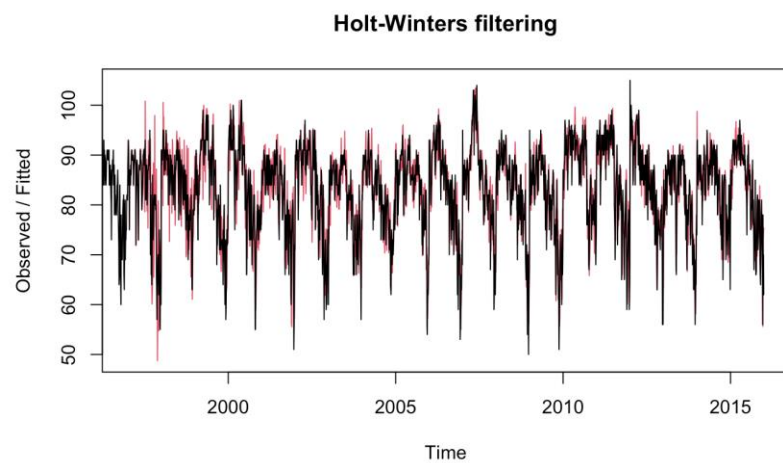
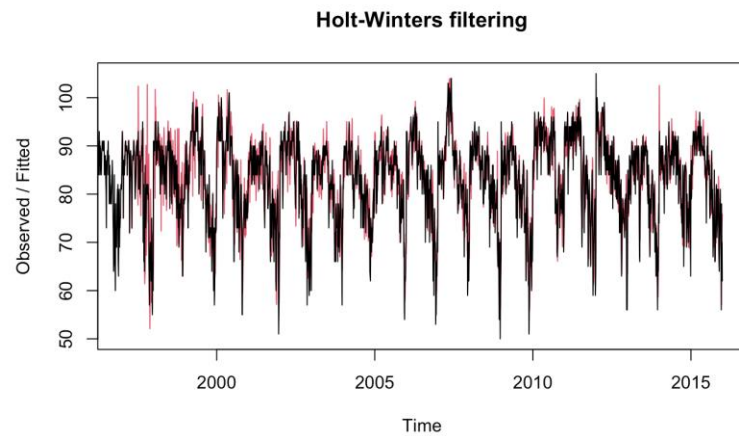


Above is the time series of the original temps data



The above is exponential smoothing using the additive method



The above is exponential smoothing using the multiplicative method

Using additive method:

Base factor: 0.661

Trend factor: 0

Seasonal factor: 0.625

Sum of Squared Errors: 66244

For multiplicative method:

Base factor: 0.615

Trend factor: 0

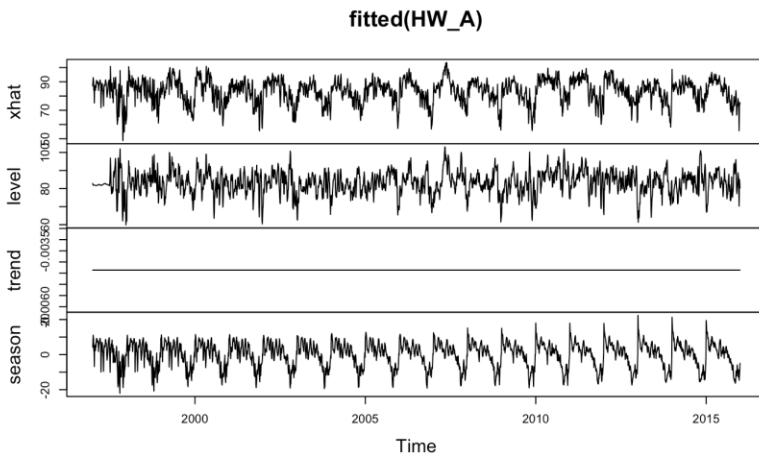
Seasonal factor: 0.55

Sum of Squared Errors: 68905

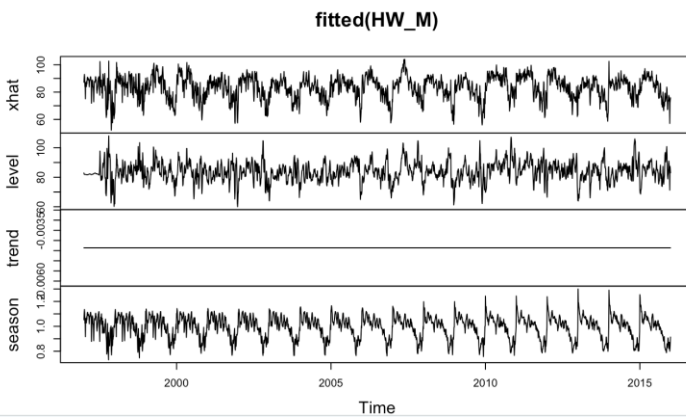
Above is a comparison of the two methods

| | xhat | level | trend | season |
|-------|------|-------|----------|--------|
| [1,] | 87.2 | 82.9 | -0.00436 | 4.30 |
| [2,] | 90.3 | 82.1 | -0.00436 | 8.24 |
| [3,] | 93.0 | 81.9 | -0.00436 | 11.09 |
| [4,] | 90.9 | 81.9 | -0.00436 | 9.04 |
| [5,] | 84.0 | 81.9 | -0.00436 | 2.07 |
| [6,] | 84.0 | 81.9 | -0.00436 | 2.12 |
| [7,] | 75.1 | 81.9 | -0.00436 | -6.83 |
| [8,] | 87.0 | 81.8 | -0.00436 | 5.20 |
| [9,] | 84.0 | 81.8 | -0.00436 | 2.21 |
| [10,] | 87.1 | 81.8 | -0.00436 | 5.26 |

Above is the output of the additive model



Holt-Winters: The additive $y(t) = \text{Level}(t) + \text{Trend}(t) + \text{Seasonality}(t) + \text{Remainder}(t)$



Holt-Winters: the multiplicative model $y(t) = \text{Level}(t) * \text{Trend}(t) * \text{Seasonality}(t) * \text{Remainder}(t)$