

PRACTICAL NO 8

Aim: To Implement Time Series

Software: R Studio

Description:

Time Series

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.

Code:

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.

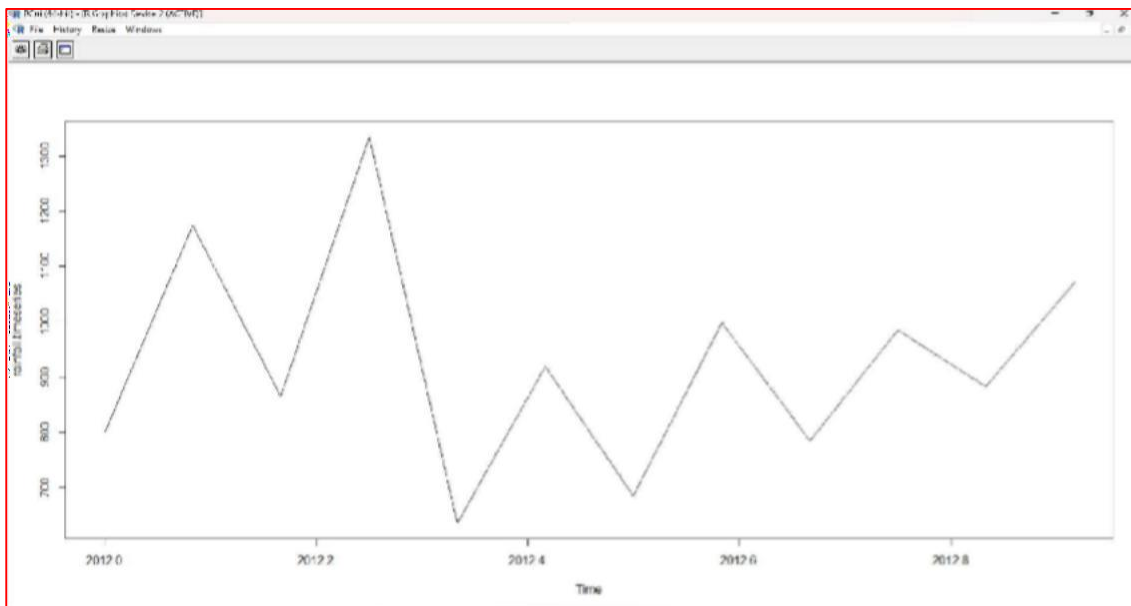
```
plot(rainfall.timeseries)
```

```
dev.off()
```

```
plot(rainfall.timeseries)
```

Output:

```
> rainfall <- c(799,1174.8,865.1,1334.6,635.4,918.5,685.5,998.6,784.2,985,882.8,1071)
> rainfall.timeseries <- ts(rainfall,start = c(2012,1),frequency = 12)
> print(rainfall.timeseries)
      Jan   Feb   Mar   Apr   May   Jun   Jul   Aug   Sep   Oct   Nov   Dec
2012 799.0 1174.8 865.1 1334.6 635.4 918.5 685.5 998.6 784.2 985.0 882.8 1071.0
> png(file = "rainfall.png")
> plot(rainfall.timeseries)
> dev.off()
null device
      1
> plot(rainfall.timeseries)
>
```



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.

Code:

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()
```

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

Output:

```
> 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)
> combined.rainfall <- matrix(c(rainfall1,rainfall2),nrow = 12)
> rainfall.timeseries <- ts(combined.rainfall,start = c(2012,1),frequency = 12)
> print(rainfall.timeseries)
      Series 1 Series 2
Jan 2012    799.0    655.0
Feb 2012   1174.8   1306.9
Mar 2012    865.1   1323.4
Apr 2012   1334.6   1172.2
May 2012    635.4    562.2
Jun 2012    918.5    824.0
Jul 2012    685.5    822.4
Aug 2012    998.6   1265.5
Sep 2012    784.2    799.6
Oct 2012    985.0   1105.6
Nov 2012    882.8   1106.7
Dec 2012   1071.0   1337.8
> png(file = "rainfall_combined.png")
> plot(rainfall.timeseries, main = "Multiple Time Series")
> dev.off()
windows
      2
> plot(rainfall.timeseries, main = "Multiple Time Series")
>
```

