

AMSC/MATH 420, Spring 2013: First Individual Homework
Due Friday, February 1

A dataset consisting of the national total numbers of births in the US on each day in 1978 can be found on the course web page as a text file `Births1978.txt`. Using these data:

(a) Show that there is an important day-of-the-week effect on the way these numbers of births turn out. Which days of the week regularly have the smallest numbers of births?

(b) See if you can demonstrate, graphically or numerically, that after subtracting a constant depending only on the day of the week either from the numbers of births or from their logarithms, what remains is a sequence of numbers that looks more or less like a curvilinear trend plus “noise” (at least with respect to temporal pattern) except for relatively few anomalous days. Here “noise” means an apparently patternless sequence of numbers which, either visually or by some other criterion, looks like a sequence of independent, identically distributed values across time.

(c) What is special about the anomalous days in (b)? Can you account for them in any way? Did anything special happen on these days in 1978 that might help account for anomalies?

(d) Using a linear least-squares fit, express as simply and smoothly as possible the common curvilinear trend remaining in (b) after adjusting for day-of-week effects and possibly for the “outliers” you found in (b).

(e) Discuss the function you fitted in (d) in relation to environmental functions of the days of the year (for example, length of daylight hours, or maybe average temperature in population centers).