MASTER 2 ACTUARIAT PARCOURS DATA SCIENCE POUR L'ACTUARIAT

TIME SERIES

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Table des matières

Environment

```
knitr::opts_chunk$set(echo = TRUE,
                      fig.width=12,
                      comment = NA,
                      message = FALSE,
                      warning=FALSE,
                      background="#ccffcc"
                      )
```

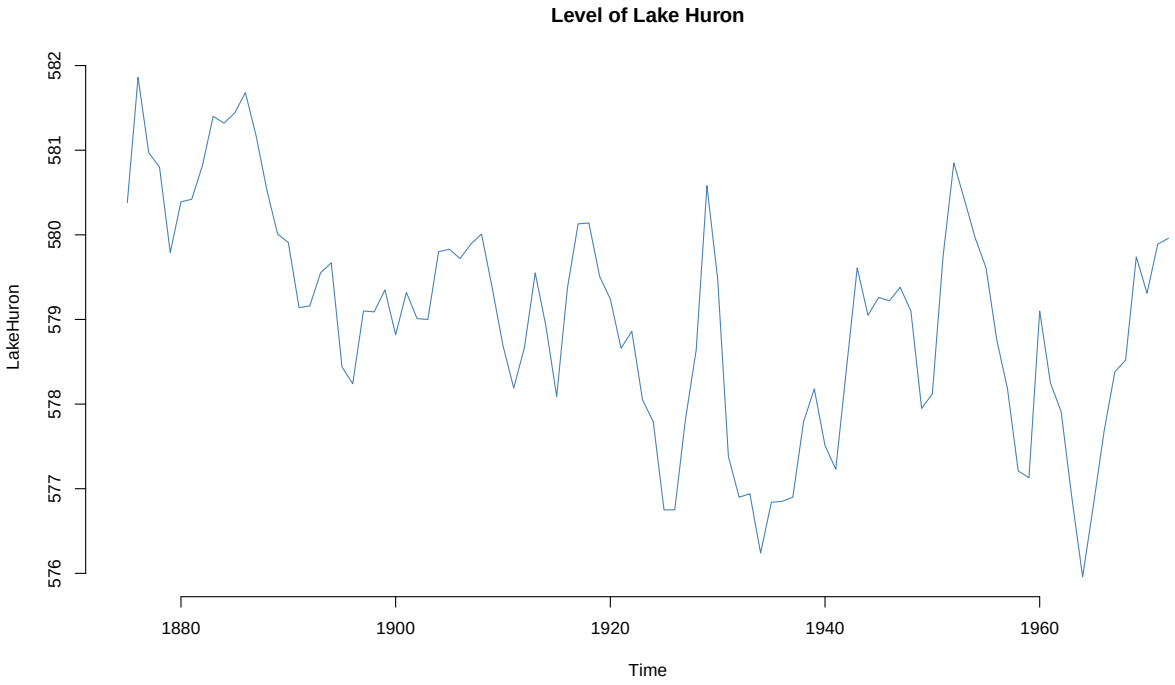
```
library(ggplot2)
library(astsa)
library(xts)
```

LAKE HURON

```
LakeHuron
```

```
Time Series:
Start = 1875
End = 1972
Frequency = 1
 [1] 580.38 581.86 580.97 580.80 579.79 580.39 580.42 580.82 581.40 581.32
[11] 581.44 581.68 581.17 580.53 580.01 579.91 579.14 579.16 579.55 579.67
[21] 578.44 578.24 579.10 579.09 579.35 578.82 579.32 579.01 579.00 579.80
[31] 579.83 579.72 579.89 580.01 579.37 578.69 578.19 578.67 579.55 578.92
[41] 578.09 579.37 580.13 580.14 579.51 579.24 578.66 578.86 578.05 577.79
[51] 576.75 576.75 577.82 578.64 580.58 579.48 577.38 576.90 576.94 576.24
[61] 576.84 576.85 576.90 577.79 578.18 577.51 577.23 578.42 579.61 579.05
[71] 579.26 579.22 579.38 579.10 577.95 578.12 579.75 580.85 580.41 579.96
[81] 579.61 578.76 578.18 577.21 577.13 579.10 578.25 577.91 576.89 575.96
[91] 576.80 577.68 578.38 578.52 579.74 579.31 579.89 579.96
```

```
plot(LakeHuron,
     col='steel blue',
     frame=FALSE,
     main="Level of Lake Huron"
     )
```



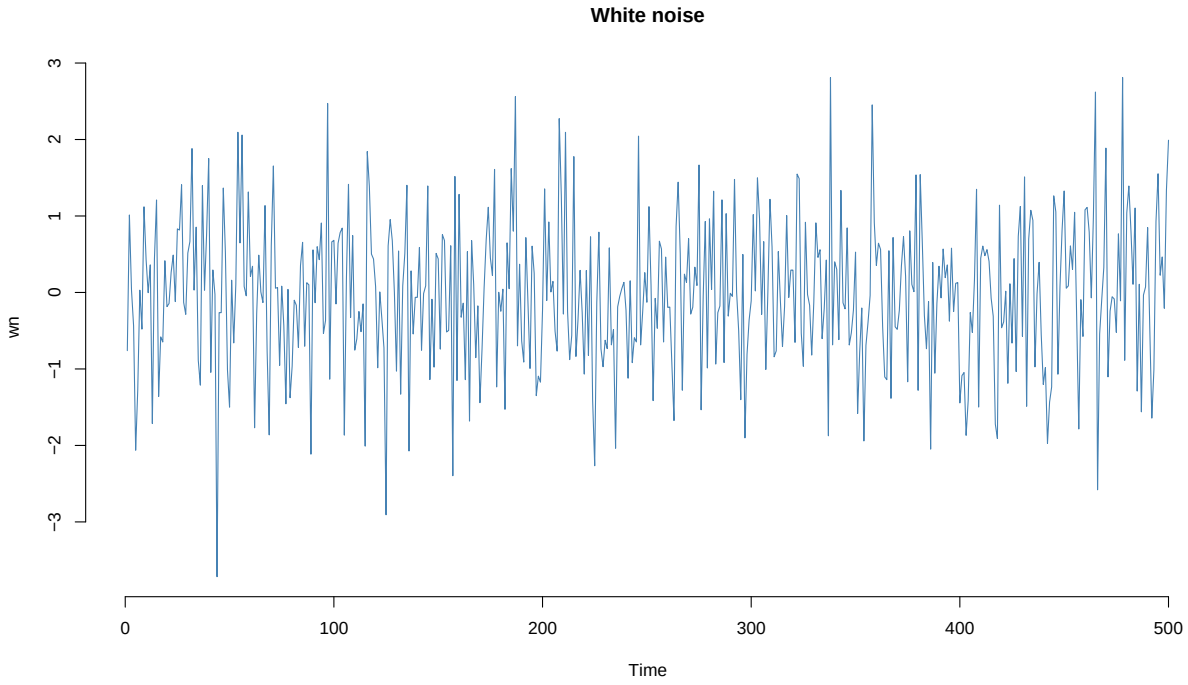
Annual measurements of the level, in feet, of Lake Huron 1875âĂŞ1972.

TIME SERIES SIMULATION

We can sumulate times series using r command.

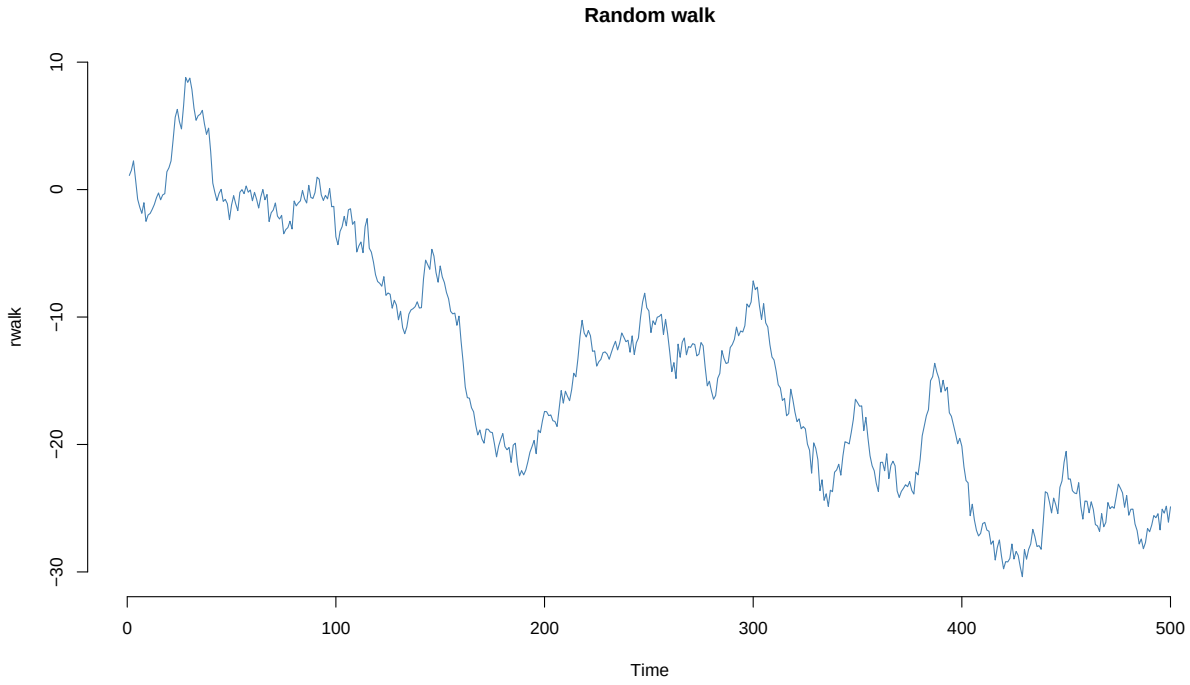
White noise

```
n<-500
wn<-rnorm(n)
plot.ts(wn,
     col='steel blue',
     main='White noise',
     frame.plot = FALSE
     )
```



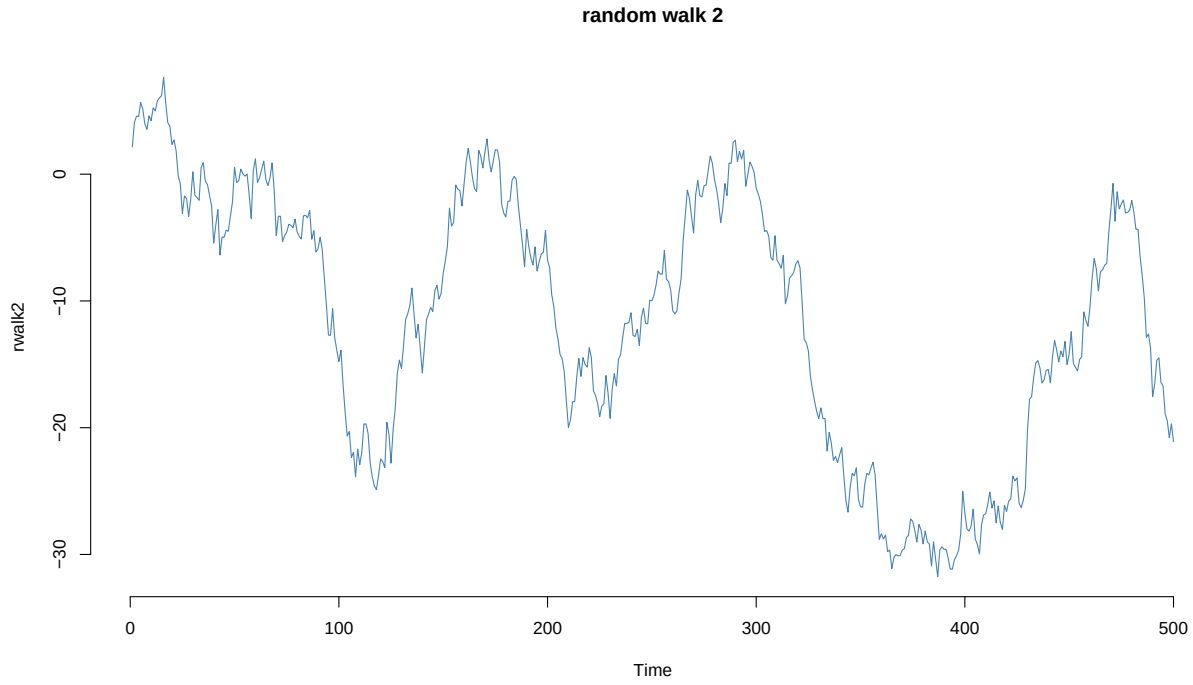
Random walk

```
n<-500
rwalk<-cumsum(rnorm(n))
plot.ts(rwalk,
     col='steel blue',
     main='Random walk',
     frame.plot = FALSE
     )
```



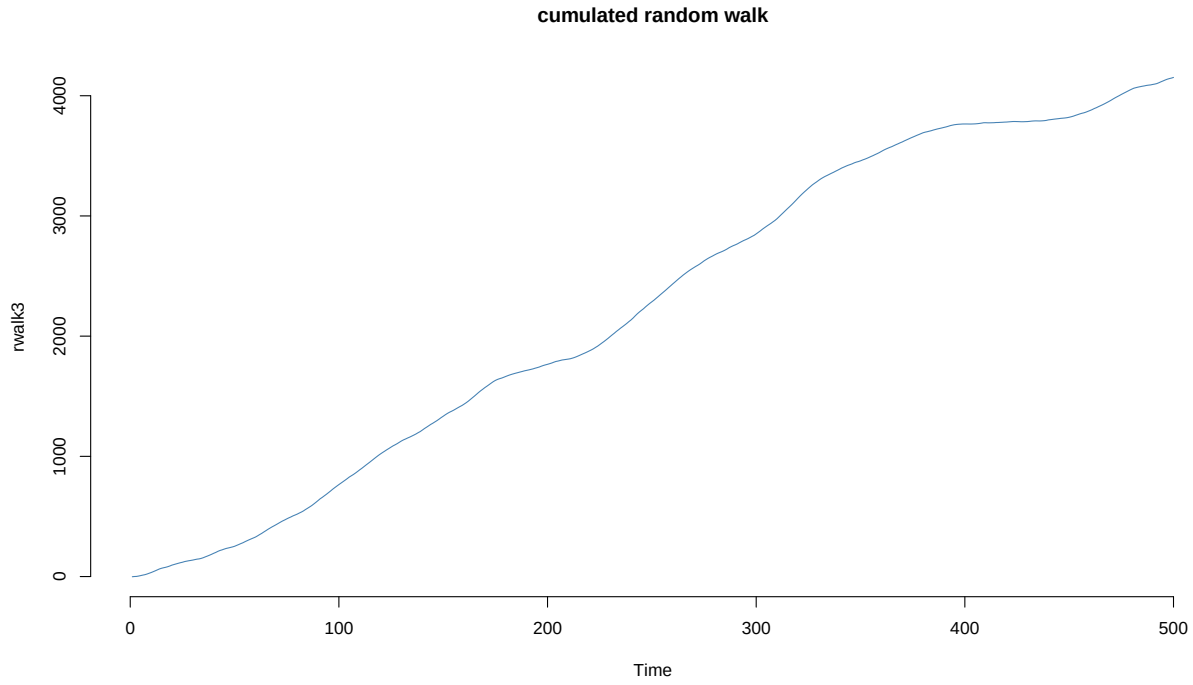
Another random walk

```
rwalk2<-cumsum(rnorm(n)+rnorm(n))
plot.ts(rwalk2,
     col='steel blue',
     main='random walk 2',
     frame.plot = FALSE
     )
```

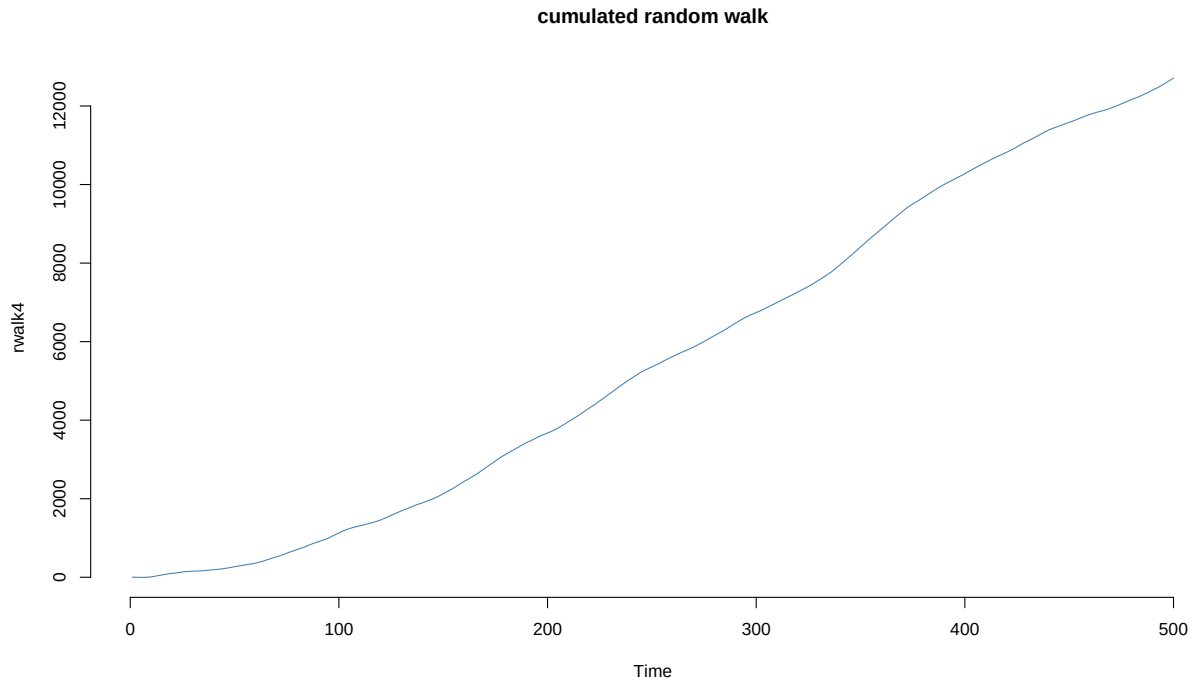


Cumulated random walk

```
rwalk3<-cumsum(cumsum(rnorm(n)))
plot.ts(rwalk3,
     col='steel blue',
     main='cumulated random walk',
     frame.plot = FALSE
     )
```




```
rwalk4<-cumsum(cumsum(rnorm(n)+rnorm(n)+rnorm(n)))
plot.ts(rwalk4,
     col='steel blue',
     main='cumulated random walk',
     frame.plot = FALSE
     )
```



With a trend

```
tseries<-1-(1:n)/100+cumsum(rnorm(n))+.2*rnorm(n)
plot.ts(tseries,
        col='steel blue',
        frame=FALSE
        )
```