Beer production in Australia

```
library(fpp2)
```

```
## Registered S3 method overwritten by 'quantmod':
##   method            from
##   as.zoo.data.frame zoo
```

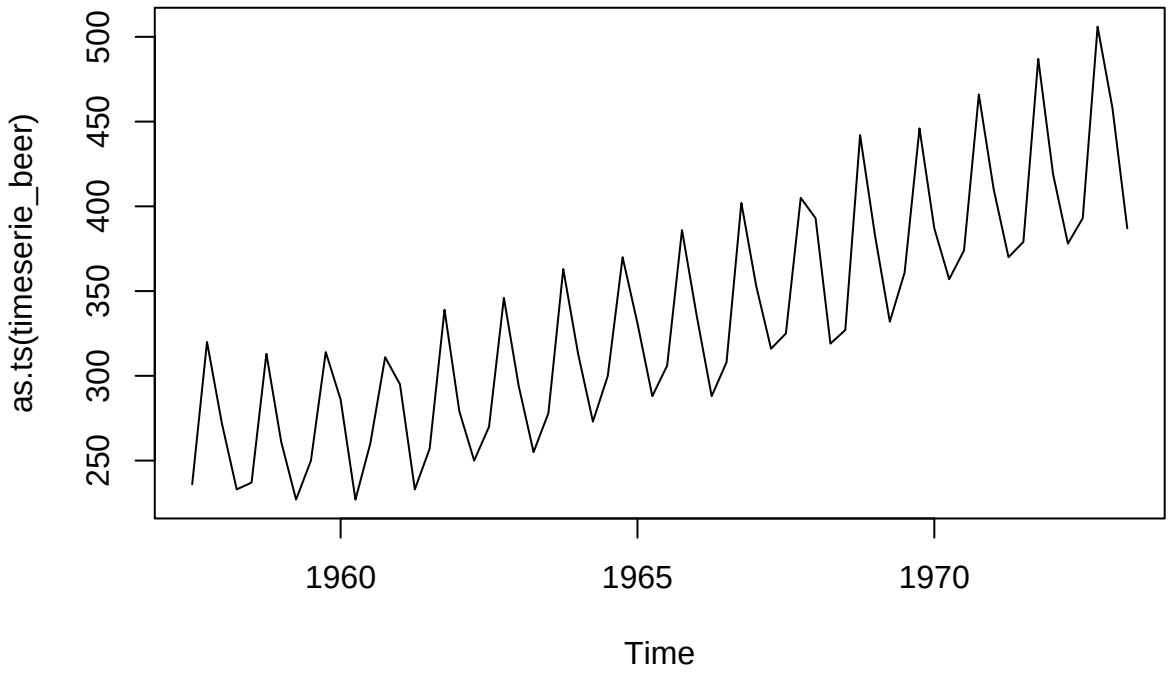
```
## -- Attaching packages --------------------------------------------- fpp2 2.5 --
```

```
## v ggplot2   3.5.1      v fma       2.5
## v forecast  8.24.0     v expsmooth 2.3
```

```
## Warning: package 'forecast' was built under R version 4.4.1
```

```
##
```

```
data(ausbeer)
timeserie_beer = tail(head(ausbeer, 17*4+2),17*4-4)
plot(as.ts(timeserie_beer))
```



Monthly airline passengers

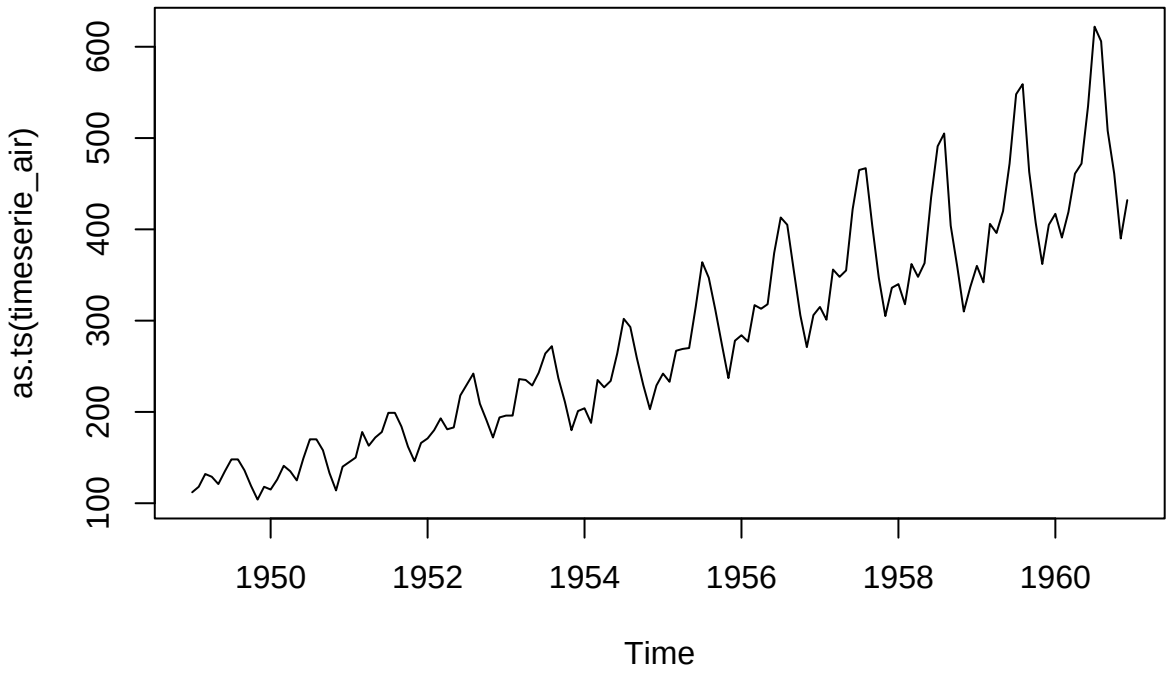
```
# install.packages("Ecdat")
library(Ecdat)
```

```
## Warning: package 'Ecdat' was built under R version 4.4.1
```

```
##
## Attaching package: 'Ecdat'
```

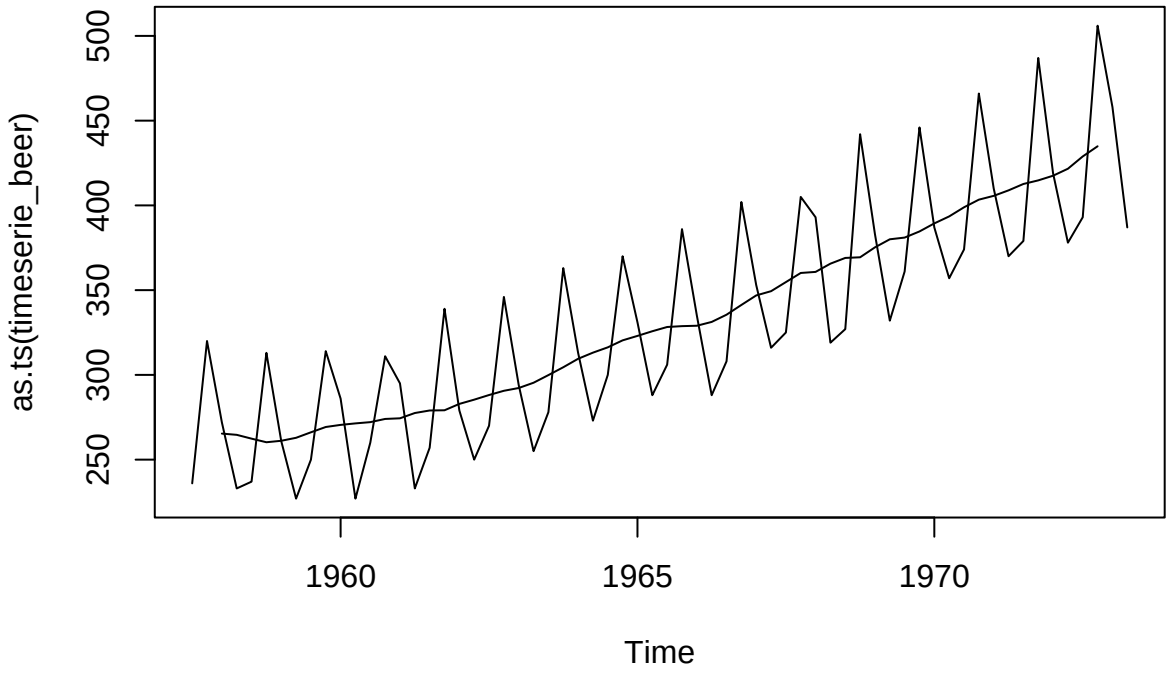
```
## The following object is masked from 'package:datasets':
##
##     Orange
```

```
data(AirPassengers)
timeserie_air = AirPassengers
plot(as.ts(timeserie_air))
```

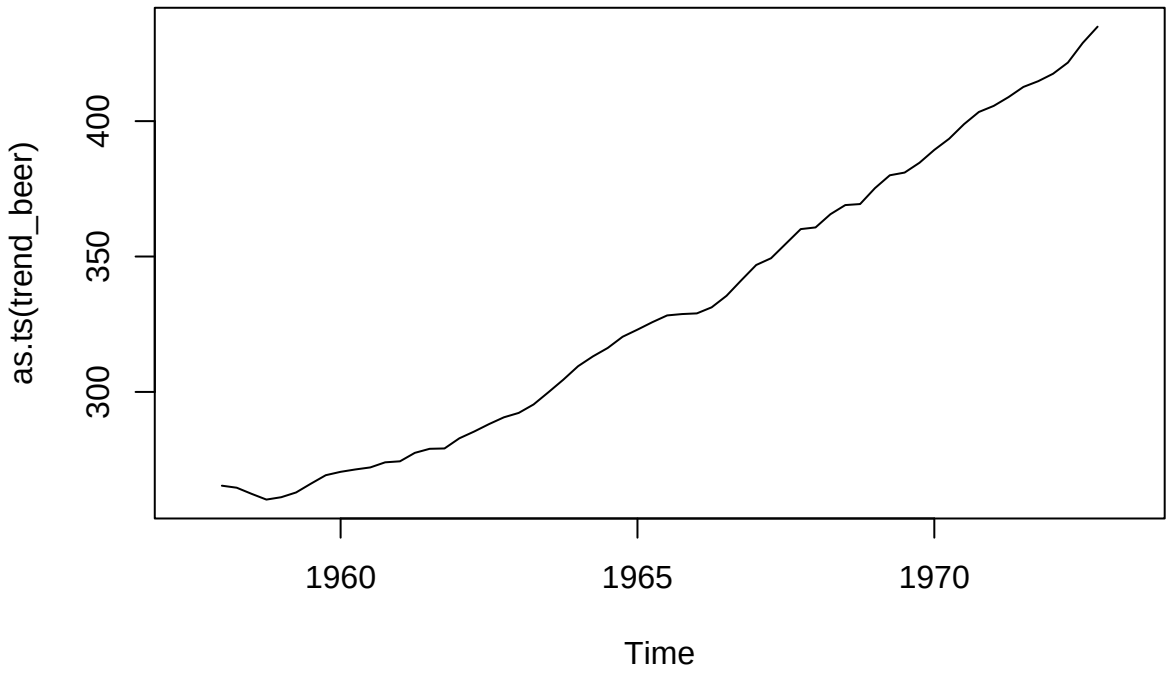


Detect trend - Beer

```
# install.packages("forecast")
library(forecast)
trend_beer = ma(timeserie_beer, order = 4, centre = T)
plot(as.ts(timeserie_beer))
lines(trend_beer)
```

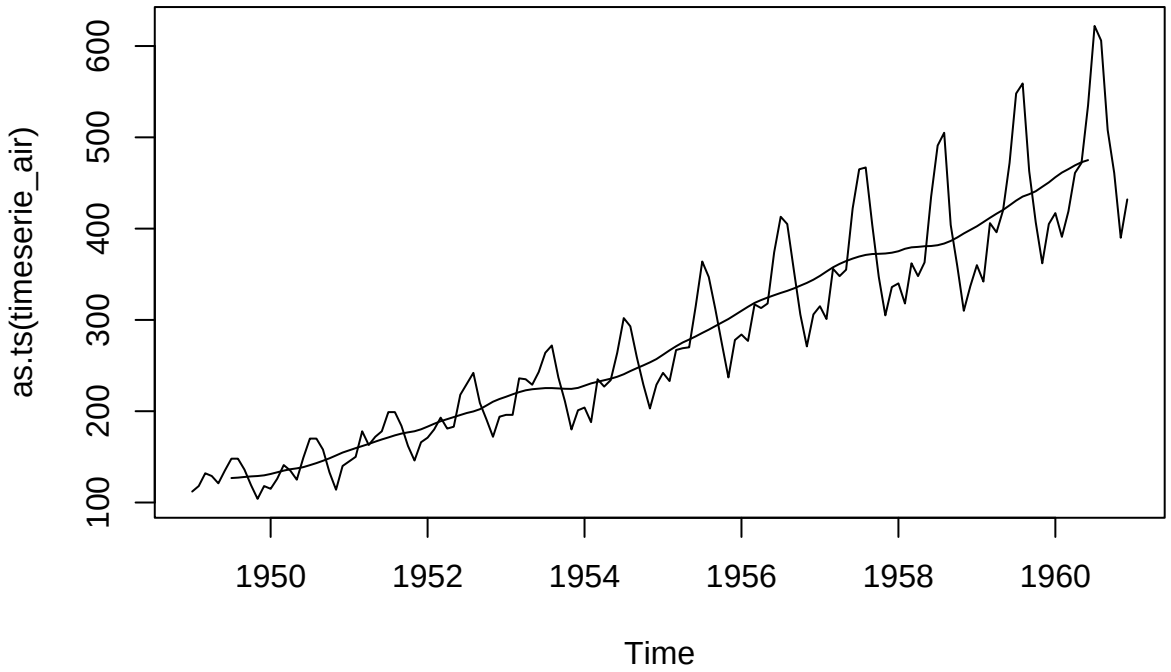



```
plot(as.ts(trend_beer))
```

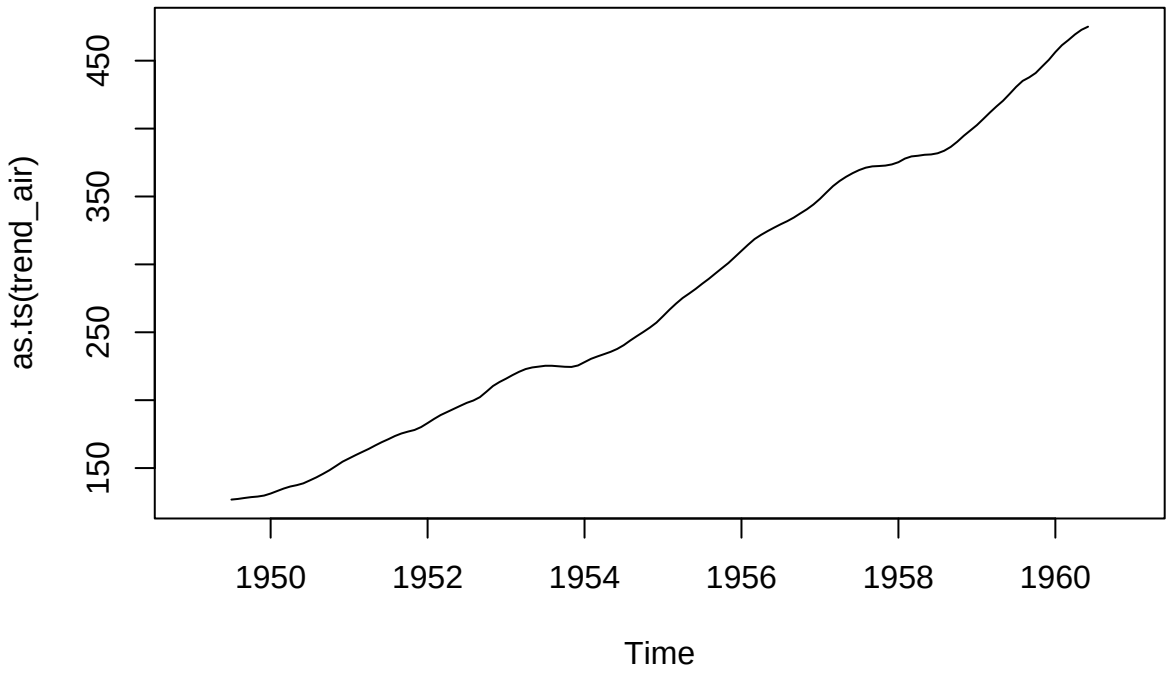


- Airlines

```
trend_air = ma(timeserie_air, order = 12, centre = T)
plot(as.ts(timeserie_air))
lines(trend_air)
```

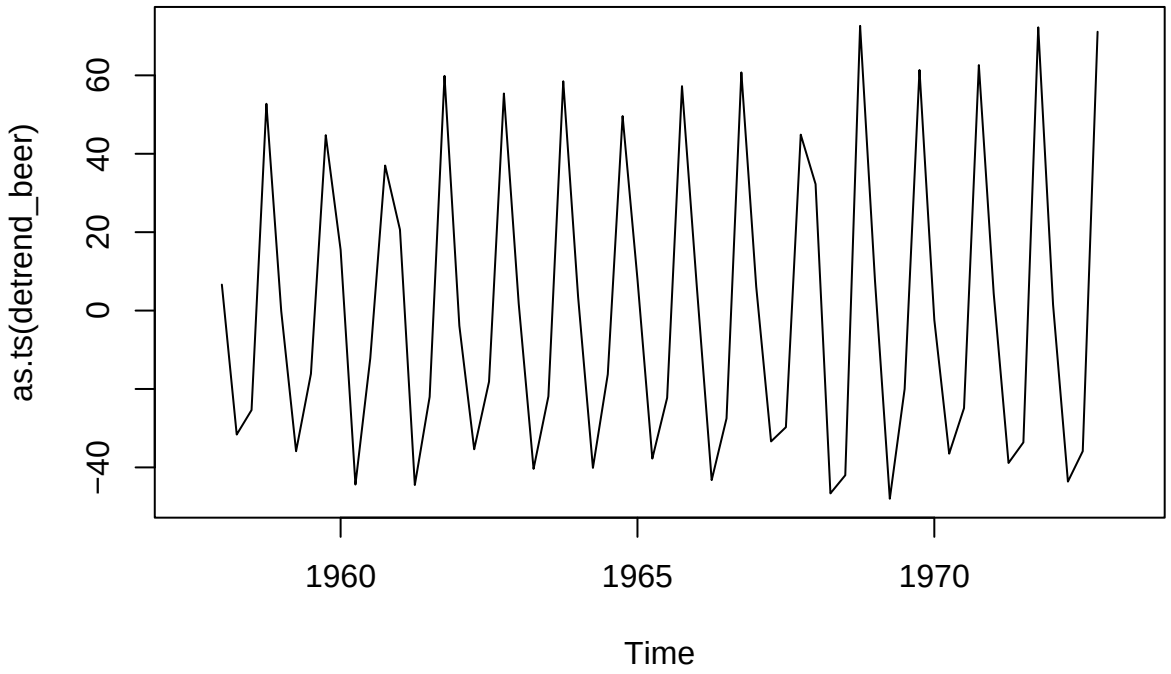



```
plot(as.ts(trend_air))
```



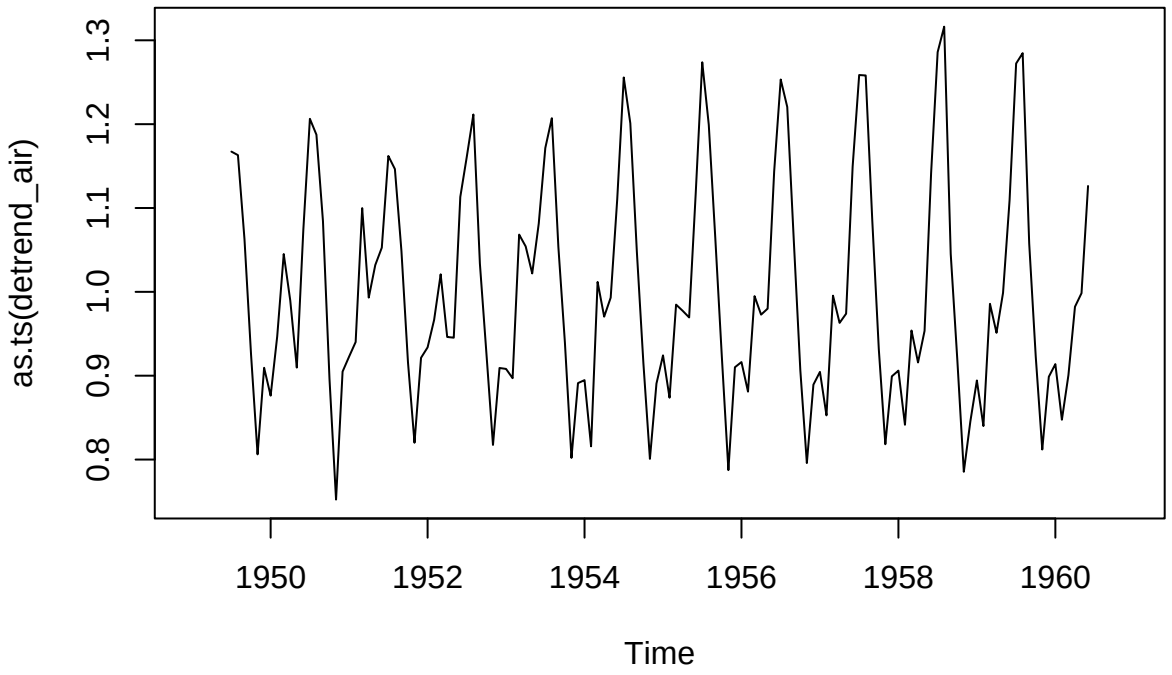
Detrend - Beer

```
detrend_beer = timeserie_beer - trend_beer
plot(as.ts(detrend_beer))
```



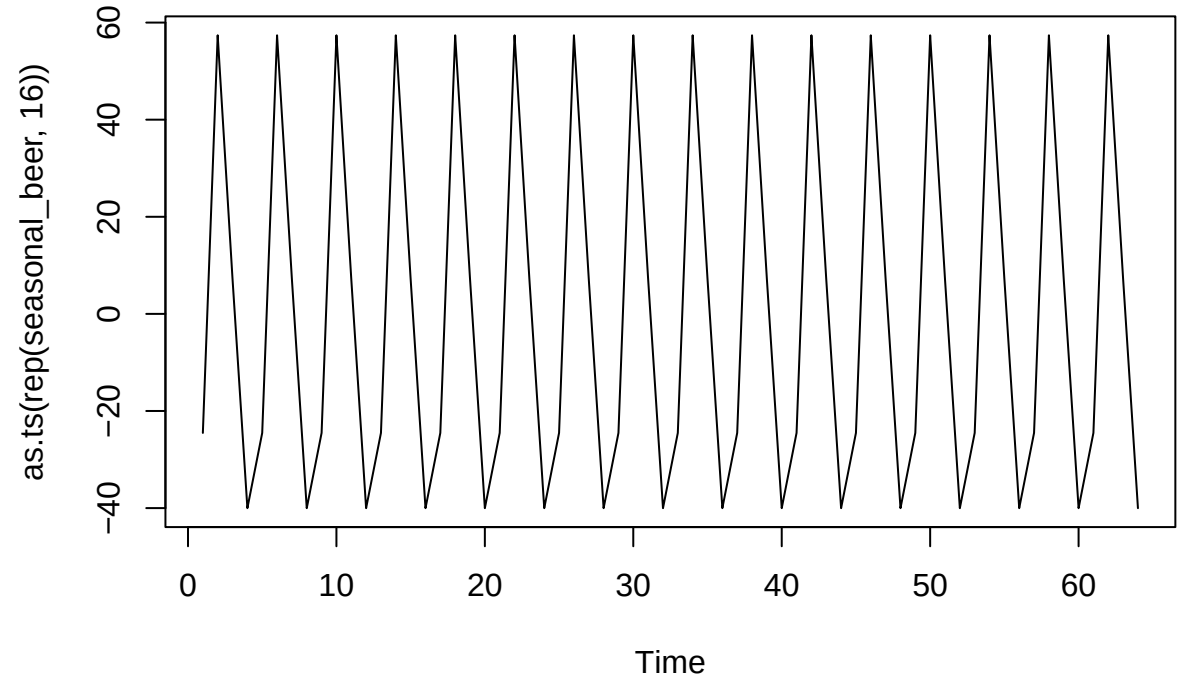
- Air

```
detrend_air = timeserie_air / trend_air
plot(as.ts(detrend_air))
```



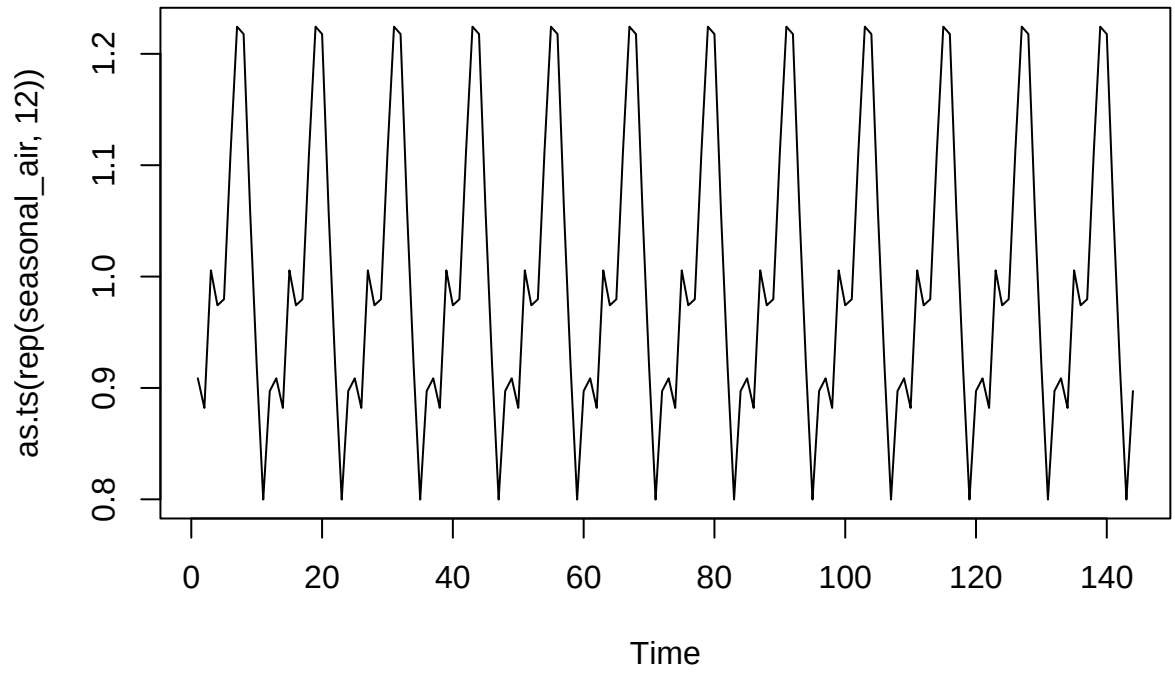
Seasonality - Beer

```
m_beer = t(matrix(data = detrend_beer, nrow = 4))
seasonal_beer = colMeans(m_beer, na.rm = T)
plot(as.ts(rep(seasonal_beer,16)))
```



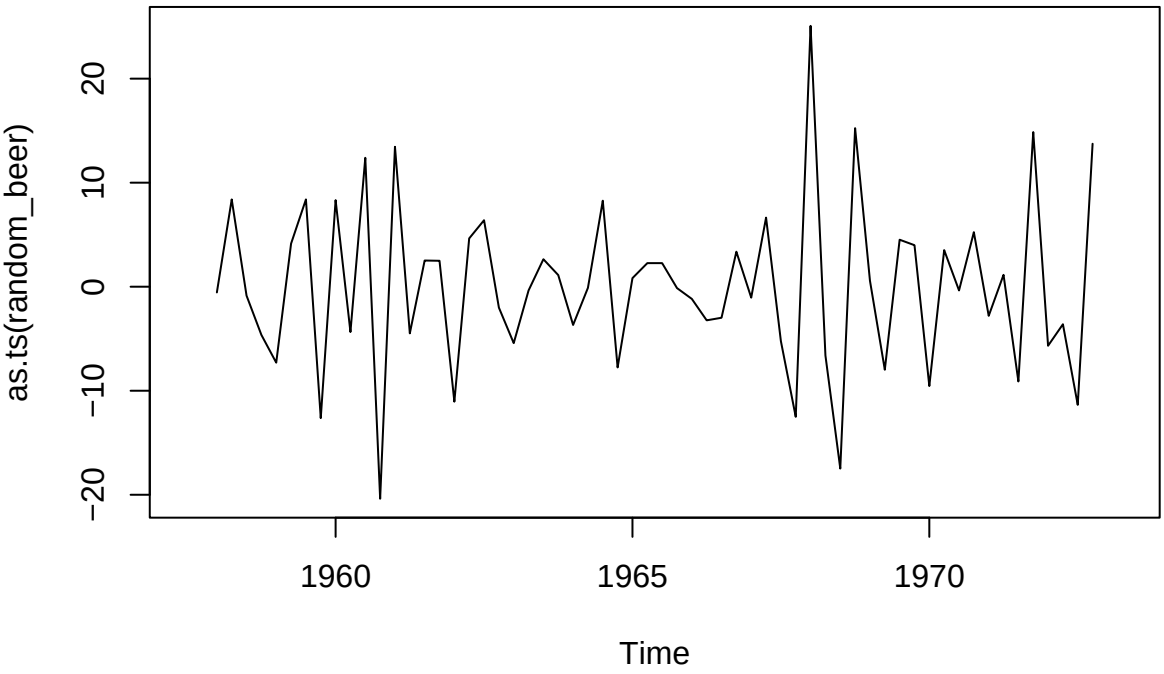
- Air

```
m_air = t(matrix(data = detrend_air, nrow = 12))
seasonal_air = colMeans(m_air, na.rm = T)
plot(as.ts(rep(seasonal_air,12)))
```



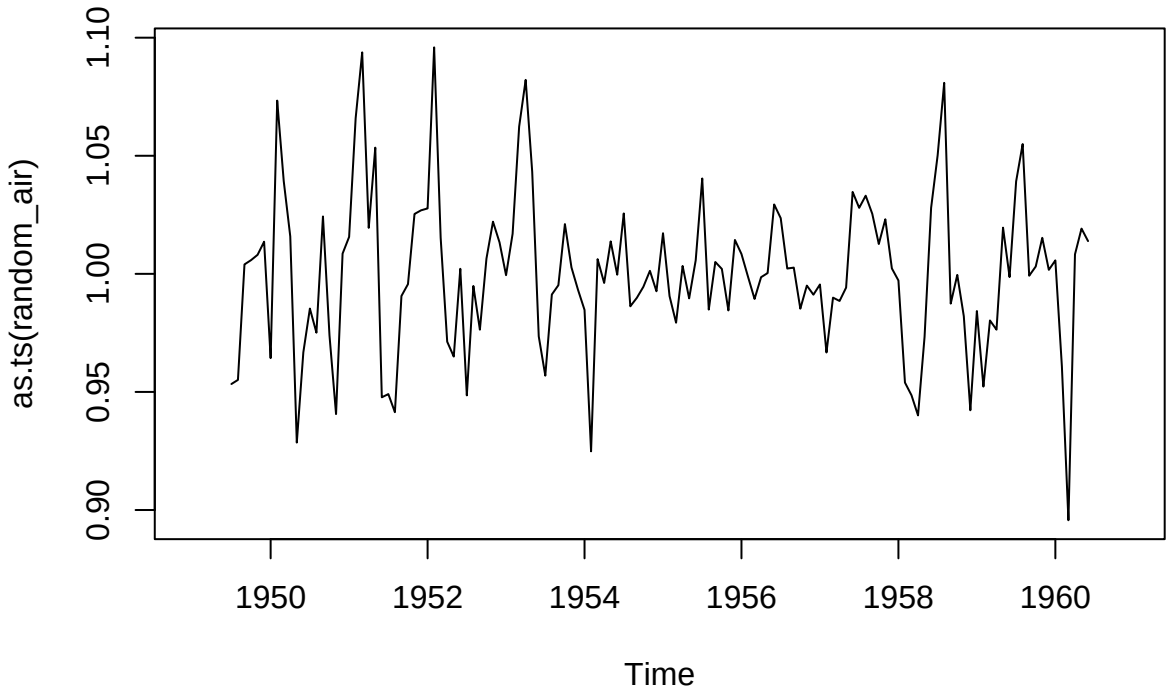
Random - Beer

```
random_beer = timeserie_beer - trend_beer - seasonal_beer
plot(as.ts(random_beer))
```



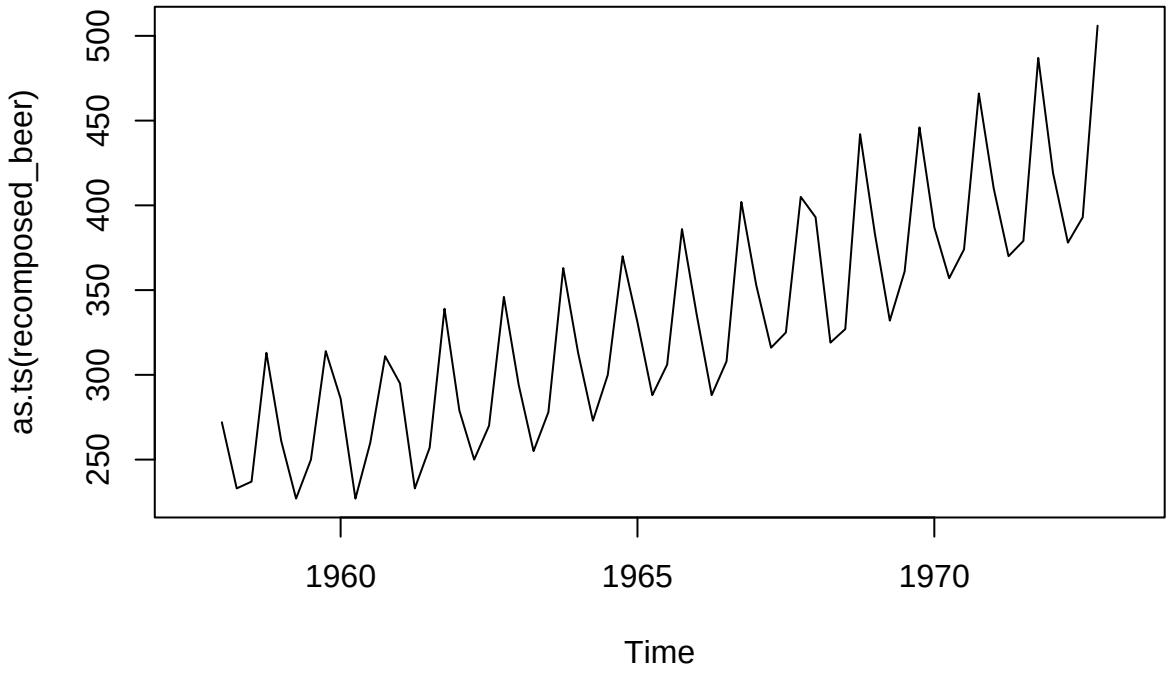
- Air

```
random_air = timeserie_air / (trend_air * seasonal_air)
plot(as.ts(random_air))
```



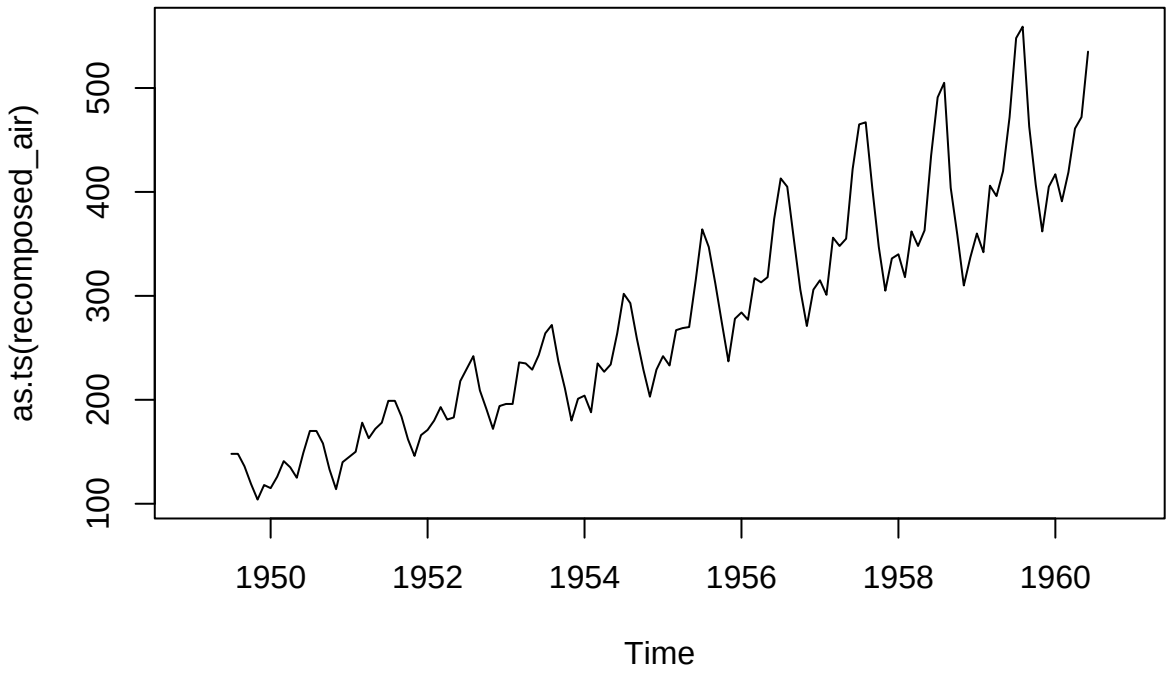
Reconstruct - Beer

```
recomposed_beer = trend_beer+seasonal_beer+random_beer
plot(as.ts(recomposed_beer))
```



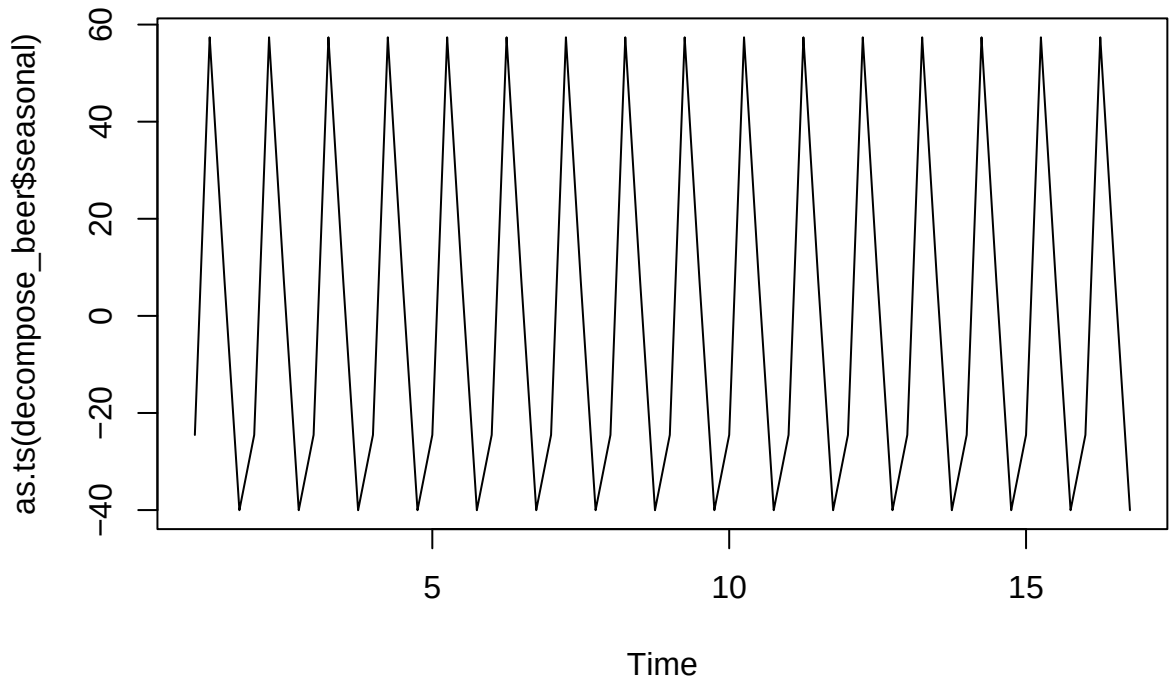
- Air

```
recomposed_air = trend_air*seasonal_air*random_air
plot(as.ts(recomposed_air))
```

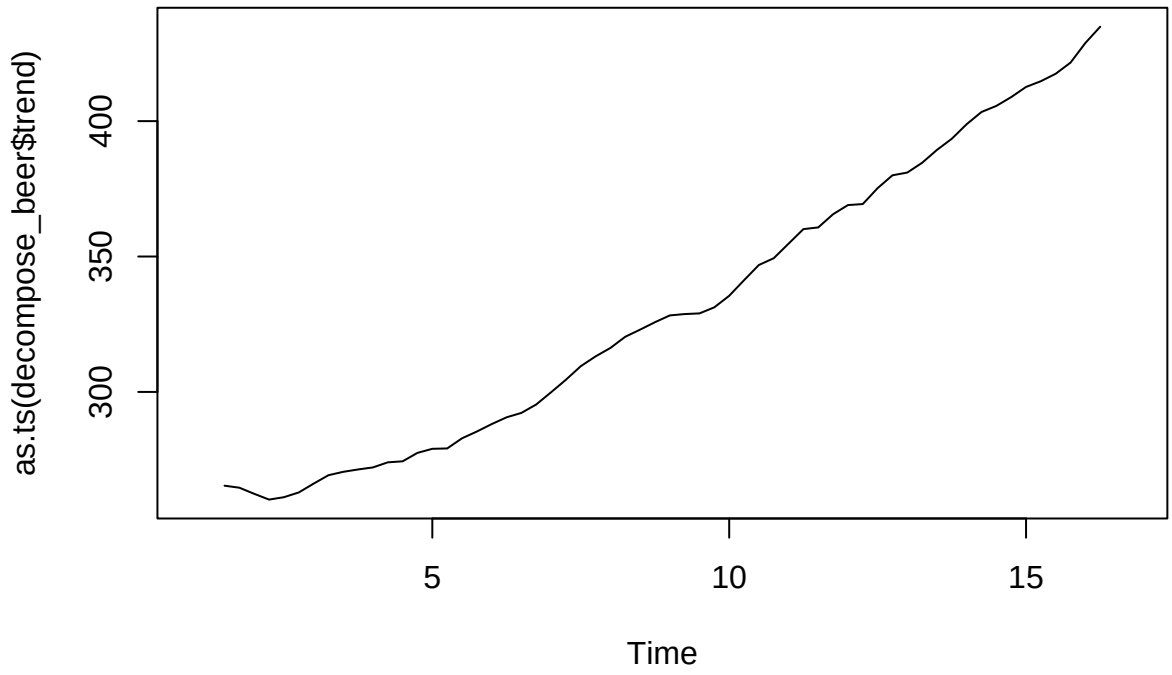


With TS - Beer

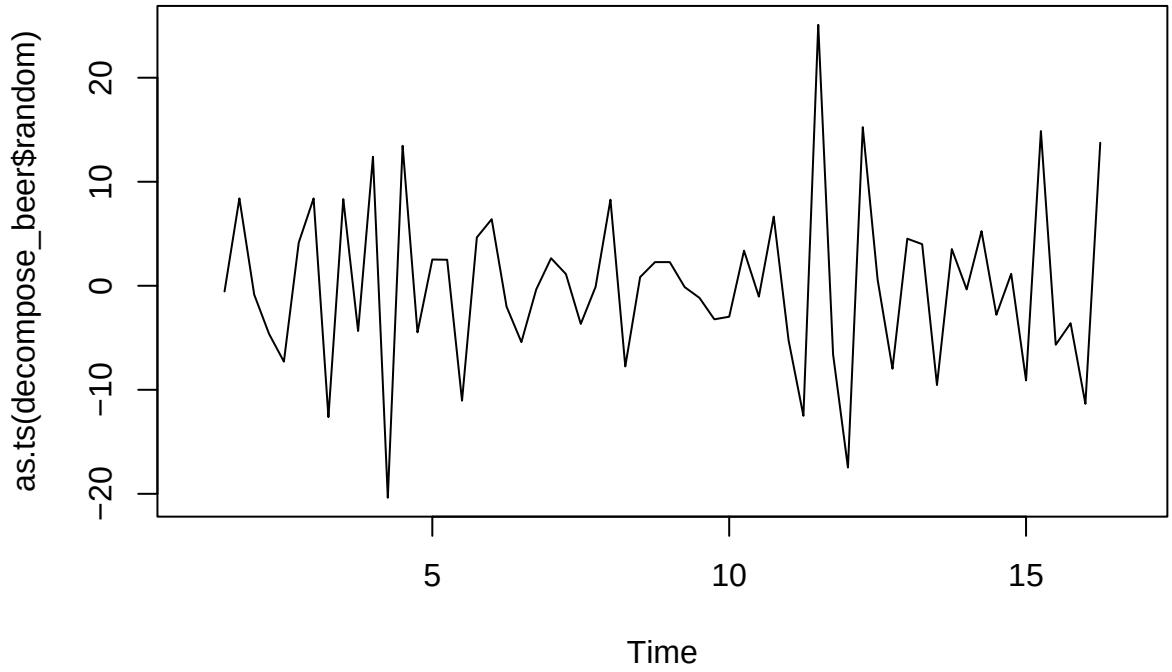
```
ts_beer = ts(timeserie_beer, frequency = 4)
decompose_beer = decompose(ts_beer, "additive")

plot(as.ts(decompose_beer$seasonal))
```



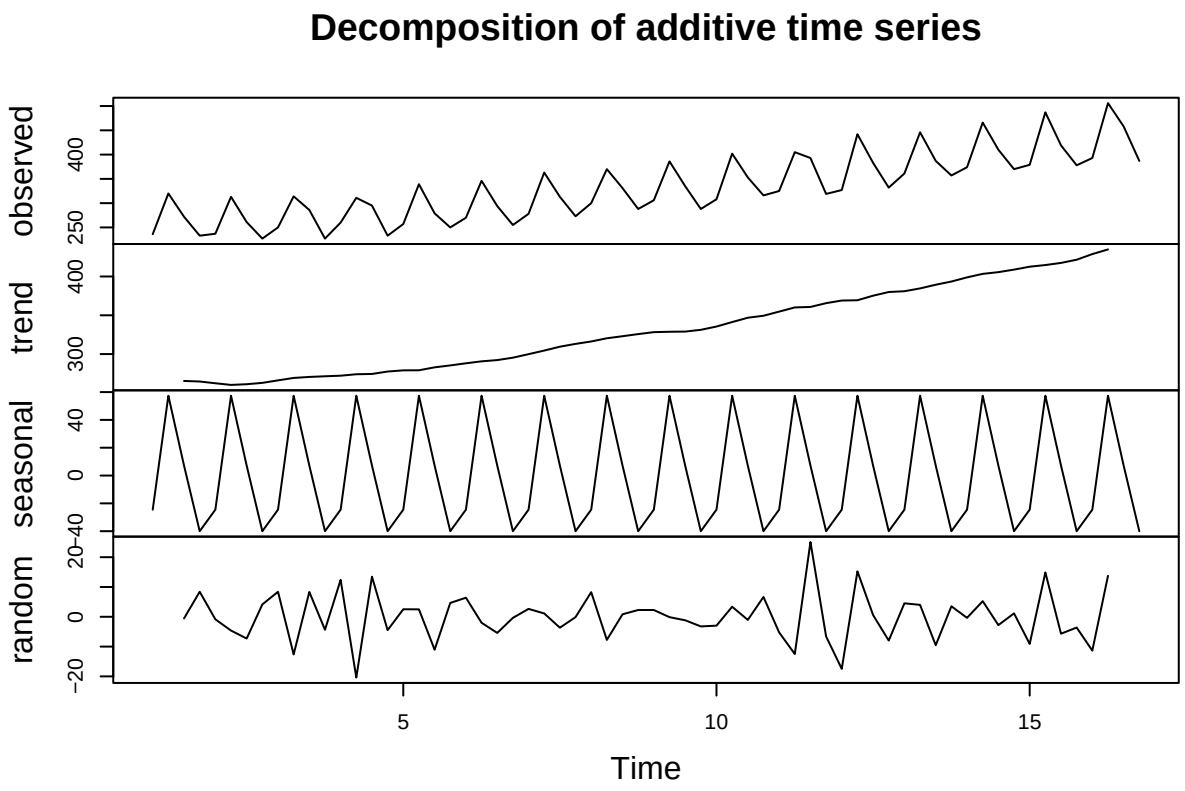

```
plot(as.ts(decompose_beer$trend))
```




```
plot(as.ts(decompose_beer$random))
```

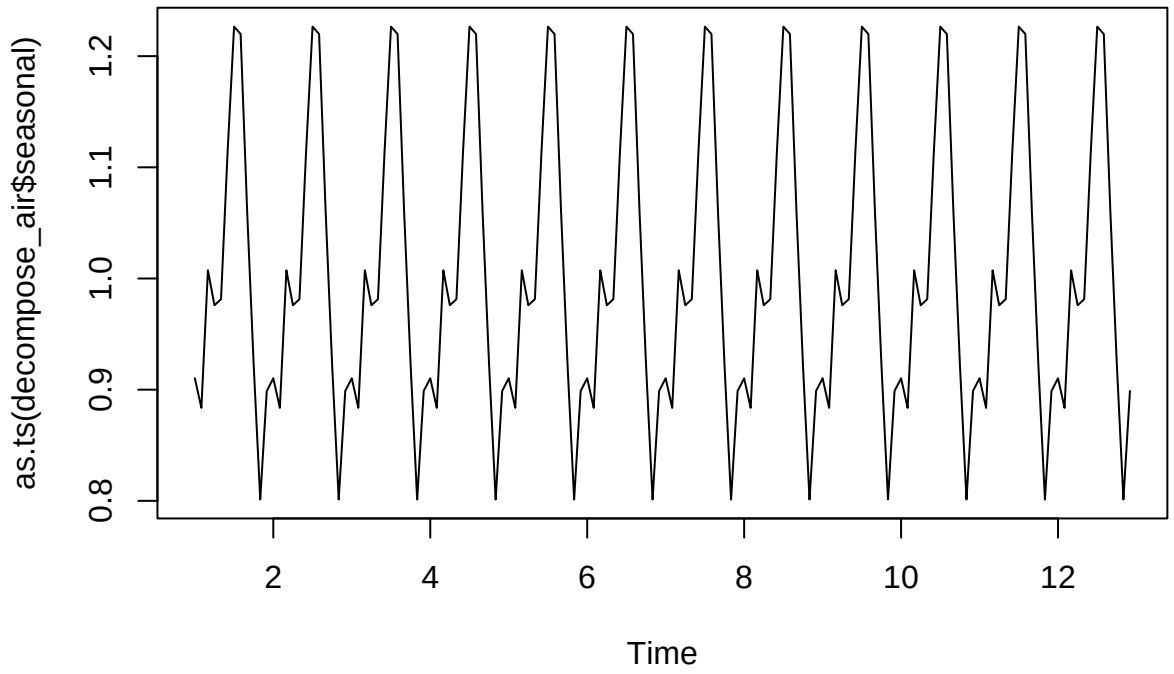



```
plot(decompose_beer)
```

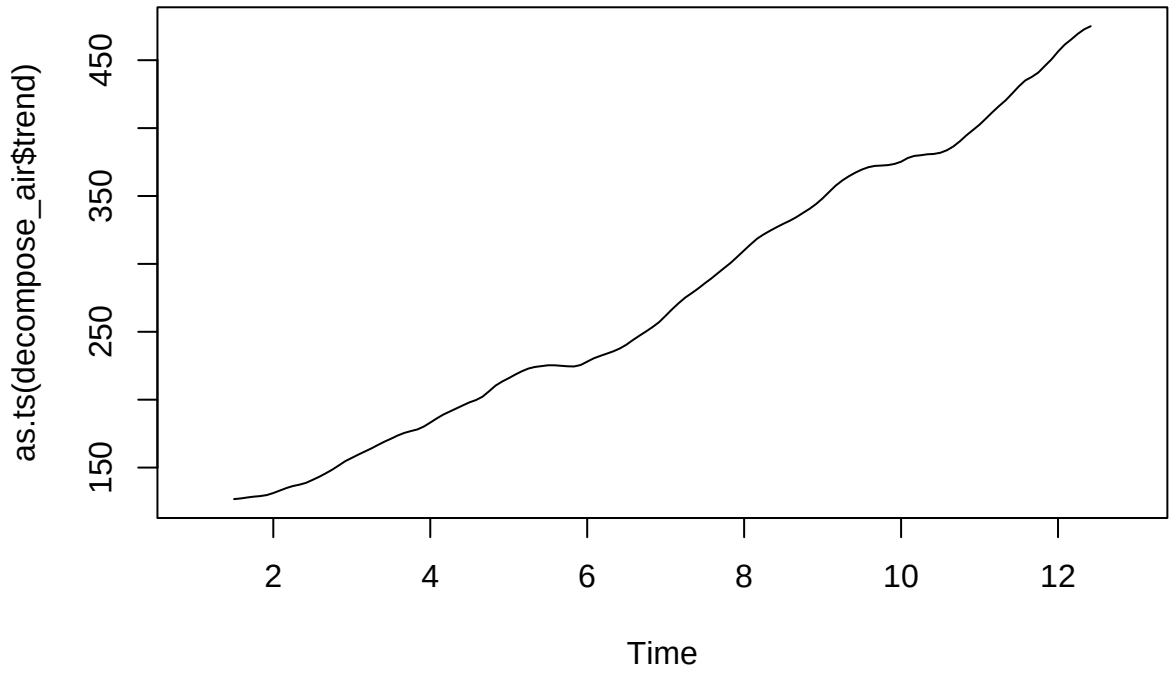


- Air

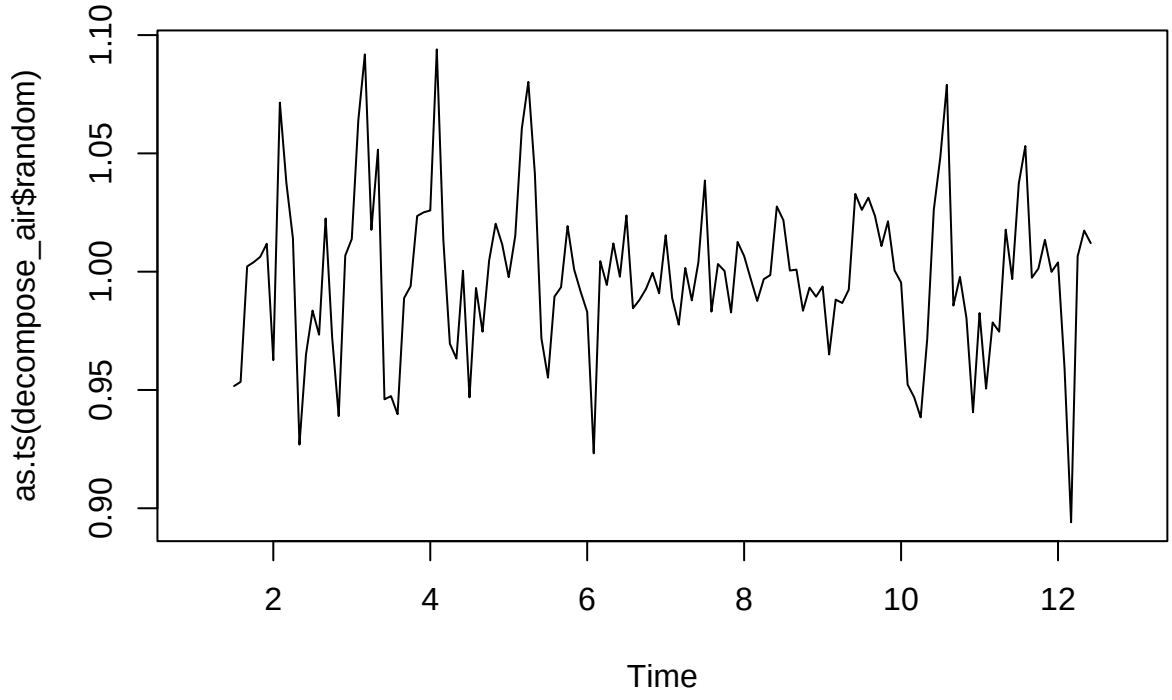
```
ts_air = ts(timeserie_air, frequency = 12)
decompose_air = decompose(ts_air, "multiplicative")

plot(as.ts(decompose_air$seasonal))
```



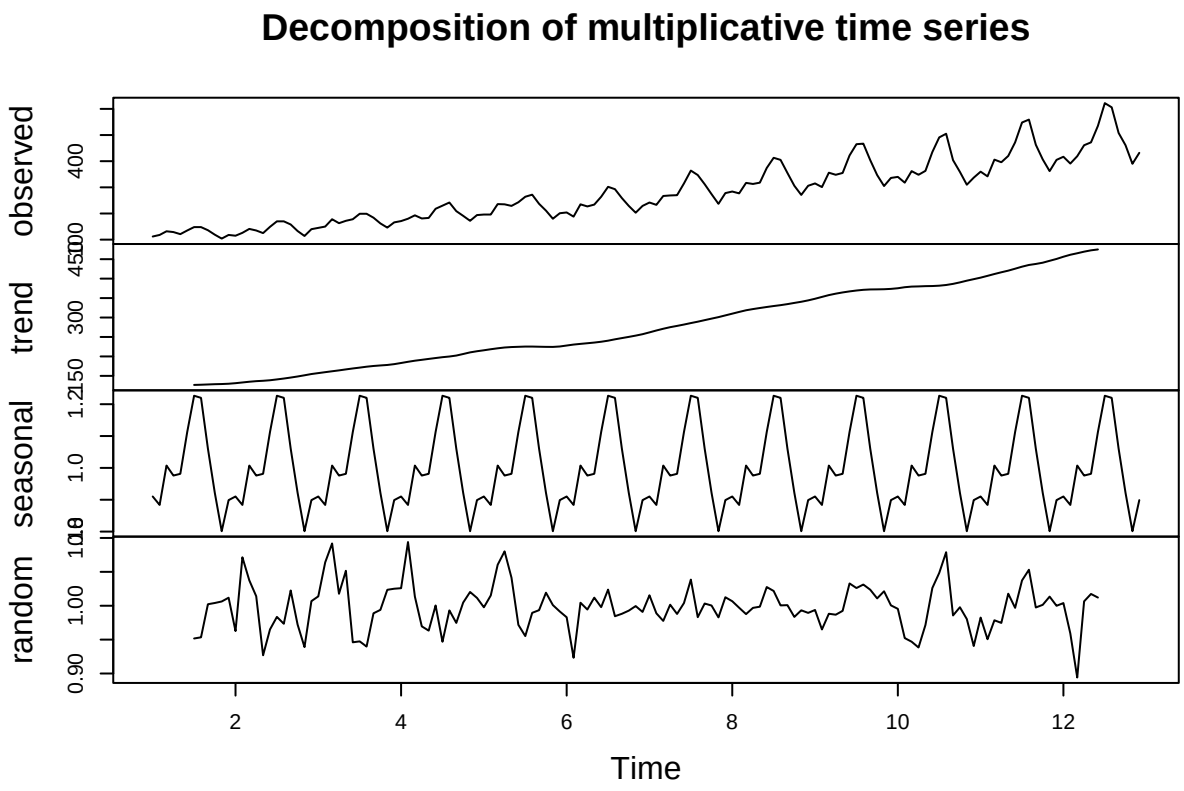
```
plot(as.ts(decompose_air$trend))
```




```
plot(as.ts(decompose_air$random))
```

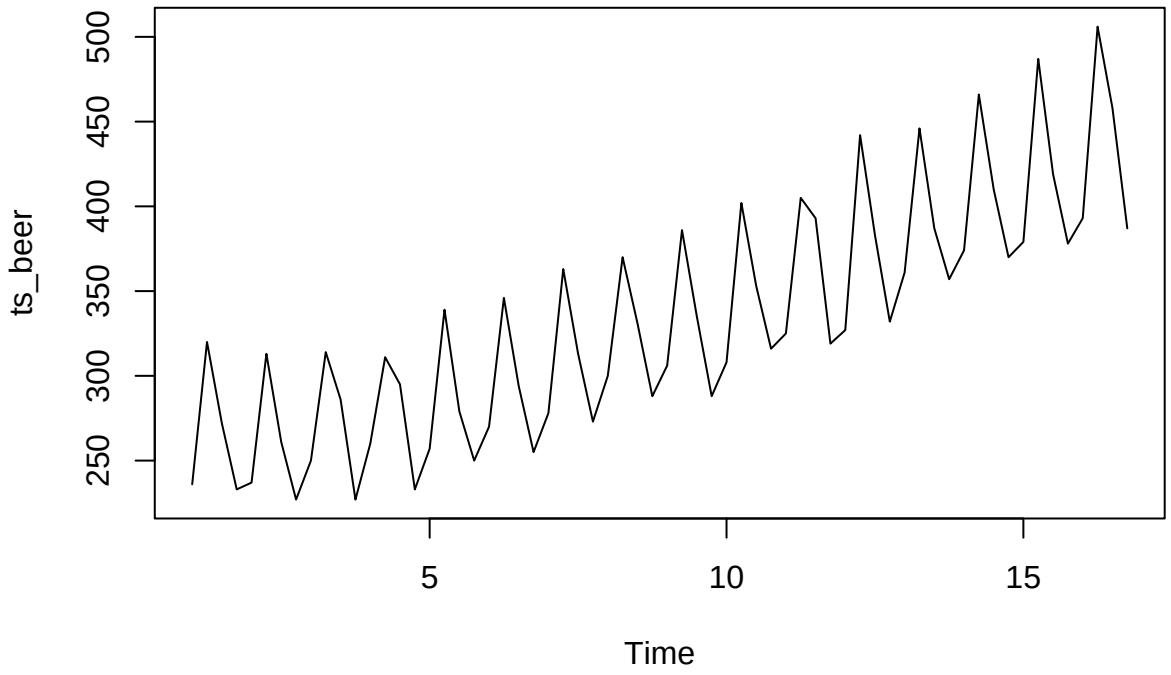



```
plot(decompose_air)
```

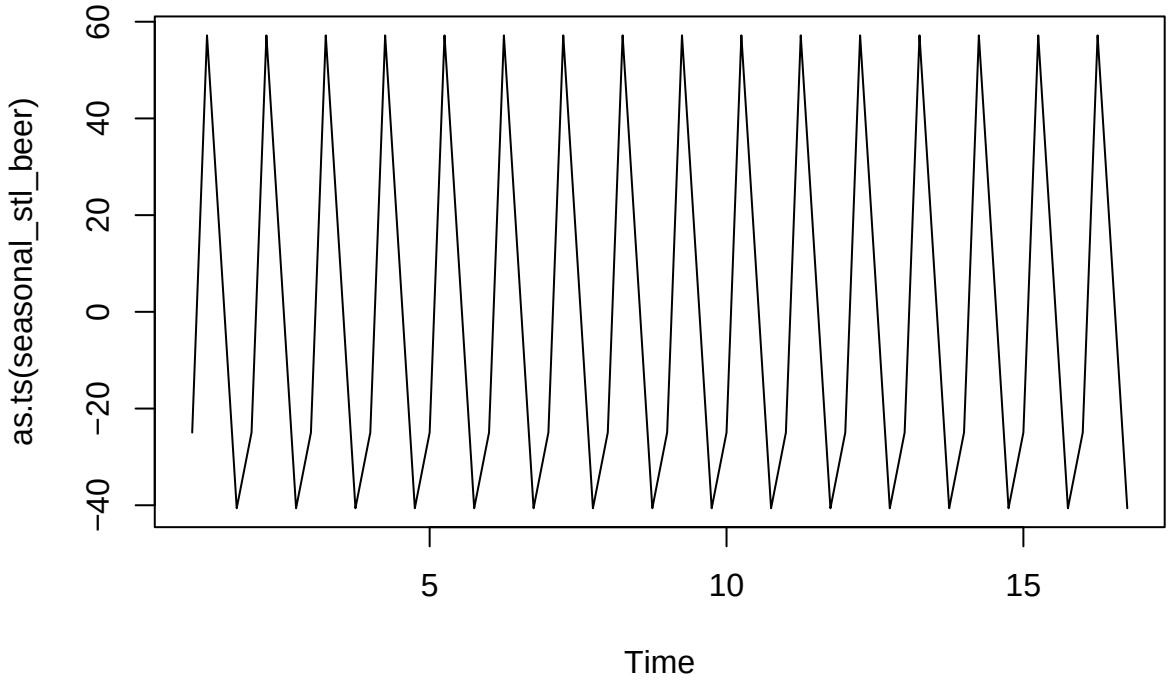


STL

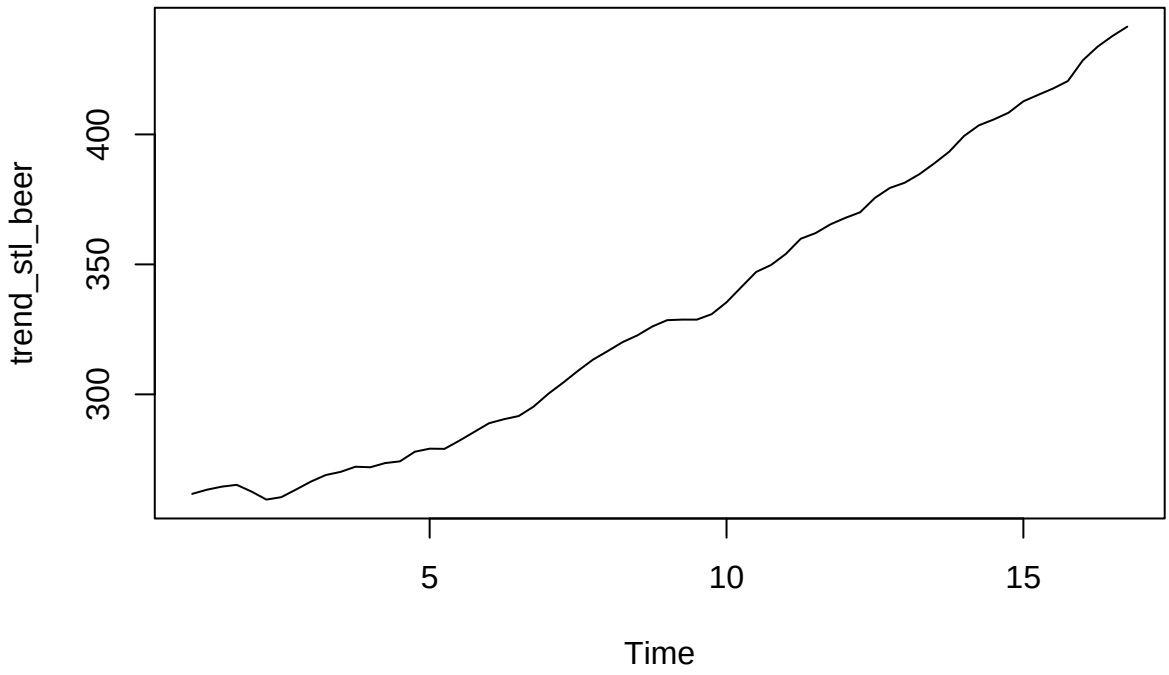
```
ts_beer = ts(timeserie_beer, frequency = 4)
stl_beer = stl(ts_beer, "periodic")
seasonal_stl_beer   <- stl_beer$time.series[,1]
trend_stl_beer     <- stl_beer$time.series[,2]
random_stl_beer  <- stl_beer$time.series[,3]

plot(ts_beer)
```



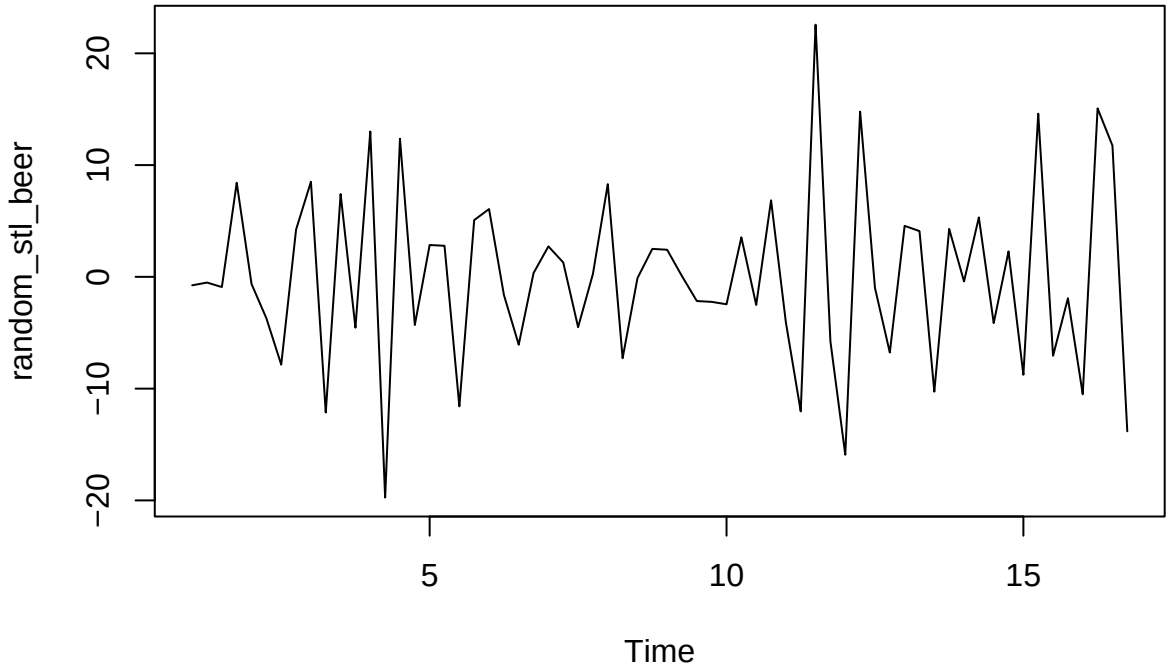

```
plot(as.ts(seasonal_stl_beer))
```



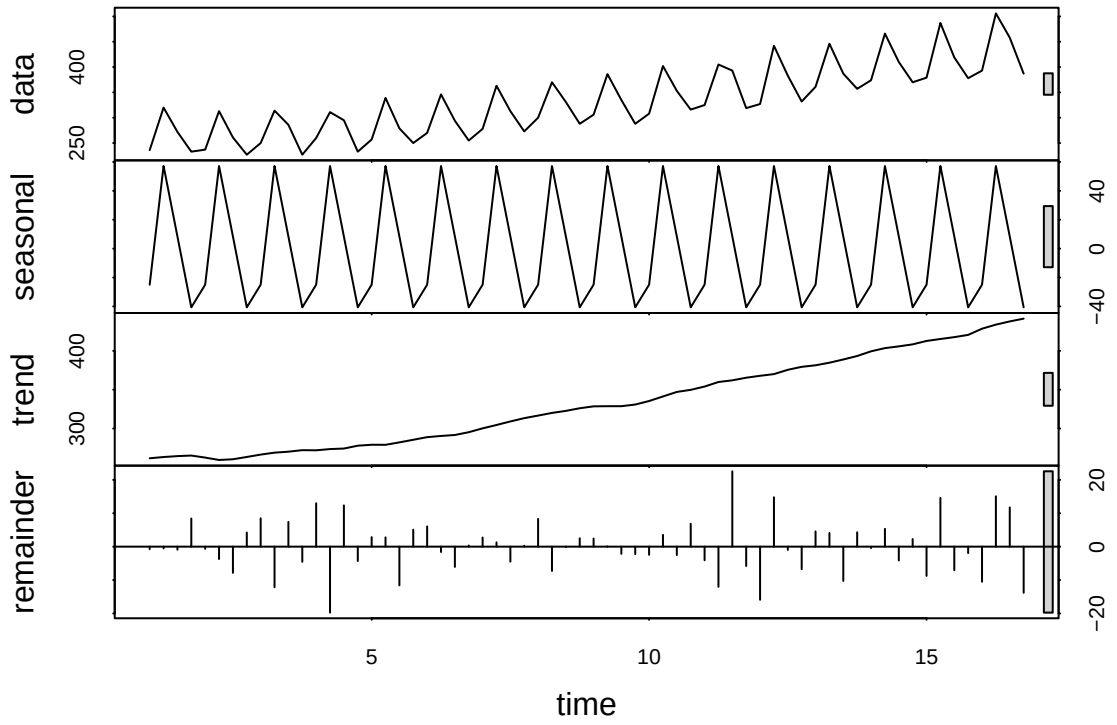

```
plot(trend_stl_beer)
```




```
plot(random_stl_beer)
```




```
plot(stl_beer)
```


data
seasonal
trend
remainder
250
400
−40
0
40
300
400
−20
0
20
5
10
15
time