Check for stationarity

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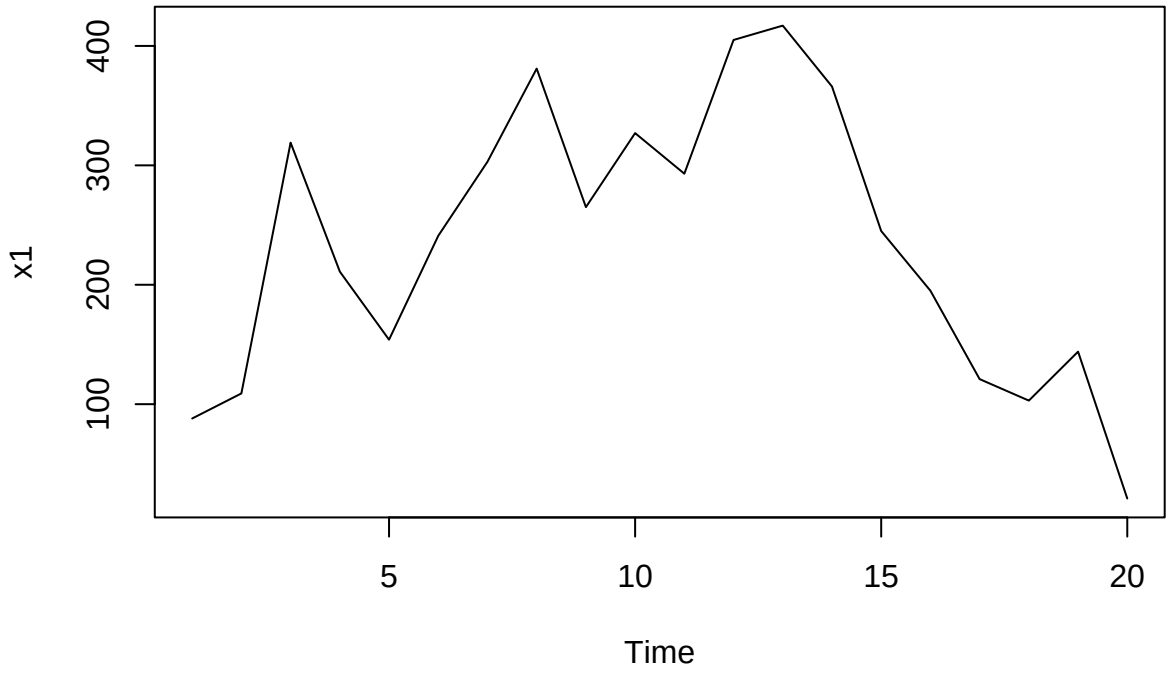
Consider the artificial series `x1` and `x2`:

```
x1 <- c(88, 109, 319, 211, 154, 241, 303, 381, 265, 327, 293, 405, 417, 366, 245, 195, 121, 103, 144, 2
x2 <- c(26, 156, 236, 526, 509, 537, 699, 768, 982, 968, 956, 1282, 1347, 1187, 1442, 1611, 1600, 1797,
```

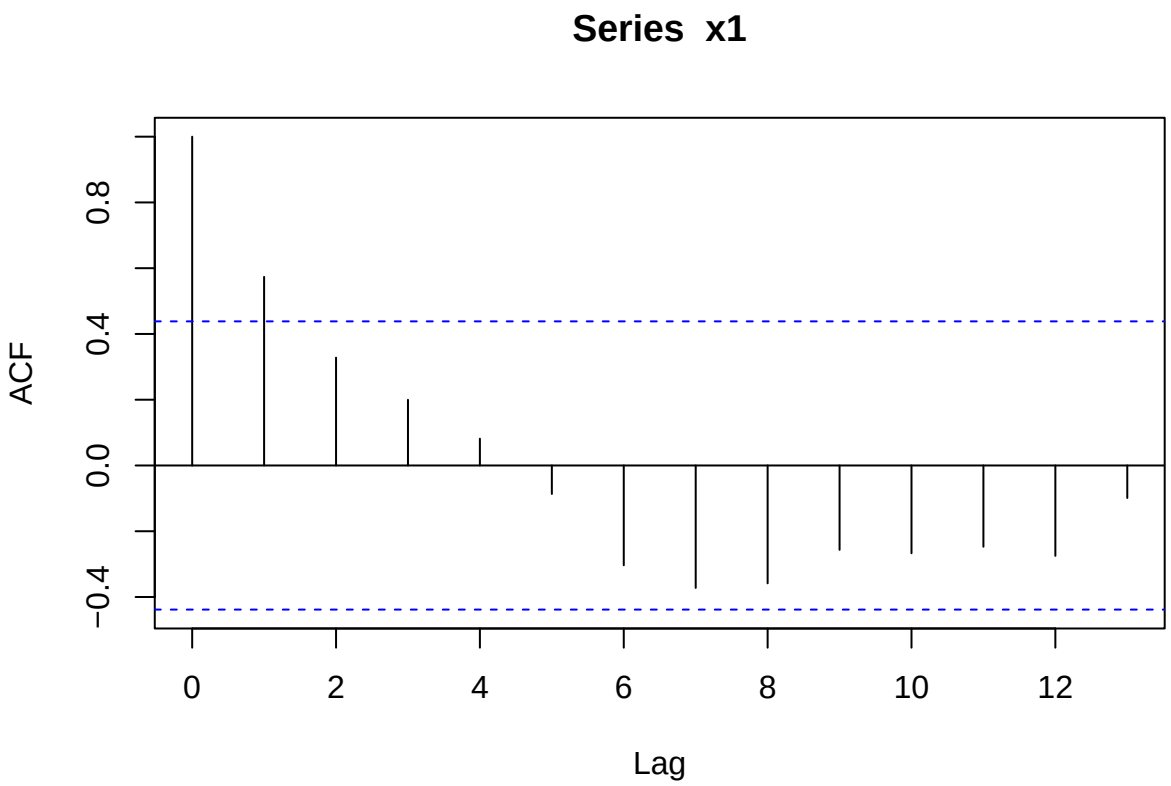
For each:

- Check whether the data behaves stationary
- If it does, calculate its mean and variance

```
ts.plot(x1)  # looks stationary
```




```
acf(x1)
```



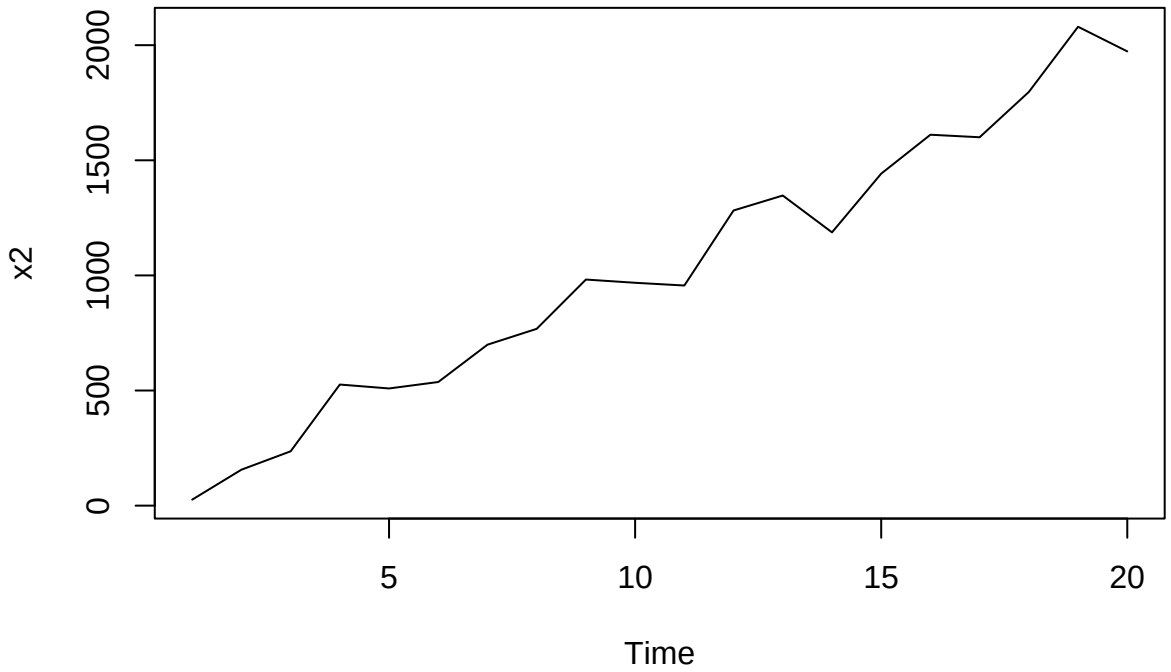

```
mean(x1)
```

```
## [1] 235.4
```

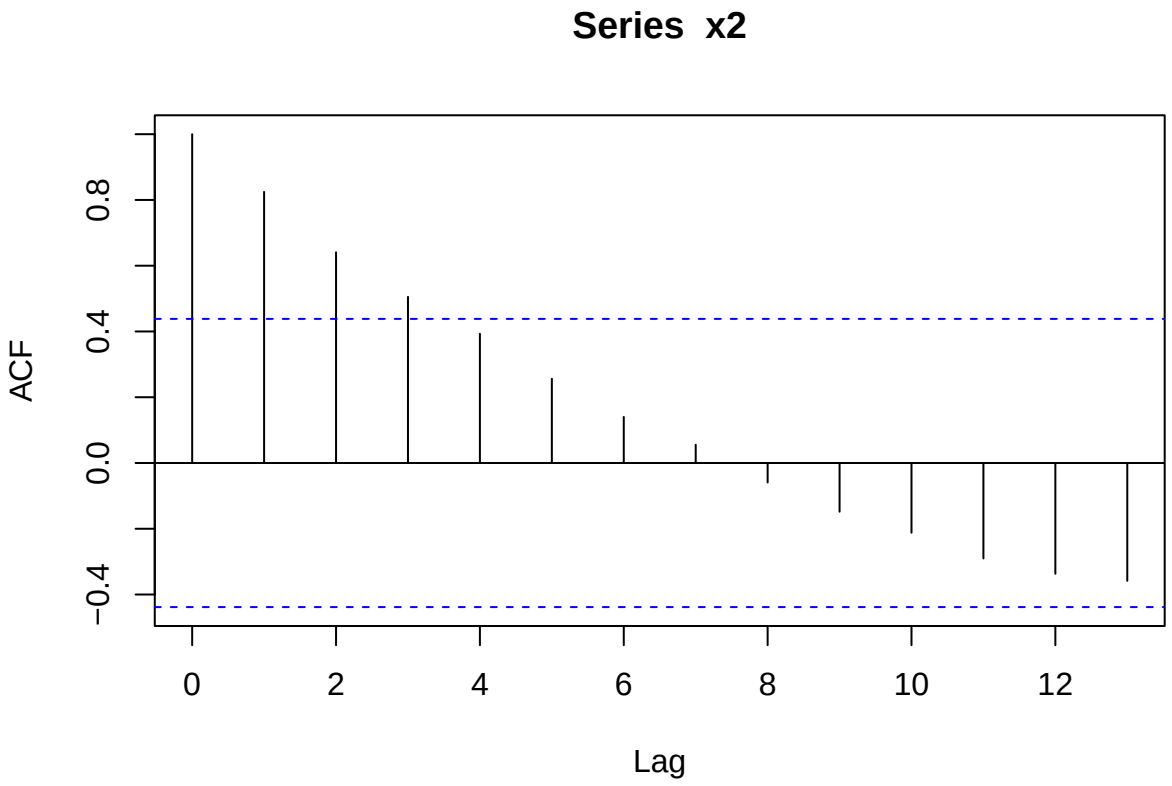
```
var(x1)
```

```
## [1] 13461.09
```

```
ts.plot(x2)
```



```r
acf(x2)  # does not look stationary - linearly increasing trend
```

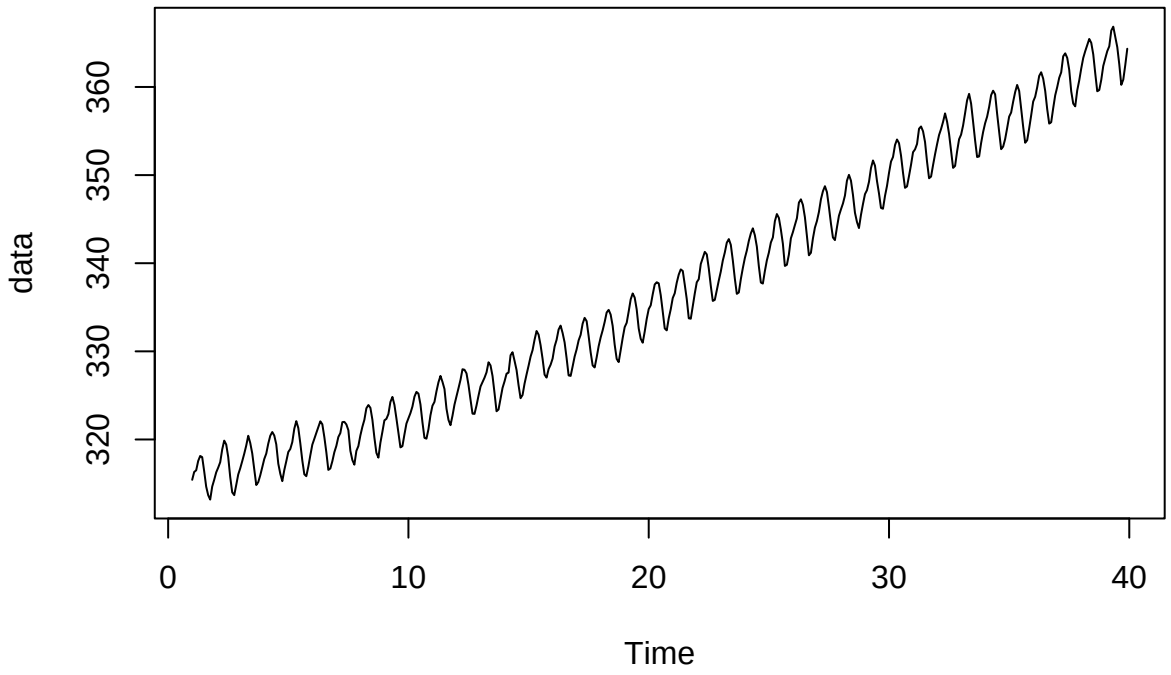


Trend and seasonality for co2 data set

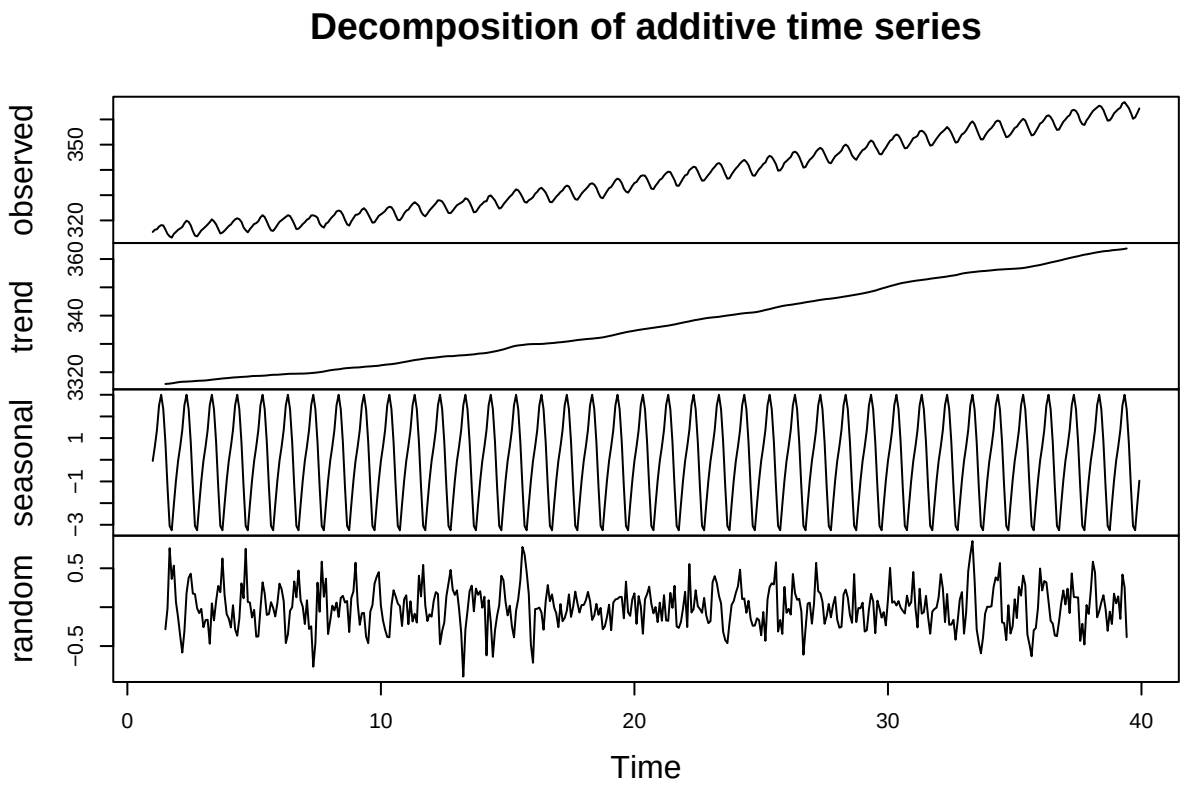
Plot the real data set co2 (a data set containing monthly measurements of the co2 concentration in the atmosphere 1959 - 1997 at Mauna Loa).

- Does it look stationary?
- If not, try to remove trend and seasonality.
- Does the random term look like white noise?

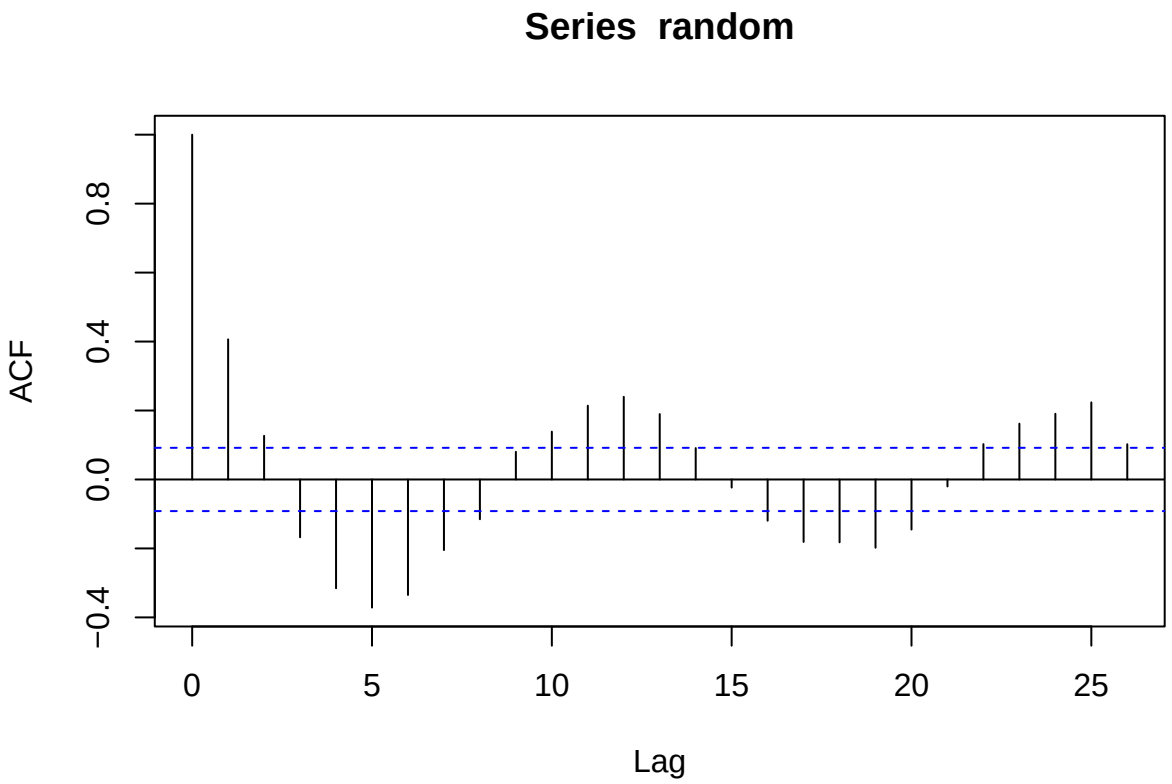
```r
data<-co2
data<-ts(data,frequency = 12)
plot(data) # Does not look stationary
```




```
plot(decompose(data))
```




```
random<-decompose(data)$random
random<-random[!is.na(random)] # Removes NA values at the beginning and end
acf(random) # Not completely white noise
```


Series random
ACF
0.8
0.4
0.0
−0.4
0
5
10
15
20
25
Lag