MATH 568

Ch2: L1 parameter estimates, individual activity

Continue with Exercise 1. in the textbook.

1. Answer 1g. in the textbook. You may use the MATLAB function *irls* on the textbook github site, in the Lib directory, to implement the L1 algorithm described in Section 2.5. Plot the data and the fitted model on the same graph, and in addition, plot error bars on the data. In MATLAB, this can be done with the function *errorbar*. Discuss the difference between this figure and the one you created for the least squares estimate in the Well-conditioned individual activity.

2. Create an ensemble of q data sets, as described in formula (2.108) of your textbook, and use these data to form q L1 estimates of the parameters. The value of q should be large enough so that the ensemble of L1 parameter estimates behaves like a normal distribution. Verify that your q is large enough by creating a Q-Q plot for each of the two parameter estimates.

3. Estimate the uncertainty in your L1 parameter estimates from 1. using confidence intervals, with two different approaches:

   (a) Find a range where 95% of the ensemble L1 parameter estimates lie, relative to the mean. Start by subtracting the mean from your ensemble parameter estimates, and then sort them (in MATLAB use *sort*). The parameter estimates that lie within the first 95% of the vector of ensembles are estimated to be within the 95% confidence interval.

   (b) Similar to the Confidence region individual activity, use a covariance matrix for the parameter estimates to compute the individual 95% confidence interval for each parameter. Use the empirical estimate of the covariance given by (2.110).

   In addition to reporting the confidence intervals resulting from each approach, discuss how they differ from each other, and how they differ from the least squares confidence intervals.