Economics 8205-8206:
Applied Econometrics I

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University of Minnesota, Fall Semester 2000

Assignment 2

Handed out: September 26, 2000
Due: October 5, 2000

Non-computer problems

1) Consider the following regression:
$y = X_1\beta_1 + X_2\beta_2 + \text{residuals}$, where X_1 and X_2 are orthogonal matrices.

a - Show that, for this model, $P_X = P_1 + P_2$.
b - Use this result to derive an easily computable least squares procedure for the case of orthogonal regressors. Prove that the fitted values and coefficients from your procedure are the same as the least squares ones.

2) Suppose that we run the regressions:
$y = X_1\beta_1 + \text{residuals}$,
$y = X_2\beta_2 + \text{residuals}$,
$y = X_1\beta_1 + X_2\beta_2 + \text{residuals}$,
where X_1 and X_2 are distinct $t \times 1$ vectors. Suppose that we obtain coefficients of determination of R_1^2, R_2^2 and R_3^2 for the three regressions respectively. Then, is it the case that $R_1^2 + R_2^2 \geq R_3^2$? Prove or give an (analytic) counterexample.

Computer problems: turn in your source code and results

3) The Matlab data set assig2_pr3 contains observations on 60 individuals over 10 periods. The data set has 600 rows (observations) and 5 columns: y, individual number, and 3 regressors. Estimate the following model, with dummy variables for each individual:
$y_{it} = \alpha_i + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \text{residuals}$
a- Compute the regression using OLS. Compute values for $\hat{\beta}_1, \ldots, \hat{\beta}_3$ and fitted residuals.
b- Compute the partitioned regression coefficients for $\hat{\beta}_1, \ldots, \hat{\beta}_3$ and fitted residuals using the F-W-L theorem. Show (numerically) that they are identical to the OLS values, subject to minor numerical error.

4) The Matlab data set assig2_pr4 contains 40 rows (observations) and 3 columns: y, constant, and 2 other regressors. Measure the leverage for each point using (1.41) from D&M. Which points, if any, would you want to investigate further?