

NYU Stern

STAT-UB3 - Regression

and

Forecasting Models

Homework 4

Multiple Regression Models

1. Using the *sat* data set, fit a model with the total SAT score as the response and expend, salary, ratio and takers as predictors. Perform regression diagnostics on this model to answer the questions below. Display any plots that are relevant but do not provide plots about which you have nothing to say. Suggest possible improvements or corrections where appropriate.
 - a. Check the constant variance assumption for the errors;
 - b. Check the normality assumption;
 - c. Check for large leverage points;
 - d. Check for outliers;
 - e. Check for influential points; and
 - f. Check the structure of the relationship between the predictors and the response.
2. For the *prostate* data, fit a model with *lpsa* as the response and the other variables as the predictors. Answer the questions as in 1.
3. For the *swiss* data, fit a model with Fertility as the response and the other variables as predictors. Answer the questions as in 1.
4. For *divusa*, data fit a model with divorce as the response and the other variables, except year as predictors. Check for serial correlation.
5. To show how two statistics that summarize how well a regression model fits, the F-ratio, and R^2 , the coefficient of determination relate:
 - a. Write down R^2 in terms of both Error SSE and Regression SSR.
 - b. Write down F-ratio in terms of Error SS, Regression SS, k, and n.

c. Establish the algebraic relationship

$$F_{Ratio} = \frac{R^2}{1 - R^2} \frac{n - (k + 1)}{k}$$

d. Suppose that $n = 40$, $k = 5$, and $R^2 = 0.20$. Calculate the F_{Ratio} . Perform the usual test of model adequacy to determine whether the five explanatory variables jointly and significantly affect the response variable.

e. Suppose that $n = 400$ (not 40), $k = 5$, and $R^2 = 0.20$. Calculate the F_{Ratio} . Perform the usual test of model adequacy to determine whether the five explanatory variables jointly and significantly affect the response variable.