**Start of Chad Madding’s Contribution**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| |  |  | | --- | --- | | **Nottingham Castle in degrees Fahrenheit for 20 years** | **Description:** This is a regular time-series object containing average air temperatures at Nottingham Castle in degrees Fahrenheit for 20 years (1920–1939). The data is publicly available through R under "nottem" (Anderson, O.D. (1976) Time Series Analysis and Forecasting: The Box-Jenkins approach. Butterworths. Series R). R code to reproduce this information  may be found [here](https://github.com/cmadding/MSDS6373/blob/master/Unit01/AverageMonthlyTemperaturesNottingham_1920_1939.R).  x1 = 40.6, x2  = 40.8, x3 = 44.4  **Additional Realization**: Since this is monthly temperature data and this period of time only happens once, it would be impossible to obtain another realization without going back in time.  **Condition 1:**  This is 20 years of data and it looks as if there is a seasonal component to the series. This data does not seem to meet the first condition of a constant mean.  **Condition 2:**  Subpopulations of X for a given time have a constant and finite variance for all t.  Given that the series is not thought to be stationary, it is tough to assess the constant variance since we only have one observation per month. | |  | **Condition 3:**  Correlation between data points is dependent only on how far apart they are, not where they are.  Evidence of the annual seasonal trend in the series is found in the ACF (of all the data, on the top) with a spike in the autocorrelation at lag 12.  Judging from the ACFs of the first half and the second half of the series, we see evidence that the autocorrelations do not depend on where they are in time, rather just on the lag.  **Conclusion:**  Only meeting one of the three conditions we can conclude that this is not a stationary dataset. | |  | **Spectral Density Estimate**  Here we see the Parzen window-based spectral density estimate using the default truncation point of 30. The smoothed spectral estimate plot shows a peak in the spectral density at .083 (1/12). This evidence that the data is seasonal on an annual basis and looks to recorded monthly.  This data was generated in R using the tswge package. (parzen.wge(nottem)) | |

**End of Chad Madding’s Contribution**

<https://docs.google.com/document/d/1KhKA_sjdFZpSOrISRAVdeoTPkEaxhiiUY-Jfj7dH_ks/edit?usp=sharing>