Suggested Answers for Problem Set 5

Dec. 27, 2002

1a If there is perfect collinearity, the $X'X$ matrix can not be inverted because the determinant of $X'X$ is zero. The vector of coefficients is unidentified.

1b A test would be to examine the determinant of $X'X$, if it is zero, perfect collinearity exists.

2a If there is perfect multicollinearity, the $X'X$ matrix can not be inverted because the determinant of $X'X$ is zero. The covariance matrix is undefined.

2b If the collinearity is high, the covariance matrix is defined, but the variances will tend to be very large as the determinant of $X'X$ approaches zero as the collinearity gets stronger.

3a Given the relatively high R^2, 0.97, the significant F, and the improperly signed, insignificant coefficient on $\ln K$, it appears there may be multicollinearity in the model.

3b One would expect the sign on $\ln K$ to be positive. It is not, probably due to the collinearity.

4a If X and Z are uncorrelated, adding Z does not change the estimate of β. Hence, the statement is true if X and Z are uncorrelated.

4b Adding an extra explanatory variable always decreases the residual sum of squares. Hence, the statement is always true.

4c This can happen if the variable Z that has been added is highly correlated with x.