Homework_4

Question 7.1

Describe a situation or problem from your job, everyday life, current events, etc., for which exponential smoothing would be appropriate. What data would you need? Would you expect the value of alpha (the first smoothing parameter) to be closer to 0 or 1, and why?

Answer

Exponential smoothing is widely used in stock price predictions. For each securities, its price may have cyclical effects derived from 1. the characters of its line of business and 2. macroeconomic factors. A overall rising trend is also expected on the price of each security.

To employ the exponential smoothing method, we need the daily close price of the security. Stock prices reflect the past information and public information under the semi-strong form efficiency. Therefore, when the market is in a inflationary period, the alpha is expected to be closer to 1 for the price are highly and positively related to the past information, while alpha may be closer to 0 when deflationary period for prices are more easily affected by theunstable market trend.

Question 7.2

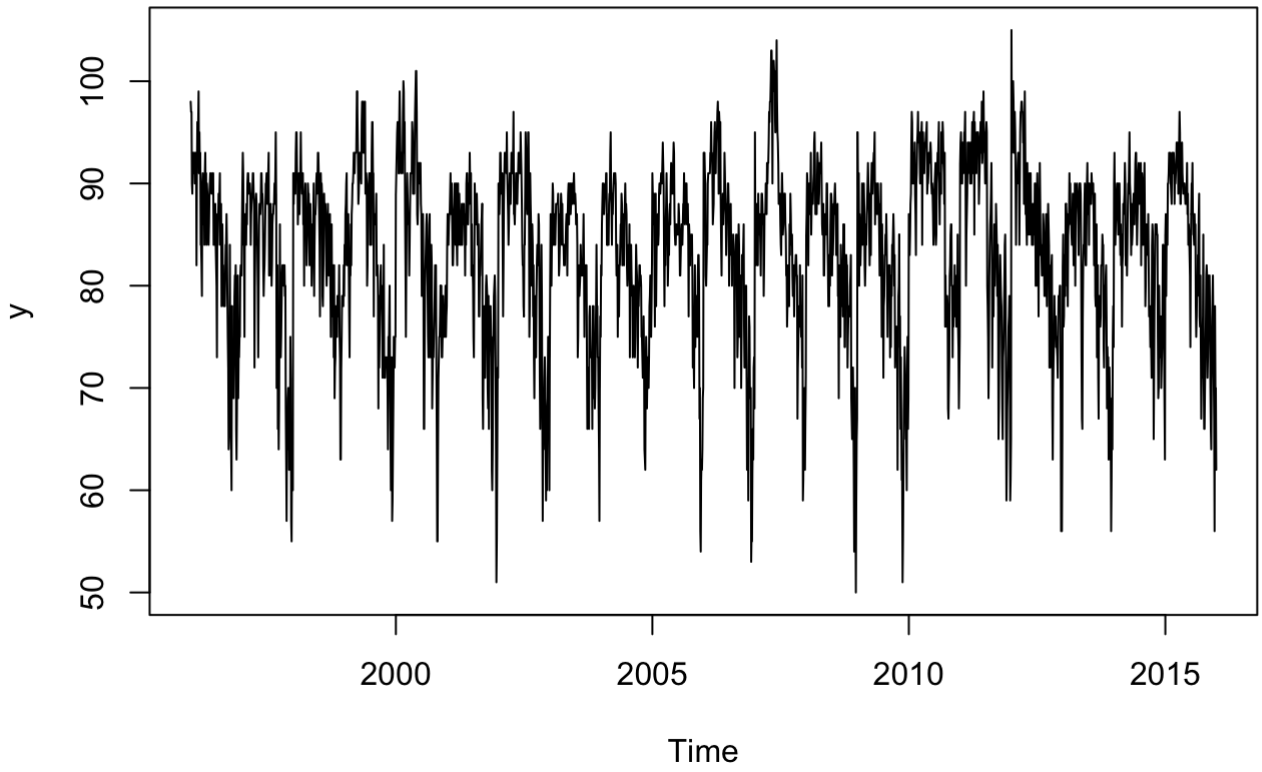
Using the 20 years of daily high temperature data for Atlanta (July through October) from Question 6.2 (file temps.txt), build and use an exponential smoothing model to help make a judgment of whether the unofficial end of summer has gotten later over the 20 years. (Part of the point of this assignment is for you to think about how you might use exponential smoothing to answer this question. Feel free to combine it with other models if you'd like to. There's certainly more than one reasonable approach.)

Note: in R, you can use either HoltWinters (simpler to use) or the smooth package's es function (harder to use, but more general). If you use es, the Holt-Winters model uses model="AAM" in the function call (the first and second constants are used "A"dditively, and the third (seasonality) is used "M"ultiplicatively; the documentation doesn't make that clear).

Answer

The combined time series data seems, just by the plot, to have seasonal effects with no strong indication of trends.

```
data <- read.csv("/Users/yahsintsai/Downloads/temps.txt",sep = '')
y <- ts(as.vector(unlist(data[,-1])),start = 1996,frequency = 123)
plot(y)
```



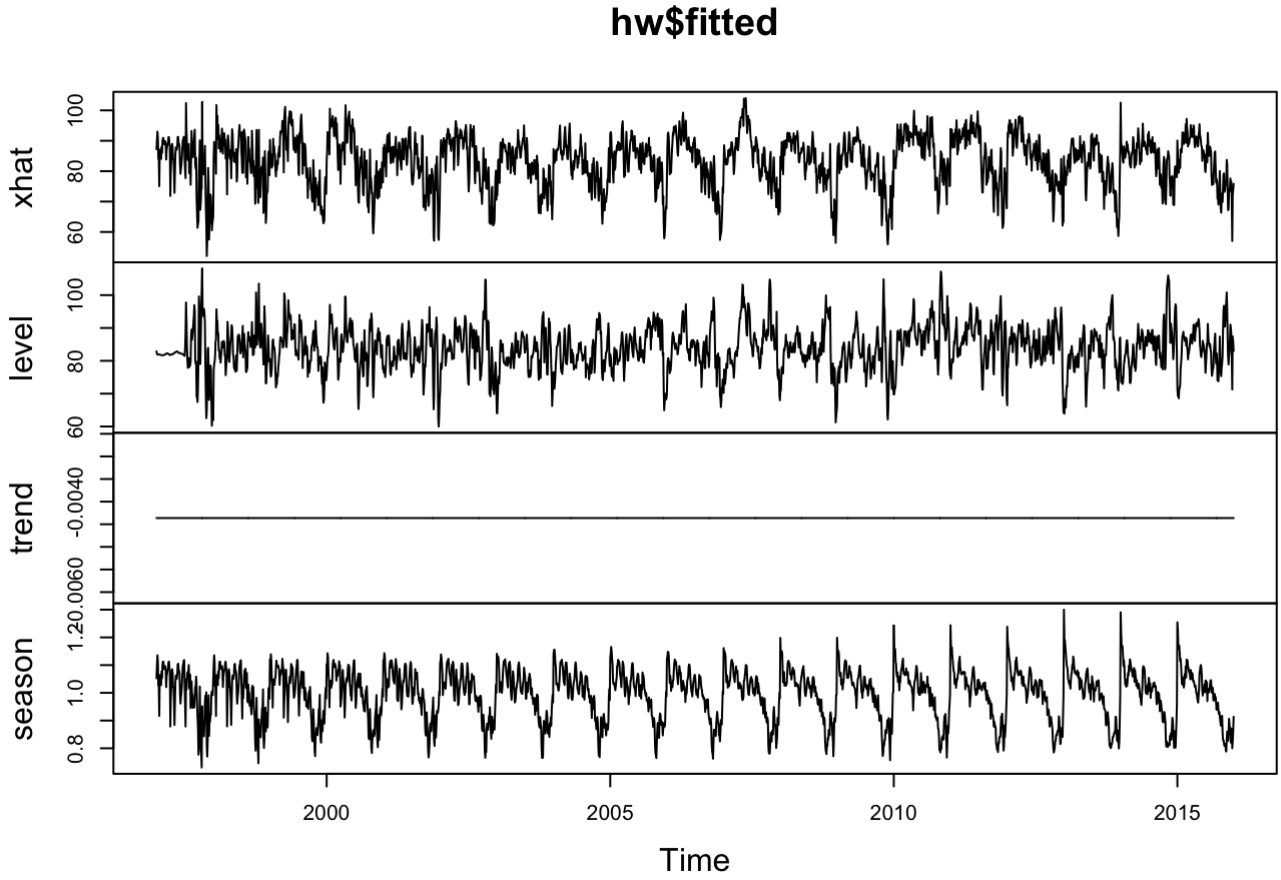
Hence we use Holt Winters' method (multiplicative) and find out that β = 0 and γ = 0.5495256, saying that this time series data has strong seasonal effect and "no trend" (i.e. the temperature does not get warmer or colder in the past 20 years).

```
hw <- HoltWinters(y,seasonal = 'multiplicative')

cat('alpha = ',hw$alpha
    ,'\nbeta = ',hw$beta
    ,'\ngamma = ',hw$gamma
    ,'\nsse = ',hw$SSE)
```

```
## alpha =  0.615003
## beta =  0
## gamma =  0.5495256
## sse =  68904.57
```

```
plot(hw$fitted)
```



Therefore, we can hardly conclude that the unofficial end of summer has gotten later over the 20 years.