PURDUE
U N I V E R S I T Y

School of Civil Engineering

CE615 – Statistical and Econometric Methods II

Assignment #2
Seemingly Unrelated Regression Estimation – Time Stability

In assignment #1, you were given a survey of respondents collected in the Fall of 2007. In this assignment, you are given a sample that includes 214 respondents collected in the Fall of 2006 and a survey of 122 respondents collected in the Fall of 2005. Again, one of the key questions in this survey was to find out how fast people drove on interstate highways with speed limits of 55 mph, 65 mph and 70 mph.

Your task is to investigate the time stability of these two surveys. The data have been organized into a single file. The first 122 observations are from 2005 and the second 214 observations are from 2006. As in assignment #1, estimate a seemingly unrelated regression model to determine the normal driving speed of individuals in this data sample. The equation system:

$$Speed_{70} = \beta_{70}Z + \alpha_{70}X + \varepsilon_{70}$$
$$Speed_{65} = \beta_{65}Z + \alpha_{65}X + \varepsilon_{65}$$
$$Speed_{55} = \beta_{55}Z + \alpha_{55}X + \varepsilon_{55}$$

In these equations, $Speed_{70}$, $Speed_{65}$ and $Speed_{55}$ are the number of miles per hour respondents normally drive above the speed limit (with little traffic) for 70, 65, and 55 mph speed limits, respectively. These variables can take on positive values if respondents normally drive above the speed limit and negative values if they normally drive below it. Also in these equations, Z is a vector of driver and driver-household characteristics, X is a vector of vector of driver preferences and opinions, βs, α's, are vectors of estimable parameters, and ε's are disturbance terms.

After estimating the best model using all of the data, test for temporal stability using,

$$-2[LL(\beta_T) - LL(\beta_{2005}) - LL(\beta_{2006})]$$

where $LL(\beta_T)$ is the log-likelihood at convergence of the model estimated with the data from both time periods, $LL(\beta_{2005})$ is the log-likelihood at convergence of the model using 2005 data, and $LL(\beta_{2006})$ is the log-likelihood at convergence of the model using 2006 data. In this test the same variables are used in all three models (total model, 2005 model, and 2006 model). This statistic is χ^2 distributed with degrees of freedom equal to the summation of the number of estimated parameters in the individual time-period models (2005 and 2006 in this case but additional time-periods can be added to this test) minus the number of estimated parameters in the overall model.

Variables available for your specification are (in file sp06(s).txt):

Variable Number	Explanation
1	Survey collection year: 1=2005, 2=2006
2	On an interstate with a 70mph speed limit and little traffic, about how fast do you normally drive? in mi/h
3	On an interstate with a 65mph speed limit and little traffic, about how fast do you normally drive? in mi/h
4	On an interstate with a 55mph speed limit and little traffic, about how fast do you normally drive? in mi/h
5	How would you rate the quality of pavements on Indiana interstates?: 1=Poor, 2=Fair, 3=Good, 4=Very good, 5=Don't know
6	Which one of these luxury car brands do you believe has the most prestige? **(2005)** 1=Acura, 2=Audi, 3=BMW, 4= Cadillac, 5=Infiniti, 6=Jaguar, 7=Lexus, 8=Lincoln, 9=Mercedes, 10=Other **(2006)** 1=Acura, 2=Audi, 3=BMW, 4= Cadillac, 5=Infiniti, 6=Jaguar, 7=Lexus, 8=Lincoln, 9=Mercedes, 10=Porsche, 11=Other
7	Which one of these of these vehicle brands do you believe provides the best value for the money? 1=Chevrolet, 2=Dodge, 3=Ford, 4=Honda, 5=Hyundai, 6=Kia, 7=Mazda, 8=Nissan, 9=Toyota, 10=Other
8	Gender: 1=female, 2=male
9	Marital status: 1=Married, 2=Single, 3=Separated, 4=Divorced, 5=Other
10	Age in years
11	Currently:1=Not affiliated with Purdue, 2=Purdue undergraduate, 3=Purdue graduate, 4=Purdue faculty, 5=Purdue staff (other than RA/TA/faculty)
12	Highest completed level of education: 1=Some high school, 2=High school diploma, 3=Technical college degree (A.A.), 4=College degree, 5=Post graduate degree
13	Annual income: 1=no income, 2=under $10,000, 3=$10,000-$19,999, 4=$20,000-$29,999, 5=$30,000-$39,999, 6=$40,000-$49,999, 7=$50,000-$74,999, 8=$75,000-$100,000, 9=Over $100,000

14	Including self, number of people living in household considered home
15	Number of children, in the household considered home, under age 6
16	Number of children, in the household considered home, aged 6 to 16
17	Number of people working outside the home
18	Number of vehicles
19	Licensed driver: 1=yes, 2=no
20	Number of years licensed as a driver
21	Lied about any question on survey: 1=yes, 2=no