Dataset Exercises

Chapter 12 and 13 Simultaneous Equations

So far we have assumed that car acceleration can be modeled using a single equation that does not suffer from bias (i.e. the covariance of the independent variables with the error term as zero). We will now consider the possibility that there is a problem of simultaneity bias, in that acceleration 'causes' fuel consumption (mpg) as well as (or instead of) the other way round.

This means our OLS estimates will be unsatisfactory and we need to use 2SLS estimates or a reduced form. We will **continue to assume that there is no bias problem with the other variables** (horsepower and weight) and we will use a linear model.

1. Estimate the reduced forms for acceleration and mpg. That is:

    *   Regress acceleration on weight and horse

    *   Regress mpg on weight and horse

2. Interpret the coefficients in these results.

3. We now go on to estimate a 2SLS/IV version of the acceleration model and we need some instruments. Let us use the following variables: vehicle weight, engine displacement, number of cylinders and model year. Estimate the 2SLS model for this specification.

(*Note this can be done using the commands in SPSS. You can go to: Analyse>Regression>2-Stage Least Squares. When you get to this stage you will need to enter variables into three boxes: The dependent, the explanatory which will be all the variables on the right hand side of the model, and finally the instrumental which is the exogenous variables from the acceleration equation plus the additional instruments we are using. The constant term will automatically be included in the instruments)*

4. Compare the new set of 2SLS results with the OLS results, paying particular attention to the coefficient and 't ratio in mpg.

[Note these are not really 2SLS but IV estimates as we have not set down a fully specified two equation model.

5. Discuss the possible state of indentifaction of the equation we have just been estimating.