Introduction to the Labor-Leisure Model II: Labor Supply & Endogeneity

Estimating supply functions inherently involves endogeneity and identification problems. In place of a labor demand function, use the following "wage offer" function to identify the labor supply function:

\[ \text{Wage} = \alpha_0 + \alpha_1 \text{hours}_i + \alpha_2 \text{Schooling}_i + \alpha_3 \text{Experience}_i + \alpha_4 \text{Experience}^2_i + v \]

(1) Test the labor supply functions for endogeneity using the Hausman test.

There are four steps to the Hausman test:

**Step 1:** Take the right hand side variable you want to test and use it as the dependent variable with all the exogenous variables available (from every equation in the model) serving as independent variables. This is the same as running the reduced form regression.

The Supply and Demand functions for the labor market

**Labor Supply Function:**  \( h_i = \beta_0 + \beta_1 \log(\text{wage})_i + \beta_2 \log(\text{non-labor income})_i + \beta_3 Z_i \)

**Wage Offer Function:**  \( \text{Wage} = \alpha_0 + \alpha_1 \text{hours}_i + \alpha_2 \text{Schooling}_i + \alpha_3 \text{Experience}_i + \alpha_4 \text{Experience}^2_i + v \)

Reduced form equation:

\[ \text{Wage} = \gamma_0 + \gamma_1 \text{hours}_i + \gamma_2 \text{Schooling}_i + \gamma_3 \text{Experience}_i + \gamma_4 \text{Experience}^2_i + \gamma_5 \log(\text{non-labor income})_i + \gamma_6 Z_i + \xi_i \]

**Step 2:** Save the error term observation (i.e., residuals) from step 1.

**Step 3:** Add the error term observations as an independent variable to the original structural form equation (i.e., the labor supply function) that the variable being tested comes from. Use OLS to estimate the regression.

**Step 4:** Use the t-statistic to see if the slope coefficient of the error term in step 3 is statistically significant. If so, there is evidence of simultaneity.

Re-estimate the following labor supply curves using instrumental variable regression (use experience and experience squared as your instruments) and compare these with your OLS regression results using the "outreg" command.

(2) (i) Estimate the following equation: \( h_i = \beta_0 + \beta_1 \log(\text{wage})_i + \beta_2 \log(\text{non-labor income})_i + \beta_3 Z_i \)

where \( Z \) is vector of personal characteristics of individual \( i \).

In \( Z \) include gender, years of schooling, age, the number of children under 6, number of children between age 18 and 6.

(ii) Interpret your regression coefficients: Are they the expected sign, are they significant, how well does the model explain labor supply?

(3) (i) Run a separate regression for men, be sure to account for the both the positively sloped and the backward bending portion of the labor supply function in your regression equation? Describe your results.

(ii) Calculate the wage at which the supply curve bends backwards. Explain fully.

(4) (i) Run a separate regression for women, be sure to account for the both the positively sloped and the backward bending portion of the labor supply function in your regression equation? Describe your results.

(ii) Calculate the wage at which the supply curve bends backwards. Explain fully.

(5) Compare the male and female labor supply functions. Are they statistically different from each other? Explain fully.

(6) Compare the labor supply functions of never married, college educated, men and women with no children. Are they statistically different from each other? Show graphically and explain fully.