

Reproduction of StatCan

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```
rm(list = ls())  
set.seed(9483)
```

Import data and load packages

```
library(ggfortify)
```

```
## Loading required package: ggplot2
```

```
## Registered S3 methods overwritten by 'ggplot2':
```

```
##   method      from  
## [.quosures    rlang  
## c.quosures    rlang  
## print.quosures rlang
```

```
library(forecast)
```

```
## Registered S3 method overwritten by 'xts':
```

```
##   method      from  
## as.zoo.xts zoo
```

```
## Registered S3 method overwritten by 'quantmod':
```

```
##   method      from  
## as.zoo.data.frame zoo
```

```
## Registered S3 methods overwritten by 'forecast':
```

```
##   method      from  
## autoplot.Arima      ggfortify  
## autoplot.acf        ggfortify  
## autoplot.ar         ggfortify  
## autoplot.bats       ggfortify  
## autoplot.decomposed.ts ggfortify  
## autoplot.ets        ggfortify  
## autoplot.forecast   ggfortify  
## autoplot.stl        ggfortify  
## autoplot.ts         ggfortify  
## fitted.ar           ggfortify  
## fitted.fracdiff     fracdiff  
## fortify.ts          ggfortify  
## residuals.ar        ggfortify  
## residuals.fracdiff  fracdiff
```

```

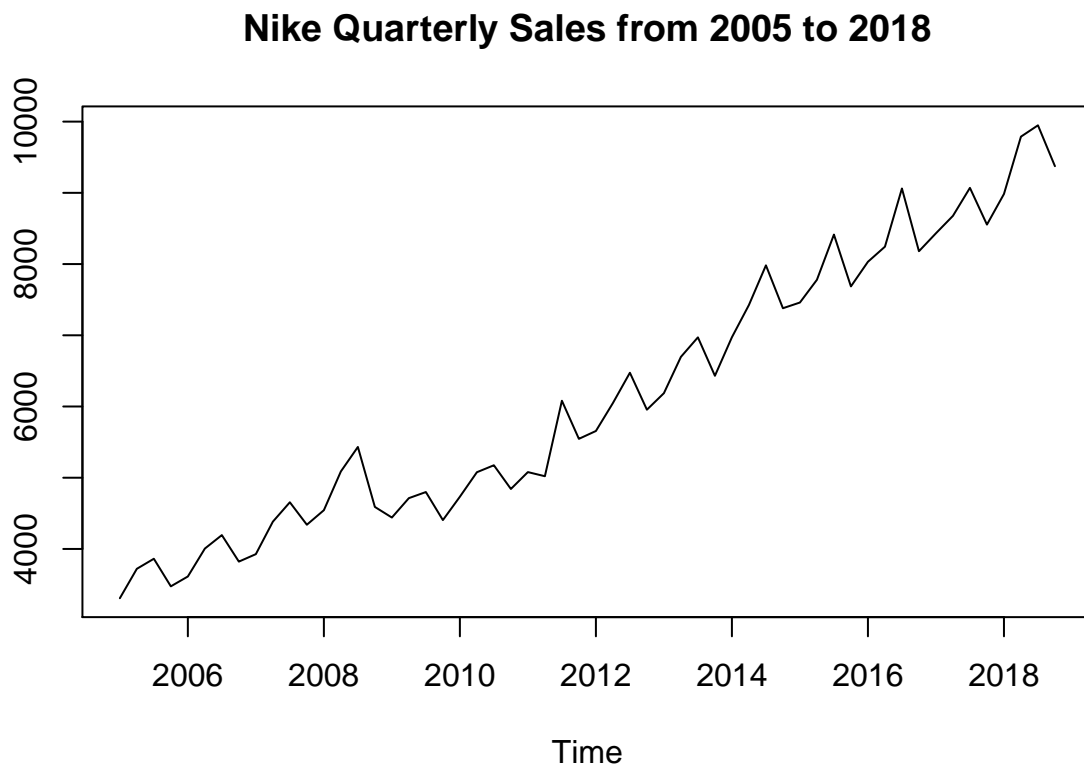
library(KFAS)
library(tseries)
library(gridExtra)
library(seasonal)

# Load Data
data_nike <- read.csv('C:\\Users\\GuoLY\\Desktop\\markdown\\nike.csv',header = TRUE)
data_adi <- read.csv('C:\\Users\\GuoLY\\Desktop\\markdown\\adidas.csv',header = TRUE)

data_nike <- ts(rev(data_nike[3:58,2]), frequency=4, start=c(2005,1))
data_adi <- ts(rev(data_adi[2:57,2]), frequency=4, start=c(2005,1))
data("AirPassengers")
data_ap <- AirPassengers

# visualize data
plot(data_nike,ylab='',main="Nike Quarterly Sales from 2005 to 2018")

```

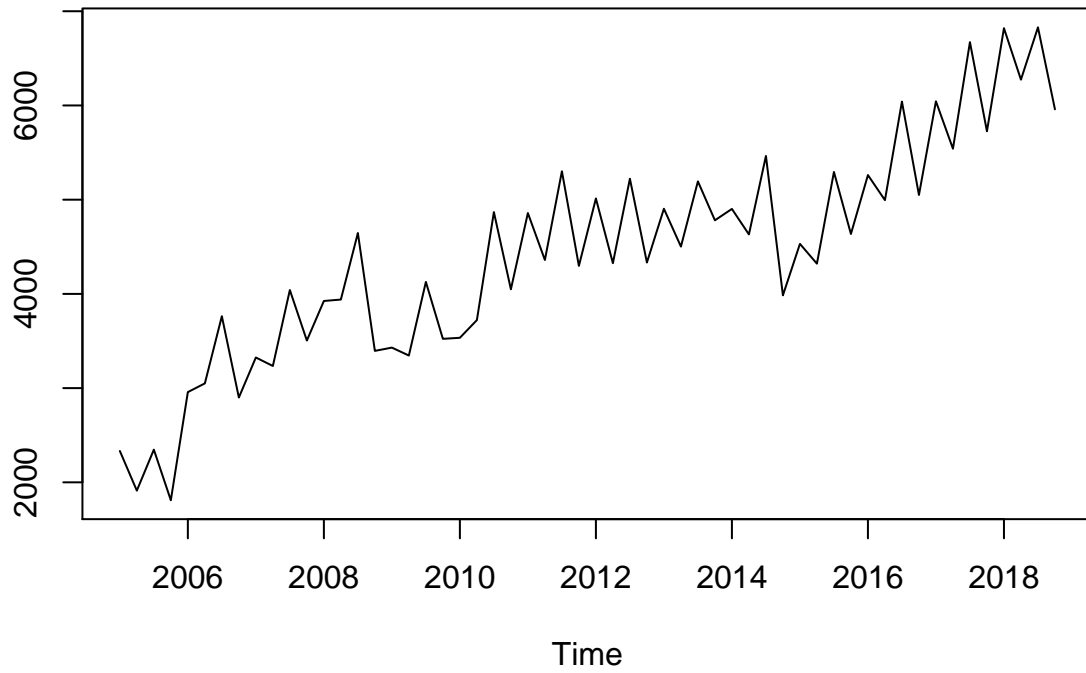


```

plot(data_adi,ylab='',main="Adidas Quarterly Sales from 2005 to 2018")

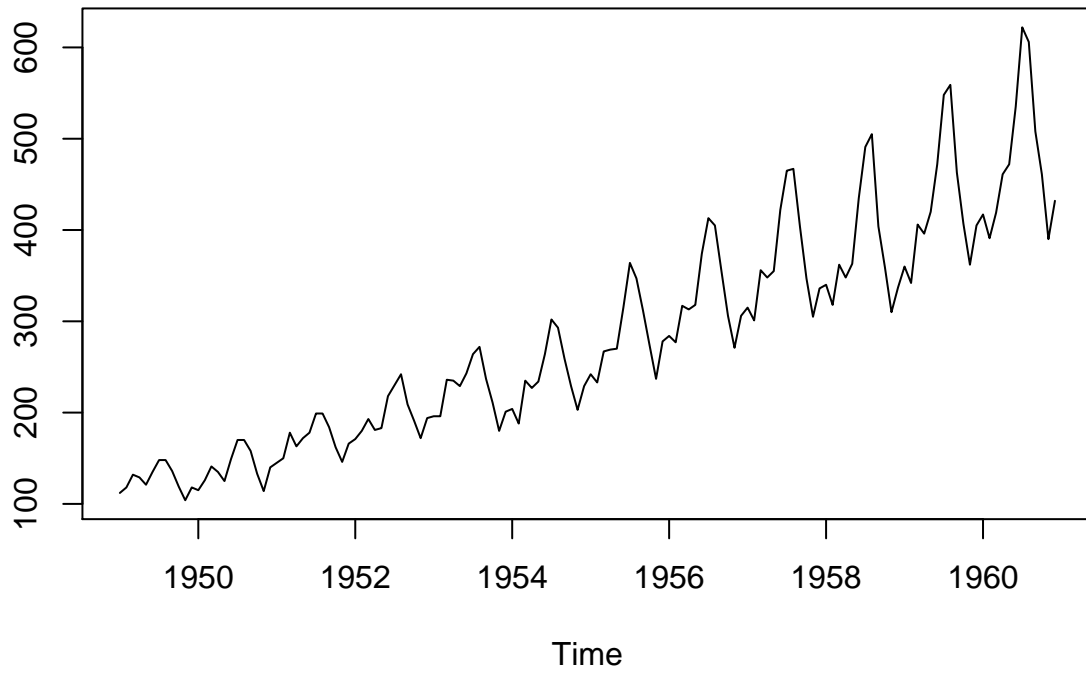
```

Adidas Quarterly Sales from 2005 to 2018



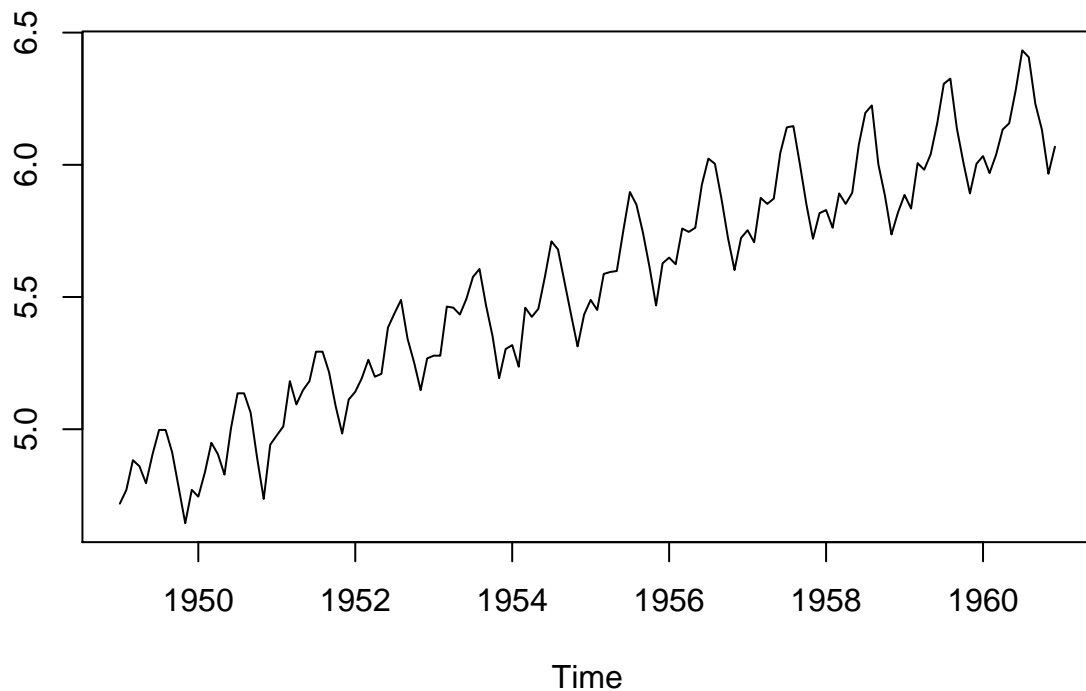
```
plot(data_ap,ylab='',main="Air Passengers from 1949 to 1960")
```

Air Passengers from 1949 to 1960



```
plot(log(data_ap),ylab='',main="Log of Air Passengers from 1949 to 1960")
```

Log of Air Passengers from 1949 to 1960



Construct Models

```
# nike
## build TRAMO-SEATS
mod_nike_seats <- seas(data_nike)

## build x-11
mod_nike_x11 <- seas(data_nike, x11='')

## build ssm
mod_nike_ssm <- SSMModel(data_nike ~ SSMtrend(1, Q = list(1)) +
                          SSMseasonal(4,Q=0.1, sea.type = "trigonometric"), H=1)
out_nike_ssm <- KFS(mod_nike_ssm)

# adi
## build TRAMO-SEATS
mod_adi_seats <- seas(data_adi)

## Model used in SEATS is different: (1 0 1)(0 1 0)
```

```

## build x-11
mod_adi_x11 <- seas(data_adi, x11='')

## build ssm
mod_adi_ssm <- SSMModel(data_adi ~ SSMtrend(1, Q = list(1)) +
                        SSMseasonal(4,Q=0.1, sea.type = "trigonometric"), H=1)
out_adi_ssm <- KFS(mod_adi_ssm)

# airpassengers
## build TRAMO-SEATS
mod_ap_seats <- seas(data_ap)

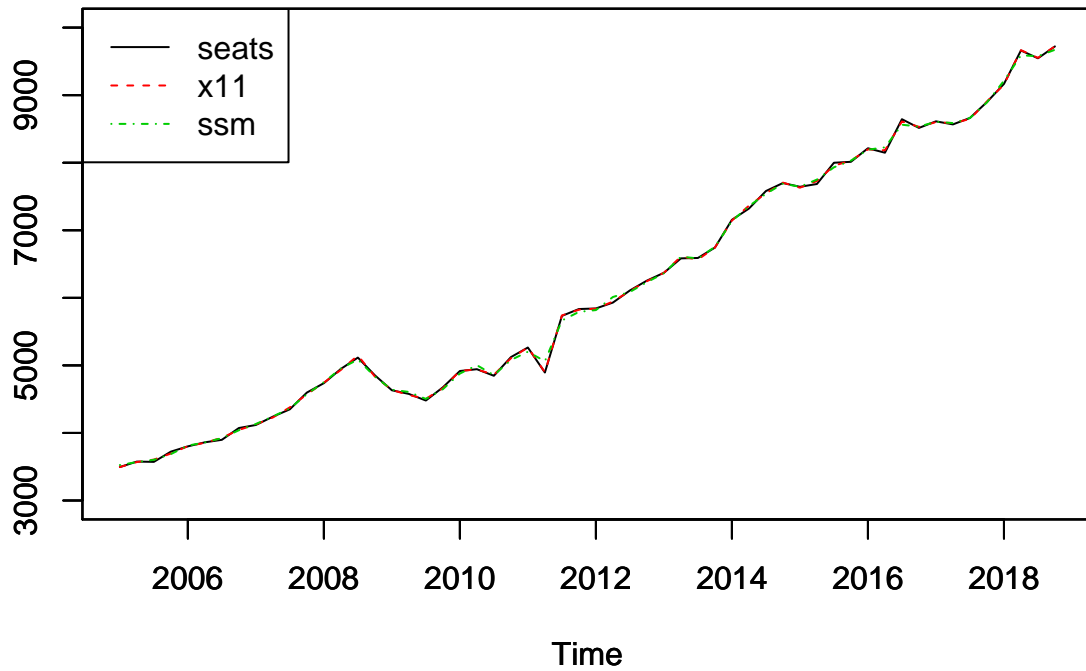
## build x-11
mod_ap_x11 <- seas(data_ap, x11='')

## build ssm
mod_ap_ssm <- SSMModel(log(data_ap) ~ SSMtrend(1, Q = list(1)) +
                        SSMseasonal(12,Q=0.1, sea.type = "trigonometric"), H=1)
out_ap_ssm <- KFS(mod_ap_ssm)

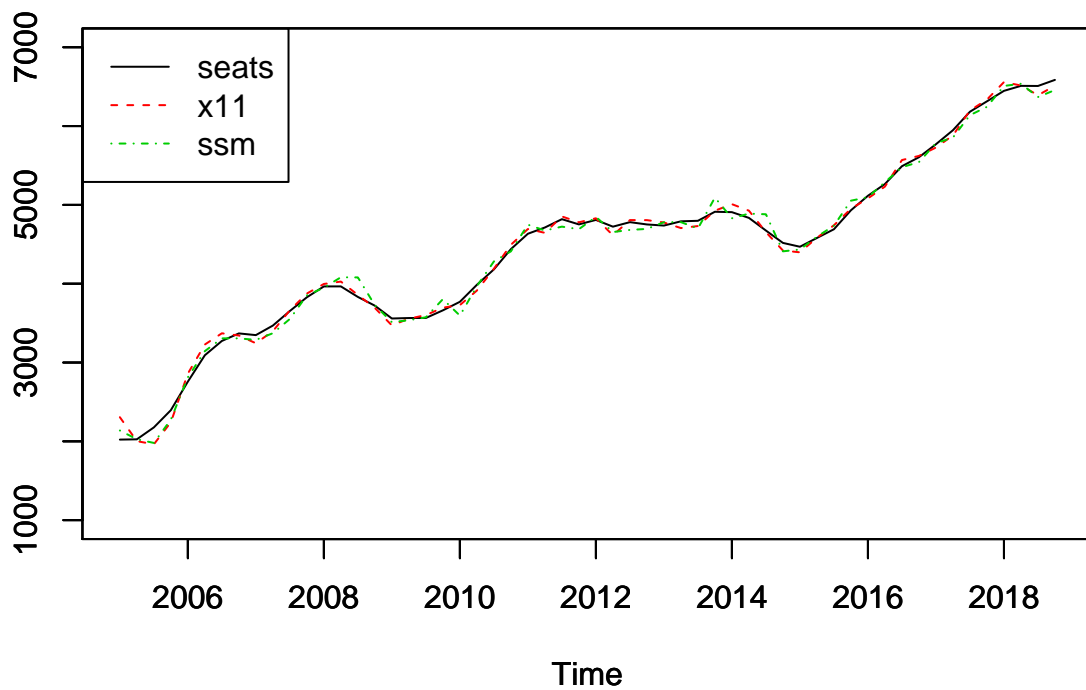
```

Seasonal adjustment

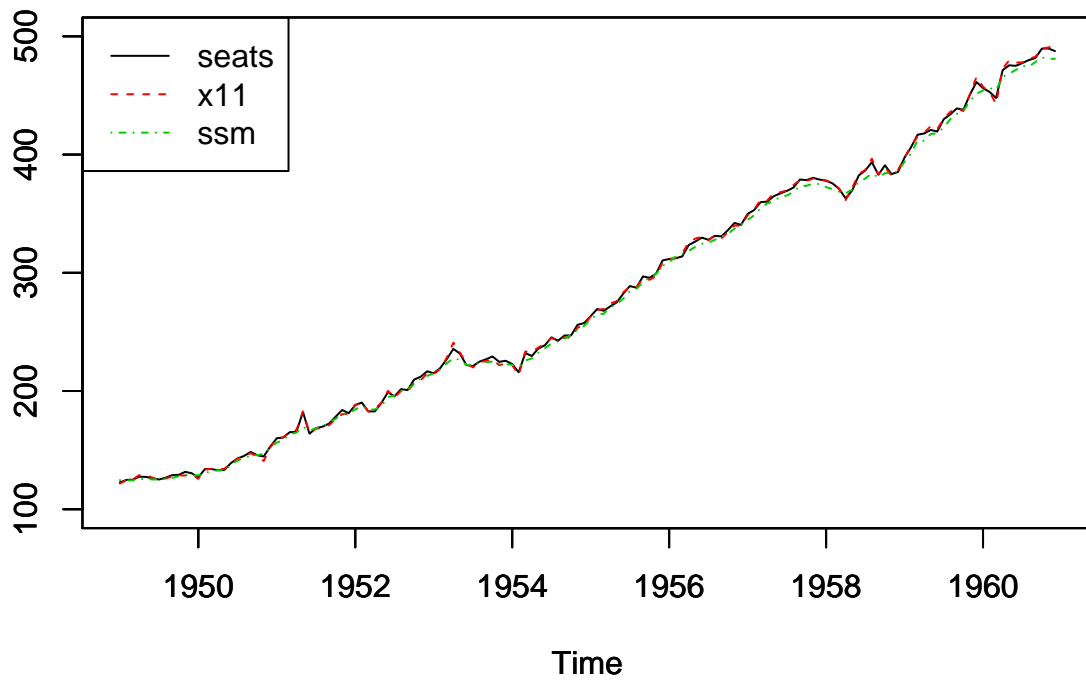
Seasonal adjusted results of Nike quarterly sales data from 2005 to 2019



Seasonal adjusted results of Adidas quarterly sales data from 2005 to 2019

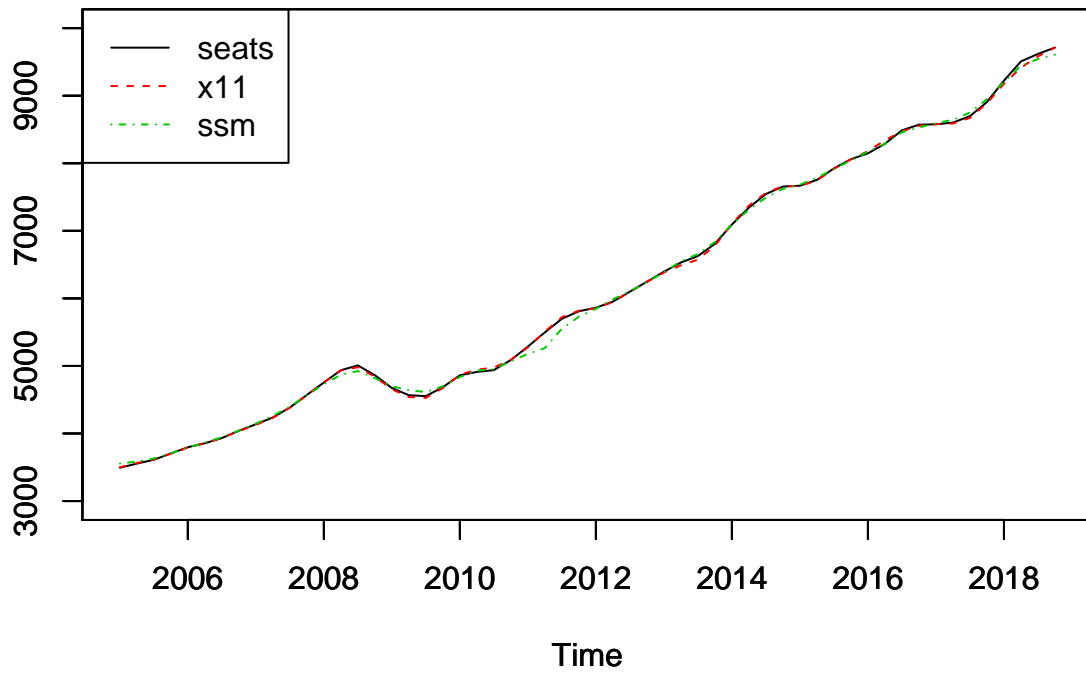


Seasonal adjusted results of air passengers from 1949 to 1960

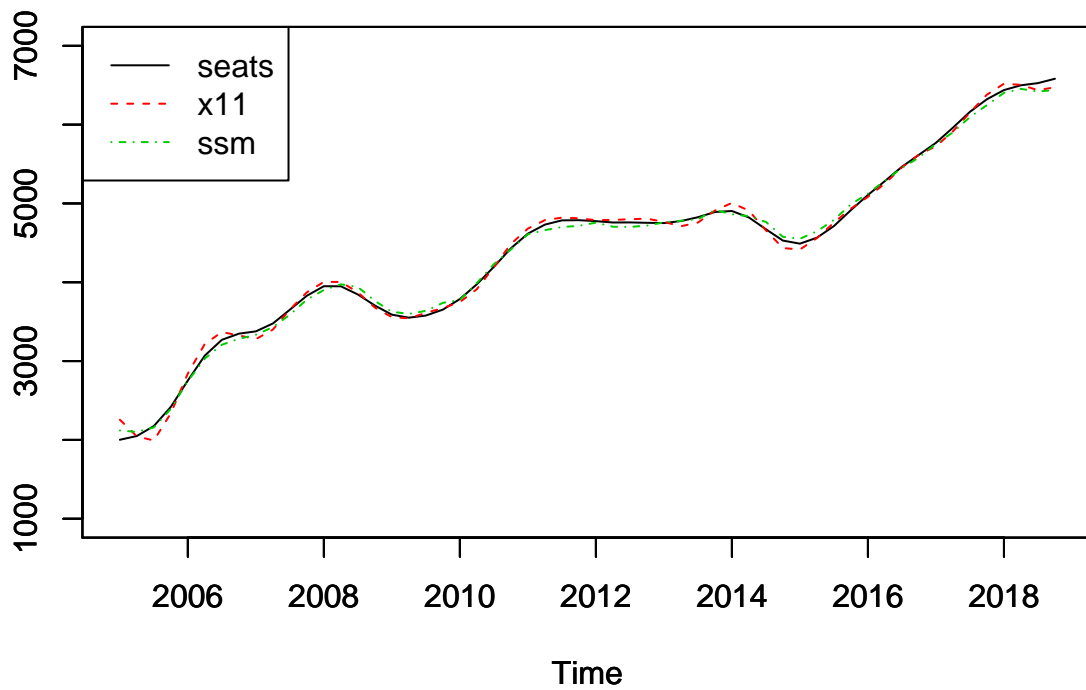


Trend

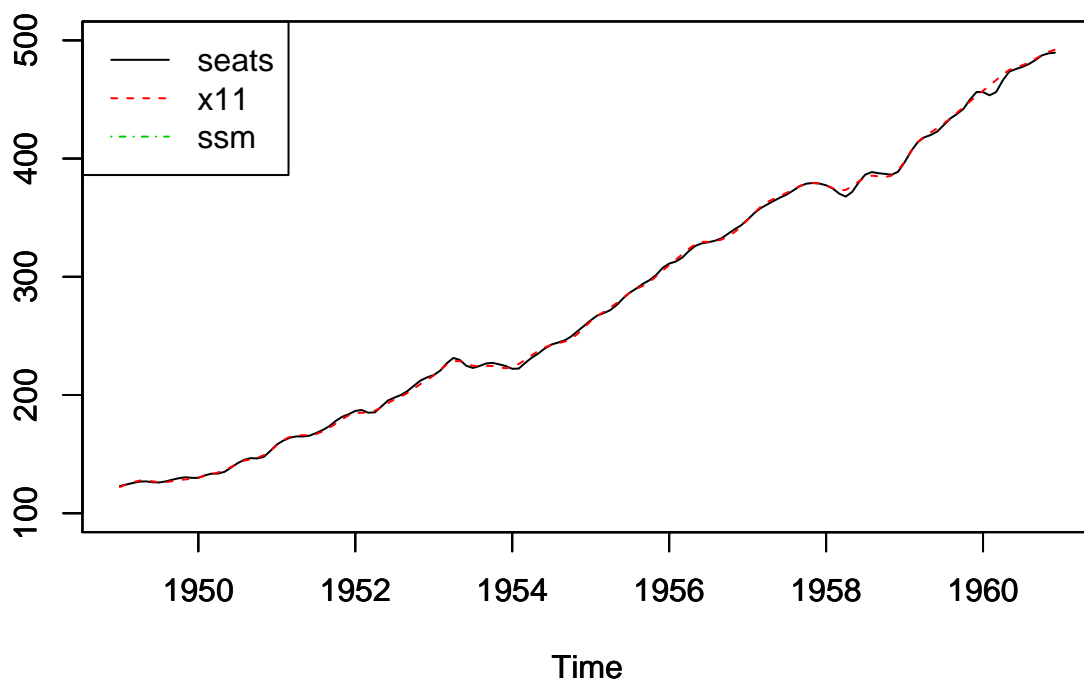
Trend component of Nike quarterly sales data from 2005 to 2018



Trend component of Adidas quarterly sales data from 2005 to 2018

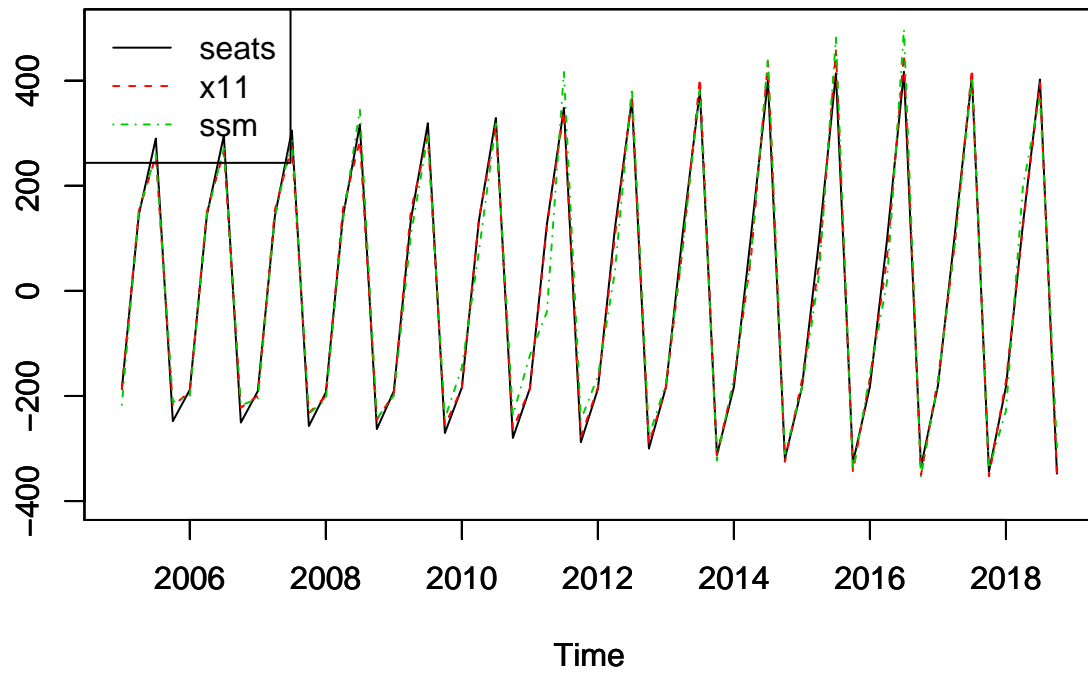


Trend component of air passengers from 1949 to 1960

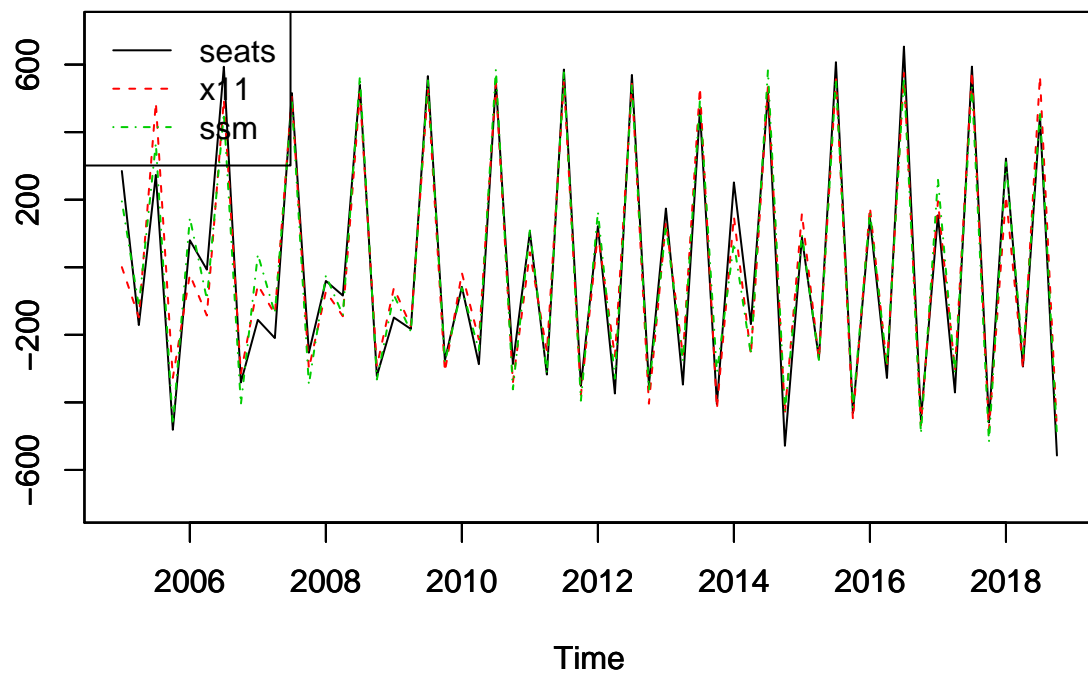


Seasonal

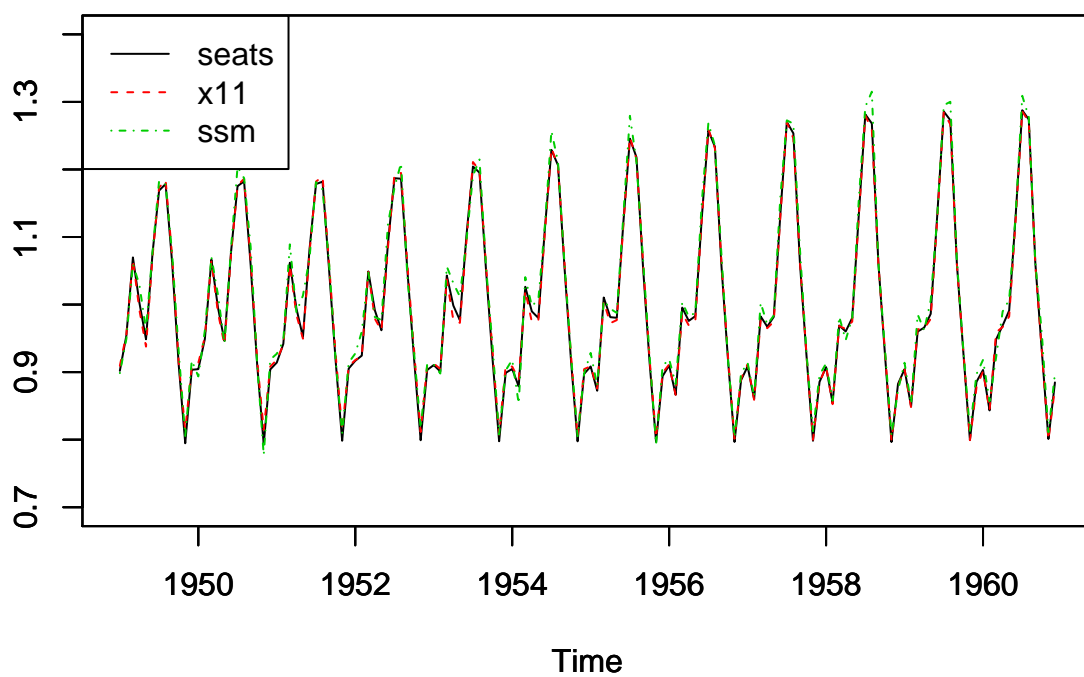
Seasonal influence of Nike quarterly sales data from 2005 to 2018



Seasonal influence of Adidas quarterly sales data from 2005 to 2018

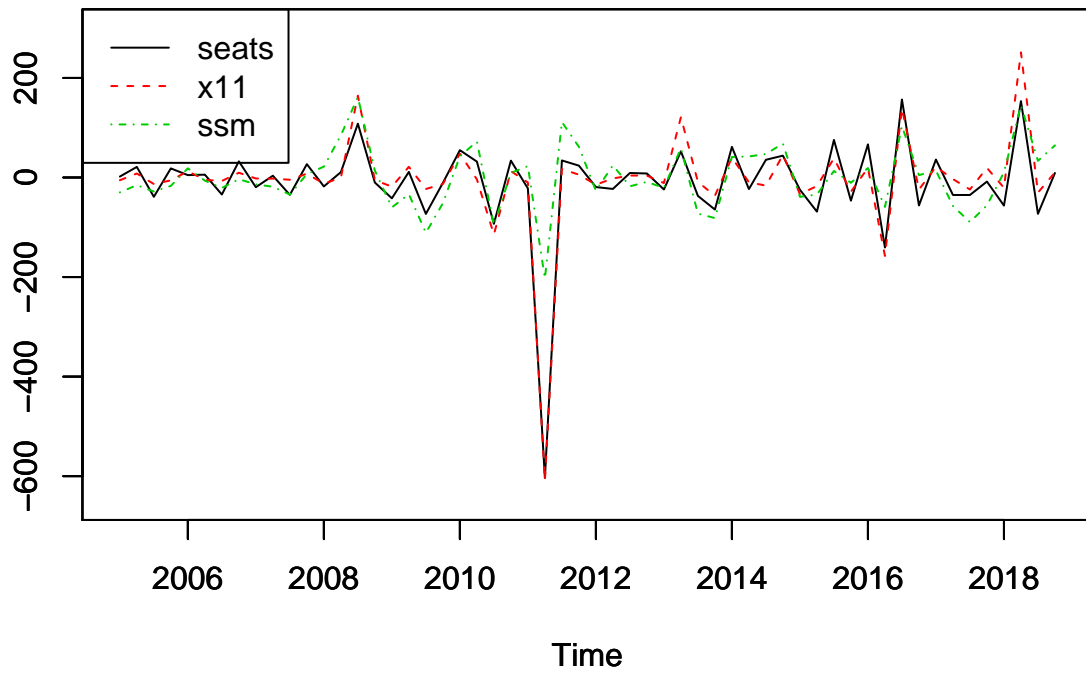


Seasonal influence of air passengers from 2005 to 2018

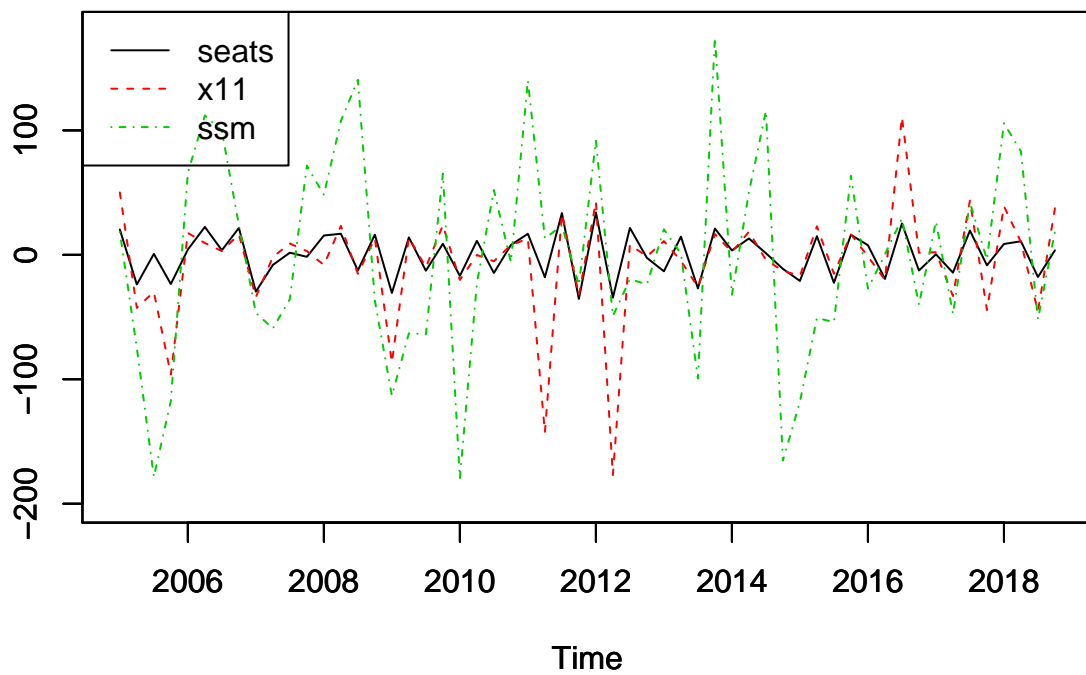


Residuals

Residuals of Nike quarterly sales data from 2005 to 2018



Residuals of Adidas quarterly sales data from 2005 to 2018



Residuals of air passengers from 1949 to 1960

