04.03.01.timeseries_analysis.R

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```
library(TTR)
library(forecast)

# reading data ------------------------------------------------------------
kings <- scan('https://robjhyndman.com/tsdldata/misc/kings.dat', skip=3)
births <- scan("http://robjhyndman.com/tsdldata/data/nybirths.dat")
souvenir <- scan("http://robjhyndman.com/tsdldata/data/fancy.dat")

# basic timeseries analysis -----------------------------------------------
head(births)
```

```
## [1] 26.663 23.598 26.931 24.740 25.806 24.364
```

```
head(kings)
```

```
## [1] 60 43 67 50 56 42
```

```
head(souvenir)
```

```
## [1] 1664.81 2397.53 2840.71 3547.29 3752.96 3714.74
```

```
kingstimeseries <- ts(kings)
birthstimeseries <- ts(births, frequency=12, start=c(1946,1))
birthstimeseries2<- ts(births, frequency=12, start=c(1946,7))
birthstimeseries3 <- ts(births, frequency=10, start=c(1946,1))
birthstimeseries4 <- ts(births, frequency=6, start=c(1946,1))
head(birthstimeseries)
```

```
##         Jan    Feb    Mar    Apr    May    Jun
## 1946 26.663 23.598 26.931 24.740 25.806 24.364
```

```
head(birthstimeseries2)
```

```
##         Jul    Aug    Sep    Oct    Nov    Dec
## 1946 26.663 23.598 26.931 24.740 25.806 24.364
```

```
head(birthstimeseries3)
```

```
## Time Series:
## Start = c(1946, 1)
## End = c(1946, 6)
## Frequency = 10
## [1] 26.663 23.598 26.931 24.740 25.806 24.364
```

```
head(birthstimeseries4)
```

```
## Time Series:
## Start = c(1946, 1)
## End = c(1946, 6)
## Frequency = 6
## [1] 26.663 23.598 26.931 24.740 25.806 24.364
```

```r
plot.ts(birthstimeseries)
```

```r
plot.ts(birthstimeseries2)
```

```r
plot.ts(birthstimeseries3)
```

```r
plot.ts(kingstimeseries)
```

```r
souvenirtimeseries <- ts(souvenir, frequency= 12, start=c(1987,1))
souvenirtimeseries
```

```
##            Jan       Feb       Mar       Apr       May       Jun       Jul
## 1987   1664.81   2397.53   2840.71   3547.29   3752.96   3714.74   4349.61
## 1988   2499.81   5198.24   7225.14   4806.03   5900.88   4951.34   6179.12
## 1989   4717.02   5702.63   9957.58   5304.78   6492.43   6630.80   7349.62
## 1990   5921.10   5814.58  12421.25   6369.77   7609.12   7224.75   8121.22
## 1991   4826.64   6470.23   9638.77   8821.17   8722.37  10209.48  11276.55
## 1992   7615.03   9849.69  14558.40  11587.33   9332.56  13082.09  16732.78
## 1993  10243.24  11266.88  21826.84  17357.33  15997.79  18601.53  26155.15
##            Aug       Sep       Oct       Nov       Dec
## 1987   3566.34   5021.82   6423.48   7600.60  19756.21
## 1988   4752.15   5496.43   5835.10  12600.08  28541.72
## 1989   8176.62   8573.17   9690.50  15151.84  34061.01
## 1990   7979.25   8093.06   8476.70  17914.66  30114.41
## 1991  12552.22  11637.39  13606.89  21822.11  45060.69
## 1992  19888.61  23933.38  25391.35  36024.80  80721.71
## 1993  28586.52  30505.41  30821.33  46634.38 104660.67
```

```r
logsouvenierstimeseries <- log(souvenirtimeseries)
plot.ts(logsouvenierstimeseries)
```

```r
# decompose non-seasonal data ------------------------------------------------
kingstimeseries.SMA3 <- SMA(kingstimeseries, n=3)
plot.ts(kingstimeseries.SMA3)
```

```r
kingstimeseries.SMA8 <- SMA(kingstimeseries, n=8)
plot.ts(kingstimeseries.SMA8)
```

```r
# Decompose Seasonal data------
birthstimeseries.components <- decompose(birthstimeseries)
# decompose(birthstimeseries, type="additive")
# decompose(birthstimeseries, type="multiplicative")
birthstimeseries.components$seasonal
```

```
##             Jan        Feb        Mar        Apr        May        Jun
## 1946 -0.6771947 -2.0829607  0.8625232 -0.8016787  0.2516514 -0.1532556
## 1947 -0.6771947 -2.0829607  0.8625232 -0.8016787  0.2516514 -0.1532556
## 1948 -0.6771947 -2.0829607  0.8625232 -0.8016787  0.2516514 -0.1532556
## 1949 -0.6771947 -2.0829607  0.8625232 -0.8016787  0.2516514 -0.1532556
## 1950 -0.6771947 -2.0829607  0.8625232 -0.8016787  0.2516514 -0.1532556
## 1951 -0.6771947 -2.0829607  0.8625232 -0.8016787  0.2516514 -0.1532556
## 1952 -0.6771947 -2.0829607  0.8625232 -0.8016787  0.2516514 -0.1532556
## 1953 -0.6771947 -2.0829607  0.8625232 -0.8016787  0.2516514 -0.1532556
## 1954 -0.6771947 -2.0829607  0.8625232 -0.8016787  0.2516514 -0.1532556
## 1955 -0.6771947 -2.0829607  0.8625232 -0.8016787  0.2516514 -0.1532556
## 1956 -0.6771947 -2.0829607  0.8625232 -0.8016787  0.2516514 -0.1532556
```

```
## 1957 -0.6771947 -2.0829607  0.8625232 -0.8016787  0.2516514 -0.1532556
## 1958 -0.6771947 -2.0829607  0.8625232 -0.8016787  0.2516514 -0.1532556
## 1959 -0.6771947 -2.0829607  0.8625232 -0.8016787  0.2516514 -0.1532556
##             Jul        Aug        Sep        Oct        Nov        Dec
## 1946  1.4560457  1.1645938  0.6916162  0.7752444 -1.1097652 -0.3768197
## 1947  1.4560457  1.1645938  0.6916162  0.7752444 -1.1097652 -0.3768197
## 1948  1.4560457  1.1645938  0.6916162  0.7752444 -1.1097652 -0.3768197
## 1949  1.4560457  1.1645938  0.6916162  0.7752444 -1.1097652 -0.3768197
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## 1959  1.4560457  1.1645938  0.6916162  0.7752444 -1.1097652 -0.3768197
```

```
birthstimeseries.components$trend
```

```
##           Jan      Feb      Mar      Apr      May      Jun      Jul
## 1946       NA       NA       NA       NA       NA       NA 23.98433
## 1947 22.35350 22.30871 22.30258 22.29479 22.29354 22.30562 22.33483
## 1948 22.43038 22.43667 22.38721 22.35242 22.32458 22.27458 22.23754
## 1949 22.06375 22.08033 22.13317 22.16604 22.17542 22.21342 22.27625
## 1950 23.21663 23.26967 23.33492 23.42679 23.50638 23.57017 23.63888
## 1951 24.00083 24.12350 24.20917 24.28208 24.35450 24.43242 24.49496
## 1952 24.27204 24.27300 24.28942 24.30129 24.31325 24.35175 24.40558
## 1953 24.78646 24.84992 24.92692 25.02362 25.16308 25.26963 25.30154
## 1954 25.92446 25.92317 25.92967 25.92137 25.89567 25.89458 25.92963
## 1955 25.64612 25.78679 25.93192 26.06388 26.16329 26.25388 26.35471
## 1956 27.21104 27.21900 27.20700 27.26925 27.35050 27.37983 27.39975
## 1957 27.44221 27.40283 27.44300 27.45717 27.44429 27.48975 27.54354
## 1958 27.68642 27.76067 27.75963 27.71037 27.65783 27.58125 27.49075
## 1959 26.96858 27.00512 27.09250 27.17263 27.26208 27.36033       NA
##           Aug      Sep      Oct      Nov      Dec
## 1946 23.66213 23.42333 23.16112 22.86425 22.54521
## 1947 22.31167 22.26279 22.25796 22.27767 22.35400
## 1948 22.21988 22.16983 22.07721 22.01396 22.02604
## 1949 22.35750 22.48862 22.70992 22.98563 23.16346
## 1950 23.75713 23.86354 23.89533 23.87342 23.88150
## 1951 24.48379 24.43879 24.36829 24.29192 24.27642
## 1952 24.44475 24.49325 24.58517 24.70429 24.76017
## 1953 25.34125 25.42779 25.57588 25.73904 25.87513
## 1954 25.98246 26.01054 25.88617 25.67087 25.57312
## 1955 26.40496 26.45379 26.64933 26.95183 27.14683
## 1956 27.44150 27.45229 27.43354 27.44488 27.46996
## 1957 27.56933 27.63167 27.67804 27.62579 27.61212
## 1958 27.46183 27.42262 27.34175 27.25129 27.08558
## 1959       NA       NA       NA       NA       NA
```

```
birthstimeseries.components$type
```

```
## [1] "additive"
```

```r
plot(birthstimeseries.components)
```

```r
plot.ts(birthstimeseries.components$seasonal)
```

```r
plot.ts(birthstimeseries.components$trend)
```

```r
# Seosonal adjusting ----------------------------------------------------

birthstimeseries.seasonally.adjusted <- birthstimeseries - birthstimeseries.components$seasonal
plot(birthstimeseries.seasonally.adjusted, main="seasonally adjusted") #
```

```r
op <- par(no.readonly = TRUE)
par(mfrow=c(1,3))

plot(birthstimeseries, main="timeseries")
plot(birthstimeseries.components$seasonal, main="seasomal")
plot(birthstimeseries.seasonally.adjusted, main="seasonally adjusted") #
```

```r
par(mfrow=c(1,1))
```