Univaraite Changepoint Models for NO2

Summary

```
## Warning: package 'zoo' was built under R version 3.6.3
```

```
##
## Attaching package: 'zoo'
```

```
## The following objects are masked from 'package:base':
##
##     as.Date, as.Date.numeric
```

```
## Loading required package: splines
```

```
##
## Attaching package: 'not'
```

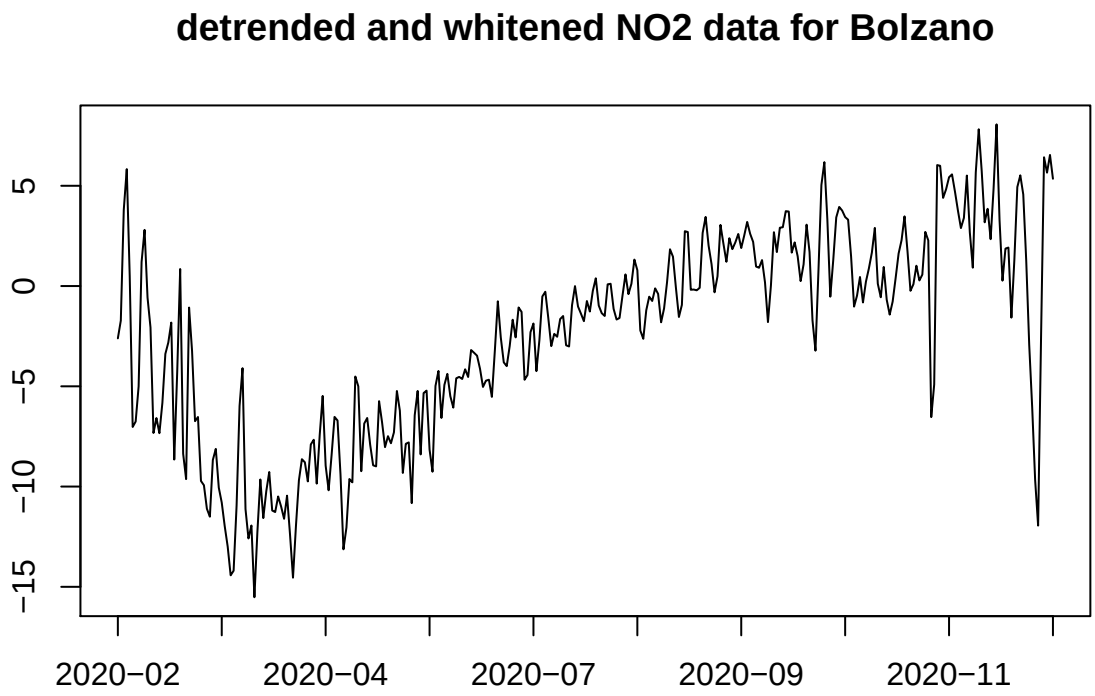
```
## The following object is masked from 'package:wbs':
##
##     random.intervals
```

```
## Warning: package 'IDetect' was built under R version 3.6.3
```

```
source("../R/pre_process_clean_data.R")

example.city <- "Bolzano"

xx <- stabilize.varaince.detrend(path.to.data = "../data/clean/NO2/",
                                 cities = example.city,
                                 target.year = "2020",
                                 trend.fit.years = c("2019","2018"),
                                 show.prog.bar = FALSE
                                 )

head(xx$detrended)
```

```
##                Bolzano
## 2020-02-14  -7.7512739
## 2020-02-15  -0.9053634
## 2020-02-16   8.3765733
## 2020-02-17  12.3730813
## 2020-02-18  -1.5499038
## 2020-02-19 -14.5844032
```

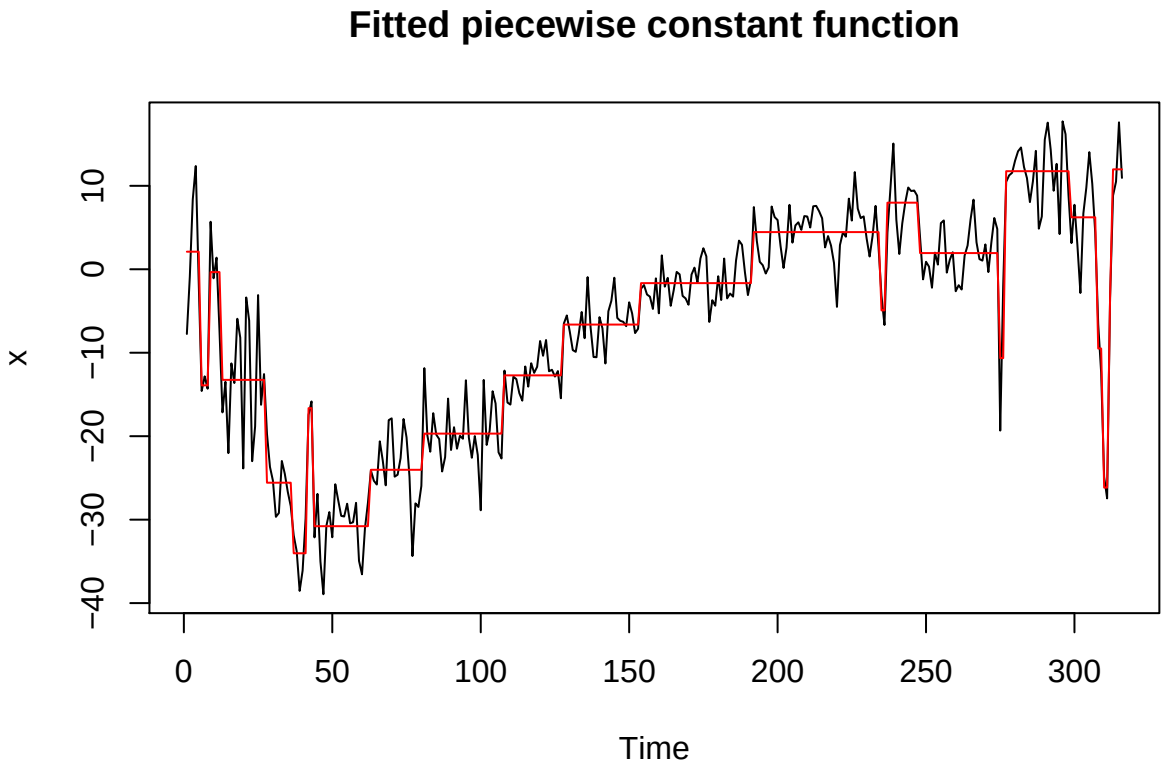
```
plot.with.dates.axis(xx$whitened[[example.city]],
                     rownames(xx$whitened),
                     main = paste0("detrended and whitened NO2 data for ", example.city)
                     )
```



Piecewise constant mean models

A piecewise constant signal is not appropriate for this data.

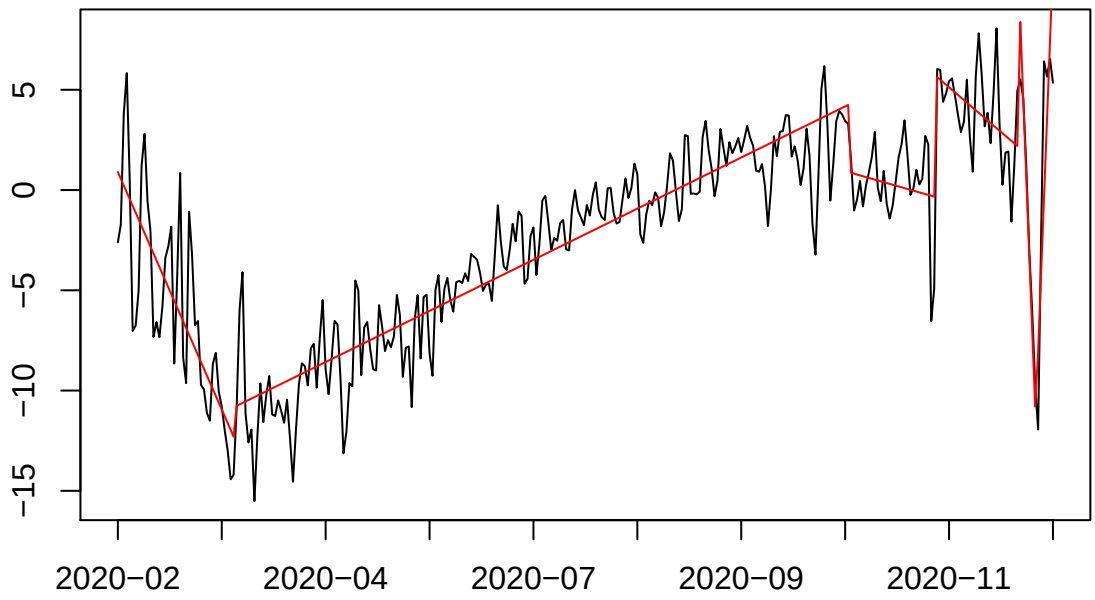
```
plot(wbs(xx$detrended[[example.city]]))
```



Piecewise linear mean models

Narrowest over threshold

```
not.obj <- not(xx$whitened[[example.city]], contrast = "pcwsLinMean")
plot.with.dates.axis(xx$whitened[[example.city]], rownames(xx$whitened))
lines(predict(not.obj), col = "red")
```



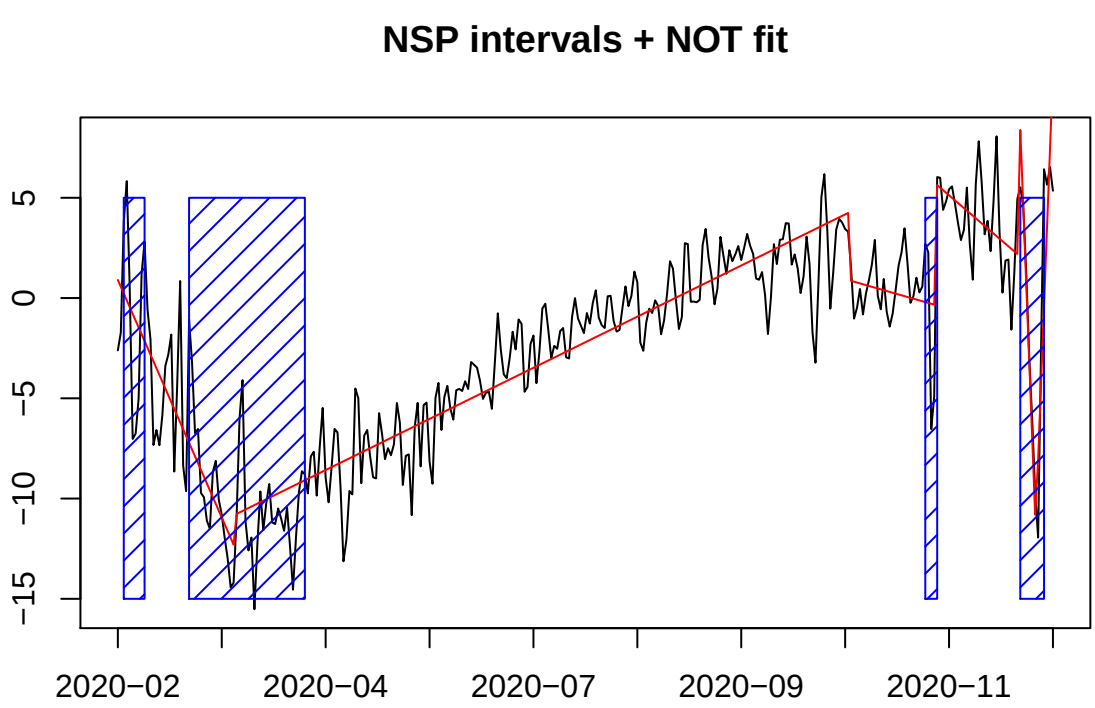

```
not.cpt <- features(not.obj)[["cpt"]]
rownames(xx$whitened)[not.cpt]
```

```
## [1] "2020-03-24" "2020-10-23" "2020-11-21" "2020-12-19" "2020-12-25"
```

Narrowest significance pursuit

```
nsp.obj <- nsp_poly_ar(xx$whitened[[example.city]], deg = 1)
```

```
plot.with.dates.axis(xx$whitened[[example.city]], rownames(xx$whitened), main = "NSP intervals + NOT fi
lines(predict(not.obj), col = "red")
draw_rects(nsp.obj, yrange = c(-15,5), col = "blue")
```


NSP intervals + NOT fit
5
0
−5
−10
−15
2020−02
2020−04
2020−07
2020−09
2020−11