Seminario de Series Temporales

Francisco Javier Mercader Martínez

08/10/2024

```
print(Nile)
```

```
## Time Series:
## Start = 1871
## End = 1970
## Frequency = 1
##   [1] 1120 1160  963 1210 1160 1160  813 1230 1370 1140  995  935 1110  994 1020
##  [16]  960 1180  799  958 1140 1100 1210 1150 1250 1260 1220 1030 1100  774  840
##  [31]  874  694  940  833  701  916  692 1020 1050  969  831  726  456  824  702
##  [46] 1120 1100  832  764  821  768  845  864  862  698  845  744  796 1040  759
##  [61]  781  865  845  944  984  897  822 1010  771  676  649  846  812  742  801
##  [76] 1040  860  874  848  890  744  749  838 1050  918  986  797  923  975  815
##  [91] 1020  906  901 1170  912  746  919  718  714  740
```

```
length(Nile)
```

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

```
head(Nile, n = 10)
```

```
## Time Series:
## Start = 1871
## End = 1880
## Frequency = 1
##  [1] 1120 1160  963 1210 1160 1160  813 1230 1370 1140
```

```
tail(Nile, n = 12)
```

```
## Time Series:
## Start = 1959
## End = 1970
## Frequency = 1
##  [1]  975  815 1020  906  901 1170  912  746  919  718  714  740
```

```
summary(AirPassengers)
```

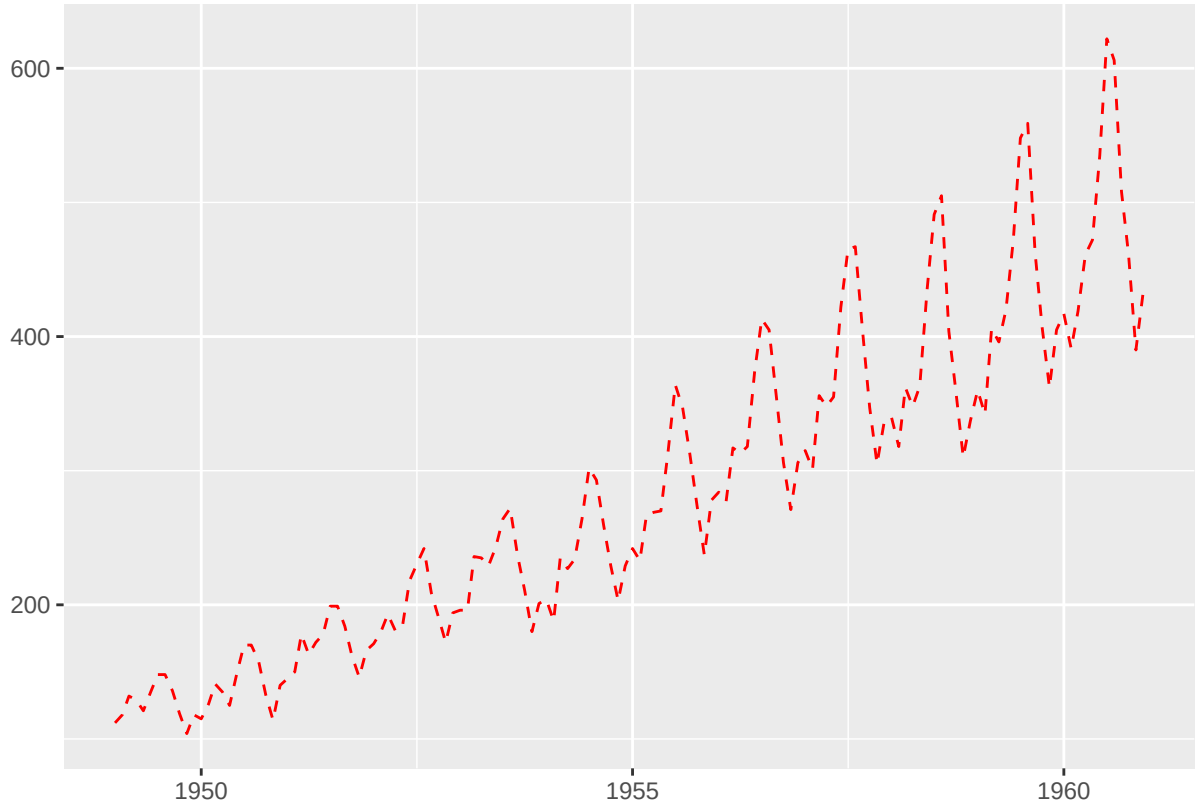
```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##     104     180     266     280     360     622
```

```
library(ggfortify)
```

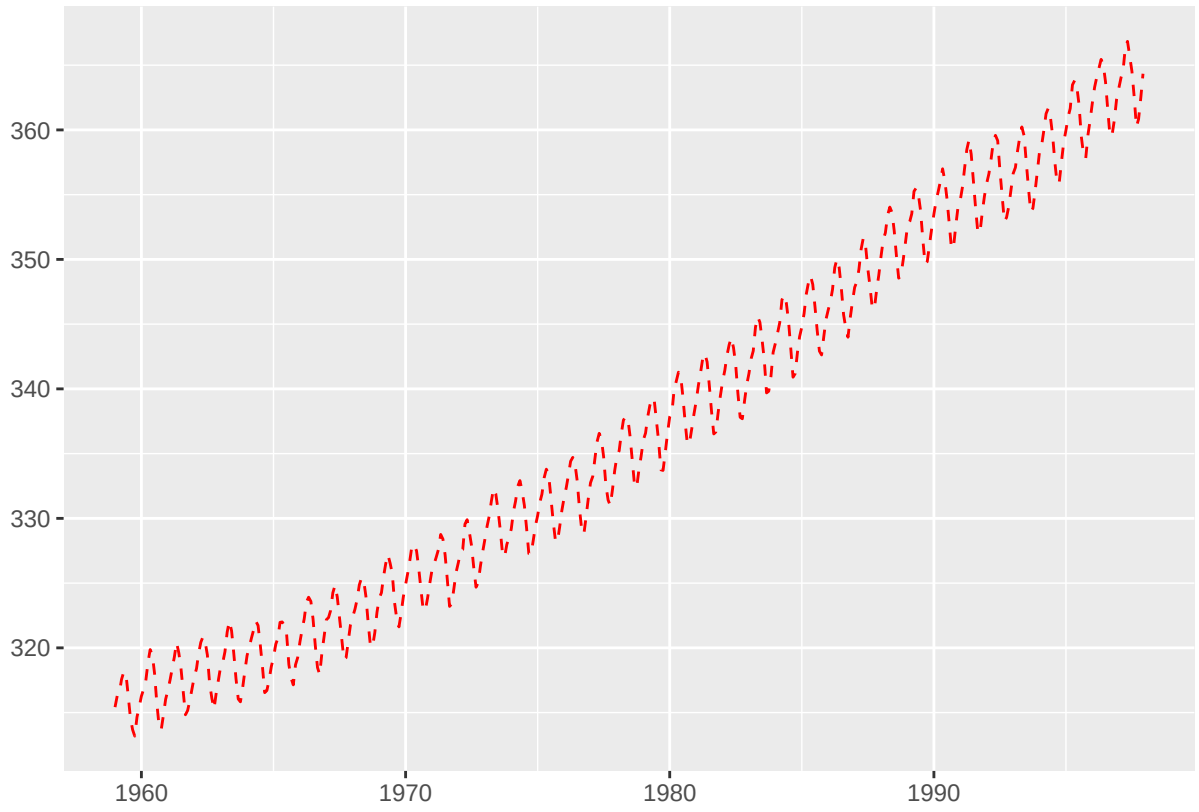
```
## Registered S3 methods overwritten by 'ggfortify':
##   method                 from
##   autoplot.Arima         forecast
##   autoplot.acf           forecast
##   autoplot.ar            forecast
```

```
##   autoplot.bats          forecast
##   autoplot.decomposed.ts forecast
##   autoplot.ets           forecast
##   autoplot.forecast      forecast
##   autoplot.stl           forecast
##   autoplot.ts            forecast
##   fitted.ar              forecast
##   fortify.ts             forecast
##   residuals.ar           forecast
```

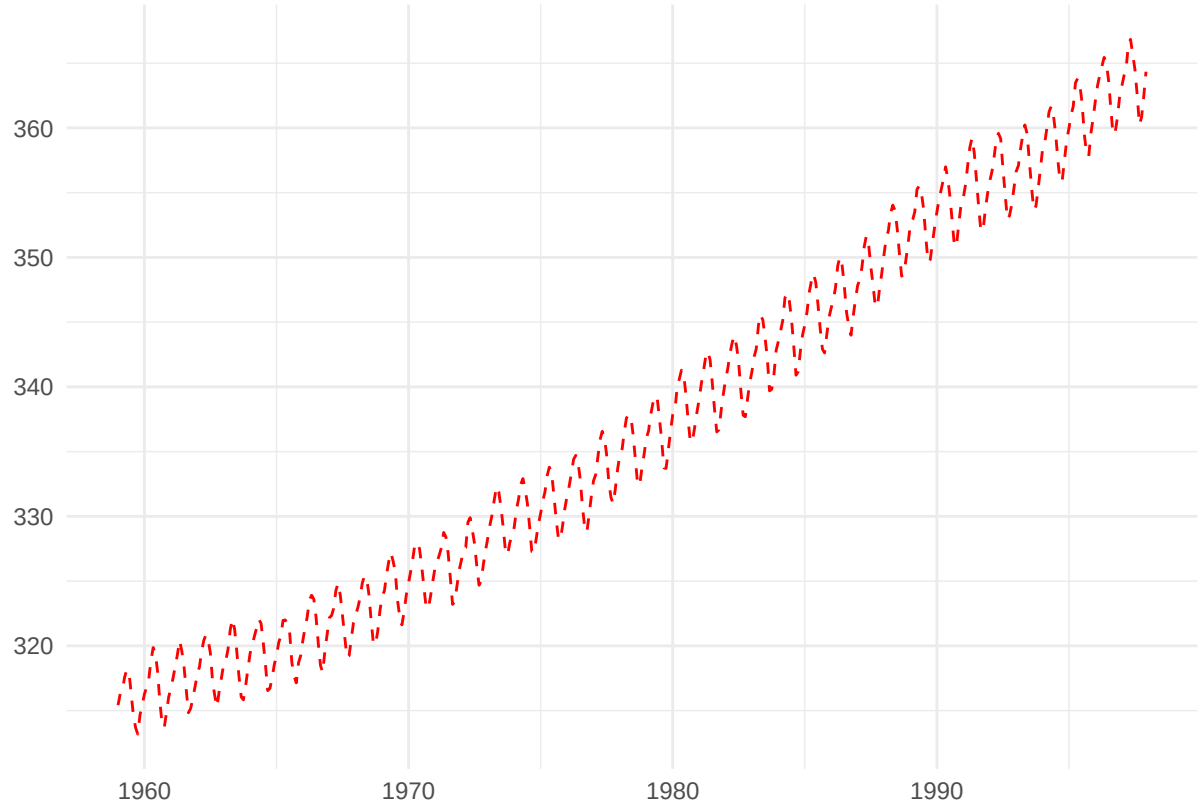
```
autoplot(AirPassengers, ts.colour = "red", ts.linetype = "dashed")
```




```
autoplot(co2, ts.colour = "red", ts.linetype = "dashed")
```



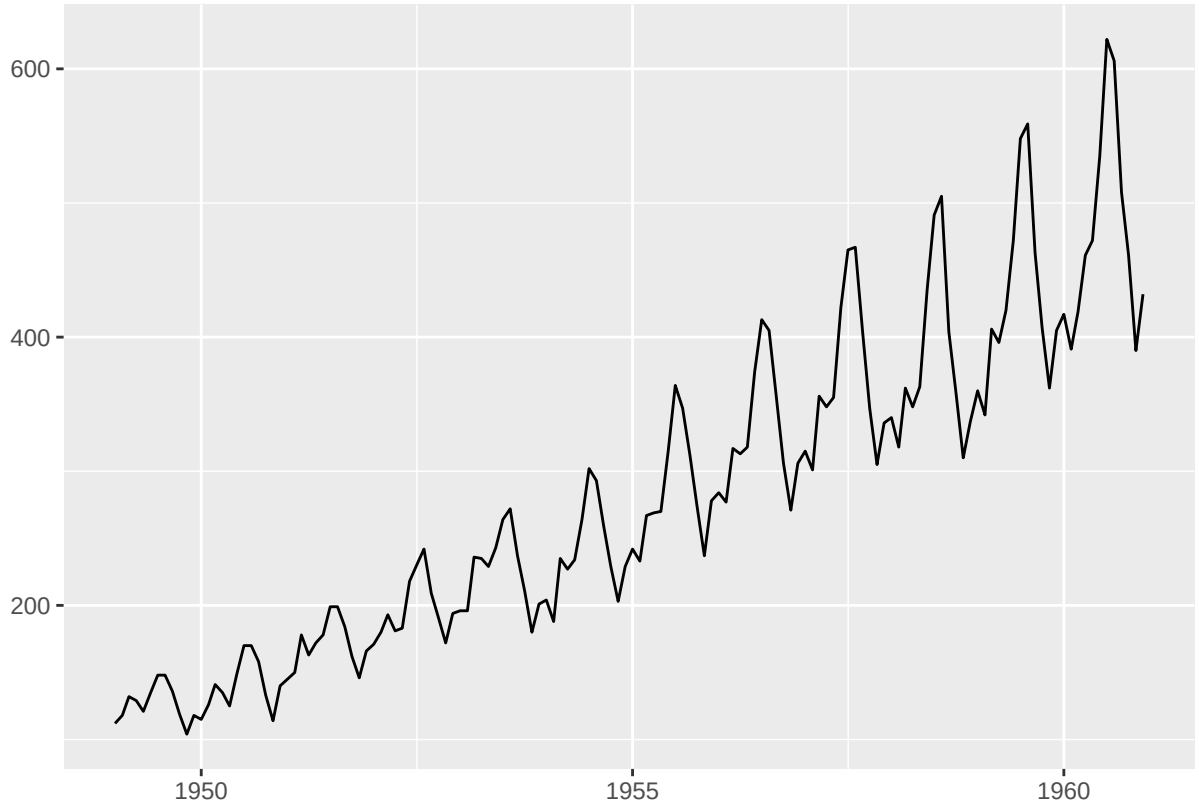

```
autoplot(co2, ts.colour = "red", ts.linetype = "dashed") + theme_minimal()
```




```
summary(co2)
```

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##     313     324     335     337     350     367
```

```
autoplot(AirPassengers)
```




```
start(AirPassengers)
```

```
## [1] 1949    1
```

```
end(AirPassengers)
```

```
## [1] 1960   12
```

```
deltat(AirPassengers)
```

```
## [1] 0.08333
```

```
frequency(AirPassengers)
```

```
## [1] 12
```

```
time(AirPassengers)
```

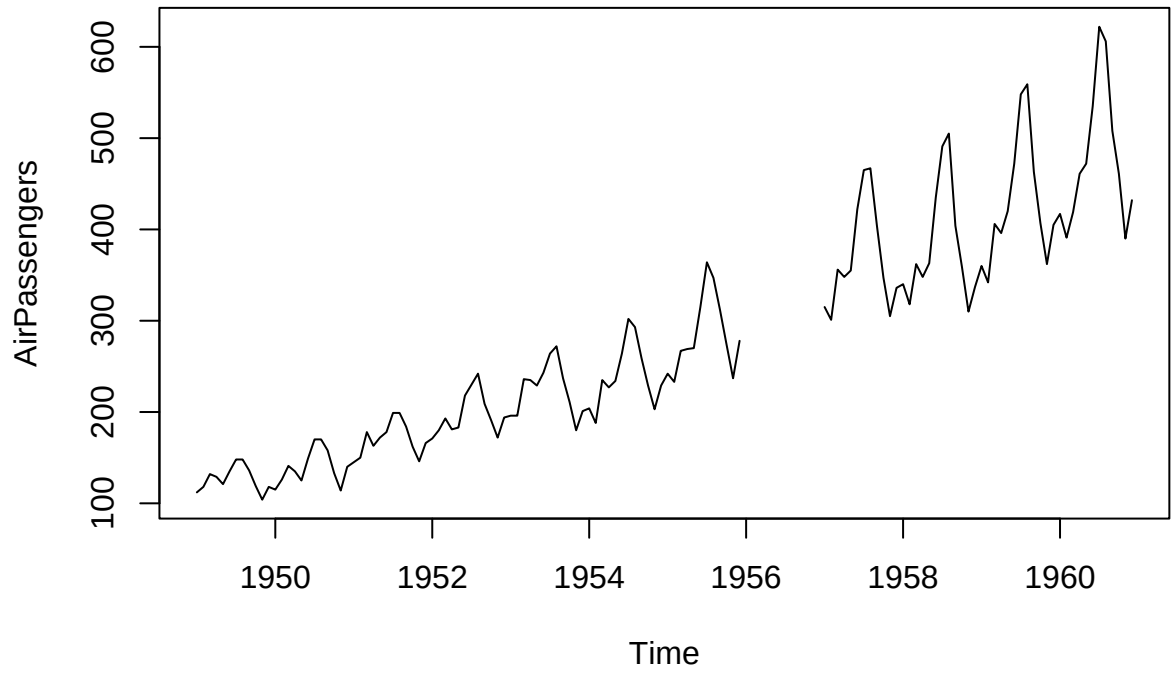
```
##       Jan  Feb  Mar  Apr  May  Jun  Jul  Aug  Sep  Oct  Nov  Dec
## 1949 1949 1949 1949 1949 1949 1949 1950 1950 1950 1950 1950 1950
## 1950 1950 1950 1950 1950 1950 1950 1951 1951 1951 1951 1951 1951
## 1951 1951 1951 1951 1951 1951 1951 1952 1952 1952 1952 1952 1952
## 1952 1952 1952 1952 1952 1952 1952 1953 1953 1953 1953 1953 1953
## 1953 1953 1953 1953 1953 1953 1953 1954 1954 1954 1954 1954 1954
## 1954 1954 1954 1954 1954 1954 1954 1955 1955 1955 1955 1955 1955
## 1955 1955 1955 1955 1955 1955 1955 1956 1956 1956 1956 1956 1956
## 1956 1956 1956 1956 1956 1956 1956 1957 1957 1957 1957 1957 1957
## 1957 1957 1957 1957 1957 1957 1957 1958 1958 1958 1958 1958 1958
## 1958 1958 1958 1958 1958 1958 1958 1959 1959 1959 1959 1959 1959
```

```
## 1959 1959 1959 1959 1959 1959 1959 1960 1960 1960 1960 1960 1960
## 1960 1960 1960 1960 1960 1960 1960 1961 1961 1961 1961 1961 1961
```

```
cycle(AirPassengers)
```

```
##      Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
## 1949   1   2   3   4   5   6   7   8   9  10  11  12
## 1950   1   2   3   4   5   6   7   8   9  10  11  12
## 1951   1   2   3   4   5   6   7   8   9  10  11  12
## 1952   1   2   3   4   5   6   7   8   9  10  11  12
## 1953   1   2   3   4   5   6   7   8   9  10  11  12
## 1954   1   2   3   4   5   6   7   8   9  10  11  12
## 1955   1   2   3   4   5   6   7   8   9  10  11  12
## 1956   1   2   3   4   5   6   7   8   9  10  11  12
## 1957   1   2   3   4   5   6   7   8   9  10  11  12
## 1958   1   2   3   4   5   6   7   8   9  10  11  12
## 1959   1   2   3   4   5   6   7   8   9  10  11  12
## 1960   1   2   3   4   5   6   7   8   9  10  11  12
```

```
time_index <- time(AirPassengers)

AirPassengers[which(floor(time_index) == 1956)] <- NA

plot(AirPassengers)
```



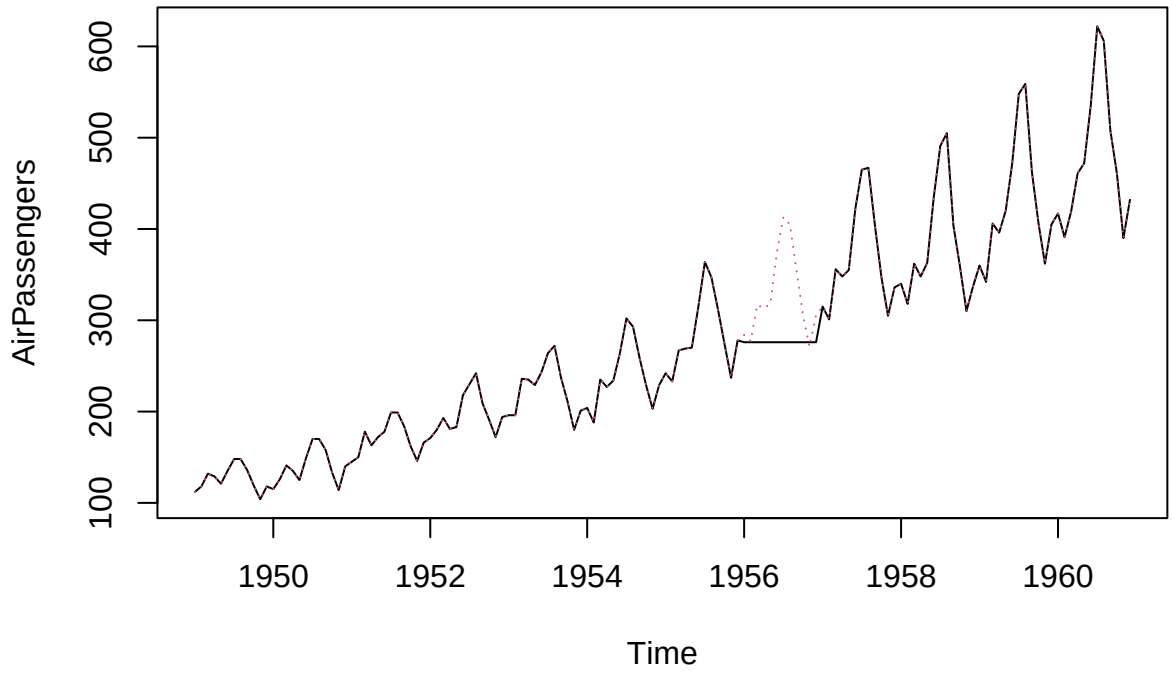

```
mean(AirPassengers)
```

```
## [1] NA
```

```r
mean(AirPassengers, na.rm = TRUE)
```

```
## [1] 275.9
```

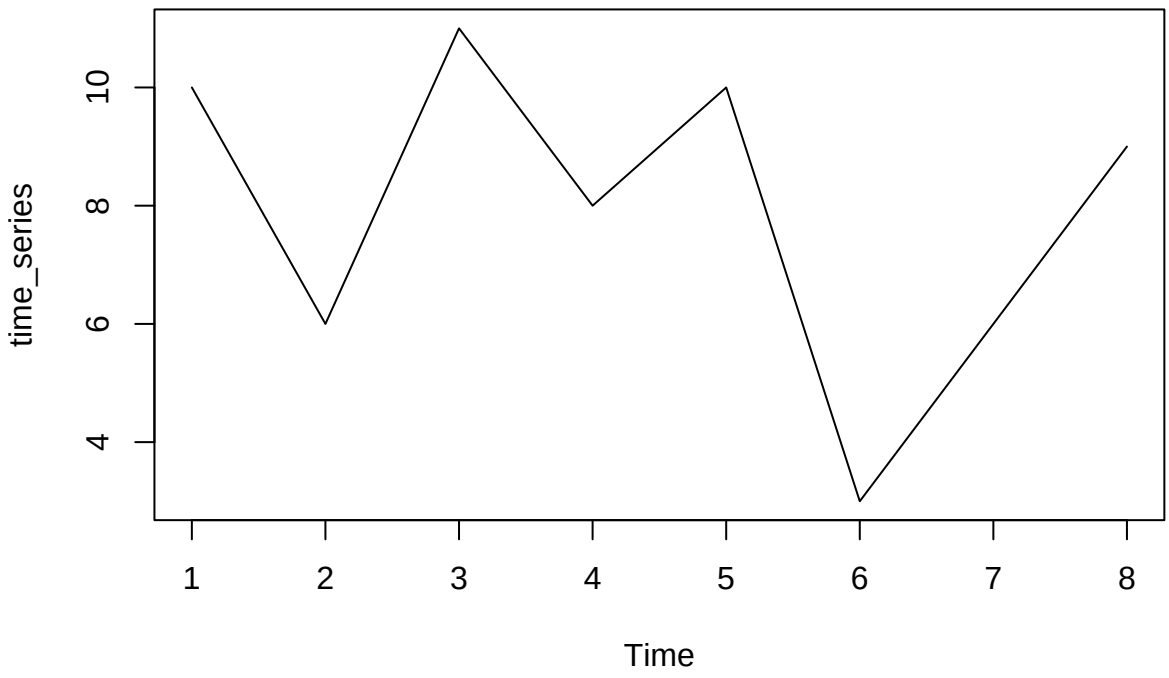
```r
AirPassengers[85:96] <- mean(AirPassengers, na.rm = TRUE)

plot(AirPassengers)

rm(AirPassengers)
points(AirPassengers, type = "l", col = 2, lty = 3)
```



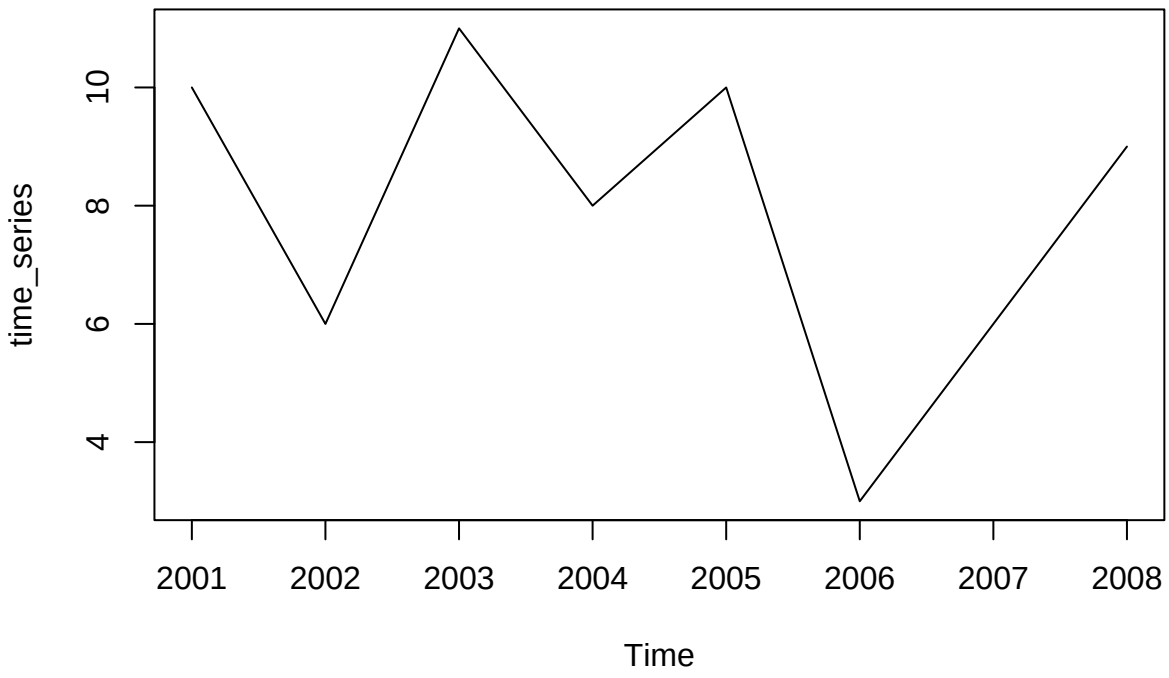

```r
data_vector <- c(10, 6, 11, 8, 10, 3, 6, 9)
data_vector
```

```
## [1] 10  6 11  8 10  3  6  9
```

```r
time_series <- ts(data_vector)
plot(time_series)
```




```
time_series <- ts(data_vector, start = 2001, frequency = 1)
plot(time_series)
```



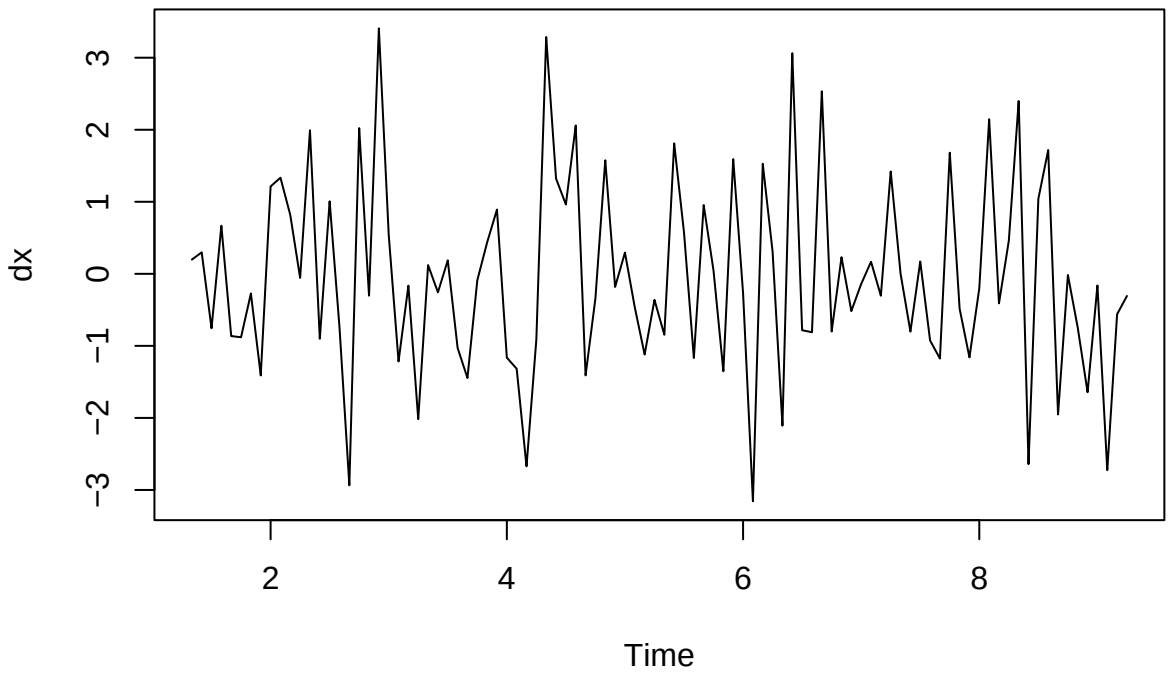

```r
is.ts(data_vector)
```

```
## [1] FALSE
```

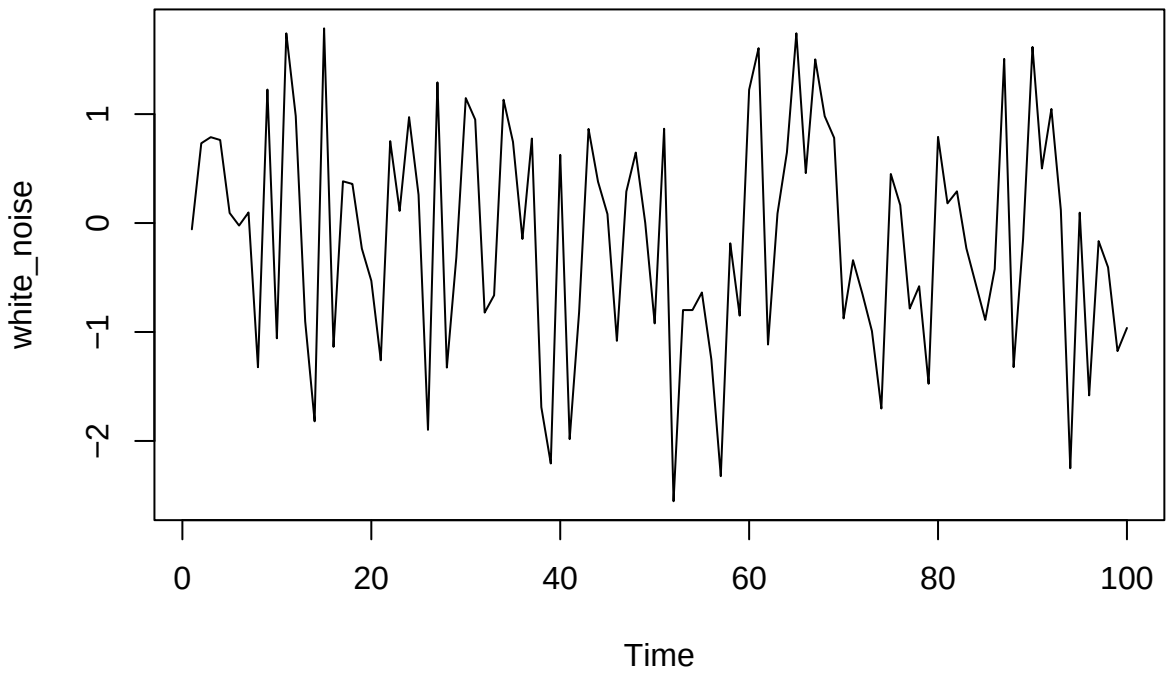
```r
is.ts(time_series)
```

```
## [1] TRUE
```

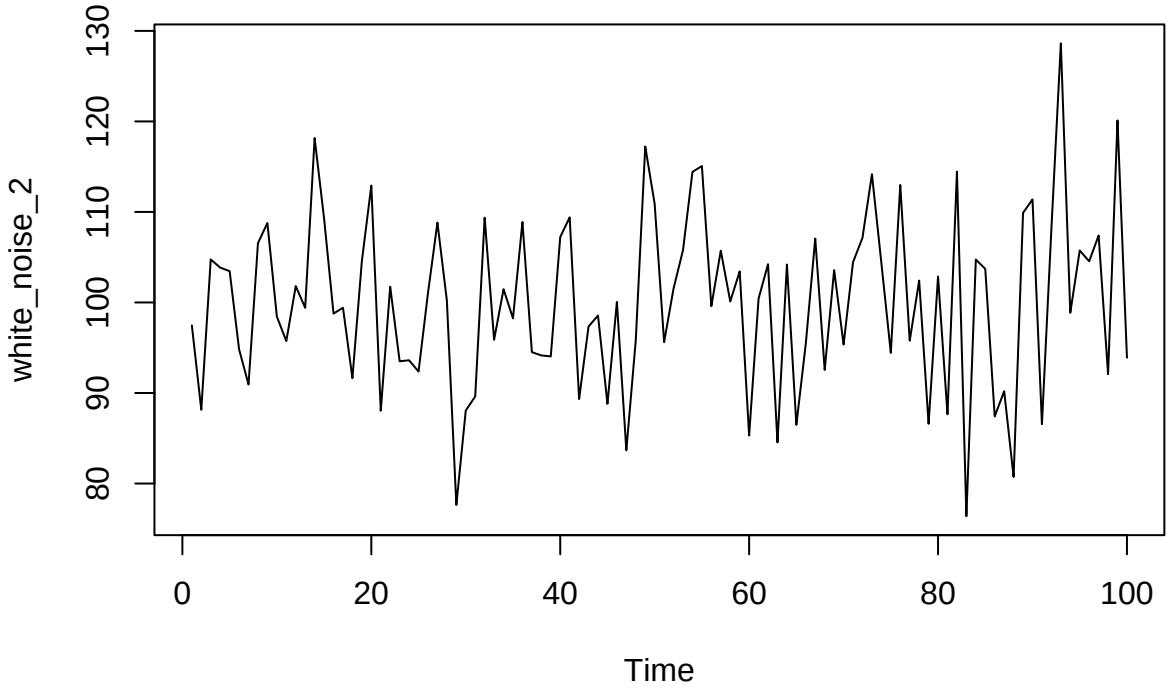
```r
x <- ts(rnorm(100), frequency = 12)
dx = diff(x, lag=4)
ts.plot(dx)
```




```
white_noise <- arima.sim(model = list(order = c(0,0,0)), n = 100)
ts.plot(white_noise)
```




```
white_noise_2 <- arima.sim(model = list(order = c(0, 0, 0)), n = 100, mean = 100, sd = 10)
ts.plot(white_noise_2)
```




```r
y <- arima.sim(model = list(order = c(0,0,0)), n = 100)
arima(y, order = c(0,0,0))
```

```
##
## Call:
## arima(x = y, order = c(0, 0, 0))
##
## Coefficients:
##       intercept
##           0.076
## s.e.      0.114
##
## sigma^2 estimated as 1.3:  log likelihood = -155.1,  aic = 314.2
```

```r
arima(y, order = c(0,0,0))
```

```
##
## Call:
## arima(x = y, order = c(0, 0, 0))
##
## Coefficients:
##       intercept
##           0.076
## s.e.      0.114
##
## sigma^2 estimated as 1.3:  log likelihood = -155.1,  aic = 314.2
```

```r
mean(y)
```

```
## [1] 0.07636
```

```r
var(y)
```

```
## [1] 1.315
```