Topics in Labor Economics

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Problem Set 1

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Note: You are encouraged to work on the problem set in groups. However, you should each hand in your own version. Solution code will be provided in Matlab but you are welcome to use your preferred language. Please submit your code and answer write-up to me via email. Remember to document your code in detail and make possible to replicate your results exactly with just one click.

Suppose that individuals have the choice to work $h \in \{0, 10, 20, 30, 40\}$ hours per week. Preferences over these discrete alternatives may be described by a parametric utility function:

$$u(c, h) = \gamma \cdot (\theta^{-1} c^{\theta} - \alpha h) + \epsilon_h$$

where the state specific errors ϵ_h follow a Type-I extreme value distribution. Consumption is given by $c = y + wh - T(wh)$, where y is non-labor income, $T(.)$ is the tax system, and w is the gross hourly wage rate generated by the following log-linear relationship:

$$ln(w) = \mu_w + \epsilon_w$$

and where the unobserved component of wages ϵ_w is normally distributed with mean zero and standard deviation σ_w.

1. Suppose that the parameter values are: $\sigma_w = 0.55$; $\mu_w = 1$; $\theta = 0.3$; $\alpha = 0.1$; $\gamma = 2$ and that $y \sim$ Uniform$[10, 100]$. Suppose also that earnings below \$80 per week are not taxed; any earnings greater then \$80 are taxed at the constant marginal tax rate $\tau = 0.3$. Non-labor income is not taxed. Under these assumptions, simulate a dataset of 1,000 observations. Plot the distribution of work hours in your simulated dataset. Assess how the distribution of non-labor income and (offered) wages varies with work hours.

2. Write down the log-likelihood function for this model, remembering that wages will be unobserved for non-workers.

3. Write your own computer code to estimate the model using the dataset you generated above (which comprises work hours, non-labor income, and wages only for workers). Having estimated the model, how close are your parameter estimates to the true values that you used to generate the dataset?

4. Using the true parameter values (i.e., those given in part 1), simulate the impact on the distribution of work hours of changing the tax system so that all earnings are taxed at the constant marginal tax rate 0.2. How does the amount of tax revenue raised by the government change? Can you determine the value of the constant marginal tax rate which provides the same amount of revenue as the progressive schedule described in part 1?