

## AMSC/MATH 420, Spring 2013 Modeling Epidemics: Team Homework 3

due Monday March 4

Let's focus now on parameter fitting with the basic SI model ( $q = r = 0$ ) versus the SI model with growth/renewal ( $r = 0$  but  $q \geq 0$ ), as last week looking at the residuals of the rate of new infections predicted by the model  $[pS(t)\mathcal{I}(t)]$  versus the new diagnoses per month in your data set. Test how well you can predict the latter part of your data sets by fitting to the first part of the data, and how much (if at all) including the parameter  $q$  improves your prediction. More specifically, for each of the cities you started with, perform the following four fits:

1. SI model to all the data
2. SI model to the first 70% of the data (that is, minimize the sum over the first 70
3. SI model with growth to all the data
4. SI model with growth to the first 70% of the data

Of course, you have already done two of these fits, though you may be able to improve your methodology this week.

For a set of residuals  $R_1, R_2, \dots, R_J$ , define root-mean-square (RMS) error to be

$$\sqrt{(R_1^2 + \dots + R_J^2)/J}.$$

For each of your fits, report the parameters you found, the RMS error for all the residuals, the RMS error for the first 70% of the residuals, and the RMS error for the last 30% of the residuals. Illustrate your results with appropriate graphs, and interpret your results.