**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).*

Here’s one possible solution. Please note that a good solution doesn’t have to try all of the possibilities in the code; they’re shown to help you learn, but they’re not necessary.

# The file solution 7.2.R shows how to use HoltWinters and run single, double, and triple exponential smoothing (including both additive and multiplicative seasonalities). In all cases, the final trend estimate seems to be just about zero, suggesting that the data don’t show significant increases or decreases over the 20-year period.

# To answer whether the unofficial end of summer has gotten later, we can look at the seasonal factors for every data point, and run a CUSUM analysis on them as in the previous homework (e.g., for every year, we find the day where a change is detected, and see if that date gets later over time). I won’t repeat all of that analysis here, but for most values of C and T, it doesn’t seem to show a change.