Assignment 2: Eviews Exercise

1. Simulation Study

(1) Data Generating Process

$$\begin{aligned} Y_i &= \beta_1 + x_i\beta_2 + e_i, \quad e_i \sim \mathcal{N}(0,\sigma_1^2) \text{ for } i = 1,2,..,40 && (1) \\ Y_i &= \gamma_1 + x_i\gamma_2 + e_i, \quad e_i \sim \mathcal{N}(0,\sigma_2^2) \text{ for } i = 41,42,..,100 && (2) \end{aligned}$$

where $T = 100$, $\beta_1 = 5$, $\beta_2 = 0.3$, $\gamma_1 = 2$, $\gamma_2 = 0.6$ and $\sigma_1^2 = \sigma_2^2 = 1$.

(1.1) Generate the independent variable x_i from the standard normal $\mathcal{N}(0,1)$.

(1.2) Generate the error term.

(1.3) Construct the dependent variable Y based on the equation (1). Note: In genr,

upper window:	Y =5+0.3*X+et
lower window:	1 40

and

upper window:	Y =2+0.6*X+et
lower window:	41 100

(1.4) Now test the following hypotheses

$$\begin{aligned} (i)\ H_0 &: \beta_1 = \gamma_1 \\ (ii)\ H_0 &: \beta_2 = \gamma_2 \\ (iii)\ H_0 &: \beta_1 = \gamma_1 \text{ and } \beta_2 = \gamma_2 \end{aligned}$$

and explain your answer. Note: In genr,

upper window:	D1 =1
lower window:	1 40

,

upper window:	D1 =0
lower window:	41 100

,

upper window:	D2 =1-D1
lower window:	

,

upper window:	X21 =D1*X
lower window:	

and

upper window:	X22 =D2*X
lower window:	

In equation specification for testing (iii), for example,

Y D1 D2 X21 X22

(1.5) Estimate the restricted model under the null hypothesis (iii). What happens to the intercept and the slope coefficient?

(1.6) Based on your answer to (1.5), explain why it is important to test those hypotheses.

(2) Given the same model, do the DGP with a different set of true values such that $T = 50$, $\beta_1 = \gamma_1 = 5$, $\beta_2 = \gamma_2 = 0.5$, $\sigma_1^2 = 9$ and $\sigma_2^2 = 1$. Note: In genr,

upper window:	et =3*nrnd
lower window:	1 40

,

upper window:	et =nrnd
lower window:	41 100

and

upper window:	Y =5+0.5*X+et
lower window:	1 100

(2.1) Test that $\sigma_1^2 = \sigma_2^2$ and explain your answer.

(2.2) What does the rejection of this null hypothesis suggest?

2. The House Prices

Joanne built a model of the price of a house as a linear function of various independent variables. The set of the regressors is constructed by her a priori conjecture that each of them can possibly affect the house price. The data is available in the chapter 11 data sets of the website (student resources). The model is given by

$$\begin{aligned} \mathbf{P} &= \beta_1 + \mathbf{A}\beta_2 + \mathbf{BA}\beta_3 + \mathbf{BE}\beta_4 + \mathbf{CA}\beta_5 + \mathbf{N}\beta_6 + \mathbf{S}\beta_7 + \mathbf{SP}\beta_8 + \mathbf{Y}\beta_9 + e, \qquad (3) \\ e &\sim \mathcal{N}(0_{T\times 1}, \sigma^2 I_T) \end{aligned}$$

where $\mathbf{P}$=the price (in thousands of dollars) of the houses, $\mathbf{A}$=the age of the houses in years, $\mathbf{BA}$=the number of bathrooms, $\mathbf{BE}$=the number of bedroom, $\mathbf{CA}$=a dummy variable equal to1 if the house has central air conditioning, 0 otherwise, $\mathbf{N}$=the quality of the neighborhood(1=best, 4=worst) as rated by two local real estate agents, $\mathbf{S}$=the size (in square feet) of the houses, $\mathbf{SP}$=a dummy variable equal to 1 if the house has a pool, 0 otherwise, $\mathbf{Y}$=the size of the yard (in square feet).

(3.1) Test for the significance of each of the coefficients at the 5% level.

(3.2) Do you appear to have irrelevant variables? Explain your answer.

(3.3) Test a joint hypothesis that $\mathbf{A}$, $\mathbf{BA}$, $\mathbf{BE}$, $\mathbf{CA}$ and $\mathbf{SP}$ are irrelevant simultaneously. Explain your answer.

(3.4) Test a joint hypothesis that $\mathbf{A}$, $\mathbf{BA}$, $\mathbf{BE}$, $\mathbf{CA}$, $\mathbf{N}$ and $\mathbf{SP}$ are irrelevant simultaneously. Explain why you obtain a different result from the previous one in (3.3).

(3.5) Estimate the restricted regression equation under the null hypothesis in (3.3), and compare $\bar{R}^2$, AIC and SIC between the restricted and the unrestricted models. Do they give the same result as in (2.3) in terms of model choice?