lab1_zejie

2023-10-11

1. read in the data

```
births <- scan("http://robjhyndman.com/tsdldata/data/nybirths.dat")
```

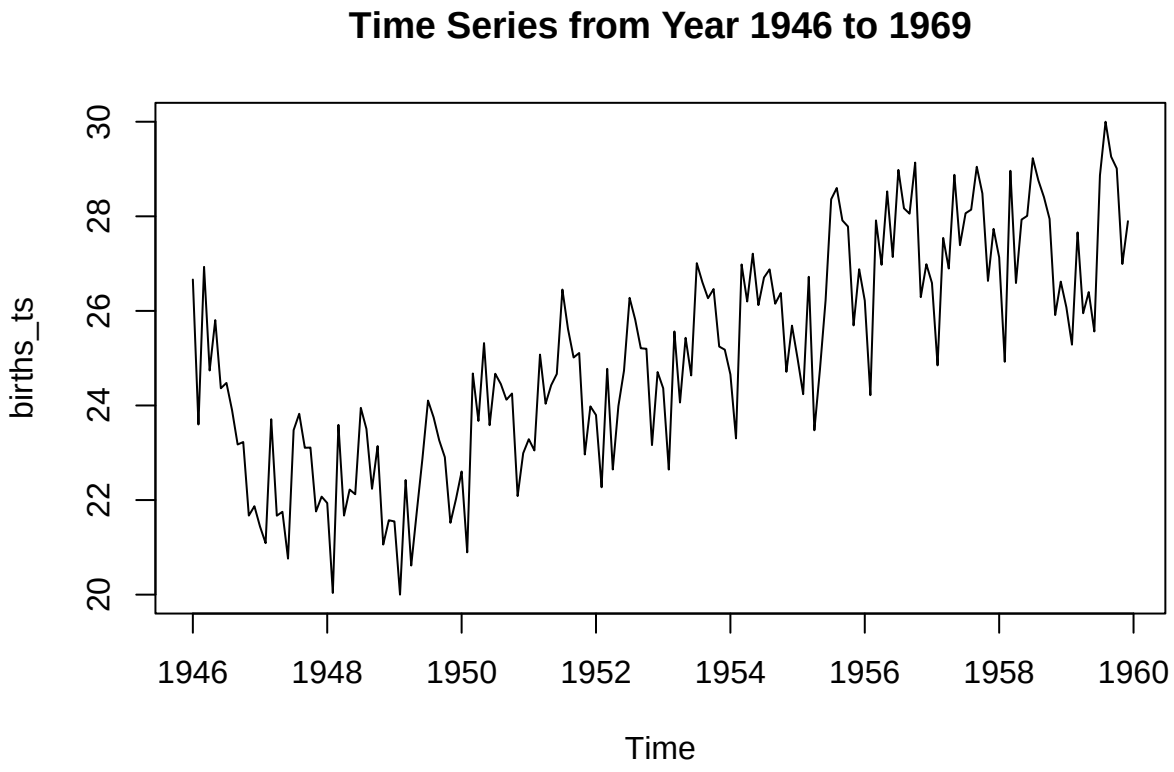
2. Convert it into time series format

```
births_ts = ts(births, start = c(1946,1), frequency = 12)
births_ts
```

```
##         Jan    Feb    Mar    Apr    May    Jun    Jul    Aug    Sep    Oct
## 1946 26.663 23.598 26.931 24.740 25.806 24.364 24.477 23.901 23.175 23.227
## 1947 21.439 21.089 23.709 21.669 21.752 20.761 23.479 23.824 23.105 23.110
## 1948 21.937 20.035 23.590 21.672 22.222 22.123 23.950 23.504 22.238 23.142
## 1949 21.548 20.000 22.424 20.615 21.761 22.874 24.104 23.748 23.262 22.907
## 1950 22.604 20.894 24.677 23.673 25.320 23.583 24.671 24.454 24.122 24.252
## 1951 23.287 23.049 25.076 24.037 24.430 24.667 26.451 25.618 25.014 25.110
## 1952 23.798 22.270 24.775 22.646 23.988 24.737 26.276 25.816 25.210 25.199
## 1953 24.364 22.644 25.565 24.062 25.431 24.635 27.009 26.606 26.268 26.462
## 1954 24.657 23.304 26.982 26.199 27.210 26.122 26.706 26.878 26.152 26.379
## 1955 24.990 24.239 26.721 23.475 24.767 26.219 28.361 28.599 27.914 27.784
## 1956 26.217 24.218 27.914 26.975 28.527 27.139 28.982 28.169 28.056 29.136
## 1957 26.589 24.848 27.543 26.896 28.878 27.390 28.065 28.141 29.048 28.484
## 1958 27.132 24.924 28.963 26.589 27.931 28.009 29.229 28.759 28.405 27.945
## 1959 26.076 25.286 27.660 25.951 26.398 25.565 28.865 30.000 29.261 29.012
##         Nov    Dec
## 1946 21.672 21.870
## 1947 21.759 22.073
## 1948 21.059 21.573
## 1949 21.519 22.025
## 1950 22.084 22.991
## 1951 22.964 23.981
## 1952 23.162 24.707
## 1953 25.246 25.180
## 1954 24.712 25.688
## 1955 25.693 26.881
## 1956 26.291 26.987
## 1957 26.634 27.735
## 1958 25.912 26.619
## 1959 26.992 27.897
```

3. Plot the data versus time

```
plot(births_ts, main = "Time Series from Year 1946 to 1969")
```



4. Plot the aggregated data versus time

```
library(xts)
```

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

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

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

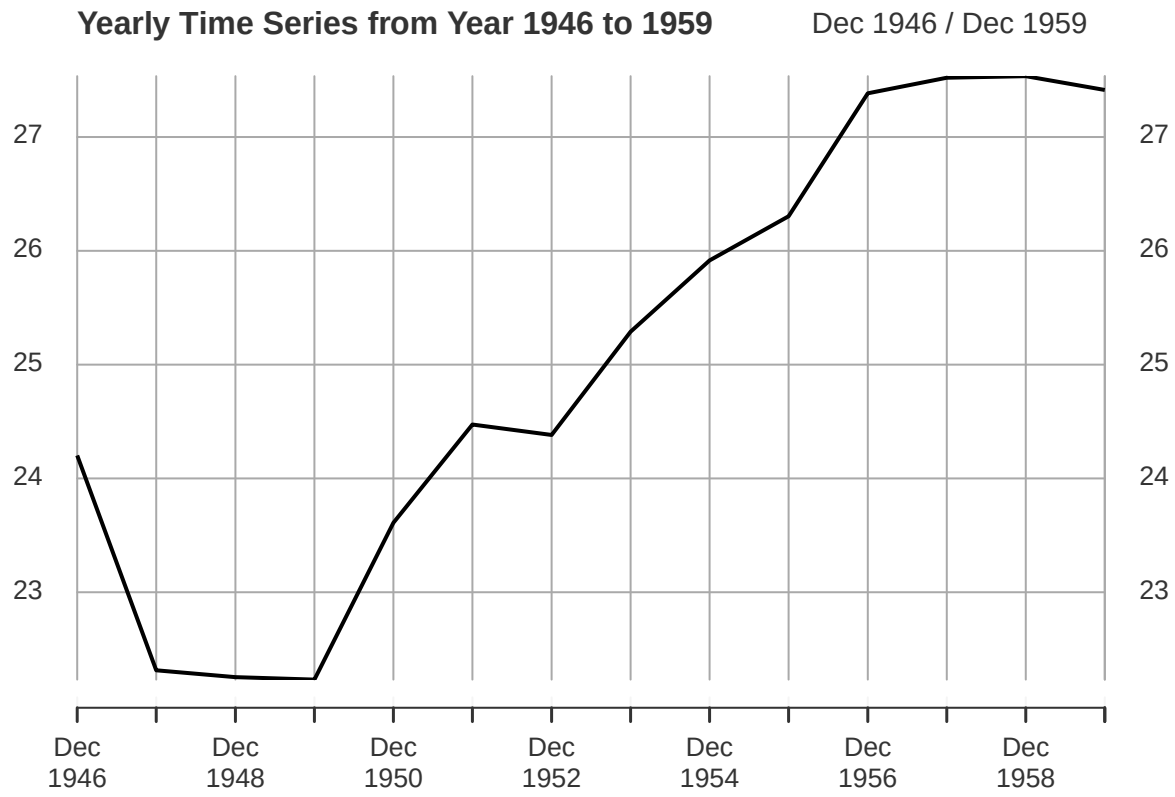
```
ts.yearly <- apply.yearly(as.xts(births_ts), FUN = mean)
ts.yearly
```

```
##              [,1]
## Dec 1946 24.20200
## Dec 1947 22.31408
```

```
## Dec 1948 22.25375
## Dec 1949 22.23225
## Dec 1950 23.61042
## Dec 1951 24.47367
## Dec 1952 24.38200
## Dec 1953 25.28933
## Dec 1954 25.91575
## Dec 1955 26.30358
## Dec 1956 27.38425
## Dec 1957 27.52092
## Dec 1958 27.53475
## Dec 1959 27.41358
```

Plot the Aggregated yearly data:

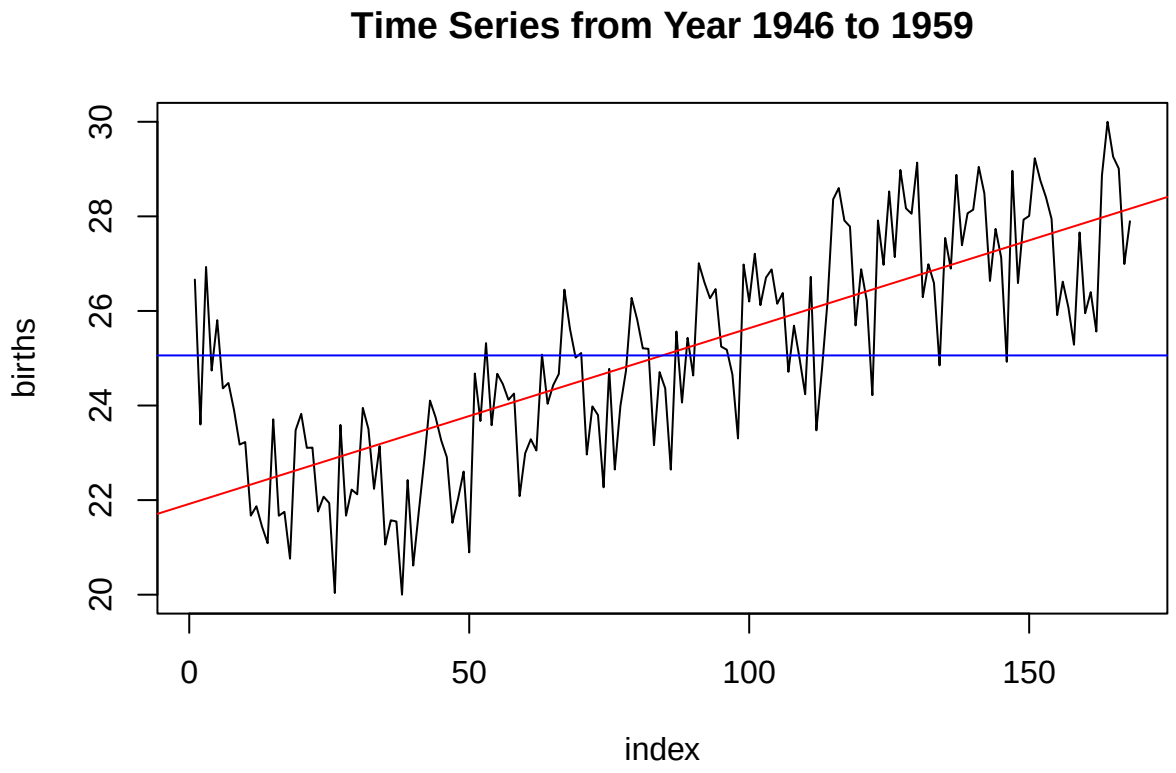
```
plot(ts.yearly, main = "Yearly Time Series from Year 1946 to 1959")
```



5 Plot the data versus time index number from 1, 2, ...n. Add regression line and mean line to the plot and print sample size n.

```
plot(1:length(births),births, main =
   "Time Series from Year 1946 to 1959", type = 'l',xlab='index')
index = 1: length(births)
trend <- lm(births ~ index)
```

```
abline(trend, col = "red")
abline(h = mean(births), col = "blue")
```

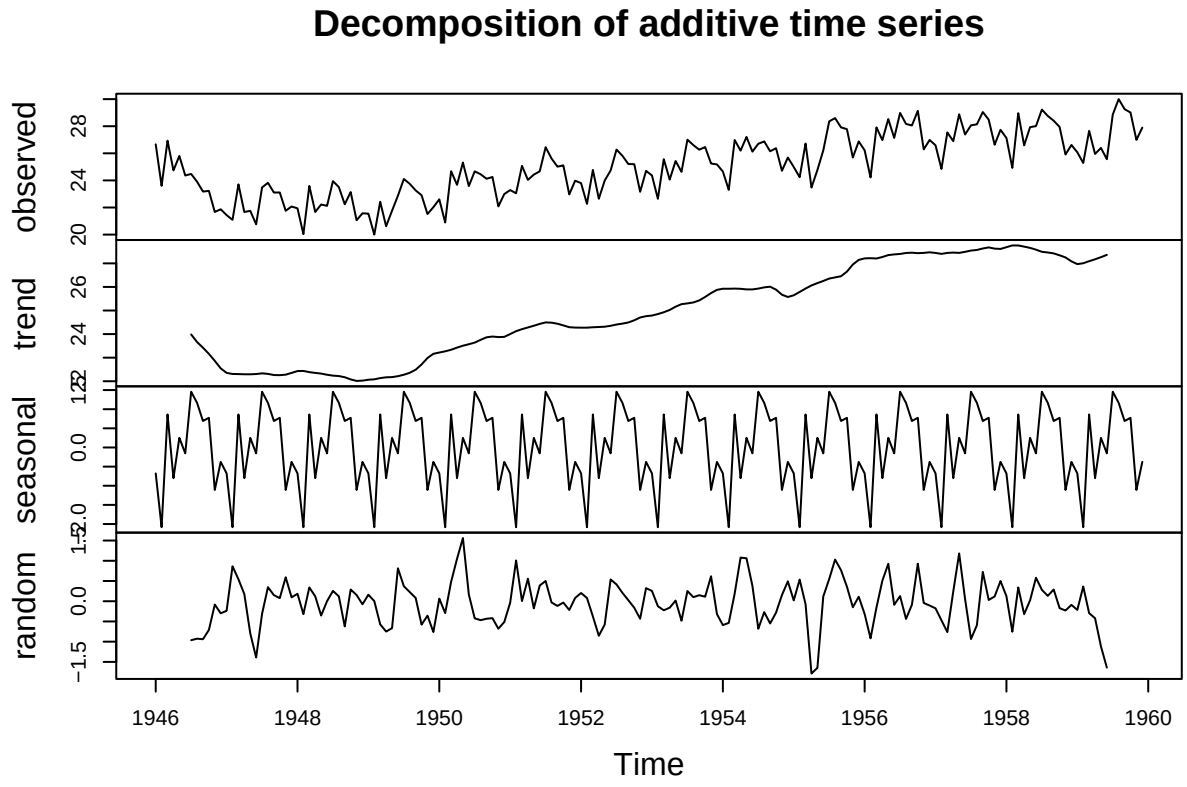



```
length(births)
```

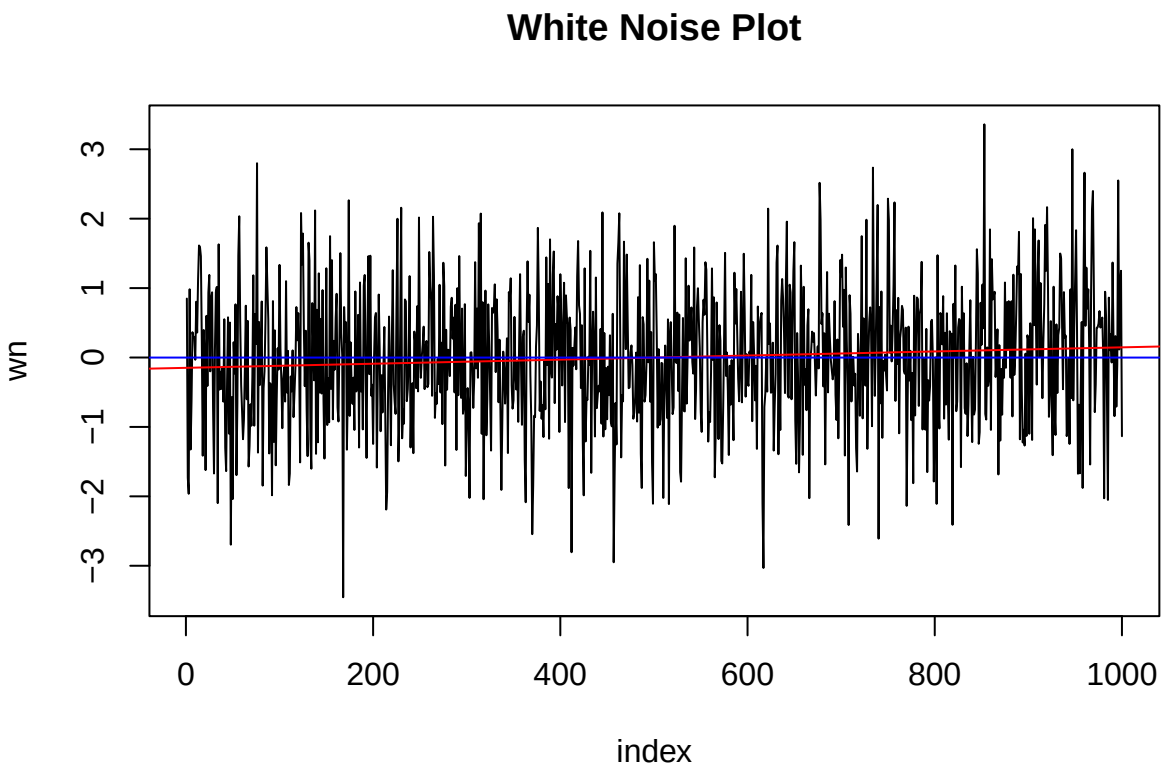
```
## [1] 168
```

6. State whether the data looks stationary.

```
birthstimeseriescomponents <- decompose(births_ts)
plot(birthstimeseriescomponents)
```




```r
wn = rnorm(1000,0,1)
plot(1:length(wn),wn, main =
   "White Noise Plot", type = 'l',xlab='index')
trend <- lm(wn ~ time(wn))
abline(trend, col="red")
abline(h=mean(wn) , col='blue')
```



7. Does 1946-1948 data have the same pattern as the rest of the data? If no, please cut the start of the data e.g. your data will start at Jan, 1948.

```
select <- c(1:24)
#eliminate data from year Jan 1946 to Dec 1947 and we therefore now have 12 years(144 obse
birth_split <- births[-c(select)]
#use the first 11 years(132 observations) for training
training = birth_split[1:132]
#use the last 1 year(12 observations) for testing
testing = birth_split[133:144]
```

8. Generating Uniform distribution and calculate the mean.

```
observations = runif(1000,-1,1)
mean(observations)
```

```
## [1] -0.008384169
```