**Analyzing Time Series Data using Exponential Smoothing and Detecting Change**

For this question, mu (for each year) was set to be the average of the seasonality coefficients from July 1st to July 31st. This is appropriate because, by definition, mu should be the expected value if no change occurred; from research and experience, we know that Atlanta’s summer never ends before September. Next, I played around with various C and T values to determine the best parameters for our model. “Best” here refers to a model that identifies the “last day of summer” for each year being relatively in the same time period as the other years, and also a model that isn’t too sensitive that it identifies random fluctuation in the seasonality coefficient values as a change (noise). In the end, C value of 0.05 and T value of 0.4 appeared to produce the best change detection model; using such values, the end of summer for each year is as follows:

|  |  |
| --- | --- |
| **Year** | **Last day of Summer** |
| 1997 | 22-Sep |
| 1998 | 22-Sep |
| 1999 | 22-Sep |
| 2000 | 22-Sep |
| 2001 | 22-Sep |
| 2002 | 22-Sep |
| 2003 | 22-Sep |
| 2004 | 22-Sep |
| 2005 | 21-Sep |
| 2006 | 22-Sep |
| 2007 | 21-Sep |
| 2008 | 19-Sep |
| 2009 | 17-Sep |
| 2010 | 15-Sep |
| 2011 | 6-Sep |
| 2012 | 4-Sep |
| 2013 | 16-Aug |
| 2014 | 15-Aug |
| 2015 | 15-Aug |

We can plot these points to give us a better idea of the overall trend. Based on the graph below, we can confidently determine that the unofficial end of summer has **NOT** gotten later over the 20 years. If anything, summers are ending earlier, demonstrated in the graph below.

For all the calculated St values for each day (per year), see the two charts below.



