R - Time Series Analysis

Time series is a series of data points in which each data point is associated with a timestamp. A simple example is the price of a stock in the stock market at different points of time on a given day.

Another example is the amount of rainfall in a region at different months of the year.

R language uses many functions to create, manipulate and plot the time series data. The data for the time series is stored in an R object called **time-series object**. It is also a R data object like a vector or data frame.

The time series object is created by using the **ts()** function.

### Syntax

The basic syntax for **ts()** function in time series analysis is −

timeseries.object.name <- ts(data, start, end, frequency)

Following is the description of the parameters used −

* **data** is a vector or matrix containing the values used in the time series.
* **start** specifies the start time for the first observation in time series.
* **end** specifies the end time for the last observation in time series.
* **frequency** specifies the number of observations per unit time.

Except the parameter "data" all other parameters are optional.

### Example

Consider the annual rainfall details at a place starting from January 2012. We create an R time series object for a period of 12 months and plot it.

[Live Demo](http://tpcg.io/UZraRG)

# Get the data points in form of a R vector.

rainfall <- c(799,1174.8,865.1,1334.6,635.4,918.5,685.5,998.6,784.2,985,882.8,1071)

# Convert it to a time series object.

rainfall.timeseries <- ts(rainfall,start = c(2012,1),frequency = 12)

# Print the timeseries data.

print(rainfall.timeseries)

# Give the chart file a name.

png(file = "rainfall.png")

# Plot a graph of the time series.

plot(rainfall.timeseries)

# Save the file.

dev.off()

## Different Time Intervals

The value of the **frequency** parameter in the ts() function decides the time intervals at which the data points are measured. A value of 12 indicates that the time series is for 12 months. Other values and its meaning is as below −

* **frequency = 12** pegs the data points for every month of a year.
* **frequency = 4** pegs the data points for every quarter of a year.
* **frequency = 6** pegs the data points for every 10 minutes of an hour.
* **frequency = 24\*6** pegs the data points for every 10 minutes of a day.

## Multiple Time Series

We can plot multiple time series in one chart by combining both the series into a matrix.

[Live Demo](http://tpcg.io/vETvkY)

# Get the data points in form of a R vector.

rainfall1 <- c(799,1174.8,865.1,1334.6,635.4,918.5,685.5,998.6,784.2,985,882.8,1071)

rainfall2 <-

c(655,1306.9,1323.4,1172.2,562.2,824,822.4,1265.5,799.6,1105.6,1106.7,1337.8)

# Convert them to a matrix.

combined.rainfall <- matrix(c(rainfall1,rainfall2),nrow = 12)

# Convert it to a time series object.

rainfall.timeseries <- ts(combined.rainfall,start = c(2012,1),frequency = 12)

# Print the timeseries data.

print(rainfall.timeseries)

# Give the chart file a name.

png(file = "rainfall\_combined.png")

# Plot a graph of the time series.

plot(rainfall.timeseries, main = "Multiple Time Series")

# Save the file.

dev.off()