HW 3 (Due June 13, Friday)

1. (20 pts.) Consider the following SUR model:

$$y_{1t} = \alpha_1 + \alpha_2 x_{1t} + \alpha_3 x_{2t} + \varepsilon_{1t};$$
$$y_{2t} = \gamma_1 + \gamma_2 x_{3t} + \gamma_3 x_{4t} + \varepsilon_{2t}.$$

To estimate this model, use the data set named “sur.db”. The data set contains 30 observations on 6 variables (y1, y2, x1, x2, x3 and x4). Using this data set, construct a GAUSS program that can do the followings:

(1) Estimate the model by two-step feasible GLS. Report the variable names, the estimated coefficients, standard errors, and t statistics. (10 pts.)
(2) Do a χ^2 test for the hypothesis: $\alpha_2 = \gamma_2$. (5 pts.)
(3) Do the LM test for the hypothesis: Σ is diagonal. (5 pts.)

Report both your program and output files.

Hint 1: For a p×p identity matrix, use “eye(p)”.
Hint 2: For the Kronecker product of two matrices A and B, use “A .*”.

2. (10 pts.) Consider the following two-equation system:

$$y_1 = \beta_1 e_T + \beta_2 x_1 + \beta_3 x_2 + \varepsilon_1;$$
$$y_2 = \beta_1 e_T + \beta_2 x_3 + \beta_4 x_4 + \varepsilon_2,$$

where e_T is a T×1 vector of ones, all of y_1, y_2, x_1, x_2, x_3, x_4, ε_1 and ε_2 are T×1 vectors. Using the data set “sur.db”, construct a GAUSS program that can estimate β_1, β_2, β_3 and β_4 by two-step GLS. Report both your program and output files. Report the variables name, estimated coefficients, standard errors, and t statistics.

3. (10 pts.) Consider the two-equation system:

$$y_1 = \beta_1 x_1 + \varepsilon_1$$
$$y_2 = \beta_2 x_2 + \beta_3 x_3 + \varepsilon_2,$$

where x_1, x_2 and x_3 are T×1 nonrandom exogenous variables and ε_1 and ε_2 are T×1 vectors of errors. Assume that $\varepsilon_{t\bullet} = (\varepsilon_{t1},\varepsilon_{t2})'$ are iid $N(0_{2\times1},\Sigma_{2\times2})$, where $\Sigma = [\sigma_{ij}]$ is known. Suppose that the analyst of this model applies GLS but erroneously omits x_3 from the second equation. Is the GLS estimator of β_1 unbiased? Justify your answer.