

Assignment #5 – Non-linear regression

Instructions:

Data from a fertilizer experiment are contained in the file “fertyield.csv” on the class website. The response variable (Y) is mean annual tree volume increment (m³/ha/yr), and the three predictor variables are: X1 = phosphorous fertilizer application rate (kg/ha), X2 = nitrogen fertilizer application rate (kg/ha), and X3 = nitrogen type (0 = NH₄, 1 = NO₃).

Consider the following candidate expectation function, and answer the following.

$$E[Y] = \theta_1(X_1)^{\theta_2}(X_2)^{\theta_3}$$

Part A

1. The expectation function can be linearized by transformation. Assuming the errors are multiplicative, estimate the parameters using linear regression. Report the regression coefficients.
2. Test for significance of the regression. Does it appear that both X1 and X2 have important effects?
3. Analyze the residuals and comment on model adequacy.

Part B

1. Fit the expectation function using non-linear regression and report the regression coefficients. Use the estimates you obtained from Part A as starting values.
2. Test for significance of the regression. Does it appear that both X1 and X2 have important effects?
3. Analyze the residuals and report on model adequacy.
4. Which model do you prefer, the nonlinear model or the model from Part A?

Part C

To examine the effect of fertilizer type, fit the following model using non-linear regression:

$$E[Y] = \theta_1(X_1)^{\theta_2}(X_2)^{\theta_3} + \theta_4 X_3$$

Is there an indication of a difference in the effect of fertilizer based on N type?

Product:

Prepare yield **short** written report in memo format. Present your **analysis** and include **relevant** detail.

Due Date:

Wednesday, April 13 2005.