Econ 312 Part A, Spring 2023

Problem Set 1

James J. Heckman

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1. **[15 pts]** Answer all of the questions embedded in the *"Econometric Policy Analysis"* handout.

2. **[30 pts]** Read Friedman's "Methodology of Positive Economics" and answer the following questions:

   (a) How does his approach accommodate the proposal for Pre-Analysis Plans by Banerjee et.al (NBER Working Paper #26993, April, 2020)?

   (b) What is the role of hypothesis testing in the process of empirical discovery in economics?

   (c) How can you correct standard errors for preliminary tests of model specification? Give explicit calculations for a normal regression model.

$$
\begin{aligned}
Y =& X_1\beta_1 + X_2\beta_2 + U \\
U \sim& N(0, \sigma^2), (X_1, X_2) \perp\!\!\!\perp U
\end{aligned}
$$

   (d) How can you build a model and, at the same time, identify and test it on the same data set? (By build I mean examine alternative specifications.)

   (e) Formally define an identified economic model. What does it mean for a model to be identified?

3. **[25 pts]** Define a Causal Model and its causal parameters. As an example consider a production function for output Y:

$$(*) \qquad Y = AK^{\alpha}L^{\beta}.$$

   Competitive firms with unit output price are assumed to maximize profits with W as the wage rate and R as the rental price of capital. In making your answer consider:

   (i) How does Y differ from a "potential outcome?"

   (ii) What is the causal effect of K on Y?

(iii) What is the ATE for changing K_1 to K_2?

(iv) What is treatment on the treated for changing K_1 to K_2?

(v) What is the causal effect of A (TFP)?

(vi) Define autonomy. In terms of technology (*) what does this mean?

(vii) Do the inputs K and L have to be randomly assigned to define causal relationships?

(viii) If A is unobserved by the analyst, how would you identify α and β if (Y, K, L) are observed? Be explicit and relate to replacement functions as discussed in the handout on causality.

4. **[15 pts]** Define Induction, Deduction and Abduction. What mode of inference characterizes Heckman and Payner (*AER*, 1989)? Contrast it with the mode of inference discussed by Banerjee (2020) you discussed in problem 2. What criteria must be followed to make valid inference?

5. **[15 pts]** Compare the application of classical statistics with the application of the likelihood principle/Bayes analysis (taught by Uhlig in Econ 311). Specifically work the details of example 6 in the handout, *"Hypothesis Testing: Part I"* on the reading list. Explain the counterfactual logic that justifies classical hypothesis testing á la R.A. Fisher.