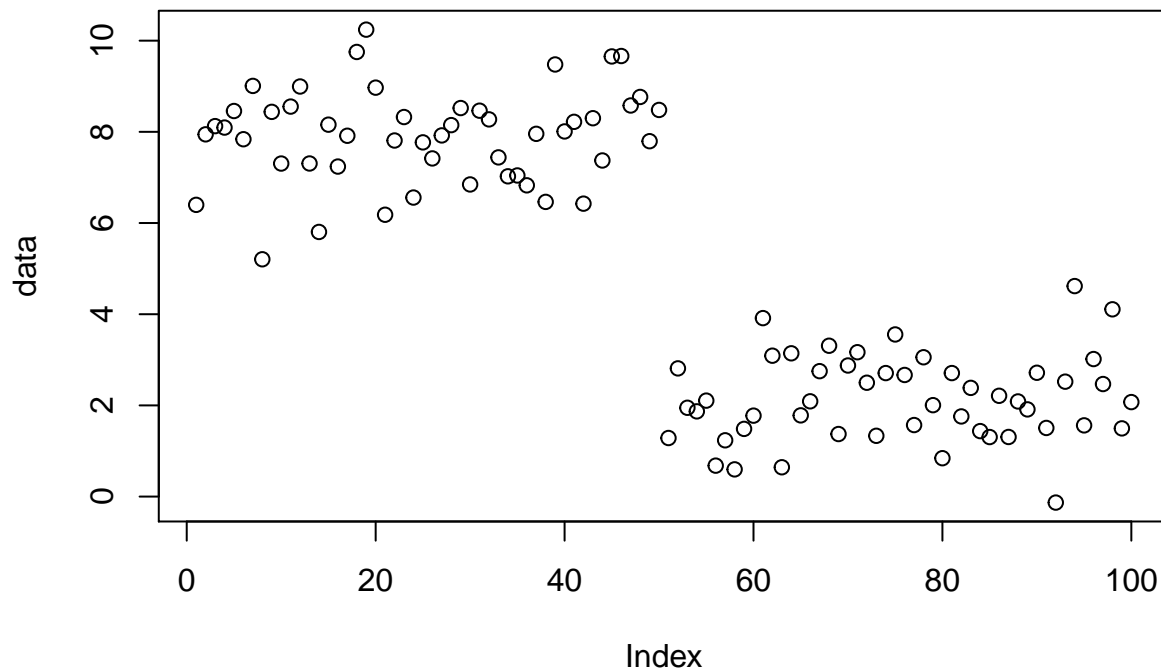
for(i in seq)
{
  print(i)
  chgt <- make_chpts(i)
  print(chgt)
  moys <- make_means(length(chgt))
  data <- data_generator(n = i, chpts = chgt, means = moys, type = "gauss")
  plot(data)
  tOP <- system.time(myOP(data, cost = "gauss"))[3]
  print(tOP)
  reschgtOPg <- c(reschgtOPg, tOP)
  tPELT <- system.time(myPELT(data, cost = "gauss"))[3]
  print(tPELT)
  reschgtPELTg <- c(reschgtPELTg, tPELT)
}

```

```

## [1] 100
## [1] 0 50

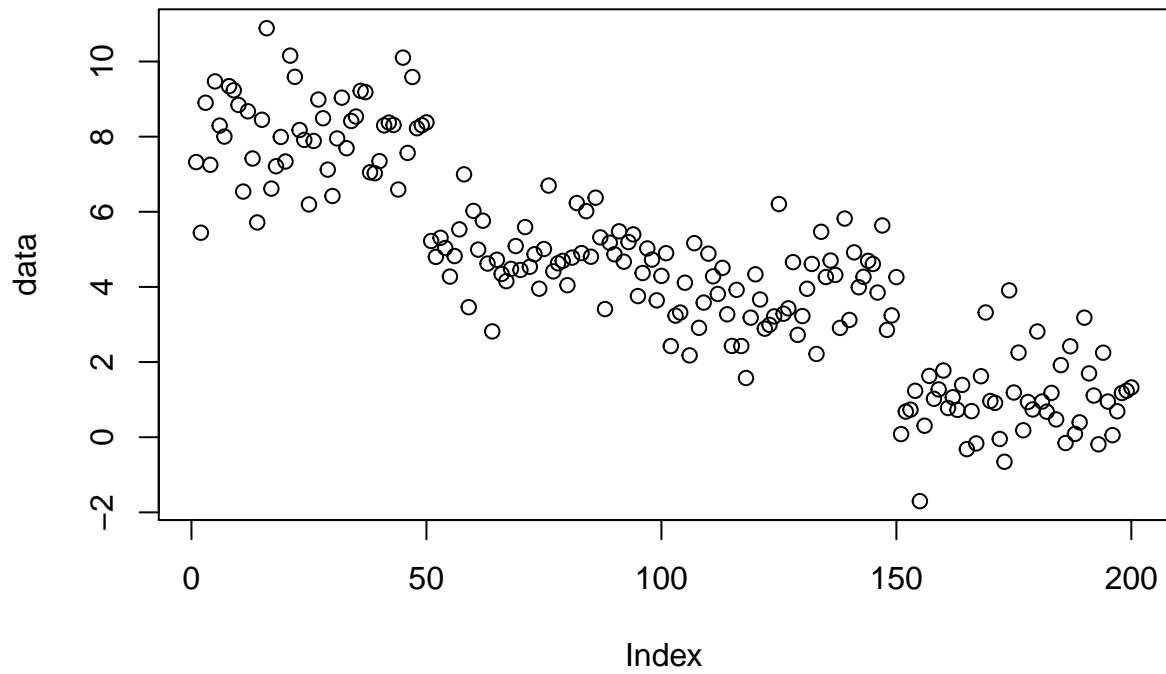
```



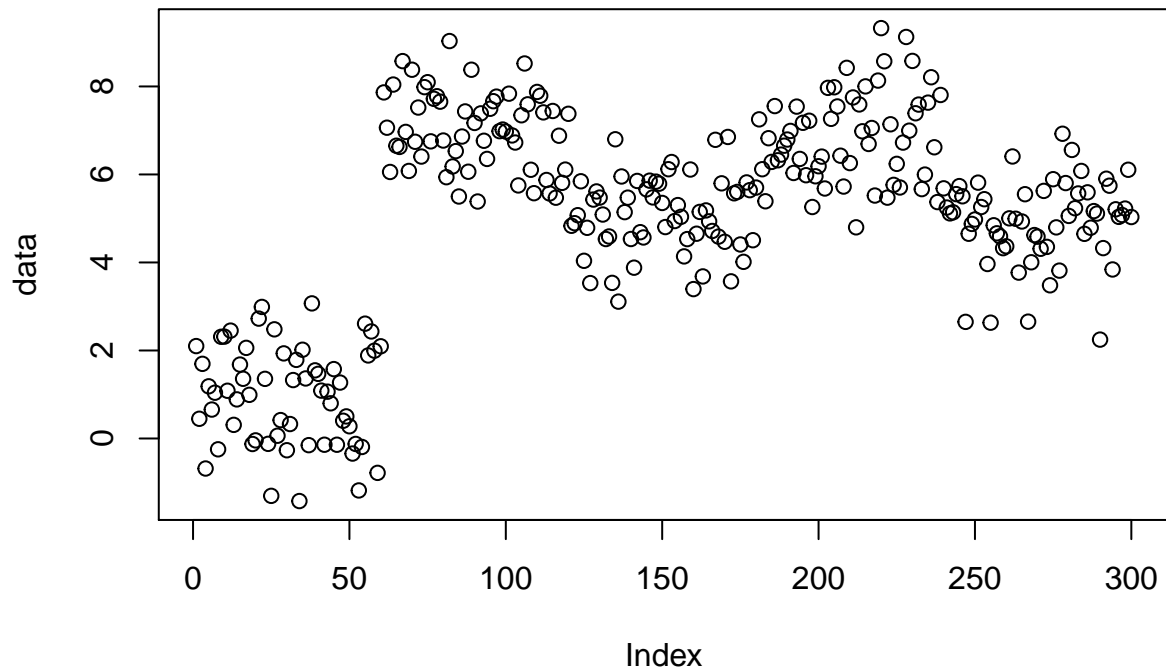
```

## elapsed
## 0.093
## elapsed
## 0.17
## [1] 200
## [1] 0 50 100 150

```

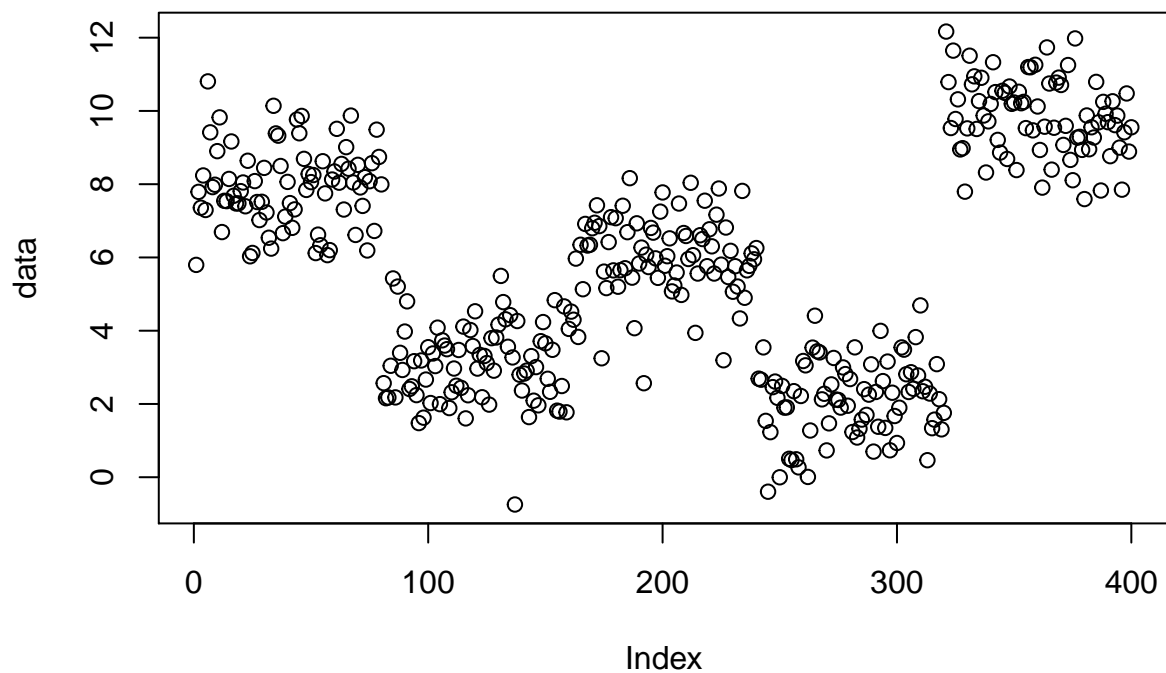



```
## elapsed
## 0.391
## elapsed
## 0.367
## [1] 300
## [1] 0 60 120 180 240
```



```
## elapsed
## 0.919
## elapsed
## 0.995
## [1] 400
```

```
## [1] 0 80 160 240 320
```



```
## elapsed
```

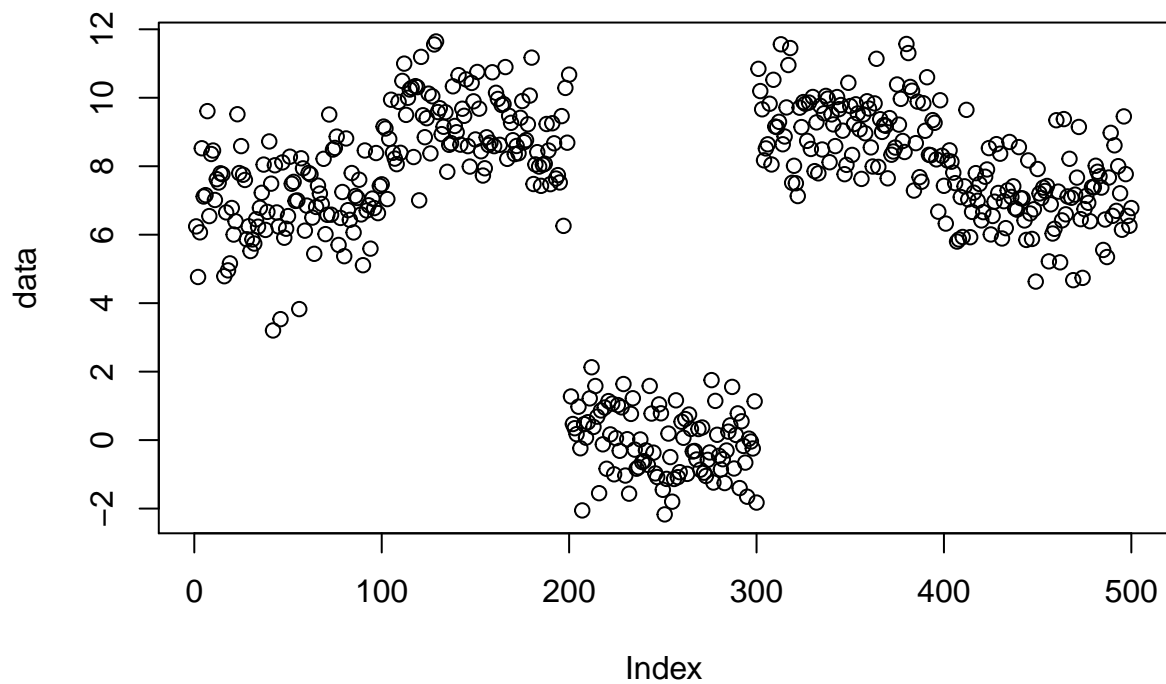
```
## 1.578
```

```
## elapsed
```

```
## 0.788
```

```
## [1] 500
```

```
## [1] 0 100 200 300 400
```

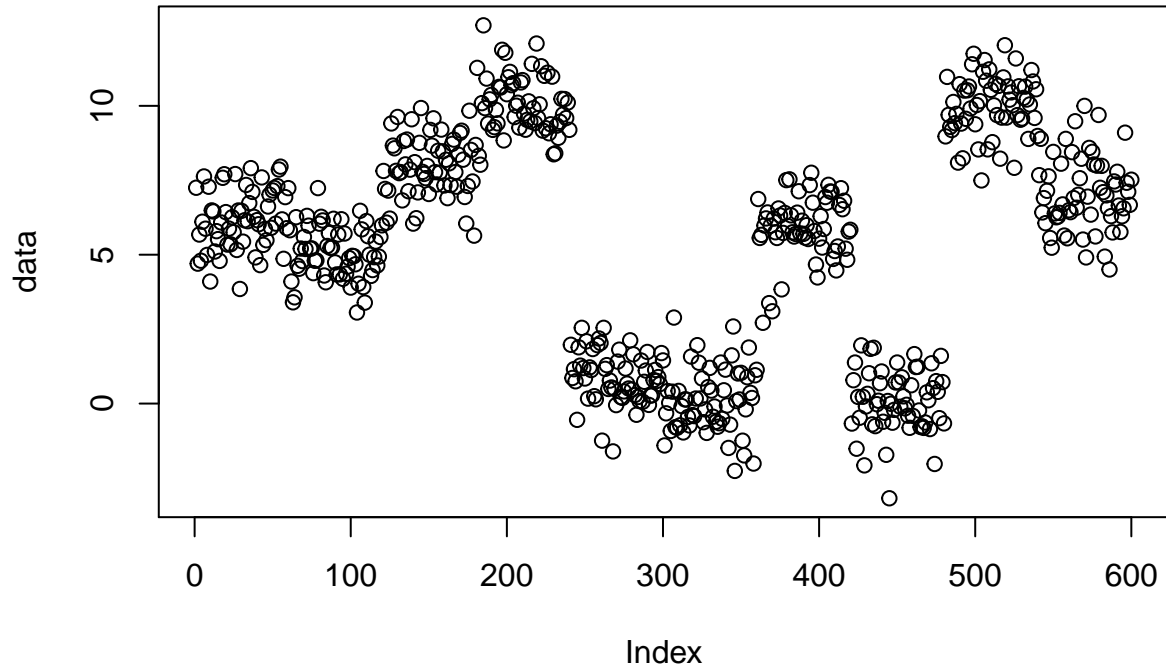


```
## elapsed
```

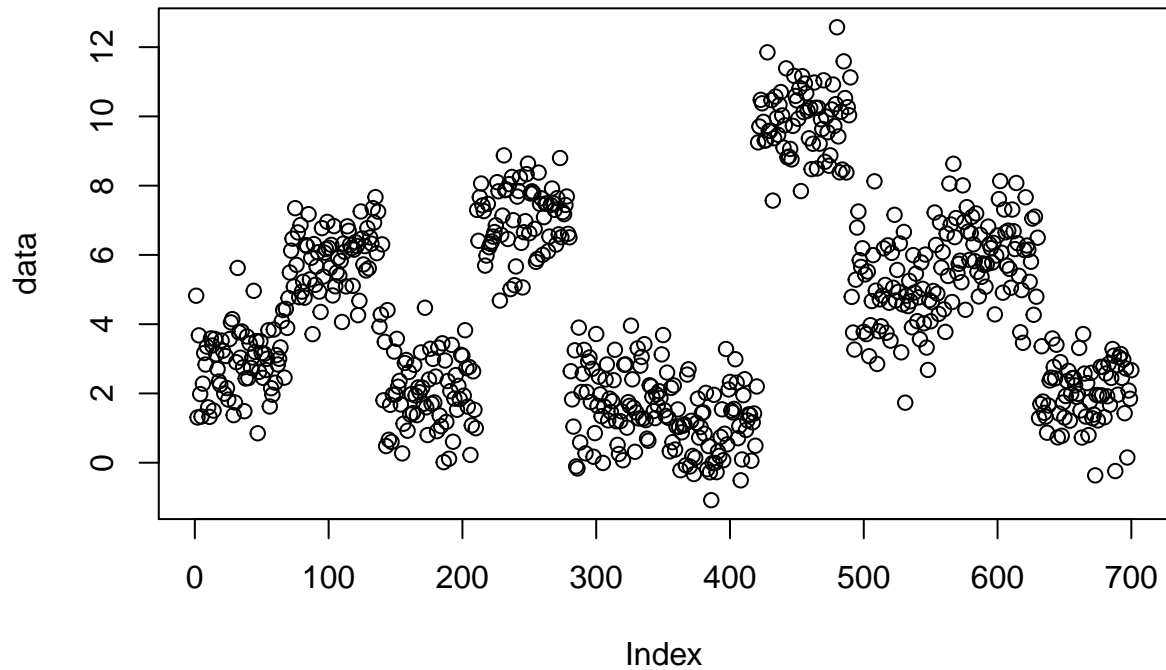
```
## 2.3
```

```
## elapsed
```

```
## 1.335
## [1] 600
## [1] 0 60 120 180 240 300 360 420 480 540
```

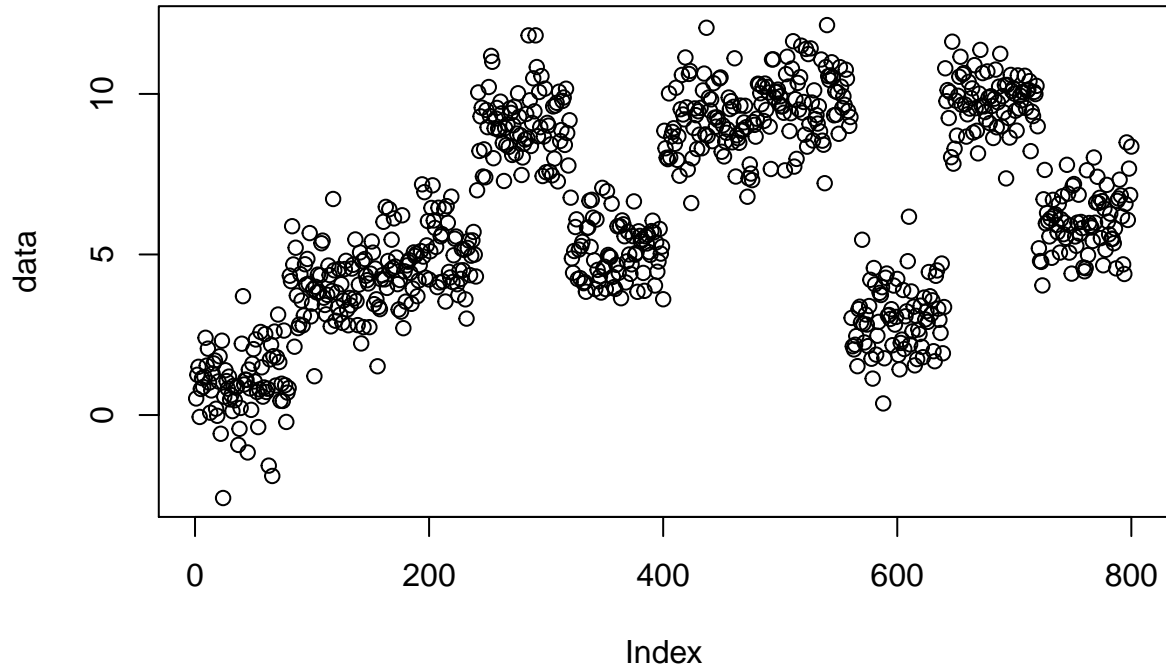


```
## elapsed
## 3.131
## elapsed
## 1.313
## [1] 700
## [1] 0 70 140 210 280 350 420 490 560 630
```

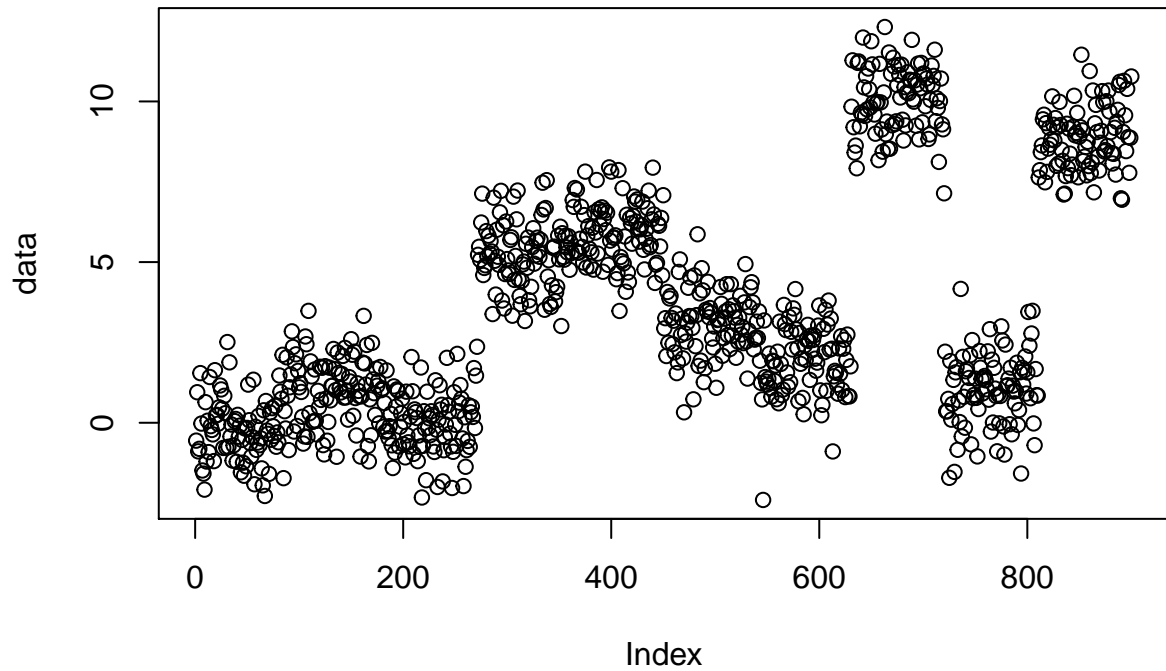


```
## elapsed
```

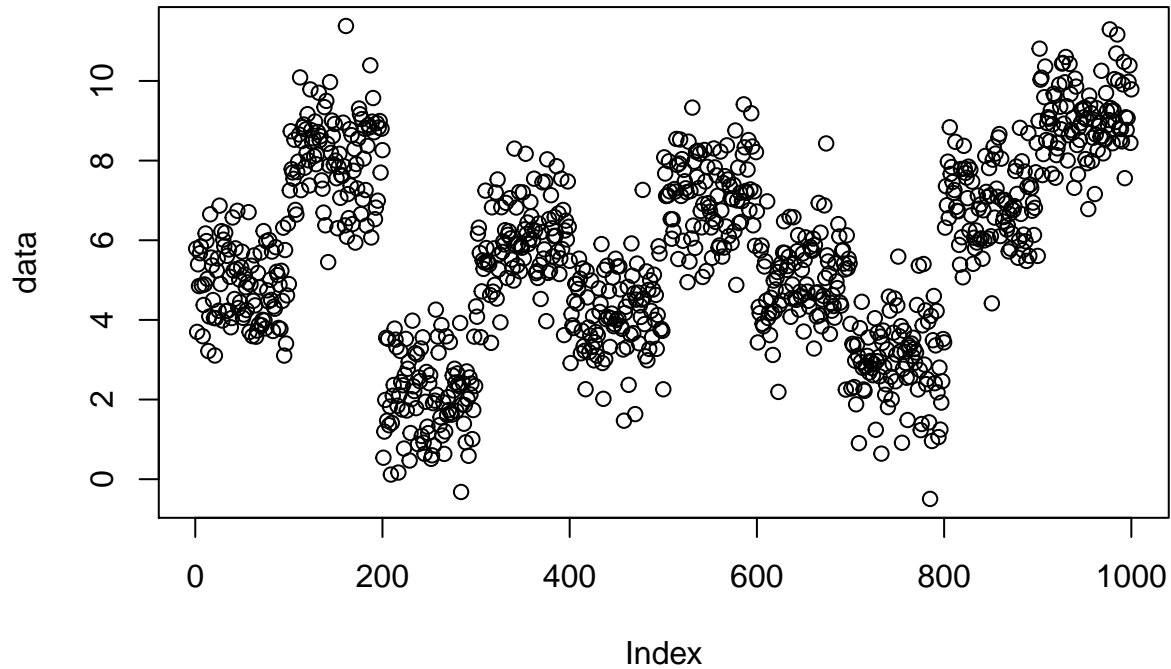
```
## 4.563
## elapsed
## 1.388
## [1] 800
## [1] 0 80 160 240 320 400 480 560 640 720
```



```
## elapsed
## 6.303
## elapsed
## 2.026
## [1] 900
## [1] 0 90 180 270 360 450 540 630 720 810
```



```
## elapsed
## 8.319
## elapsed
## 3.465
## [1] 1000
## [1] 0 100 200 300 400 500 600 700 800 900
```



```
## elapsed
## 9.735
## elapsed
## 2.399
```

```
seq
```

```
## [1] 100 200 300 400 500 600 700 800 900 1000
```

```
reschgtOPg
```

```
## elapsed elapsed elapsed elapsed elapsed elapsed elapsed elapsed elapsed elapsed
## 0.093 0.391 0.919 1.578 2.300 3.131 4.563 6.303 8.319 9.735
```

```
reschgtPELTg
```

```
## elapsed elapsed elapsed elapsed elapsed elapsed elapsed elapsed elapsed elapsed
## 0.170 0.367 0.995 0.788 1.335 1.313 1.388 2.026 3.465 2.399
```

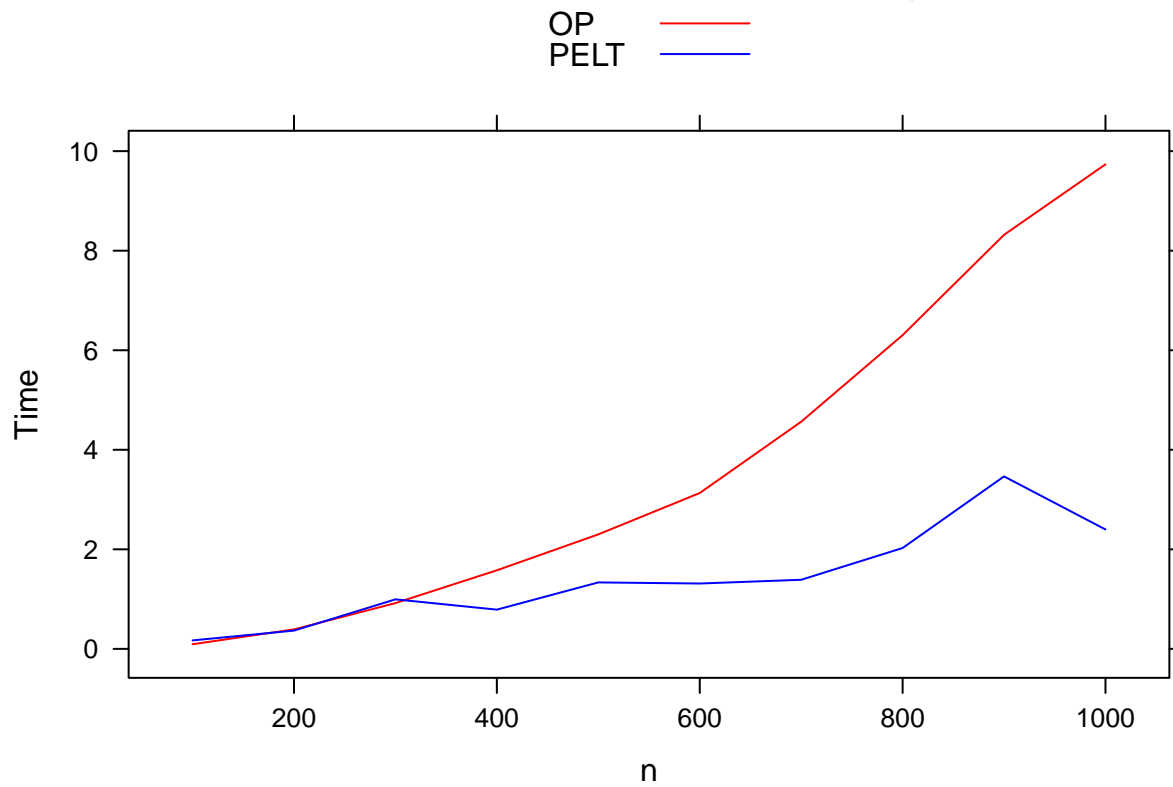
```
n <- seq
```

```
OP <- reschgtOPg
```

```
PELT <- reschgtPELTg
```

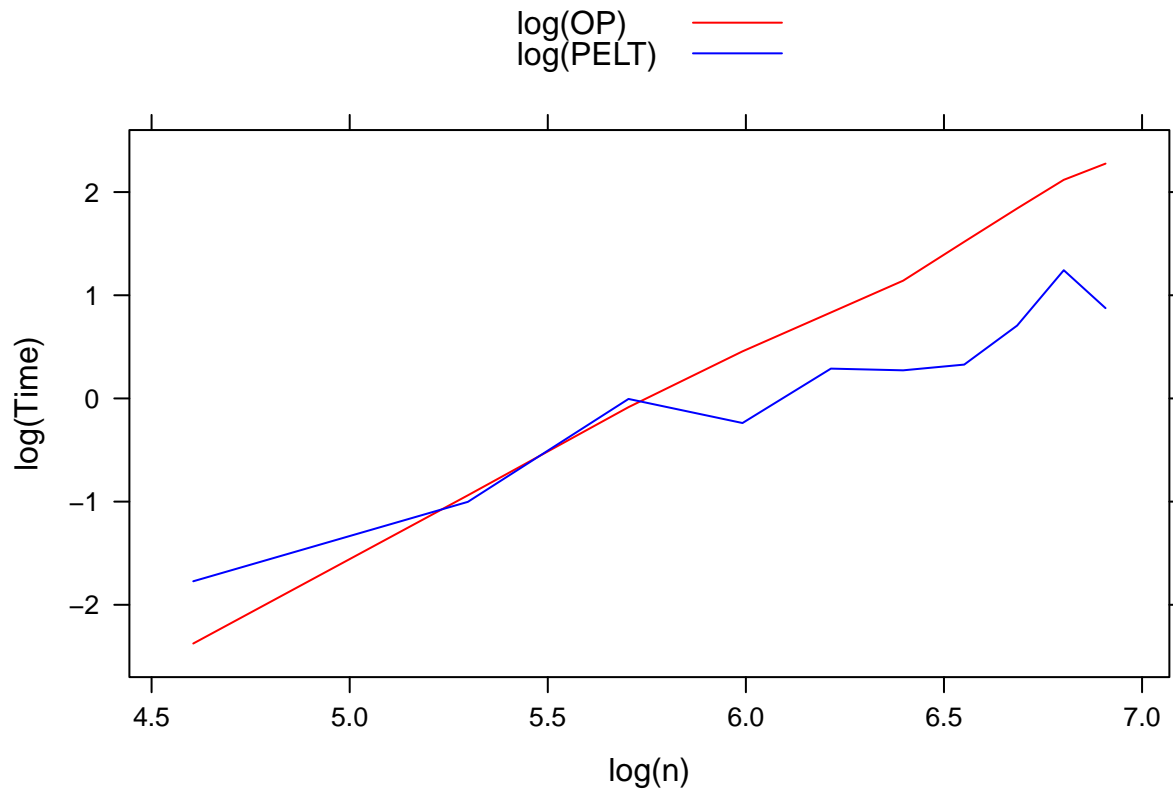
```
xyplot(OP + PELT ~ n, ylab = "Time", main = "OP vs PELT : Gaussian model with changepoints", type = "l")
```

OP vs PELT : Gaussian model with changepoints



```
xyplot(log(OP) + log(PELT) ~ log(n), ylab = "log(Time)", main = "OP vs PELT : Gaussian model with changepoints")
```

OP vs PELT : Gaussian model with changepoints



2.b) Poisson

```

reschgtOPp <- NULL
reschgtPELTp <- NULL

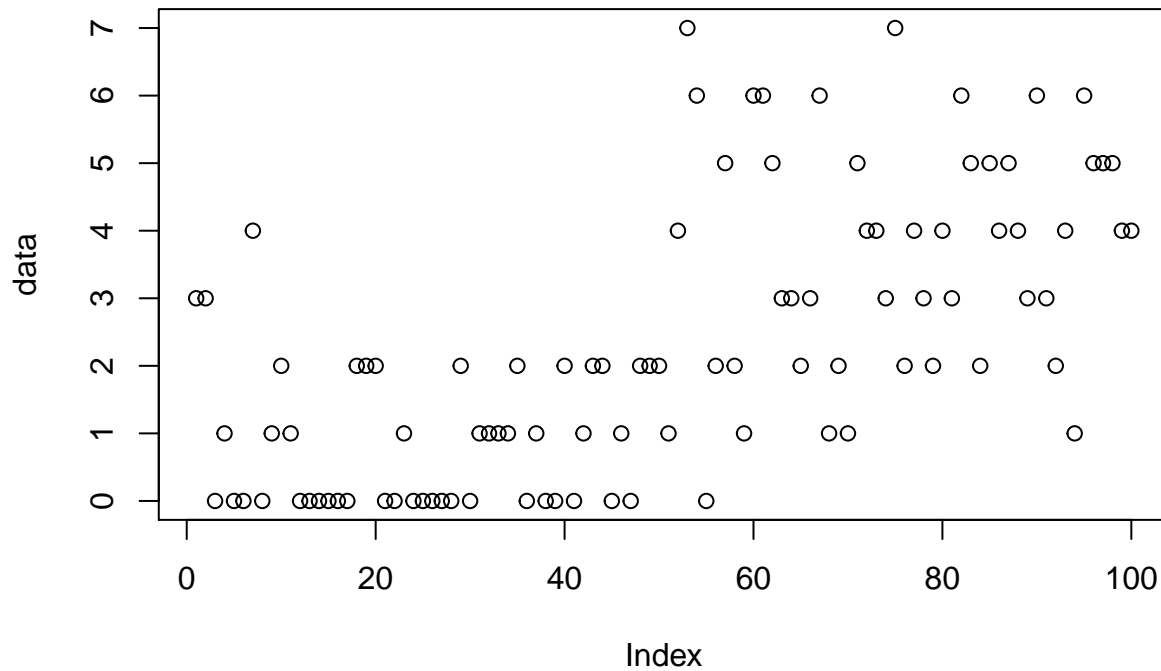
for(i in seq)
{
  print(i)
  chgt <- make_chpts(i)
  print(chgt)
  moys <- make_means(length(chgt))
  data <- data_generator(n = i, chpts = chgt, means = moys, type = "poisson")
  plot(data)
  tOP <- system.time(myOP(data, cost = "poisson"))[3]
  print(tOP)
  reschgtOPp <- c(reschgtOPp, tOP)
  tPELT <- system.time(myPELT(data, cost = "poisson"))[3]
  print(tPELT)
  reschgtPELTp <- c(reschgtPELTp, tPELT)
}

```

```

## [1] 100
## [1] 0 50

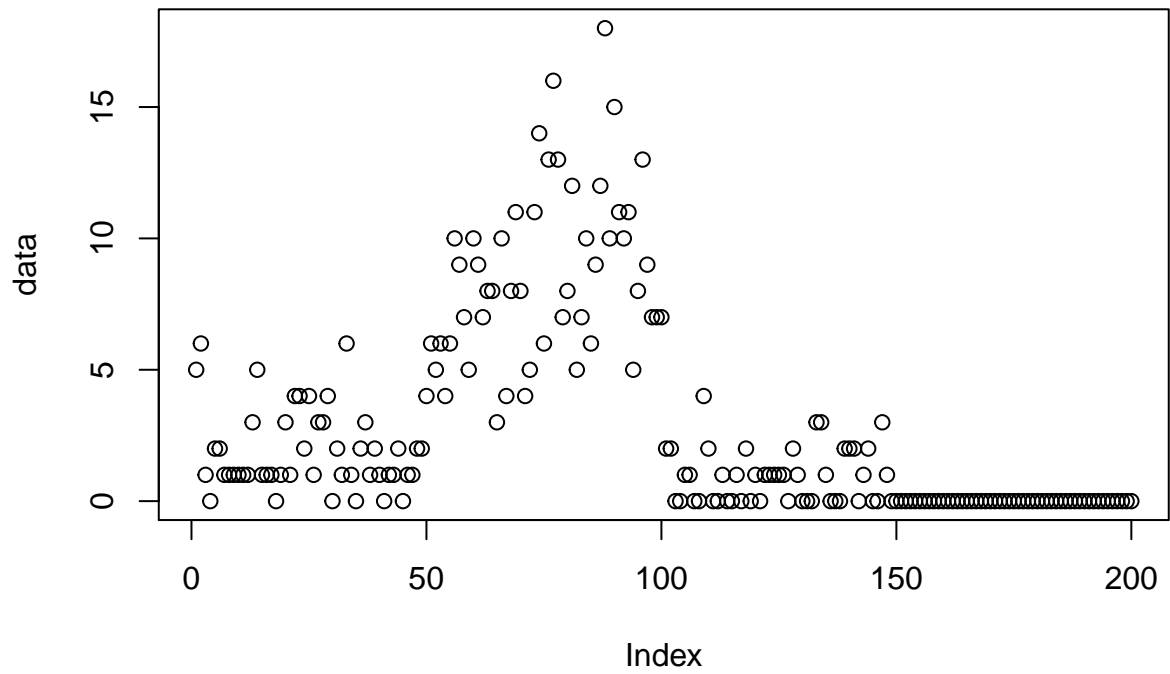
```



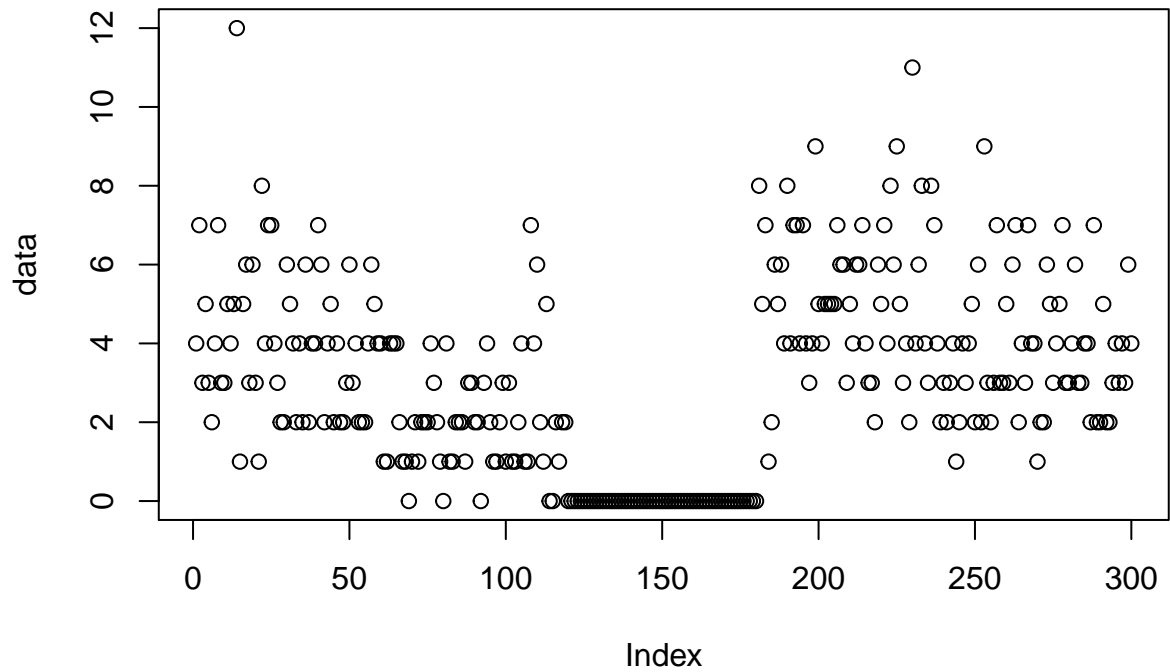
```

## elapsed
## 0.069
## elapsed
## 0.171
## [1] 200
## [1] 0 50 100 150

```



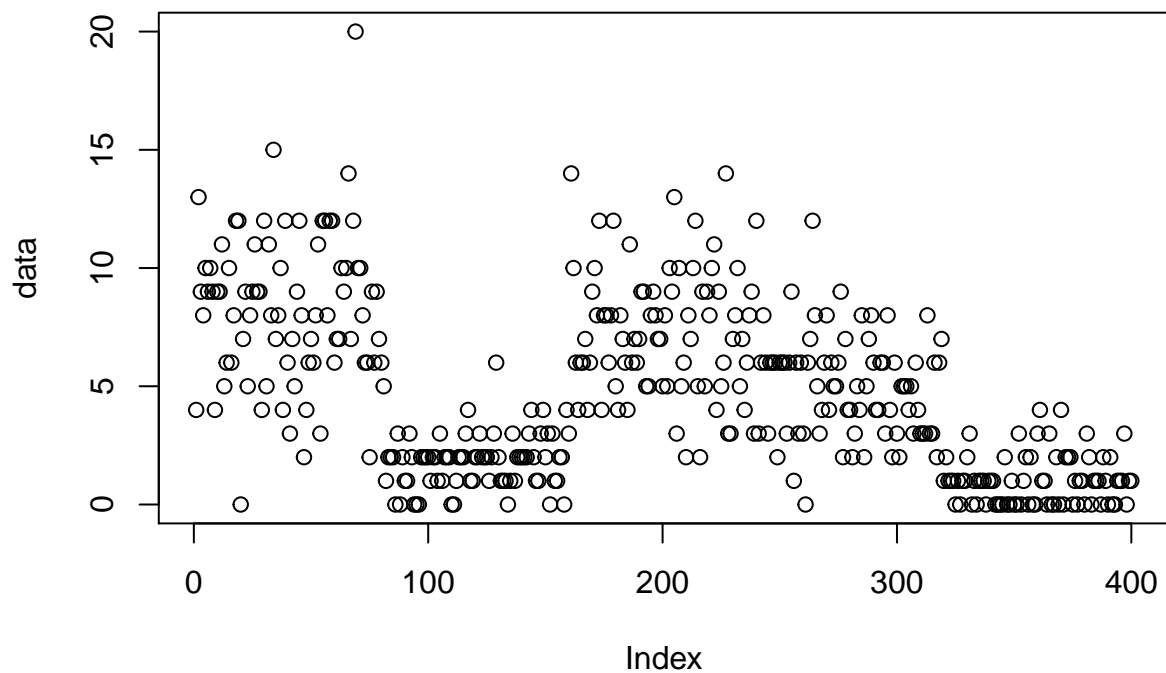
```
## elapsed
## 0.442
## elapsed
## 0.614
## [1] 300
## [1] 0 60 120 180 240
```



```
## elapsed
## 0.947
## elapsed
## 0.795
## [1] 400
```



```
## [1] 0 80 160 240 320
```



```
## elapsed
```

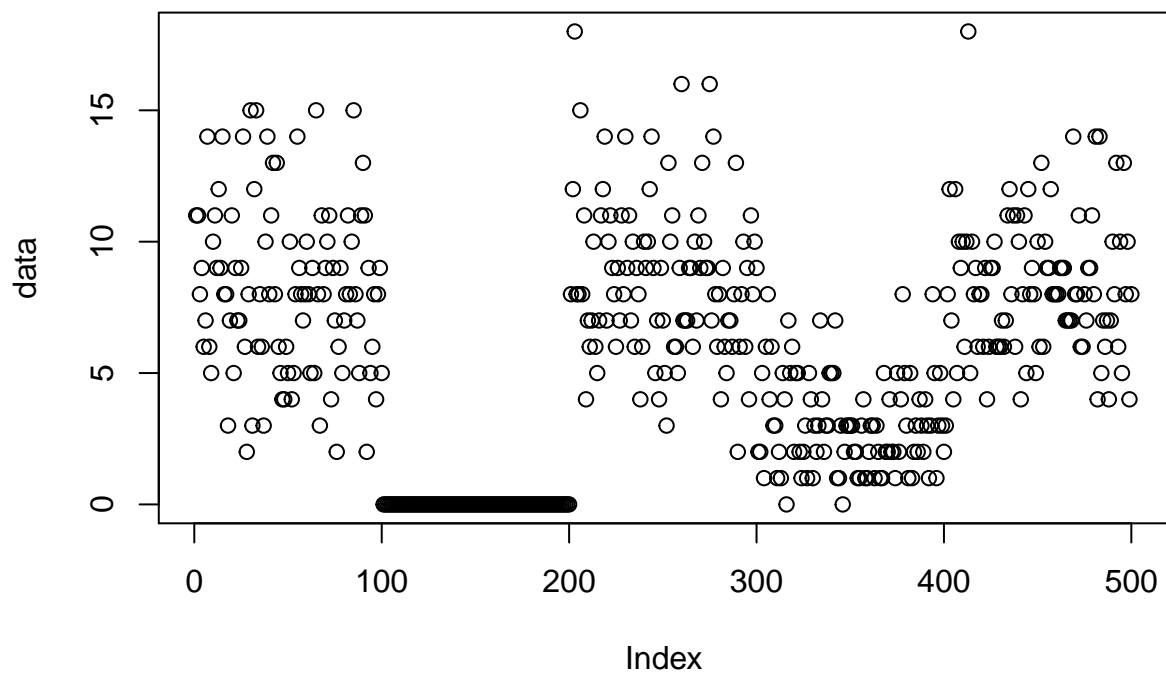
```
## 1.906
```

```
## elapsed
```

```
## 3.061
```

```
## [1] 500
```

```
## [1] 0 100 200 300 400
```

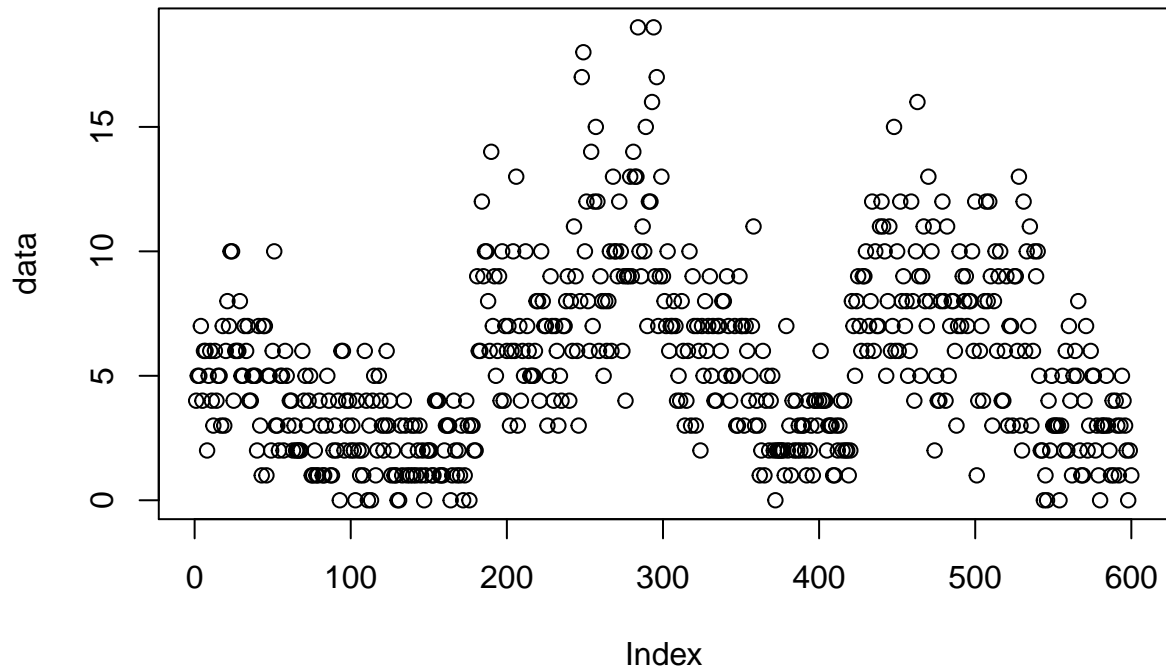


```
## elapsed
```

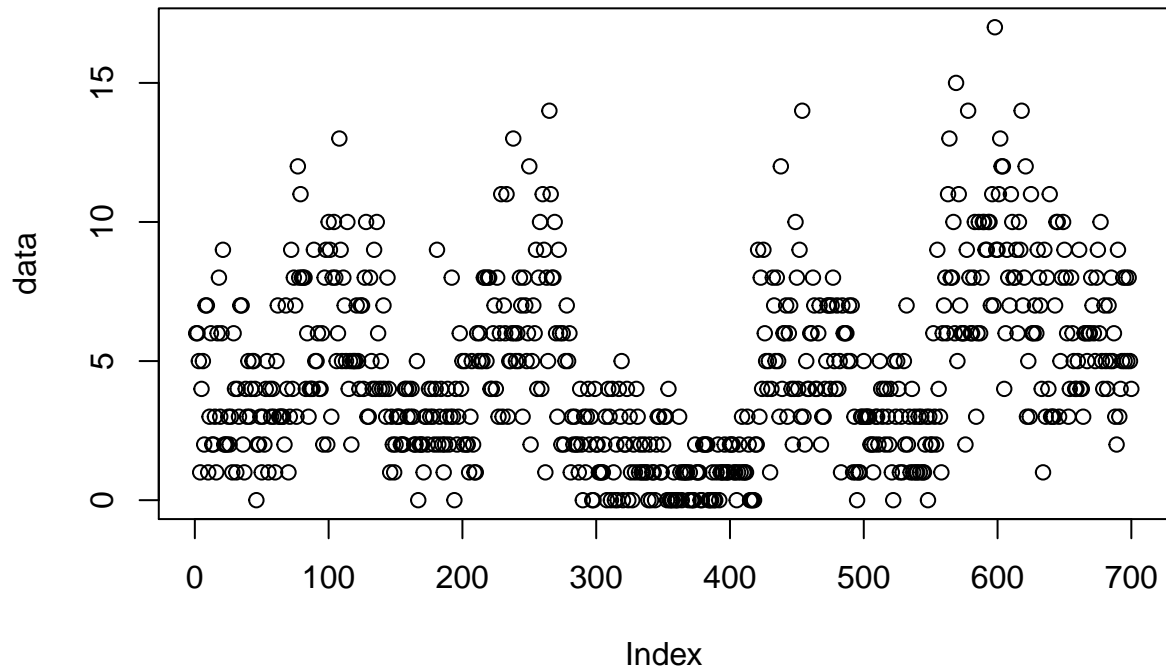
```
## 3.079
```

```
## elapsed
```

```
## 2.062
## [1] 600
## [1] 0 60 120 180 240 300 360 420 480 540
```

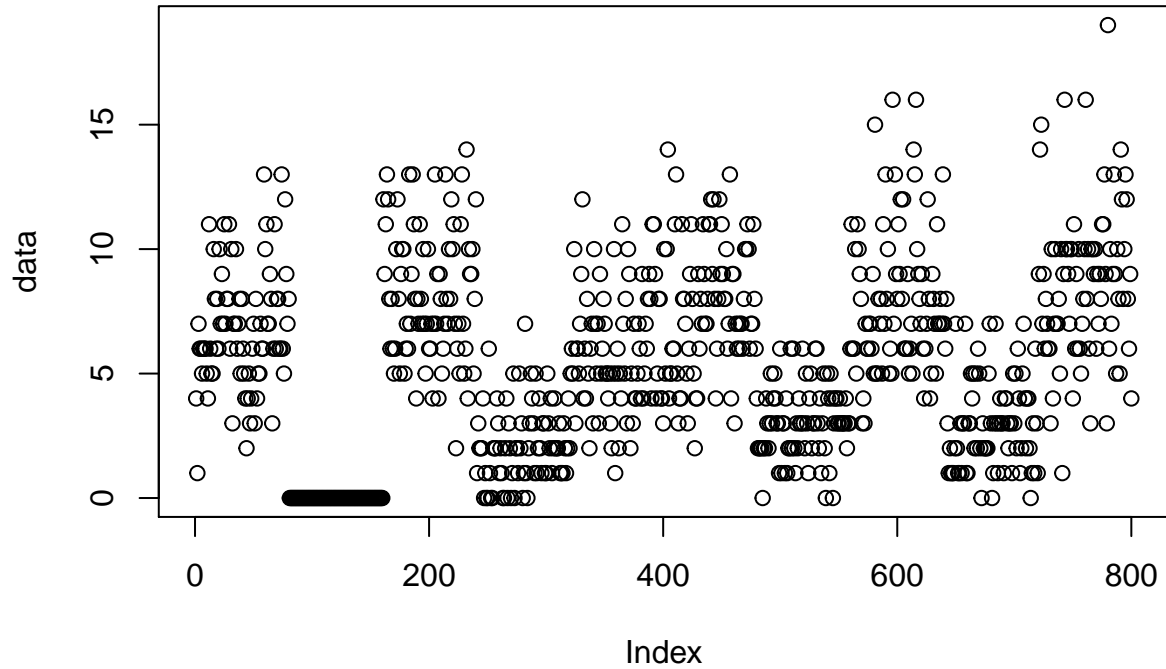


```
## elapsed
## 4.924
## elapsed
## 7.02
## [1] 700
## [1] 0 70 140 210 280 350 420 490 560 630
```

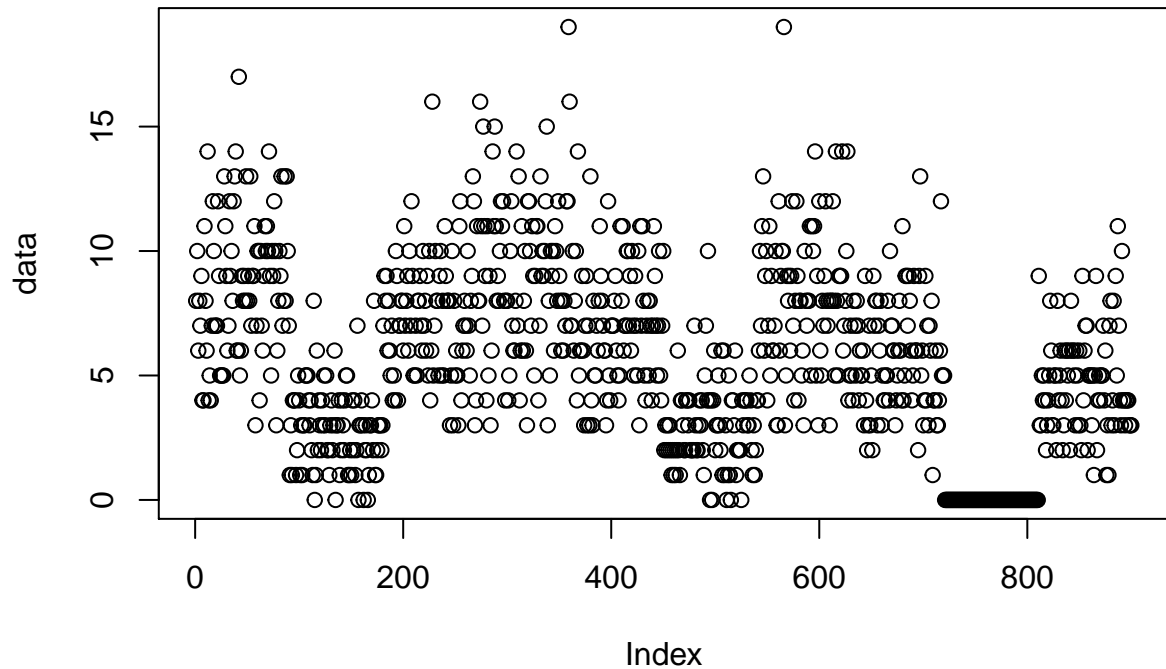


```
## elapsed
```

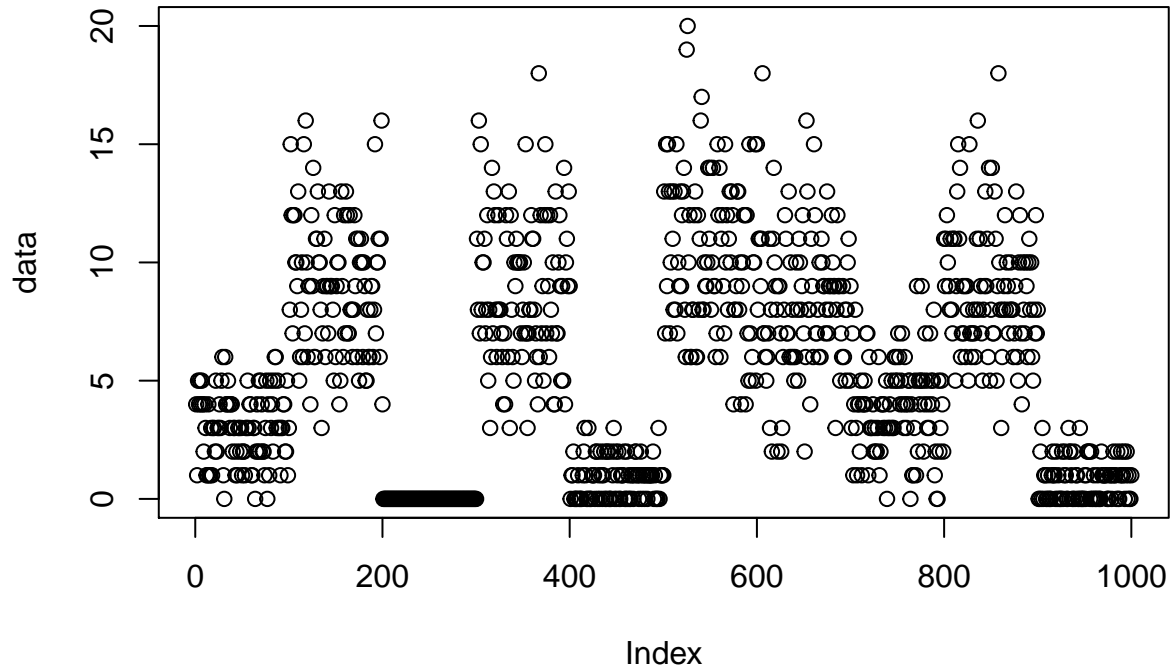
```
## 7.463
## elapsed
## 7.415
## [1] 800
## [1] 0 80 160 240 320 400 480 560 640 720
```



```
## elapsed
## 10.757
## elapsed
## 11.88
## [1] 900
## [1] 0 90 180 270 360 450 540 630 720 810
```



```
## elapsed
## 14.715
## elapsed
## 18.111
## [1] 1000
## [1] 0 100 200 300 400 500 600 700 800 900
```



```
## elapsed
## 18.782
## elapsed
## 12.576
```

```
seq
```

```
## [1] 100 200 300 400 500 600 700 800 900 1000
```

```
reschgtOPp
```

```
## elapsed elapsed elapsed elapsed elapsed elapsed elapsed elapsed elapsed elapsed
## 0.069 0.442 0.947 1.906 3.079 4.924 7.463 10.757 14.715 18.782
```

```
reschgtPELTp
```

```
## elapsed elapsed elapsed elapsed elapsed elapsed elapsed elapsed elapsed elapsed
## 0.171 0.614 0.795 3.061 2.062 7.020 7.415 11.880 18.111 12.576
```

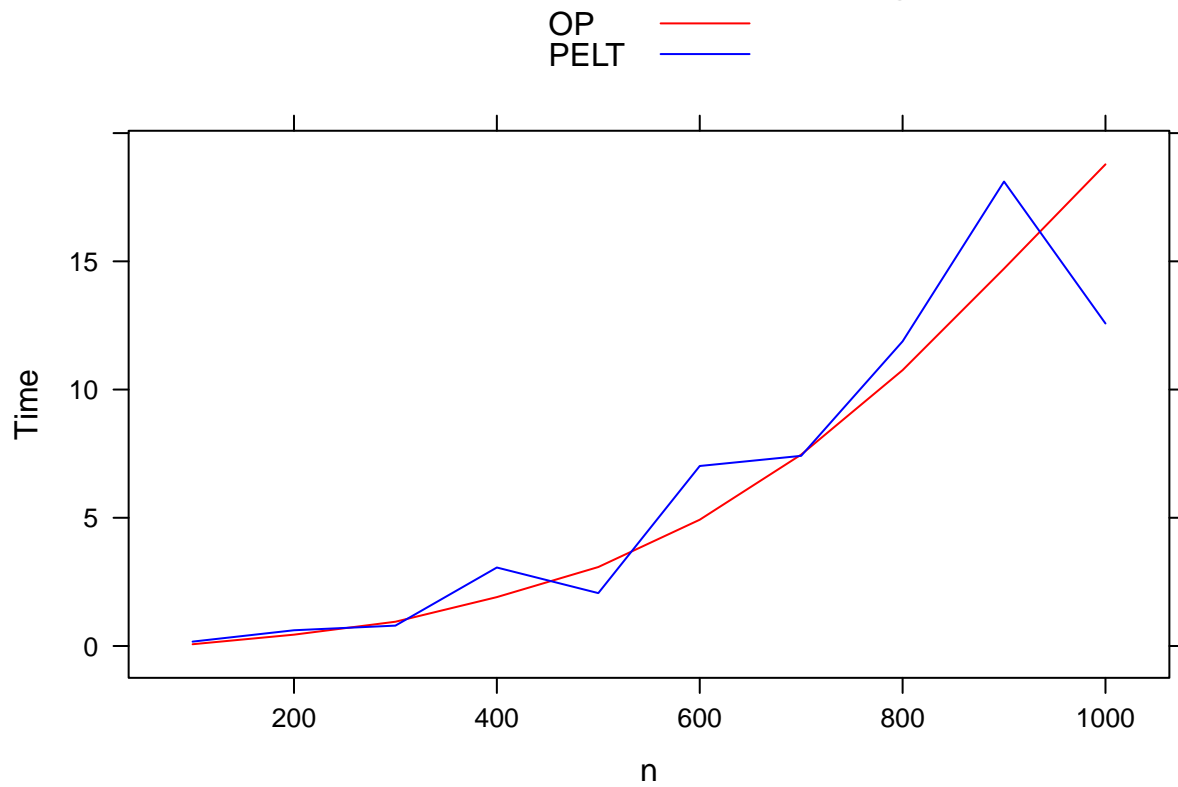
```
n <- seq
```

```
OP <- reschgtOPp
```

```
PELT <- reschgtPELTp
```

```
xyplot(OP + PELT ~ n, ylab = "Time", main = "OP vs PELT : Poisson model with changepoints", type = "l",
```

OP vs PELT : Poisson model with changepoints



```
xyplot(log(OP) + log(PELT) ~ log(n), ylab = "log(Time)", main = "OP vs PELT : Poisson model with changepoints")
```

OP vs PELT : Poisson model with changepoints

