Homework 5

2022-10-09

```
library(fpp)
```

```
## Loading required package: forecast
```

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

```
## Loading required package: fma
```

```
## Loading required package: expsmooth
```

```
## Loading required package: lmtest
```

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

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

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

```
## Loading required package: tseries
```

```
library(fpp2)
```

```
## -- Attaching packages --------------------------------------------- fpp2 2.4 --
```

```
## v ggplot2 3.3.6
```

```
##
```

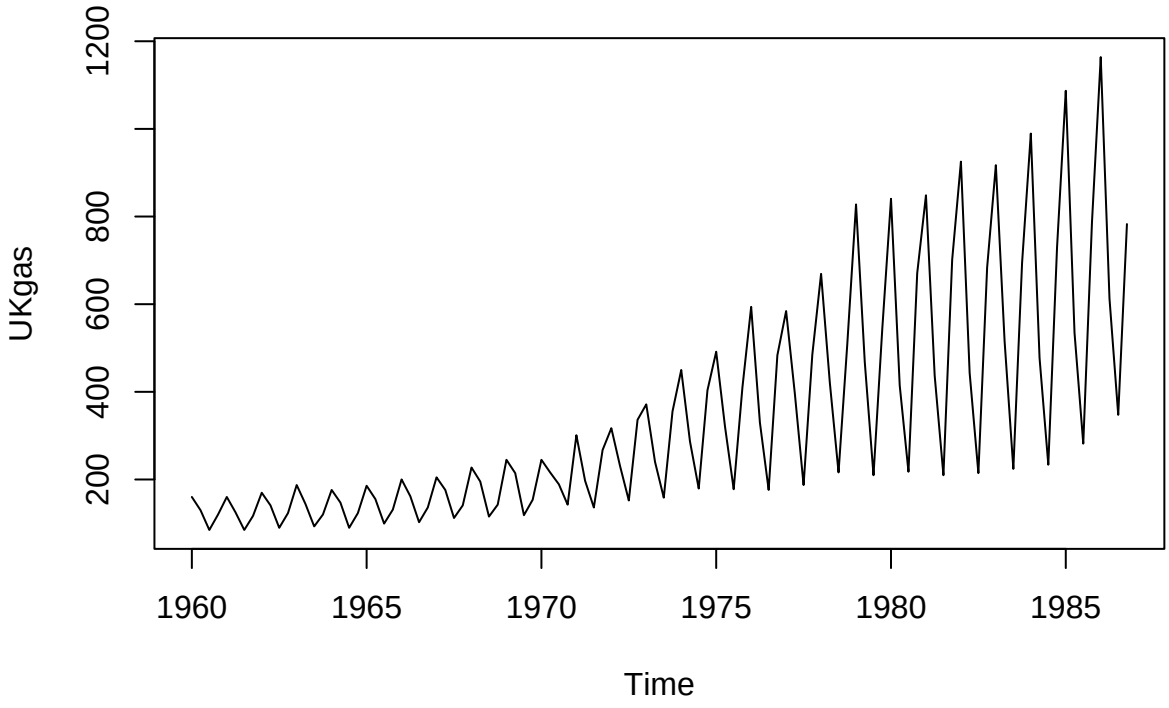
```
##
## Attaching package: 'fpp2'
```

```
## The following objects are masked from 'package:fpp':
##
##     ausair, ausbeer, austa, austourists, debitcards, departures,
##     elecequip, euretail, guinearice, oil, sunspotarea, usmelec
```

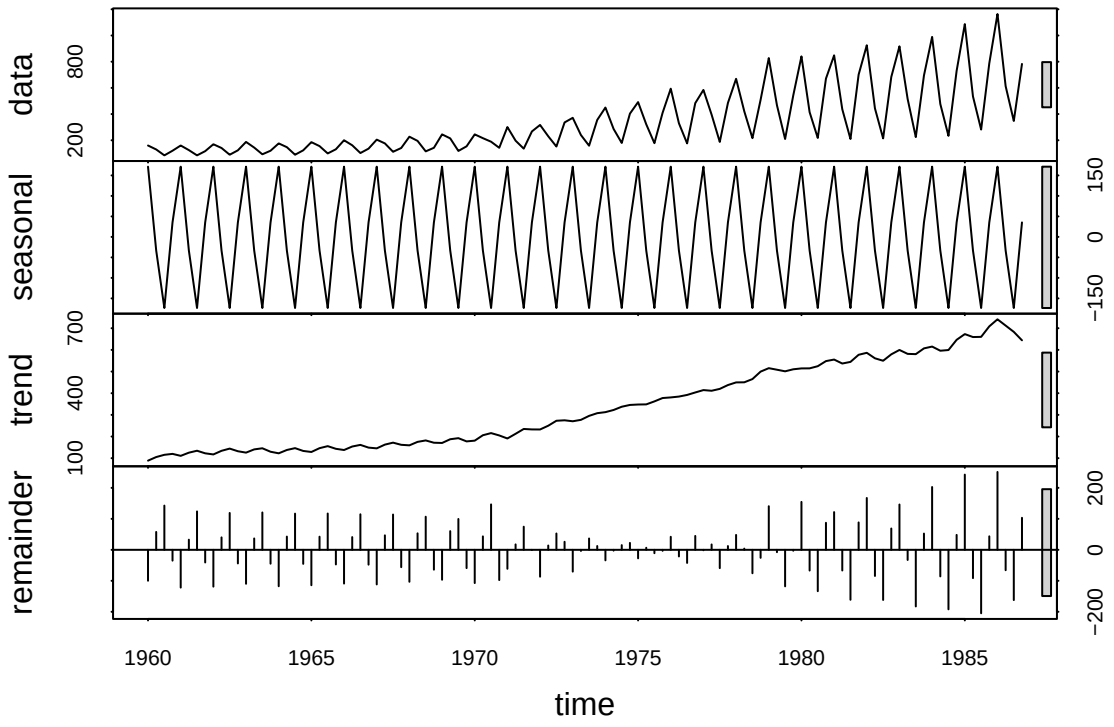
```
head(UKgas)
```

```
##       Qtr1  Qtr2  Qtr3  Qtr4
## 1960 160.1 129.7  84.8 120.1
## 1961 160.1 124.9
```

```
plot(UKgas)
```




```
stl_decomp <- stl(UKgas,s.window ="periodic")
plot(stl_decomp)
```




```
attributes(stl_decomp)
```

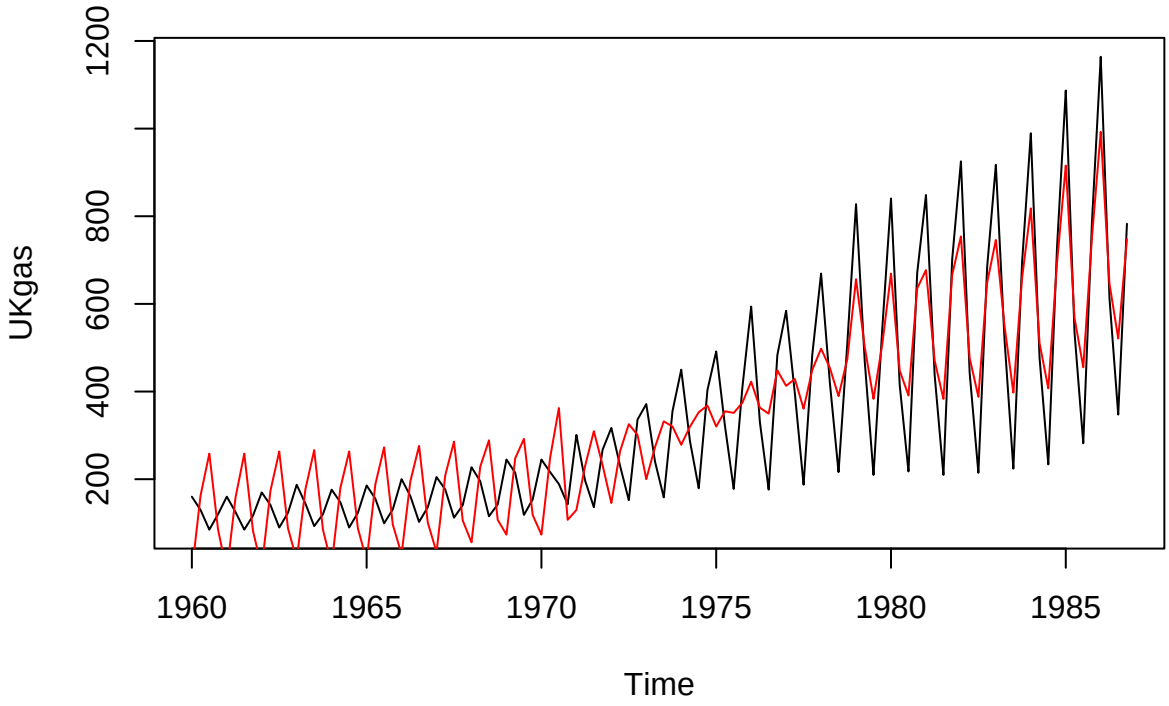
```
## $names
## [1] "time.series" "weights"     "call"        "win"         "deg"
## [6] "jump"        "inner"       "outer"
##
## $class
## [1] "stl"
```

```
seasadj(stl_decomp)
```

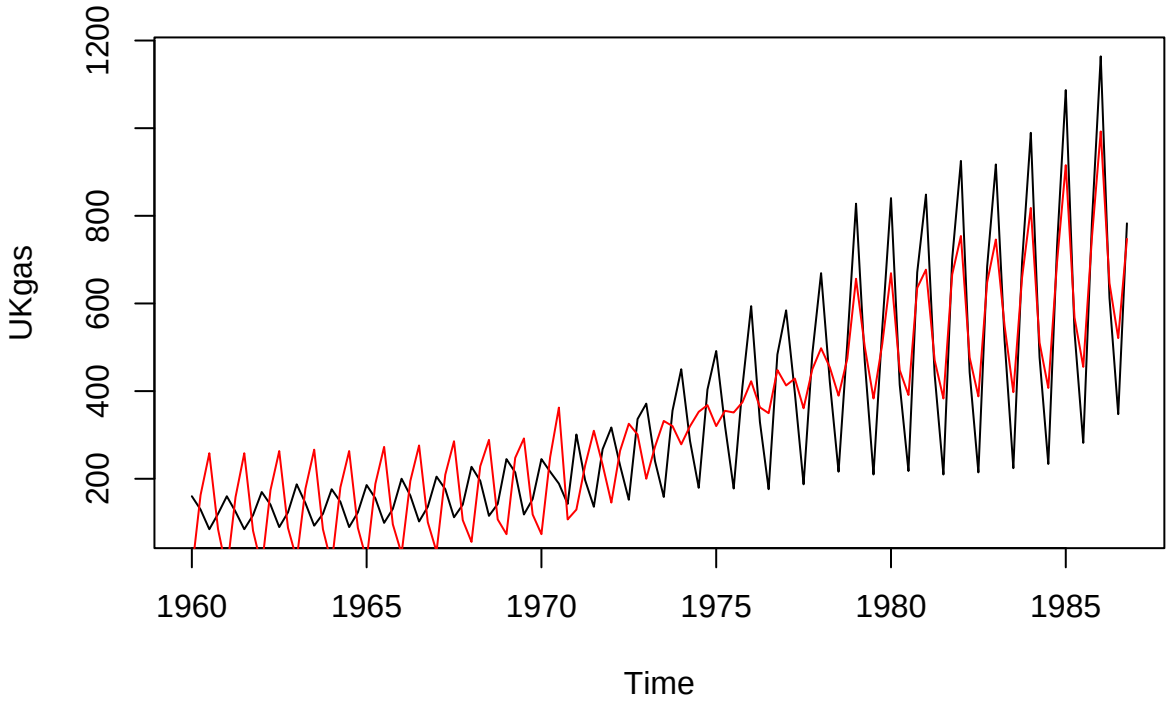
```
##            Qtr1       Qtr2       Qtr3       Qtr4
## 1960 -11.266482 162.919518 258.278229  84.768980
## 1961 -11.266482 158.119518 258.278229  81.568980
## 1962  -1.666482 174.119518 263.178229  87.968980
## 1963  15.933518 177.319518 266.378229  84.768980
## 1964   4.733518 180.519518 263.178229  87.968980
## 1965  14.333518 188.519518 272.778229  95.968980
## 1966  28.733518 194.919518 275.978229 100.768980
## 1967  33.533518 209.319518 285.578229 105.568980
## 1968  55.933518 228.519518 288.778229 107.168980
## 1969  73.533518 247.719518 291.978229 118.368980
## 1970  73.533518 249.319518 362.378229 107.168980
## 1971 129.633518 230.119518 309.578229 231.968980
```

```
## 1972 145.633518 263.719518 325.578229 300.868980
## 1973 200.033518 273.319518 331.978229 320.068980
## 1974 278.533518 319.819518 352.778229 368.068980
## 1975 320.133518 355.019518 351.178229 374.468980
## 1976 422.533518 363.019518 349.578229 448.168980
## 1977 412.933518 428.619518 360.778229 449.768980
## 1978 497.833518 454.219518 389.578229 473.768980
## 1979 656.333518 500.719518 383.178229 507.368980
## 1980 669.133518 447.819518 391.178229 635.468980
## 1981 677.133518 470.219518 383.178229 665.868980
## 1982 753.933518 476.619518 387.978229 648.268980
## 1983 745.933518 548.719518 397.578229 659.468980
## 1984 818.033518 510.319518 407.178229 694.668980
## 1985 915.633518 567.919518 455.278229 752.268980
## 1986 992.533518 646.319518 520.878229 747.468980
```

```
plot(UKgas)
lines(seasadj(stl_decomp), col="Red")
```



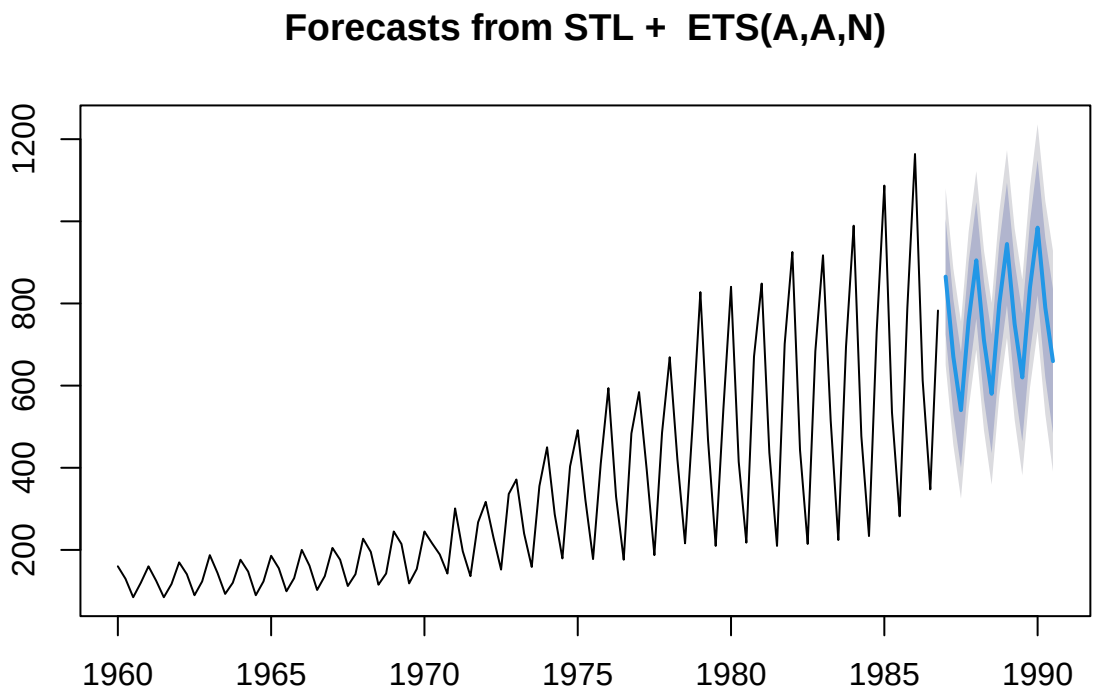

```
plot(UKgas)
lines(seasadj(stl_decomp), col="Red")
```




```
f_stl <- forecast(stl_decomp)
f_stl <- forecast(stl_decomp,h=15)
f_stl
```

```
##          Point Forecast    Lo 80     Hi 80    Lo 95     Hi 95
## 1987 Q1       865.2376 724.9641 1005.5110 650.7078 1079.7673
## 1987 Q2       670.5955 530.1935  810.9975 455.8692  885.3218
## 1987 Q3       540.2807 399.5902  680.9712 325.1132  755.4483
## 1987 Q4       759.0339 617.8320  900.2358 543.0843  974.9835
## 1988 Q1       905.0133 763.0162 1047.0104 687.8475 1122.1791
## 1988 Q2       710.3713 567.2370  853.5055 491.4663  929.2762
## 1988 Q3       580.0565 435.3889  724.7241 358.8065  801.3065
## 1988 Q4       798.8097 652.1636  945.4557 574.5339 1023.0855
## 1989 Q1       944.7891 795.6768 1093.9014 716.7415 1172.8367
## 1989 Q2       750.1470 598.0452  902.2488 517.5274  982.7666
## 1989 Q3       619.8322 464.1900  775.4744 381.7980  857.8664
## 1989 Q4       838.5854 678.8322  998.3387 594.2639 1082.9069
## 1990 Q1       984.5648 820.1179 1149.0117 733.0650 1236.0647
## 1990 Q2       789.9228 620.1949  959.6506 530.3464 1049.4991
## 1990 Q3       659.6080 484.0136  835.2023 391.0596  928.1564
```

```
plot(f_stl)
```




```
decomp_ukgas <- decompose(UKgas)
```

```
attributes(decomp_ukgas)
```

```
## $names
## [1] "x"        "seasonal" "trend"    "random"   "figure"   "type"
##
## $class
## [1] "decomposed.ts"
```

```
seasadj(decomp_ukgas)
```

```
##            Qtr1       Qtr2       Qtr3       Qtr4
## 1960 -15.038101 165.841226 253.767668  90.129207
## 1961 -15.038101 161.041226 253.767668  86.929207
## 1962  -5.438101 177.041226 258.667668  93.329207
## 1963  12.161899 180.241226 261.867668  90.129207
## 1964   0.961899 183.441226 258.667668  93.329207
## 1965  10.561899 191.441226 268.267668 101.329207
## 1966  24.961899 197.841226 271.467668 106.129207
## 1967  29.761899 212.241226 281.067668 110.929207
## 1968  52.161899 231.441226 284.267668 112.529207
## 1969  69.761899 250.641226 287.467668 123.729207
## 1970  69.761899 252.241226 357.867668 112.529207
```

```
## 1971 125.861899 233.041226 305.067668 237.329207
## 1972 141.861899 266.641226 321.067668 306.229207
## 1973 196.261899 276.241226 327.467668 325.429207
## 1974 274.761899 322.741226 348.267668 373.429207
## 1975 316.361899 357.941226 346.667668 379.829207
## 1976 418.761899 365.941226 345.067668 453.529207
## 1977 409.161899 431.541226 356.267668 455.129207
## 1978 494.061899 457.141226 385.067668 479.129207
## 1979 652.561899 503.641226 378.667668 512.729207
## 1980 665.361899 450.741226 386.667668 640.829207
## 1981 673.361899 473.141226 378.667668 671.229207
## 1982 750.161899 479.541226 383.467668 653.629207
## 1983 742.161899 551.641226 393.067668 664.829207
## 1984 814.261899 513.241226 402.667668 700.029207
## 1985 911.861899 570.841226 450.767668 757.629207
## 1986 988.761899 649.241226 516.367668 752.829207
```