

Due Wednesday, May 4
(40 points)

This assignment is on seemingly unrelated regressions and simultaneous equations. The necessary data come from the Excel file *credit.xls*. Be sure to attach the supporting computer print out to the completed assignment and make clear where your answers are shown.

The definitions of the variables used in this assignment are as follows. *majordrg* is the number of derogatory credit reports, *age* is the applicant's age, *age2* is age squared, *cur_add* is months living at current address, *ownrent* is a dummy variable that takes on the value 1 if the applicant owns his or her home, and 0 otherwise, *avgexp* is average monthly credit card expenditure, *income* is yearly income/10,000, *depndt* is the number of dependents, and *active* is the number of active credit accounts.

1. Consider the following model for a random sample of 1,319 credit card applicants:

$$majordrg_t = \beta_{10} + \beta_{11}age_t + \beta_{12}age2_t + \beta_{13}cur_add_t + \beta_{14}ownrent_t + \varepsilon_{1t}$$

$$avgexp_t = \beta_{20} + \beta_{21}cur_add_t + \beta_{22}income_t + \beta_{23}depndt_t + \beta_{24}ownrent_t + \varepsilon_{2t}$$

$$active_t = \beta_{30} + \beta_{31}age_t + \beta_{32}age2_t + \beta_{34}income_t + \beta_{34}ownrent + \varepsilon_{3t},$$

- a. Estimate the above equations by *OLS* and *SUR* (seemingly unrelated regressions). You may use either two-step or iterated *SUR*.
- b. Test $H_0: \Sigma$ is diagonal, $H_1: \sim H_0$ at the 5% level. Use the tests given below.
 - (1) the Breusch-Pagan Lagrange Multiplier test.
 - (2) the likelihood ratio test.
- c. What can you conclude about the use of *OLS* vs *SUR*? Explain.

2. A simultaneous equations model of credit card applications is specified as

$$majordrg_t = \gamma_{10} + \gamma_{11}age_t + \gamma_{12}age2_t + \gamma_{13}cur_add_t + \beta_{13}active_t + u_{1t}$$

$$avgexp_t = \gamma_{20} + \gamma_{21}age_t + \gamma_{22}age2_t + \gamma_{24}income_t + \gamma_{25}depndt_t + \beta_{21}majordrg_t + u_{2t}$$

$$active_t = \gamma_{30} + \gamma_{31}age_t + \gamma_{32}age2_t + \gamma_{36}ownrent + \beta_{32}avgexp_t + u_{3t}$$

- a. Determine the identification status of each structural equation according to the rank and order conditions.
- b. Estimate the model by *OLS*, *2SLS*, and *3SLS*.
 - (1) Solve for the *derived* reduced form parameters from the *3SLS* estimated structural parameters, and estimate the *unrestricted* reduced form equations by *OLS*.

- (2) Treat your *derived* reduced form parameters as given restrictions on the reduced form parameters, and conduct F tests of these restrictions for each reduced form (at the 5% level). Although these tests are only approximate, what do they suggest about the validity of the specifications of the structural equations? Explain.