# retailts.R

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```
setwd("D:/retailts/")
rm(list=ls())

library(forecast)
```

```
## Warning: package 'forecast' was built under R version 3.3.2
```

```
## Loading required package: zoo
```

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

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

```
## Loading required package: timeDate
```

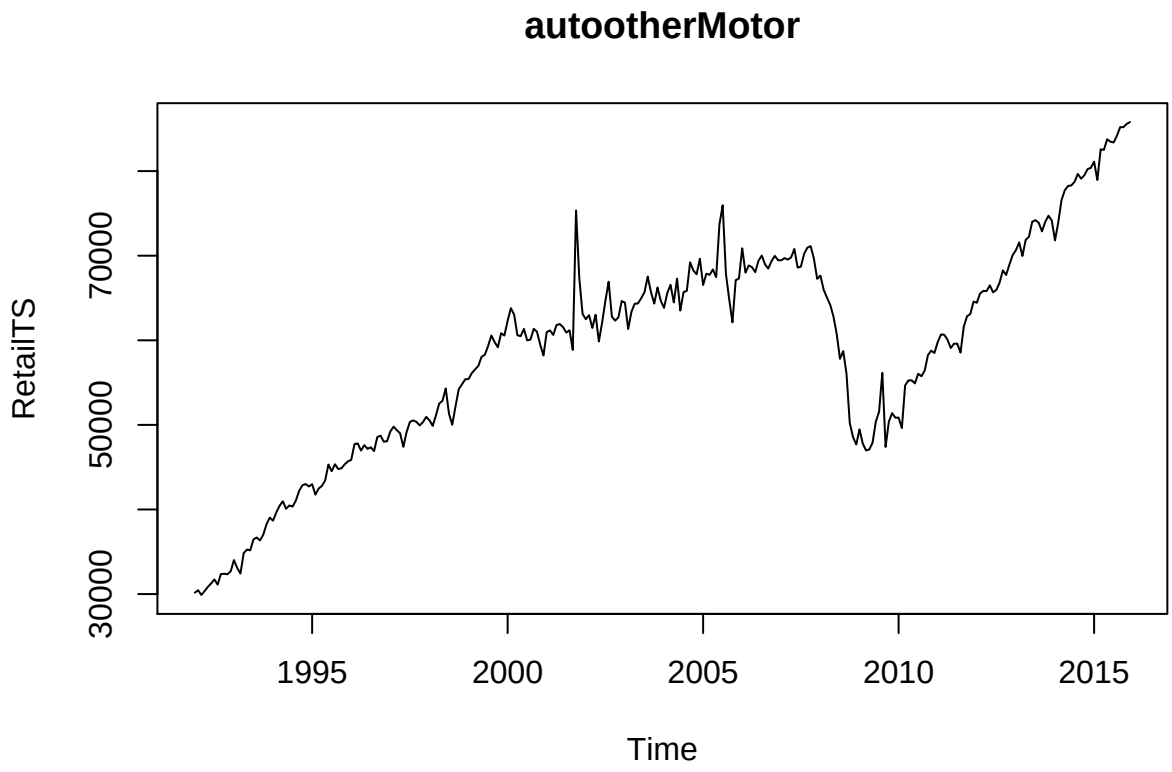
```
## Warning: package 'timeDate' was built under R version 3.3.2
```

```
## This is forecast 7.3
```

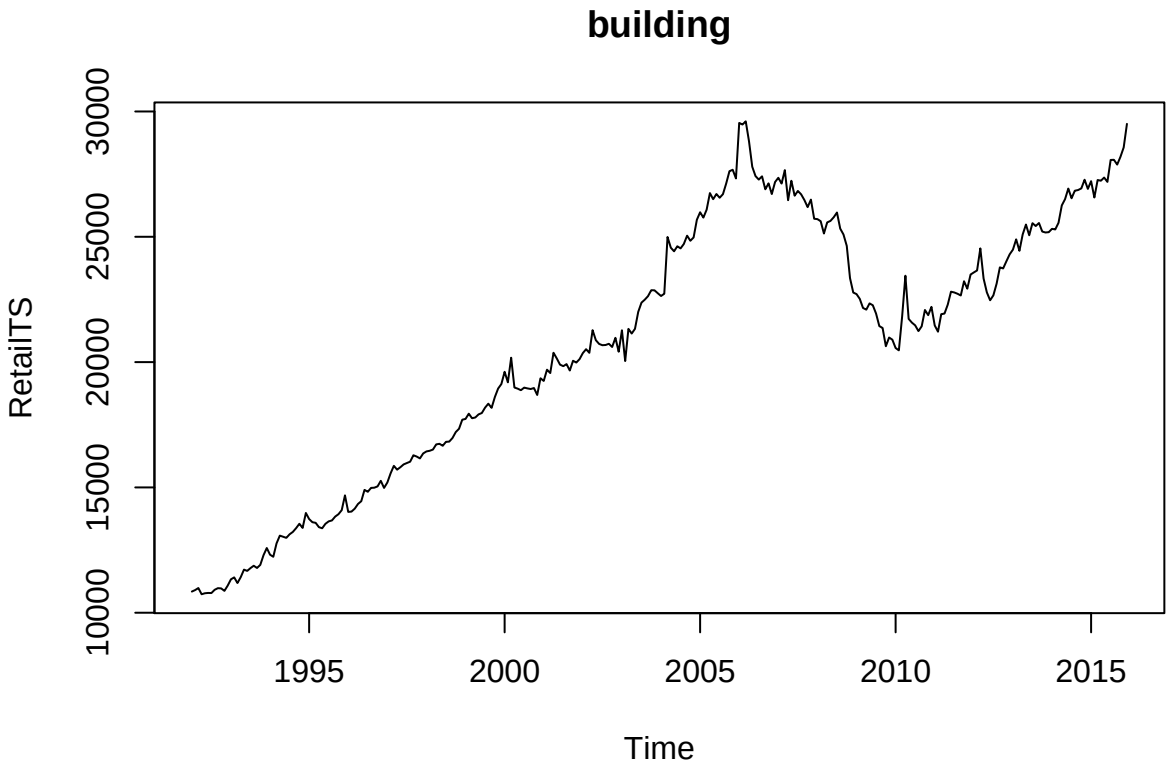
```
#### Note:
####
#### Sales data are adjusted for seasonal, holiday, and
#### trading day differences, but not for price changes
####
#### This code uses auto.arima to suggest a model for each of the data sets
#### under Monthly and Annual Retail Trade (US Census Bureau)

# Retail, and Food Services, total
foodURL <- "https://www.census.gov/retail/marts/www/adv44x72.txt"

# Retail, total
retailTotalURL <- "https://www.census.gov/retail/marts/www/adv44000.txt"

# Motor, vehicle and parts dealers
motorURL <- "https://www.census.gov/retail/marts/www/adv44100.txt"

# Furniture, and Home Furnishings Stores
furnitureURL <- "https://www.census.gov/retail/marts/www/adv44200.txt"

# Building Material and Garden Equipment and Supplies Dealers
buildingURL <- "https://www.census.gov/retail/marts/www/adv44400.txt"

# Grocery Stores
groceryURL <- "https://www.census.gov/retail/marts/www/adv44510.txt"

# Gasonline Stations
gasolineURL <- "https://www.census.gov/retail/marts/www/adv44700.txt"
```

```r
# Sporting Goods, Hobby, Book and Music Stores
sportURL <- "https://www.census.gov/retail/marts/www/adv45100.txt"

# Dept. Stores (ex. leased depts)
deptURL <- "https://www.census.gov/retail/marts/www/adv45210.txt"

# Nonstore Retailers
nonstoreURL <- "https://www.census.gov/retail/marts/www/adv45400.txt"

# Total (excl. Motor Vehicle)
totalexclMotorURL <- "https://www.census.gov/retail/marts/www/adv44y72.txt"

# Retail (excl. Motor Vehicle and Parts Dealers)
retailexclMotorURL <- "https://www.census.gov/retail/marts/www/adv4400a.txt"

# Auto, other Motor Vehicle
autootherMotorURL <- "https://www.census.gov/retail/marts/www/adv441x0.txt"

# Electronics and Appliance Stores
electronicsURL <- "https://www.census.gov/retail/marts/www/adv44300.txt"

# Food and Beverage Stores
foodbeverageURL <- "https://www.census.gov/retail/marts/www/adv44500.txt"

# Health and Personal Care Stores
healthURL <- "https://www.census.gov/retail/marts/www/adv44600.txt"

# Clothing and Clothing Accessories Stores
clothingURL <- "https://www.census.gov/retail/marts/www/adv44800.txt"

# General Merchandise Stores
genMerchandiseURL <- "https://www.census.gov/retail/marts/www/adv45200.txt"

# Miscellaneous Store Retailers
miscellaneousURL <- "https://www.census.gov/retail/marts/www/adv45300.txt"

# Food Services and Drinking Places
foodServicesDrinkingURL <- "https://www.census.gov/retail/marts/www/adv72200.txt"


url <- sapply(ls(), get)
topic <- as.character(strsplit(names(url), "URL"))

for(i in 1:length(topic))
{
  DataFile <- paste0("Data/", topic[i], ".txt")
  download.file(url[i], destfile = DataFile)

  RetailData <- read.table(DataFile, skip = 2, header = TRUE, nrows = 24)

  years <- RetailData$YEAR
  RetailData <- RetailData[,-1]
```

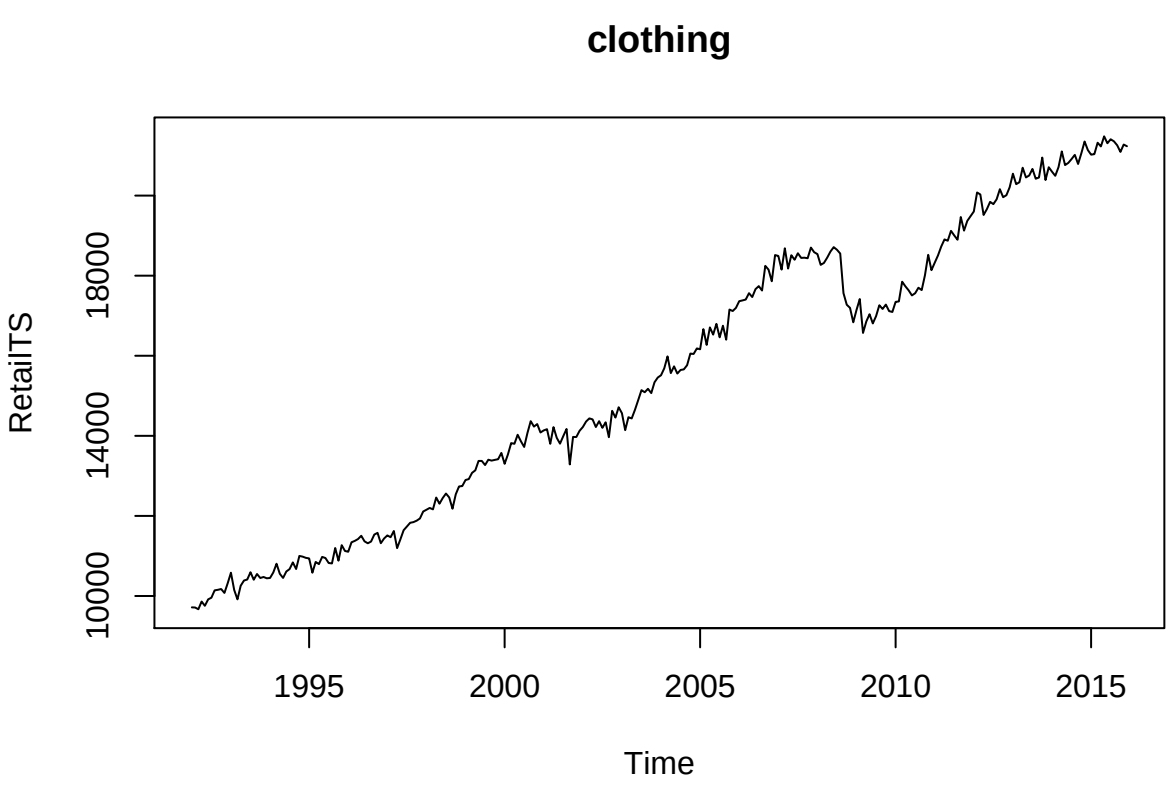
```
  RetailTS <- as.numeric(apply(RetailData, MARGIN = 1, c))
  RetailTS <- ts(RetailTS, start = c(min(years), 1),
                           end = c(max(years), 12),
                           frequency = 12)

  plot(RetailTS, main = topic[i])

  cat("Model ", i, "\n")
  print(auto.arima(RetailTS))
}
```



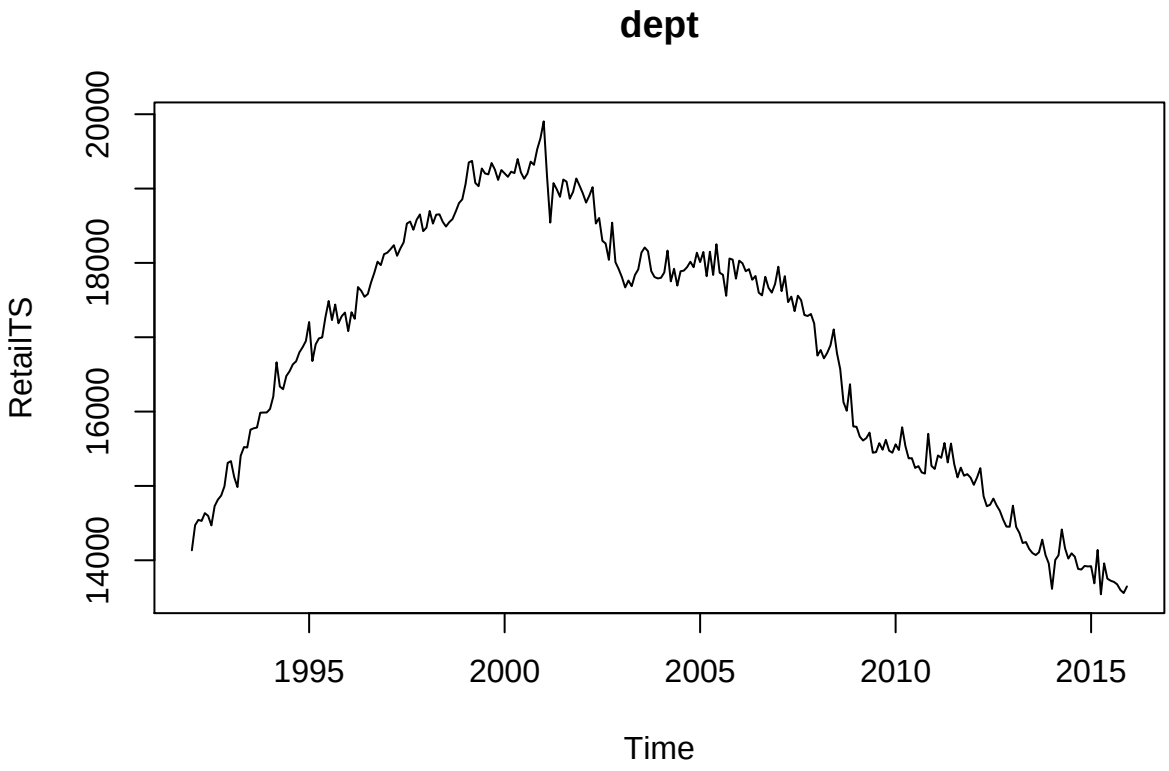

```
## Model  1
## Series: RetailTS
## ARIMA(0,1,2) with drift
##
## Coefficients:
##           ma1      ma2     drift
##       -0.2546  -0.0916  193.8325
## s.e.   0.0575   0.0512   73.4444
##
## sigma^2 estimated as 3643394:  log likelihood=-2573.84
## AIC=5155.67   AICc=5155.81   BIC=5170.31
```



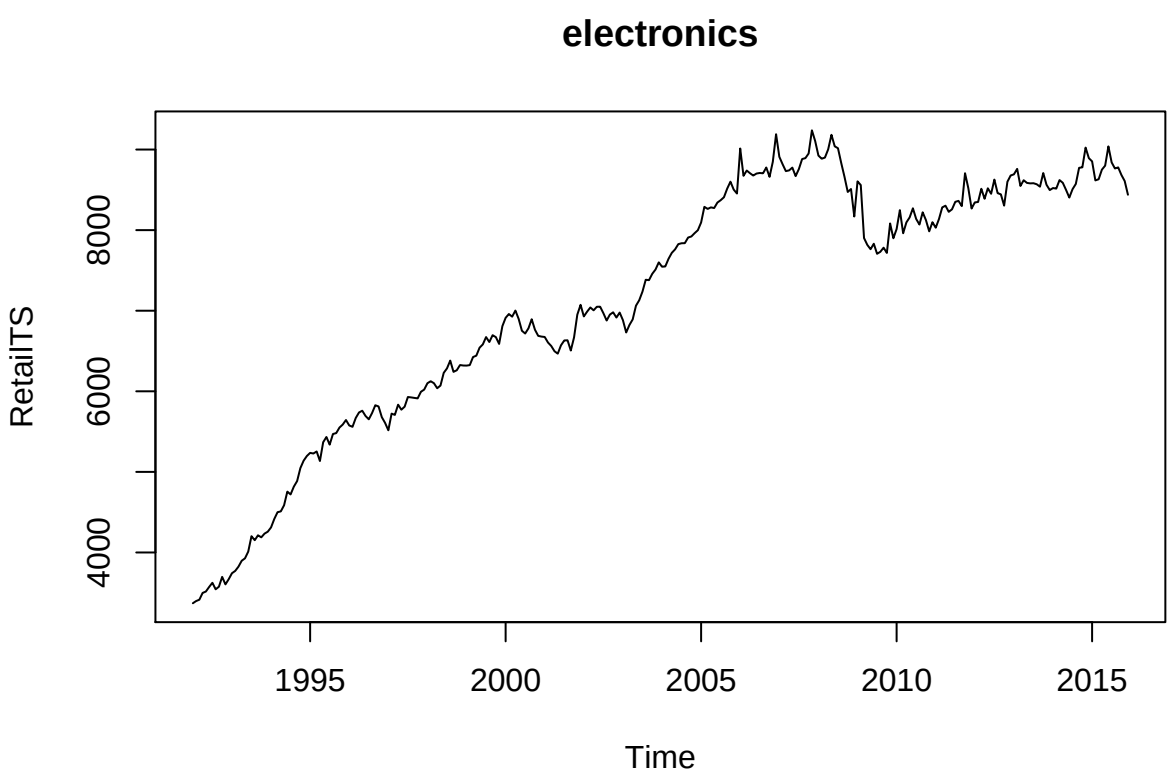

```
## Model  2
## Series: RetailTS
## ARIMA(0,1,1) with drift
##
## Coefficients:
##           ma1    drift
##       -0.1631  64.4888
## s.e.   0.0546  21.6532
##
## sigma^2 estimated as 193215:  log likelihood=-2152.86
## AIC=4311.73   AICc=4311.81   BIC=4322.71
```



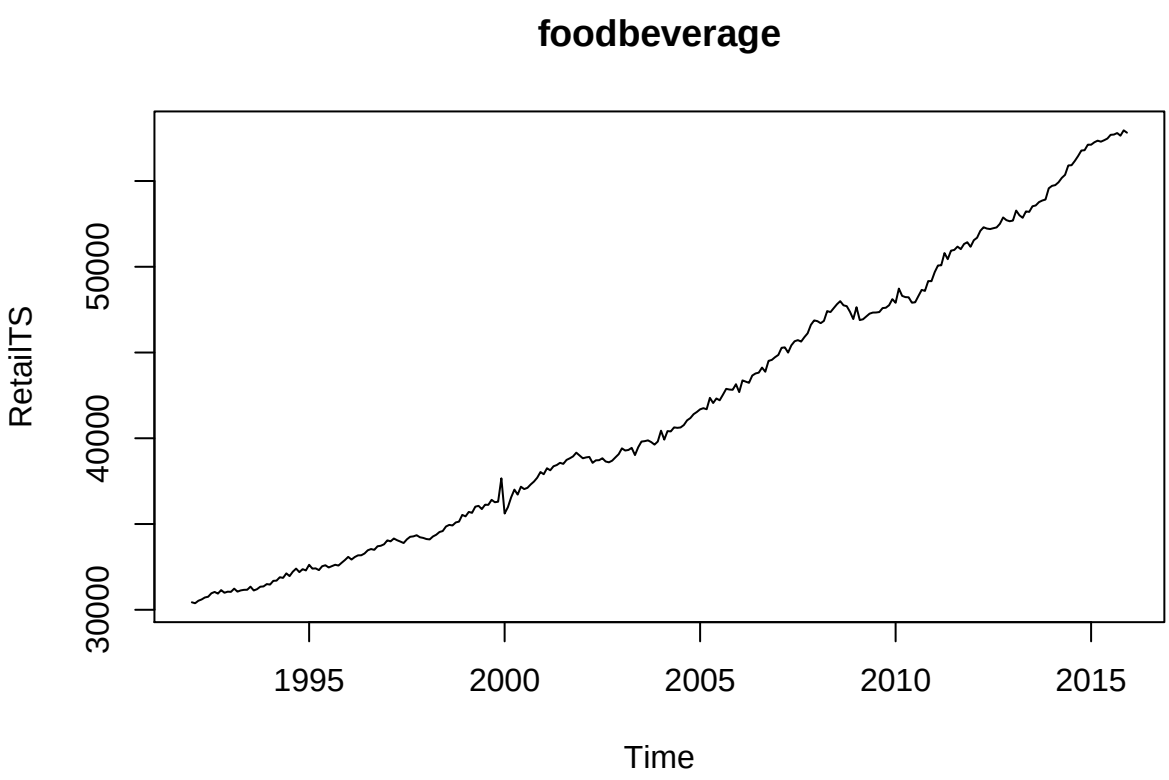

```
## Model  3
## Series: RetailTS
## ARIMA(0,1,1)(0,0,2)[12] with drift
##
## Coefficients:
##           ma1     sma1     sma2    drift
##       -0.3927  -0.1145  -0.2815  40.9337
## s.e.   0.0507   0.0572   0.0563   4.8791
##
## sigma^2 estimated as 46406:  log likelihood=-1948.38
## AIC=3906.76   AICc=3906.98   BIC=3925.06
```



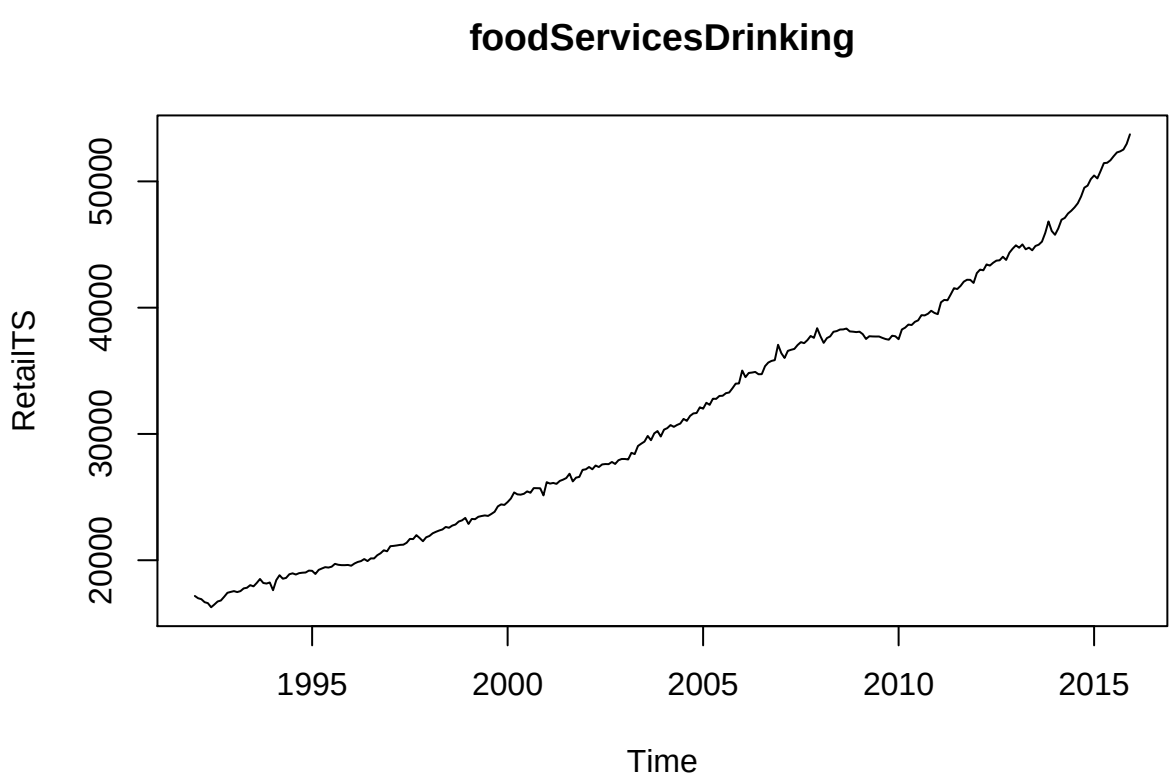

```
## Model  4
## Series: RetailTS
## ARIMA(1,2,2)(0,0,2)[12]
##
## Coefficients:
##          ar1      ma1     ma2     sma1     sma2
##       0.3515  -1.7143  0.7499  -0.2737  -0.1128
## s.e.  0.1243   0.0956  0.0963   0.0644   0.0617
##
## sigma^2 estimated as 33263:  log likelihood=-1894.75
## AIC=3801.5   AICc=3801.8   BIC=3823.44
```



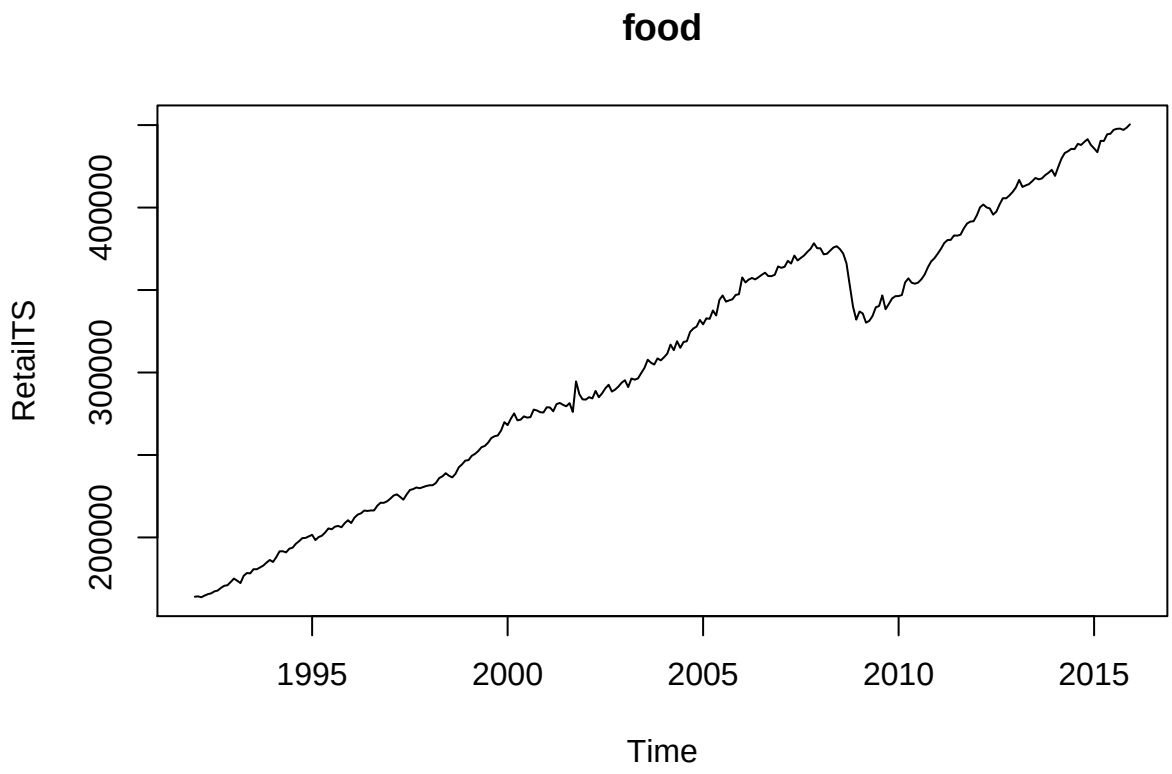

```
## Model  5
## Series: RetailTS
## ARIMA(0,2,2)(0,0,2)[12]
##
## Coefficients:
##           ma1     ma2     sma1     sma2
##       -1.1748  0.2008  -0.1514  -0.1219
## s.e.   0.0646  0.0669   0.0624   0.0587
##
## sigma^2 estimated as 14846:  log likelihood=-1779.54
## AIC=3569.07   AICc=3569.29   BIC=3587.35
```



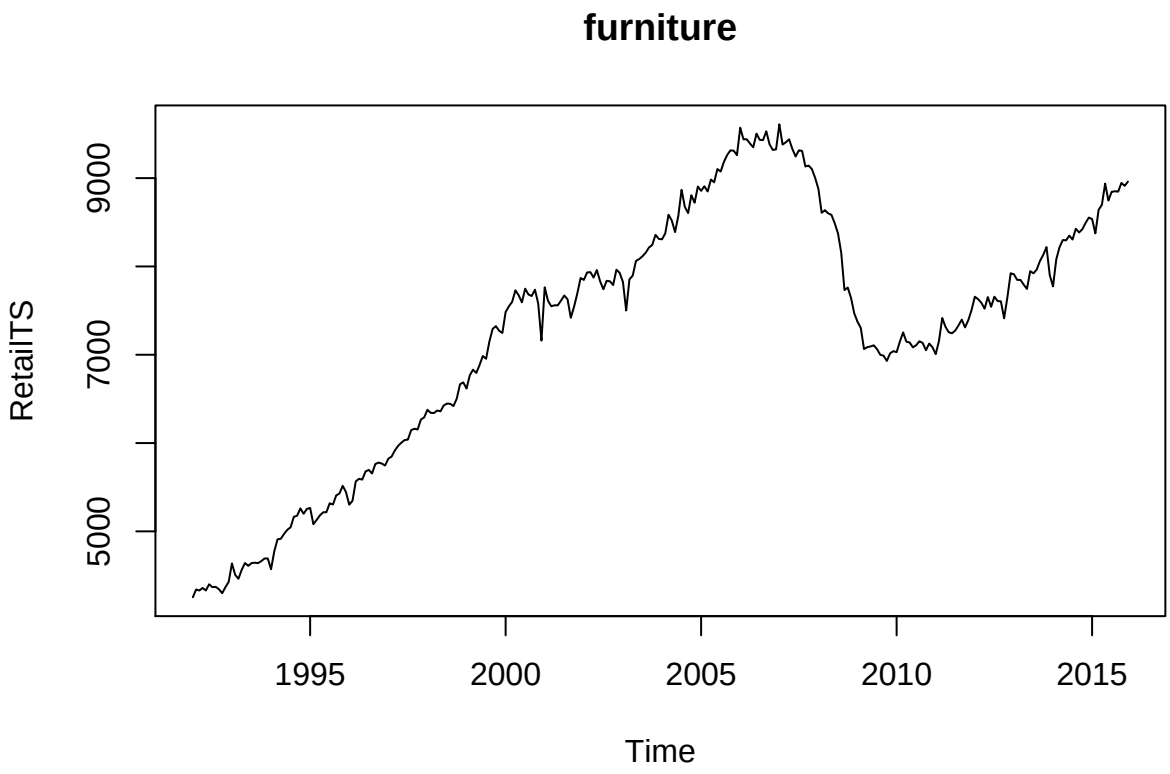

```
## Model  6
## Series: RetailTS
## ARIMA(1,2,2)
##
## Coefficients:
##           ar1      ma1     ma2
##       -0.2157  -1.2152  0.2317
## s.e.   0.1154   0.1102  0.1090
##
## sigma^2 estimated as 61448:  log likelihood=-1983.14
## AIC=3974.27   AICc=3974.41   BIC=3988.9
```



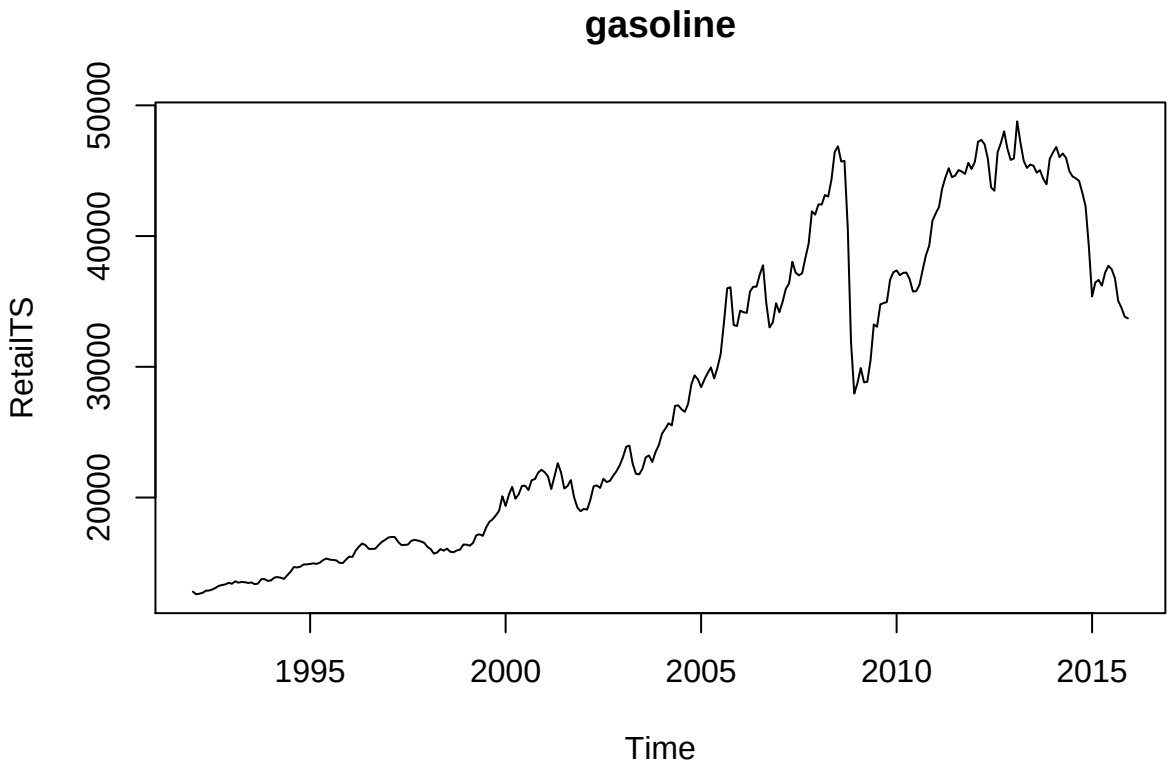

```
## Model  7
## Series: RetailTS
## ARIMA(1,2,2)(2,0,2)[12]
##
## Coefficients:
##          ar1      ma1     ma2    sar1    sar2     sma1     sma2
##       0.3229  -1.5873  0.6350  0.1571  0.2901  -0.2919  -0.5187
## s.e.  0.1610   0.1331  0.1302  0.4965  0.3851   0.4728   0.4380
##
## sigma^2 estimated as 71740:  log likelihood=-2004.89
## AIC=4025.77   AICc=4026.29   BIC=4055.02
```



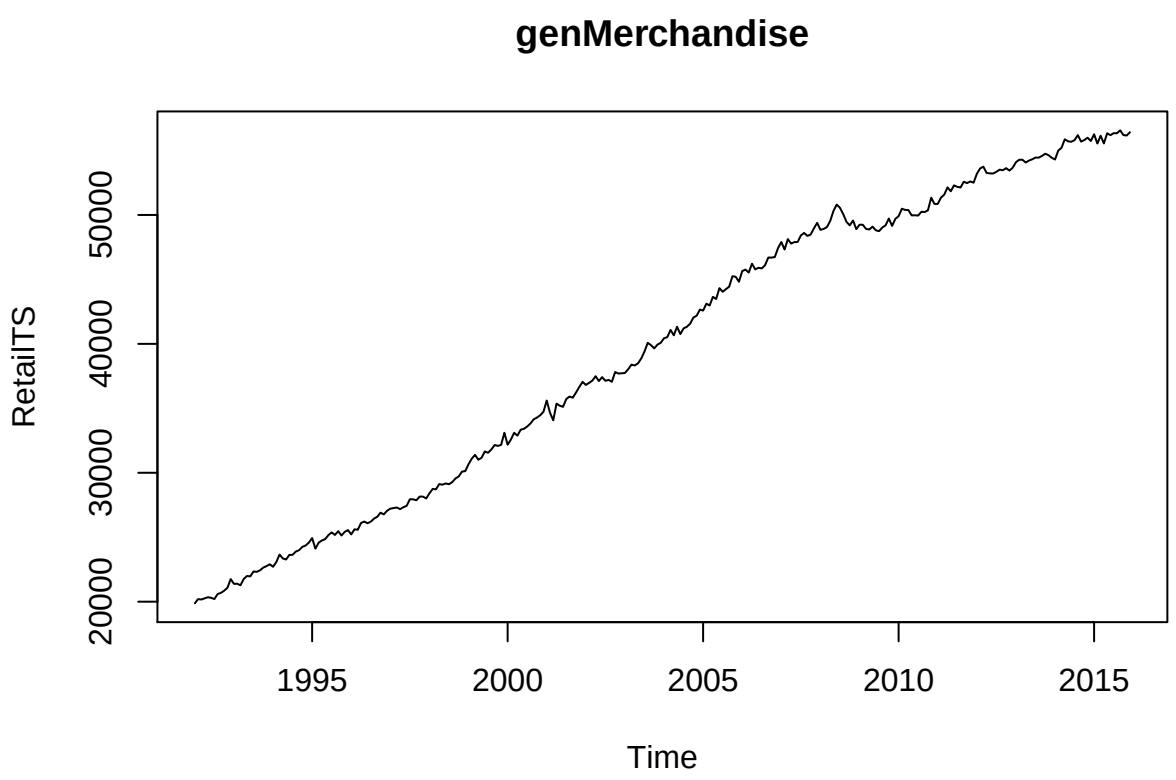

```
## Model  8
## Series: RetailTS
## ARIMA(0,1,0)(0,0,2)[12] with drift
##
## Coefficients:
##          sma1     sma2     drift
##       -0.1489  -0.2156  992.7297
## s.e.   0.0584   0.0608  113.6840
##
## sigma^2 estimated as 8570308:  log likelihood=-2697.32
## AIC=5402.65   AICc=5402.79   BIC=5417.29
```



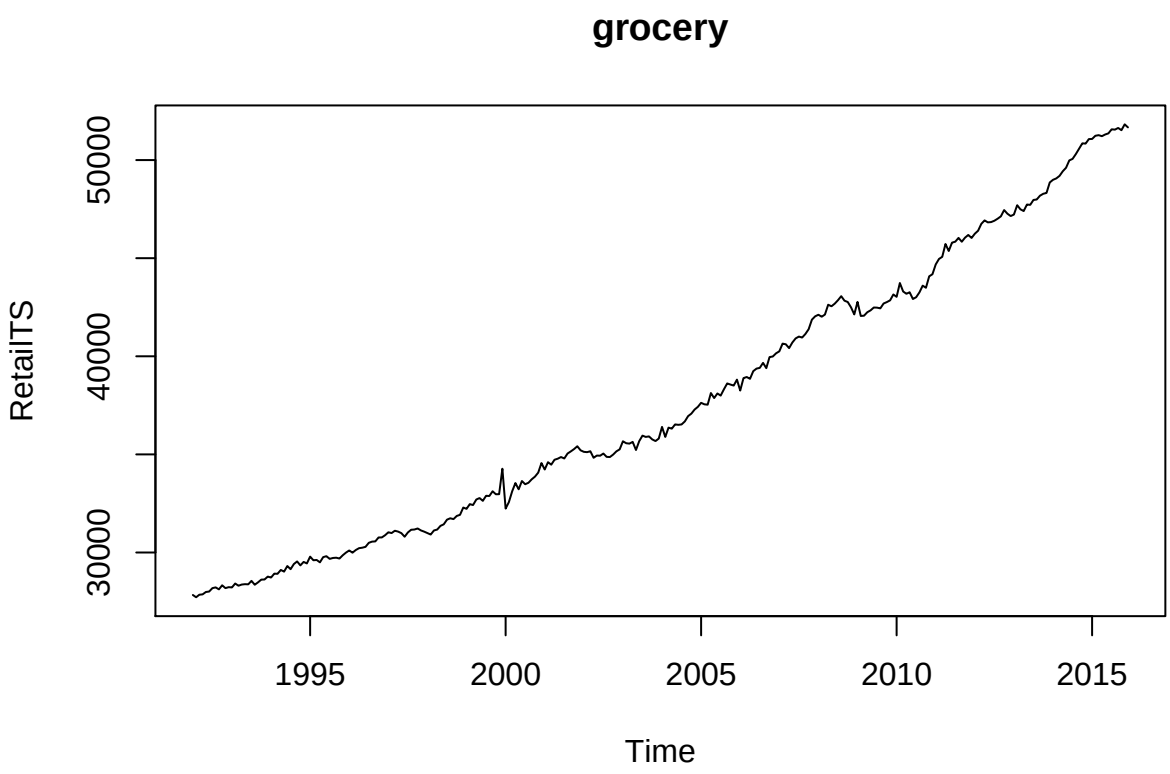

```
## Model  9
## Series: RetailTS
## ARIMA(2,2,2)
##
## Coefficients:
##          ar1      ar2      ma1     ma2
##       0.2401  -0.1560  -1.4173  0.5075
## s.e.  0.1527   0.0758   0.1467  0.1388
##
## sigma^2 estimated as 12857:  log likelihood=-1758.04
## AIC=3526.08   AICc=3526.29   BIC=3544.36
```



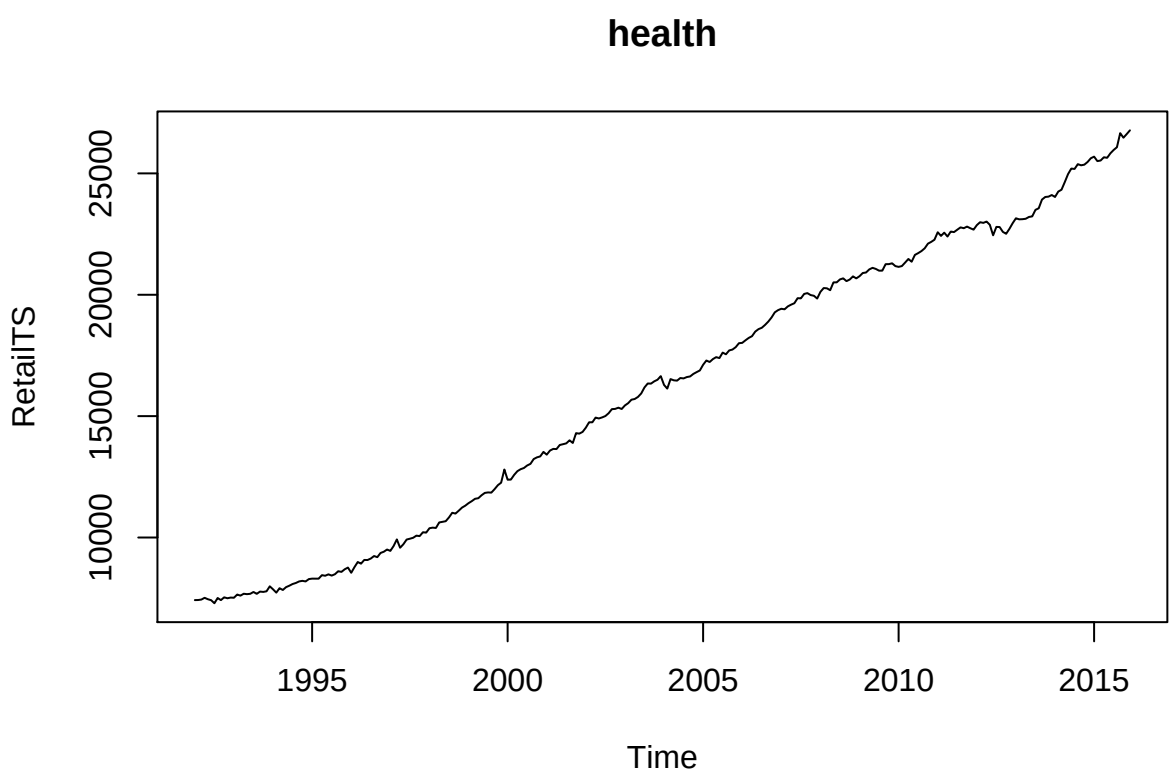

```
## Model  10
## Series: RetailTS
## ARIMA(1,1,2)(0,0,1)[12]
##
## Coefficients:
##           ar1     ma1     ma2     sma1
##       -0.7805  1.3017  0.4686  -0.1930
## s.e.   0.1794  0.1668  0.0733   0.0624
##
## sigma^2 estimated as 870298:  log likelihood=-2368.2
## AIC=4746.41   AICc=4746.62   BIC=4764.7
```



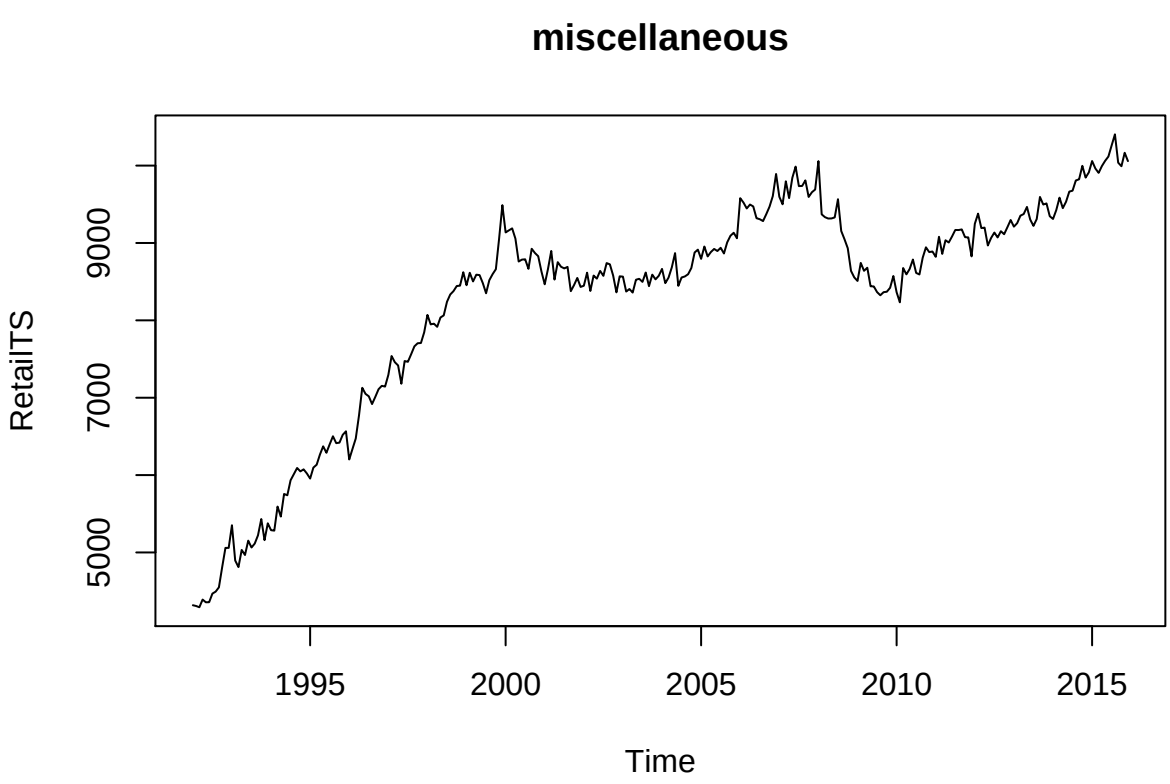

```
## Model  11
## Series: RetailTS
## ARIMA(0,1,1)(0,0,2)[12] with drift
##
## Coefficients:
##           ma1     sma1     sma2     drift
##       -0.2908  -0.2371  -0.1534  129.4215
## s.e.   0.0582   0.0651   0.0648    8.2825
##
## sigma^2 estimated as 97969:  log likelihood=-2055.2
## AIC=4120.4   AICc=4120.61   BIC=4138.7
```



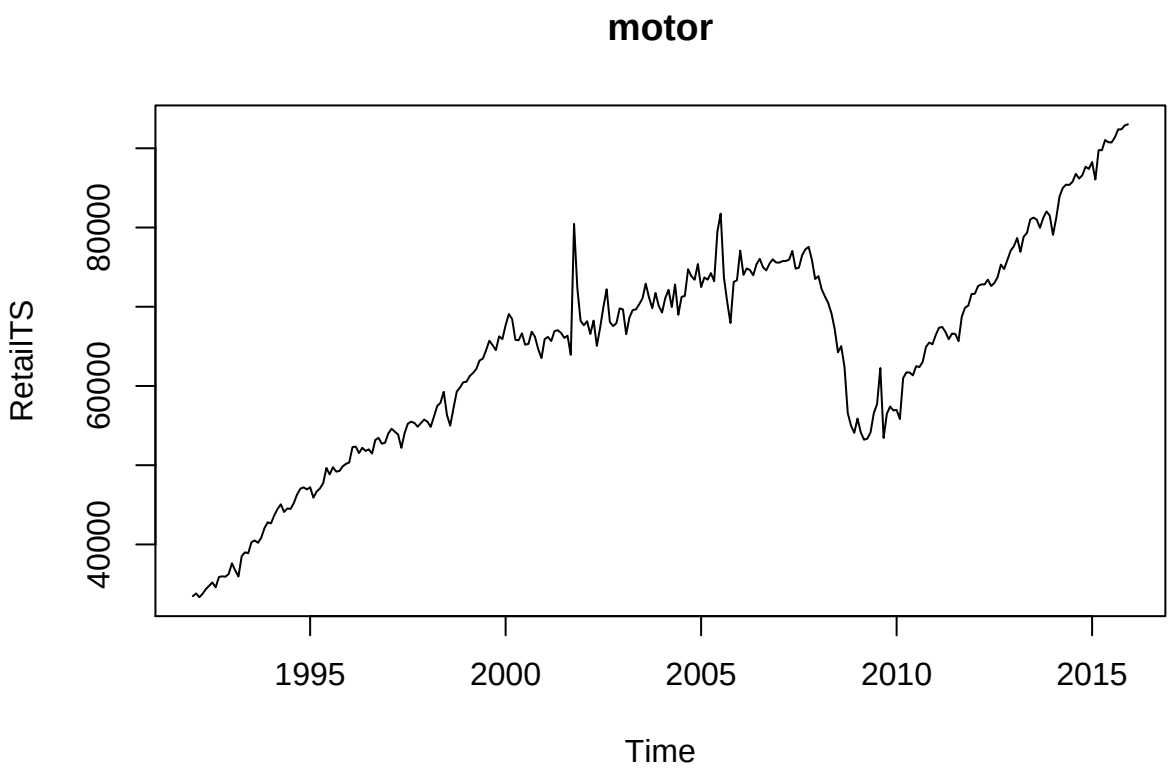

```
## Model  12
## Series: RetailTS
## ARIMA(1,2,2)
##
## Coefficients:
##           ar1      ma1     ma2
##       -0.2272  -1.2083  0.2233
## s.e.   0.1136   0.1086  0.1074
##
## sigma^2 estimated as 55019:  log likelihood=-1967.39
## AIC=3942.77   AICc=3942.91   BIC=3957.4
```



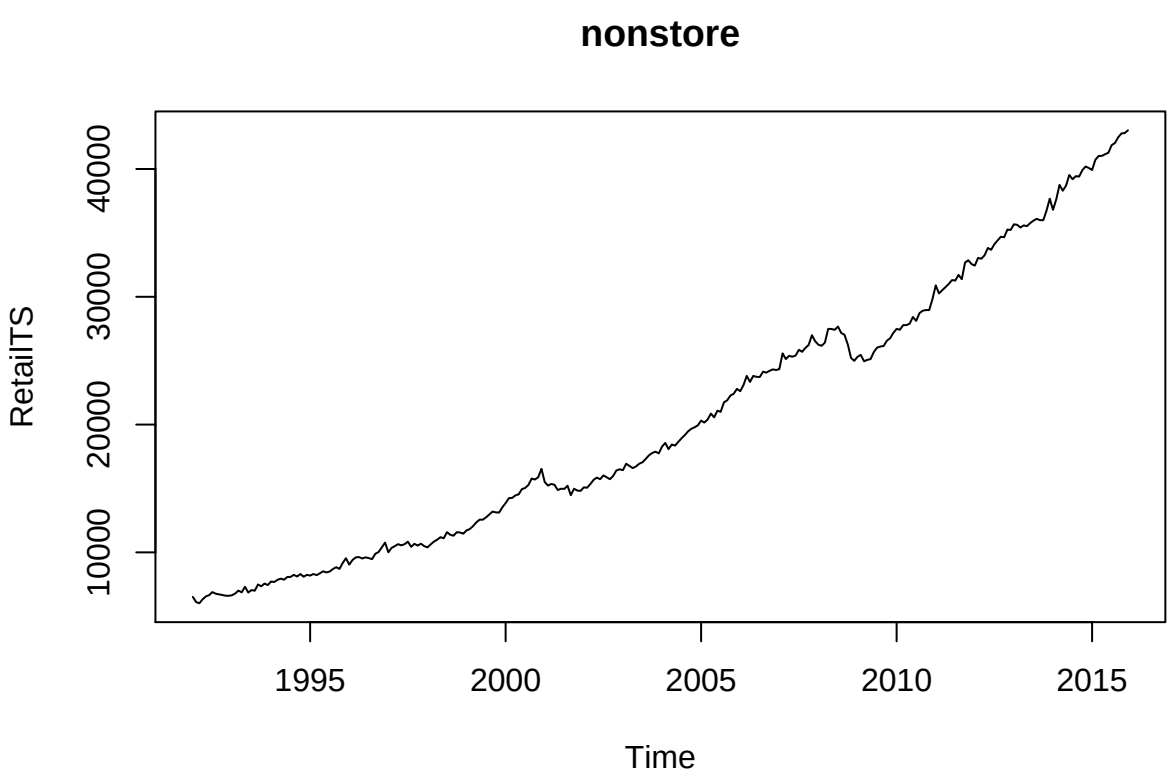

```
## Model  13
## Series: RetailTS
## ARIMA(0,1,1)(1,0,1)[12] with drift
##
## Coefficients:
##           ma1    sar1     sma1    drift
##       -0.2181  0.3513  -0.4952  67.7255
## s.e.   0.0554  0.2885   0.2688   4.5239
##
## sigma^2 estimated as 15412:  log likelihood=-1789.18
## AIC=3588.36   AICc=3588.58   BIC=3606.66
```



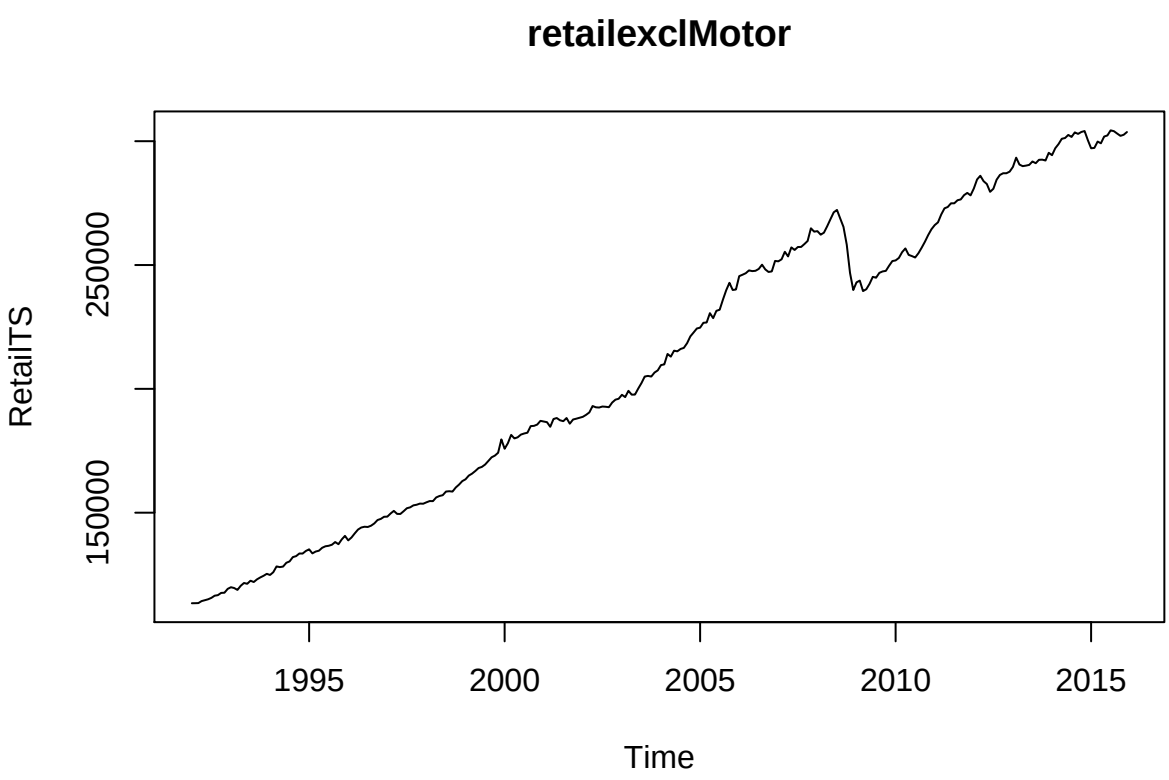

```
## Model  14
## Series: RetailTS
## ARIMA(2,1,0)(2,0,0)[12] with drift
##
## Coefficients:
##           ar1      ar2     sar1     sar2    drift
##       -0.2324  -0.0817  -0.1402  -0.1164  19.6263
## s.e.   0.0604   0.0600   0.0613   0.0612   5.5975
##
## sigma^2 estimated as 24264:  log likelihood=-1853.88
## AIC=3719.77   AICc=3720.07   BIC=3741.72
```



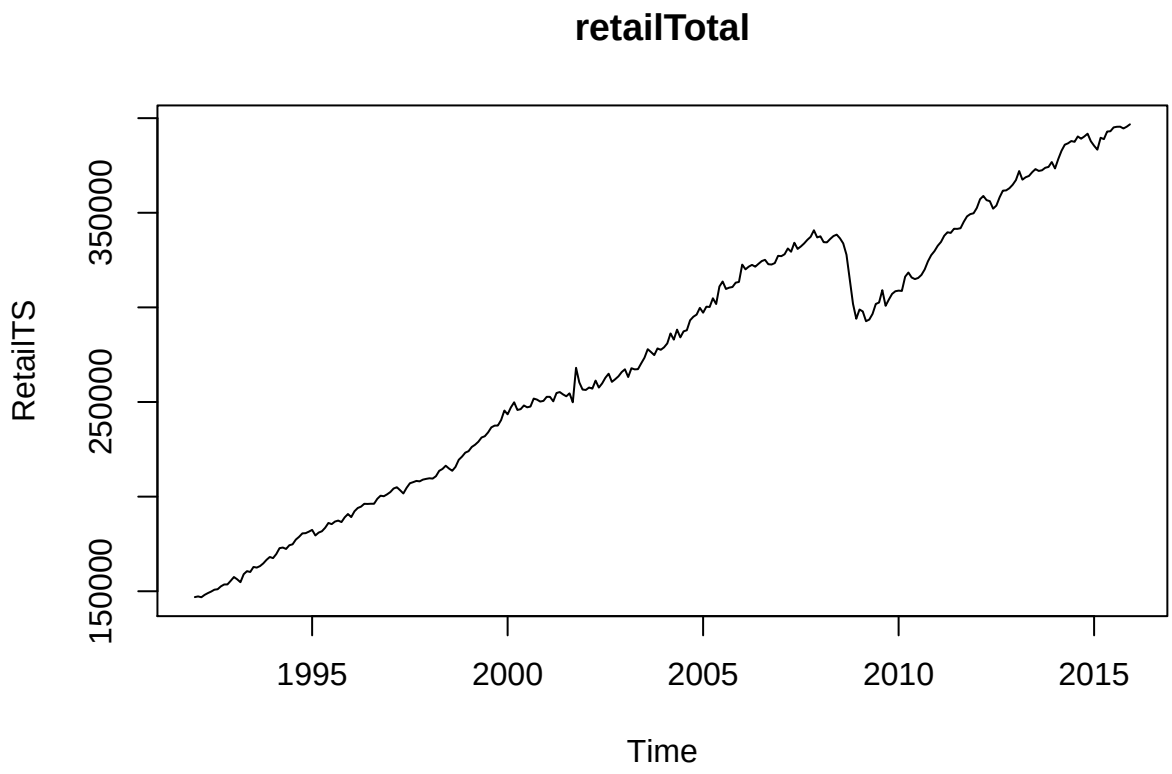

```
## Model  15
## Series: RetailTS
## ARIMA(0,1,2) with drift
##
## Coefficients:
##           ma1      ma2     drift
##       -0.2591  -0.0873  207.4538
## s.e.   0.0576   0.0510   73.8581
##
## sigma^2 estimated as 3686608:  log likelihood=-2575.53
## AIC=5159.06   AICc=5159.2   BIC=5173.69
```



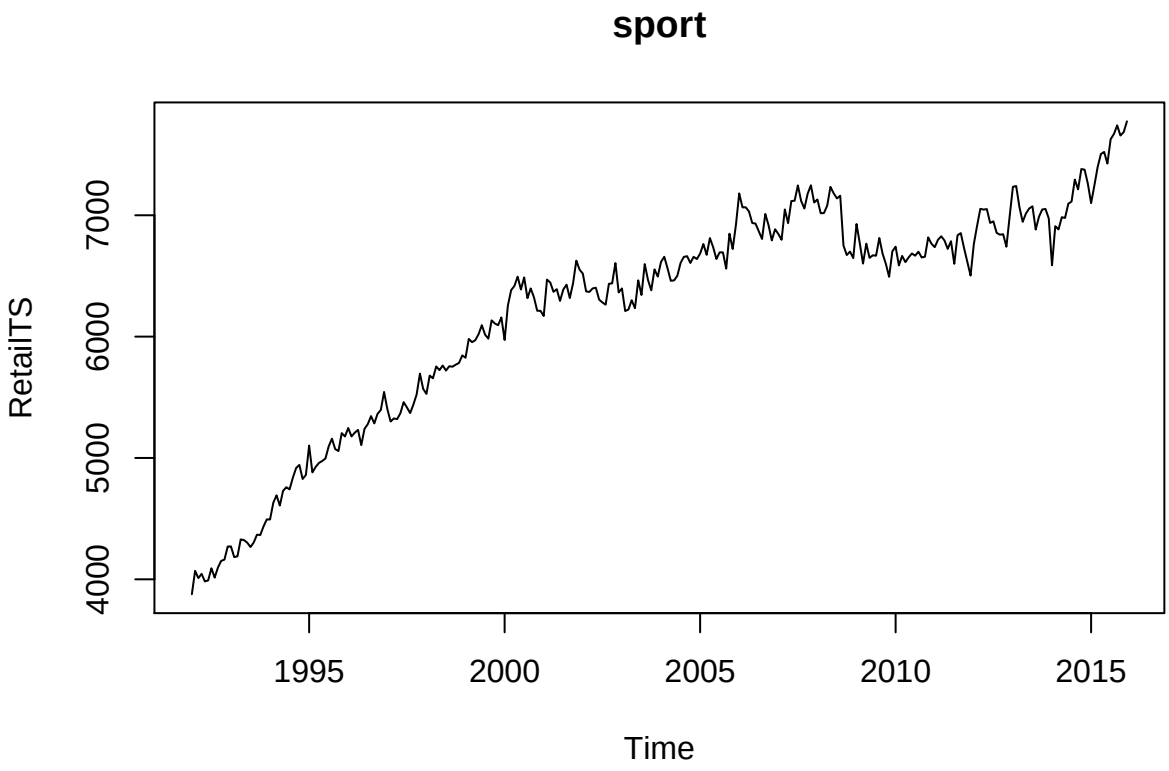

```
## Model  16
## Series: RetailTS
## ARIMA(2,2,1)(0,0,2)[12]
##
## Coefficients:
##           ar1      ar2      ma1     sma1     sma2
##       -0.2791  -0.1514  -0.9348  -0.1925  -0.1737
## s.e.   0.0673   0.0649   0.0356   0.0613   0.0584
##
## sigma^2 estimated as 102559:  log likelihood=-2055.51
## AIC=4123.01   AICc=4123.31   BIC=4144.95
```



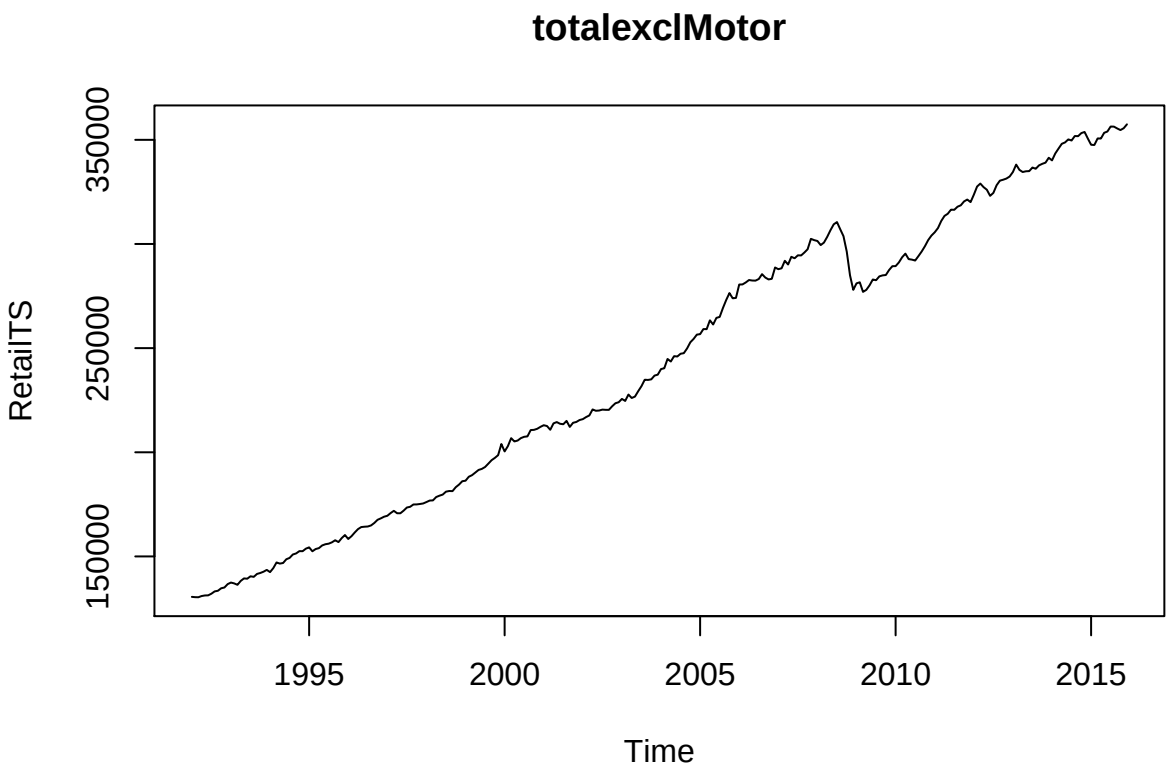

```
## Model  17
## Series: RetailTS
## ARIMA(0,1,2)(0,0,2)[12] with drift
##
## Coefficients:
##          ma1     ma2     sma1     sma2     drift
##       0.1850  0.0836  -0.1491  -0.2097  675.7164
## s.e.  0.0589  0.0560   0.0605   0.0632   84.7643
##
## sigma^2 estimated as 2939187:  log likelihood=-2542.73
## AIC=5097.46   AICc=5097.76   BIC=5119.41
```




```
## Model  18
## Series: RetailTS
## ARIMA(0,1,0)(0,0,2)[12] with drift
##
## Coefficients:
##          sma1     sma2     drift
##       -0.1355  -0.2223  867.6776
## s.e.   0.0583   0.0603  111.6349
##
## sigma^2 estimated as 8099465:  log likelihood=-2689.22
## AIC=5386.44   AICc=5386.58   BIC=5401.07
```




```
## Model  19
## Series: RetailTS
## ARIMA(1,1,1) with drift
##
## Coefficients:
##          ar1      ma1    drift
##       0.4030  -0.6938  13.2054
## s.e.  0.1161   0.0886   3.2589
##
## sigma^2 estimated as 11572:  log likelihood=-1748.45
## AIC=3504.89   AICc=3505.03   BIC=3519.53
```




```
## Model  20
## Series: RetailTS
## ARIMA(0,1,2)(0,0,2)[12] with drift
##
## Coefficients:
##         ma1     ma2     sma1     sma2     drift
##       0.167  0.0825  -0.1649  -0.2097  801.4373
## s.e.  0.059  0.0558   0.0604   0.0643   85.1570
##
## sigma^2 estimated as 3201823:  log likelihood=-2555.06
## AIC=5122.11   AICc=5122.41   BIC=5144.07
```