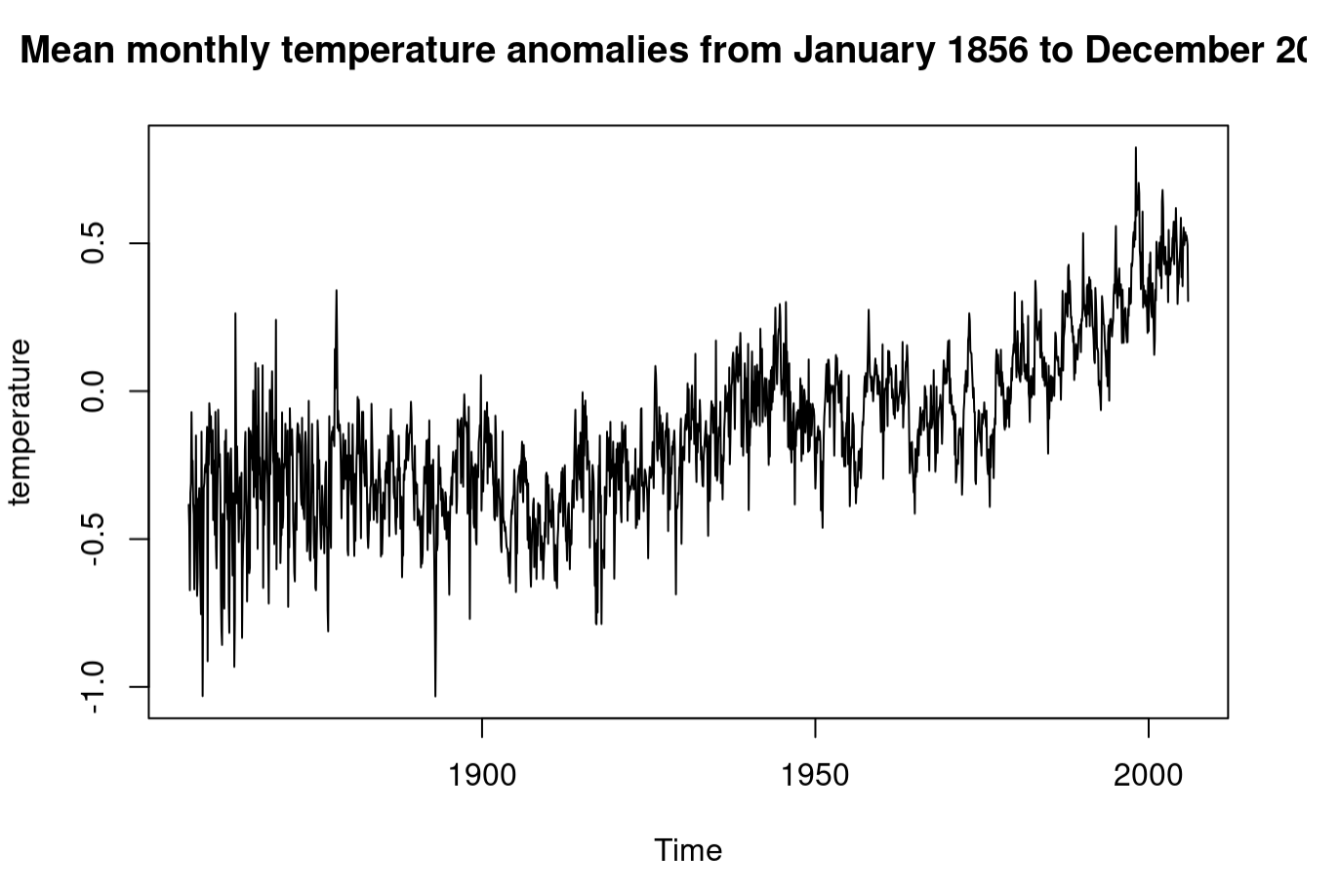
Homework02

2022-05-18

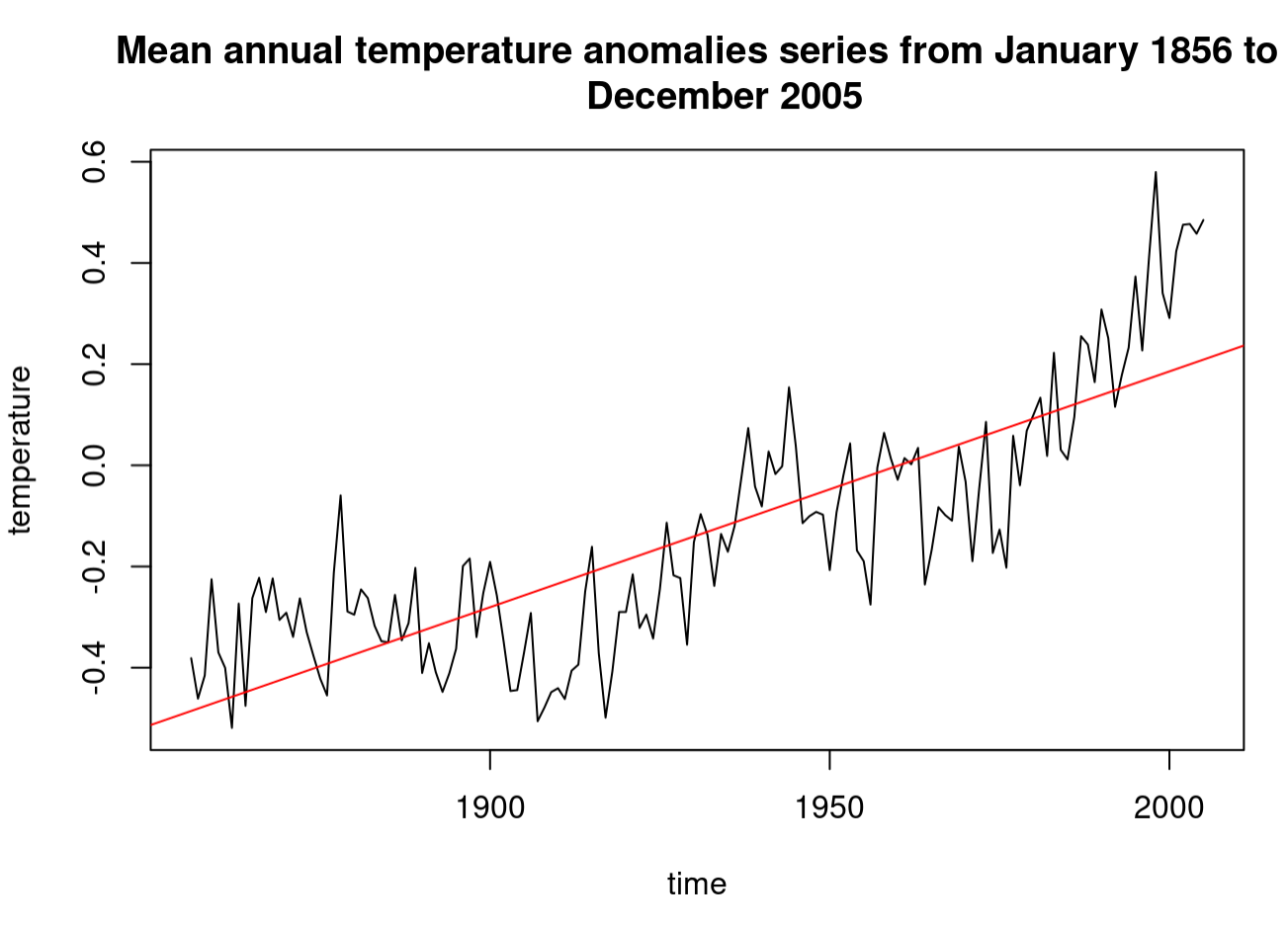
```r
global <- scan('global.dat')

# (1) plot the time series
global.ts <- ts(global, start = c(1856,1), end = c(2005,12), frequency = 12)
plot(global.ts, ylab= 'temperature', xlab = 'Time',
     main = 'Mean monthly temperature anomalies from January 1856 to December 2005')
```



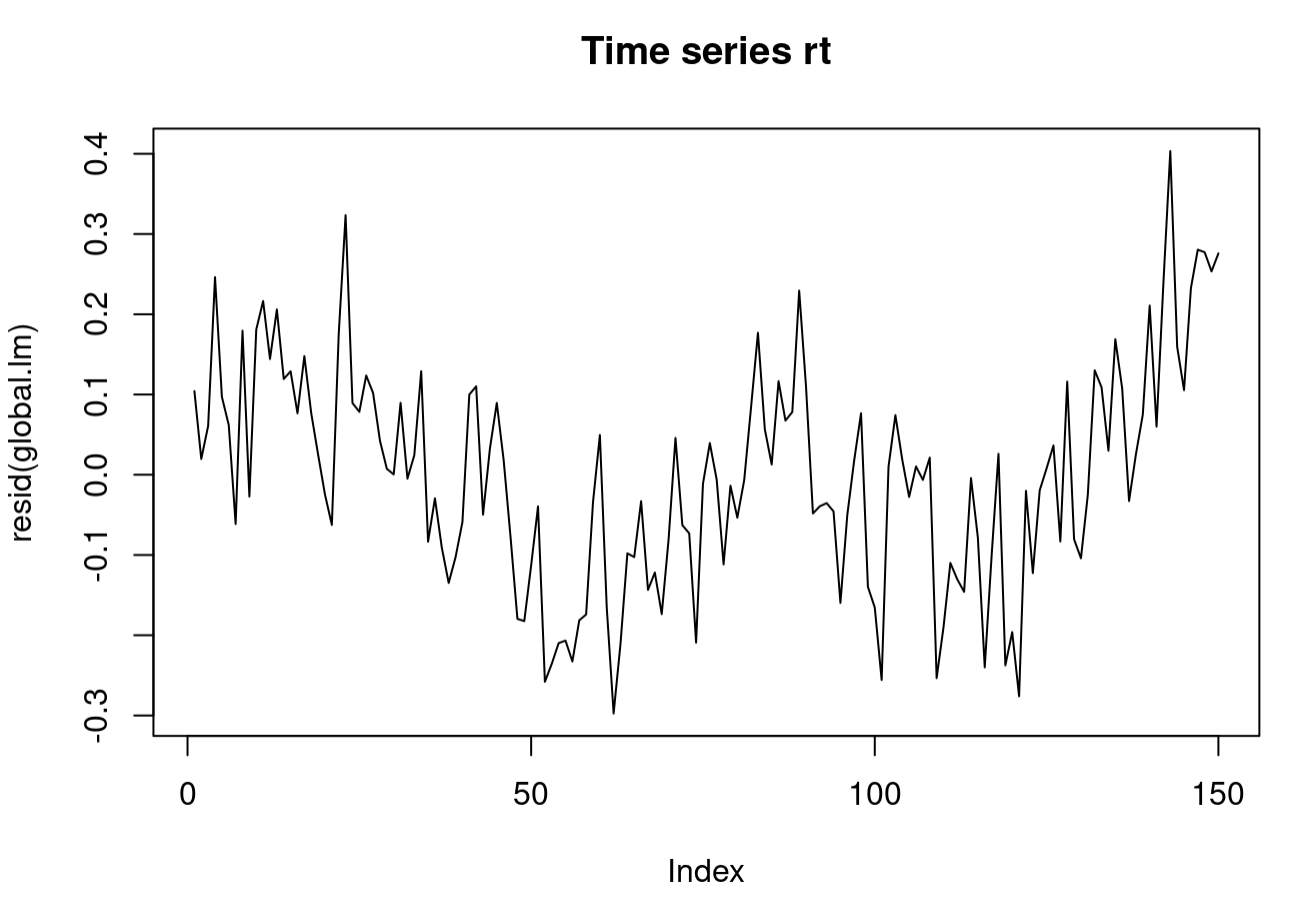

```r
#(2) Use the aggregate function to remove any seasonal effects within each
# year and plot an annual series (called {xt}) of mean temperatures for
# the period 1856-2005

global.ts.annual <- aggregate(global.ts) / 12
plot(global.ts.annual, ylab = 'temperature', xlab = 'time',
     main = 'Mean annual temperature anomalies series from January 1856 to
     December 2005')
# (3)
t <- time(global.ts.annual)
global.lm <- lm(global.ts.annual ~ t)
coef(global.lm)
```

```
##  (Intercept)            t
## -9.135592601  0.004660622
```

```r
# (4) Use the command abline to draw a regression line to the existing plot
#in step (2).
abline(global.lm, col = 'red')
```




```r
#(5) plot the time series rt
plot(resid(global.lm), type = 'l', main='Time series rt')
```




```r
#(6)

library(randtests)
rt <- resid(global.lm)
turning.point.test(rt)
```

```
##
##  Turning Point Test
##
## data:  rt
## statistic = -2.6627, n = 150, p-value = 0.007752
## alternative hypothesis: non randomness
```

```r
#Box-Pierce and Ljung-Box Test
for(i in 1:24){
  box_pierce <- Box.test(rt, lag = i, type = 'Box-Pierce')
  print(box_pierce)
}
```

```
##
##  Box-Pierce test
##
## data:  rt
## X-squared = 64.371, df = 1, p-value = 9.992e-16
##
##
##  Box-Pierce test
##
## data:  rt
## X-squared = 99.342, df = 2, p-value < 2.2e-16
##
##
##  Box-Pierce test
##
## data:  rt
## X-squared = 130.39, df = 3, p-value < 2.2e-16
##
##
##  Box-Pierce test
##
## data:  rt
## X-squared = 164.74, df = 4, p-value < 2.2e-16
##
##
##  Box-Pierce test
##
## data:  rt
## X-squared = 189.31, df = 5, p-value < 2.2e-16
##
##
##  Box-Pierce test
##
## data:  rt
## X-squared = 212.99, df = 6, p-value < 2.2e-16
##
##
##  Box-Pierce test
##
## data:  rt
## X-squared = 236.66, df = 7, p-value < 2.2e-16
##
##
##  Box-Pierce test
##
## data:  rt
## X-squared = 254.47, df = 8, p-value < 2.2e-16
##
##
##  Box-Pierce test
##
## data:  rt
## X-squared = 267.3, df = 9, p-value < 2.2e-16
##
##
##  Box-Pierce test
##
## data:  rt
## X-squared = 282.51, df = 10, p-value < 2.2e-16
##
##
##  Box-Pierce test
##
## data:  rt
## X-squared = 292.38, df = 11, p-value < 2.2e-16
##
##
##  Box-Pierce test
##
## data:  rt
## X-squared = 296.8, df = 12, p-value < 2.2e-16
##
##
##  Box-Pierce test
##
## data:  rt
## X-squared = 299.25, df = 13, p-value < 2.2e-16
##
##
##  Box-Pierce test
##
## data:  rt
## X-squared = 304.1, df = 14, p-value < 2.2e-16
##
##
##  Box-Pierce test
##
## data:  rt
## X-squared = 307.56, df = 15, p-value < 2.2e-16
##
##
##  Box-Pierce test
##
## data:  rt
## X-squared = 308.53, df = 16, p-value < 2.2e-16
##
##
##  Box-Pierce test
##
## data:  rt
## X-squared = 309.65, df = 17, p-value < 2.2e-16
##
##
##  Box-Pierce test
##
## data:  rt
## X-squared = 311.43, df = 18, p-value < 2.2e-16
##
##
##  Box-Pierce test
##
## data:  rt
## X-squared = 311.63, df = 19, p-value < 2.2e-16
##
##
##  Box-Pierce test
##
## data:  rt
## X-squared = 311.64, df = 20, p-value < 2.2e-16
##
##
##  Box-Pierce test
##
## data:  rt
## X-squared = 311.79, df = 21, p-value < 2.2e-16
##
##
##  Box-Pierce test
##
## data:  rt
## X-squared = 312.32, df = 22, p-value < 2.2e-16
##
##
##  Box-Pierce test
##
## data:  rt
## X-squared = 315.39, df = 23, p-value < 2.2e-16
##
##
##  Box-Pierce test
##
## data:  rt
## X-squared = 318.76, df = 24, p-value < 2.2e-16
```

```r
for(i in 1:24) {
  box_ljung <- Box.test(rt, lag = i, type = 'Ljung-Box')
  print(box_ljung)
}
```

```
##
##  Box-Ljung test
##
## data:  rt
## X-squared = 65.667, df = 1, p-value = 5.551e-16
##
##
##  Box-Ljung test
##
## data:  rt
## X-squared = 101.58, df = 2, p-value < 2.2e-16
##
##
##  Box-Ljung test
##
## data:  rt
## X-squared = 133.69, df = 3, p-value < 2.2e-16
##
##
##  Box-Ljung test
##
## data:  rt
## X-squared = 169.45, df = 4, p-value < 2.2e-16
##
##
##  Box-Ljung test
##
## data:  rt
## X-squared = 195.21, df = 5, p-value < 2.2e-16
##
##
##  Box-Ljung test
##
## data:  rt
## X-squared = 220.2, df = 6, p-value < 2.2e-16
##
##
##  Box-Ljung test
##
## data:  rt
## X-squared = 245.36, df = 7, p-value < 2.2e-16
##
##
##  Box-Ljung test
##
## data:  rt
## X-squared = 264.42, df = 8, p-value < 2.2e-16
##
##
##  Box-Ljung test
##
## data:  rt
## X-squared = 278.26, df = 9, p-value < 2.2e-16
##
##
##  Box-Ljung test
##
## data:  rt
## X-squared = 294.77, df = 10, p-value < 2.2e-16
##
##
##  Box-Ljung test
##
## data:  rt
## X-squared = 305.57, df = 11, p-value < 2.2e-16
##
##
##  Box-Ljung test
##
## data:  rt
## X-squared = 310.43, df = 12, p-value < 2.2e-16
##
##
##  Box-Ljung test
##
## data:  rt
## X-squared = 313.14, df = 13, p-value < 2.2e-16
##
##
##  Box-Ljung test
##
## data:  rt
## X-squared = 318.56, df = 14, p-value < 2.2e-16
##
##
##  Box-Ljung test
##
## data:  rt
## X-squared = 322.46, df = 15, p-value < 2.2e-16
##
##
##  Box-Ljung test
##
## data:  rt
## X-squared = 323.57, df = 16, p-value < 2.2e-16
##
##
##  Box-Ljung test
##
## data:  rt
## X-squared = 324.85, df = 17, p-value < 2.2e-16
##
##
##  Box-Ljung test
##
## data:  rt
## X-squared = 326.89, df = 18, p-value < 2.2e-16
##
##
##  Box-Ljung test
##
## data:  rt
## X-squared = 327.13, df = 19, p-value < 2.2e-16
##
##
##  Box-Ljung test
##
## data:  rt
## X-squared = 327.14, df = 20, p-value < 2.2e-16
##
##
##  Box-Ljung test
##
## data:  rt
## X-squared = 327.32, df = 21, p-value < 2.2e-16
##
##
##  Box-Ljung test
##
## data:  rt
## X-squared = 327.94, df = 22, p-value < 2.2e-16
##
##
##  Box-Ljung test
##
## data:  rt
## X-squared = 331.62, df = 23, p-value < 2.2e-16
##
##
##  Box-Ljung test
##
## data:  rt
## X-squared = 335.69, df = 24, p-value < 2.2e-16
```

```r
# difference sign test
difference.sign.test(rt)
```

```
##
##  Difference Sign Test
##
## data:  rt
## statistic = 0.42286, n = 150, p-value = 0.6724
## alternative hypothesis: nonrandomness
```