CO2

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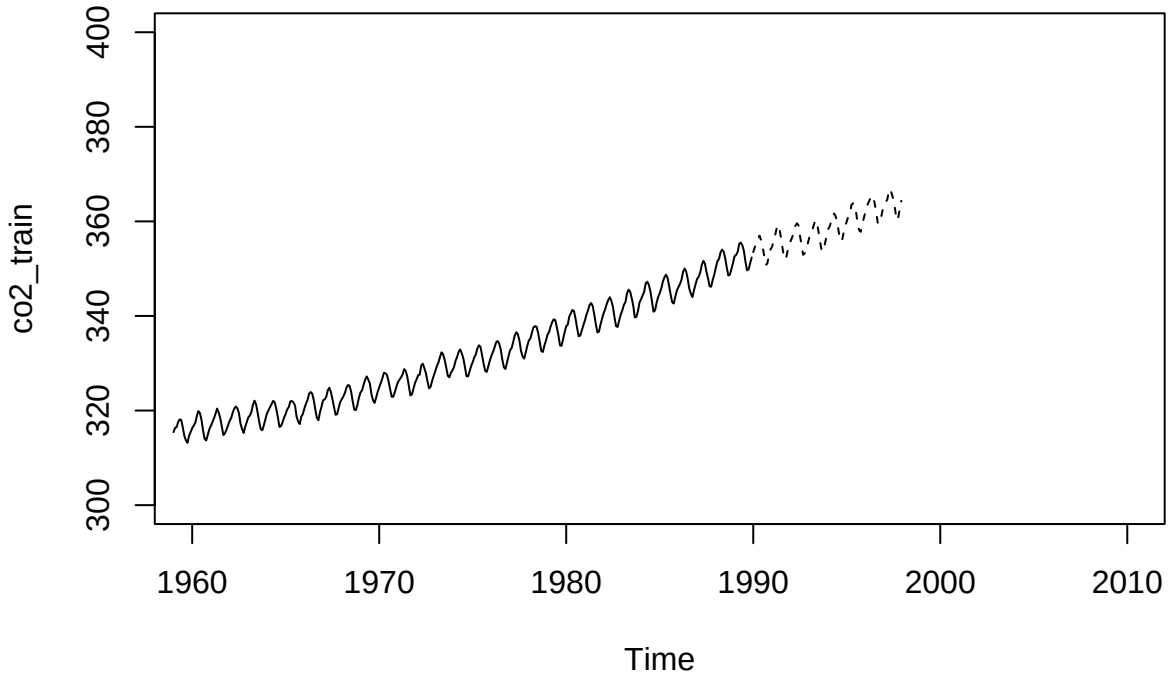
We extract training and test set

```
co2_train=window(co2,start=c(1959,1),end=c(1989,12))
co2_test=window(co2,start=c(1990,1),end=c(1997,12))
```

We can plot both

```
plot(co2_train,xlim=c(1960,2010),ylim=c(300,400))
lines(co2_test,lty=2)
```

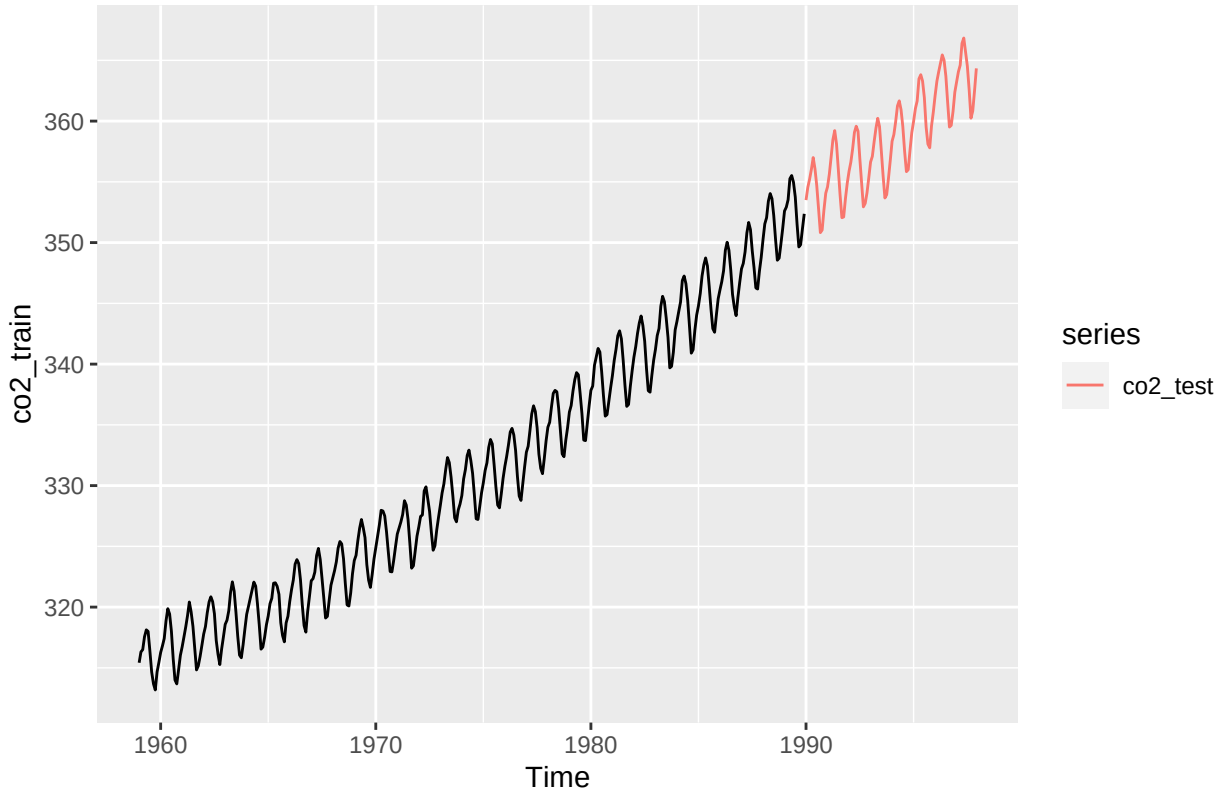


or with

```
library(forecast);library(ggplot2)
```

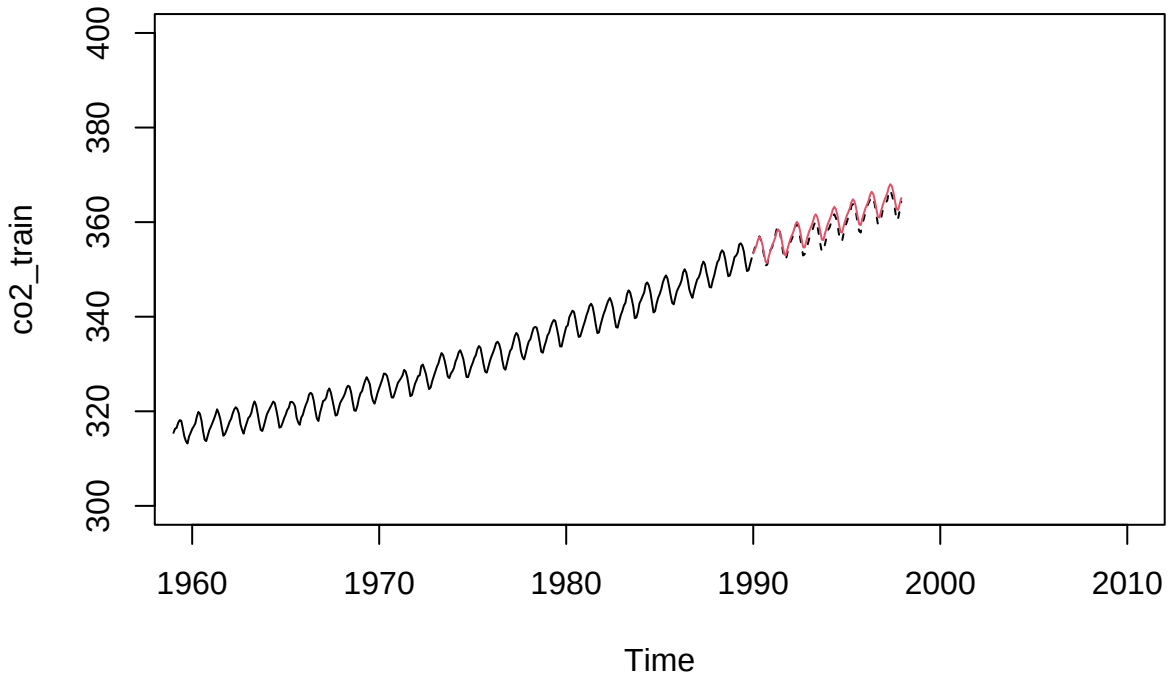
```
## Registered S3 method overwritten by 'quantmod':
##   method            from
##   as.zoo.data.frame zoo
```

```
autoplot(co2_train)+
  autolayer(co2_test)
```



We see a trend and a seasonal pattern, probably additive.

```
library(forecast)
h=hw(co2_train,seasonal='additive',damped=FALSE,h=96)
plot(co2_train,xlim=c(1960,2010),ylim=c(300,400))
lines(co2_test,lty=2)
lines(h$mean,col=2)
```

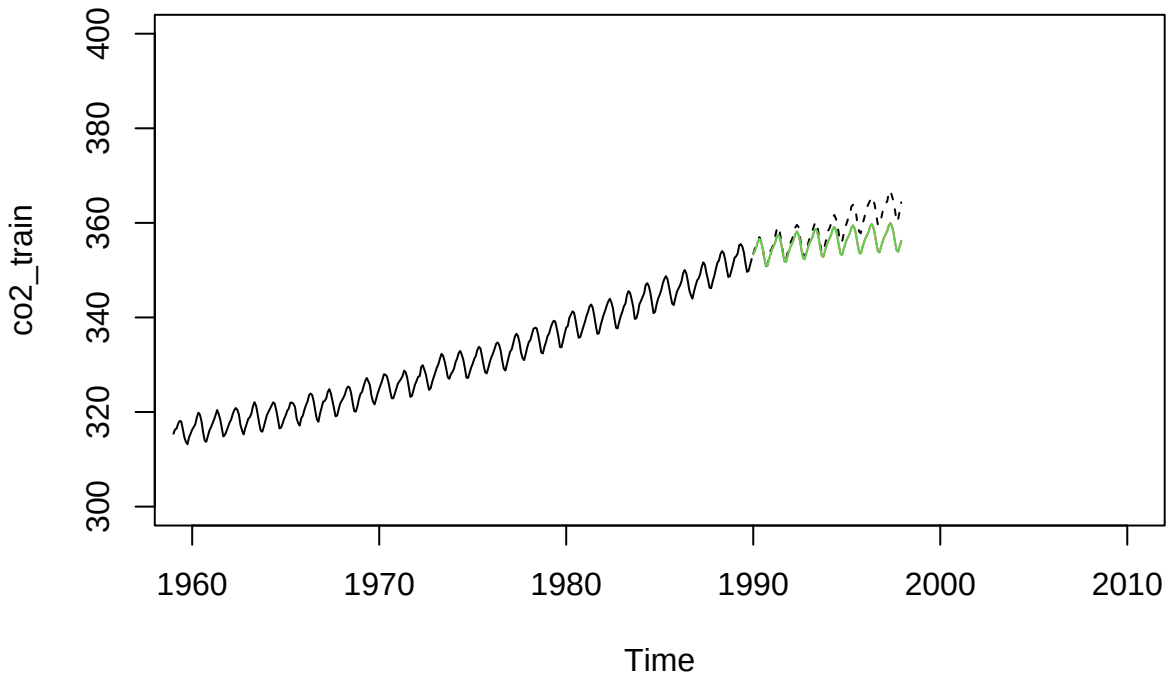


```
print(sqrt(mean((h$mean-co2_test)^2)))
```

```
## [1] 1.316165
```

We can compare with a damped version, but the result are worse

```
h=hw(co2_train,seasonal='additive',damped=TRUE,h=96)
plot(co2_train,xlim=c(1960,2010),ylim=c(300,400))
lines(co2_test,lty=2)
lines(h$mean,col=2)
lines(h$mean,col=3)
```

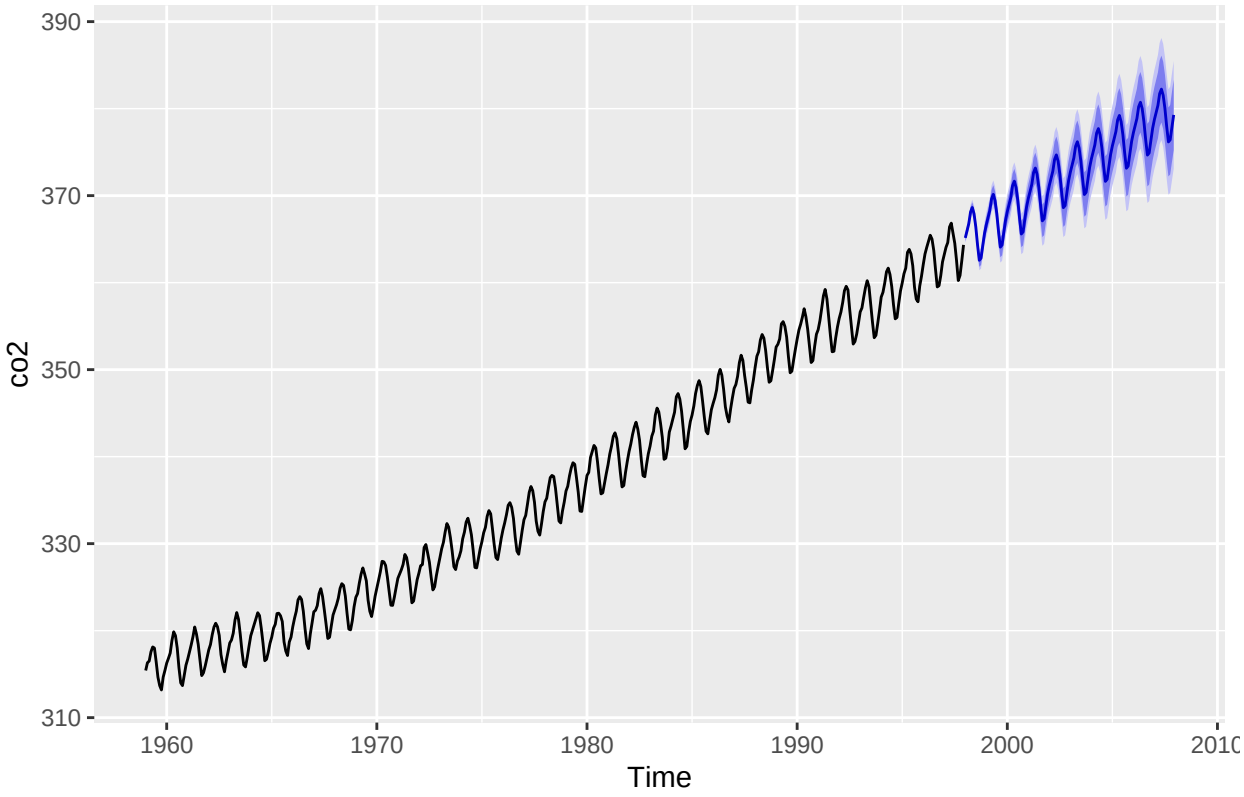



```
print(sqrt(mean((h$mean-co2_test)^2)))
```

```
## [1] 3.686467
```

Let's finish by predict the next 10 years

```
h=hw(co2,seasonal='additive',damped=FALSE,h=120)
autoplot(co2)+autolayer(h)
```


390
370
350
330
310
co2
1960
1970
1980
1990
2000
2010
Time