Instructions

- Duration: 1 hour.No document allowed
- You have to answer to questions related to **3 topics** of your choice.

DEV: Natural Experiments in Development Economics TOPIC 1. (Matteo Bobba)

- 1. Many data collections are repeated on a regular basis (e.g. census, labor force surveys, etc). Briefly explain the advantages of pooling these data across the different time waves instead of considering the pure cross-sectional dimension.
- 2. Discuss the identifying assumptions that have to hold for the validity of a Regression Discontinuity Design (RDD). For each assumption, propose a corresponding empirical test using the paper "Liquidity Constraints and High School Track Choice" (Avitabile, Bobba and Pariguana, 2015) as a running example.

TOPIC 2. IO: Industrial Organization (Yinghua He)

1. Consider a model of product choice where consumer i in market m assigns indirect utility u_{imj} to product j:

$$u_{imj} = \alpha (y_{im} - p_{mj}) + x_j \beta + \xi_{mj} + \epsilon_{imj},$$

$$u_{im0} = \alpha y_{im} + \epsilon_{im0},$$

where j = 0 indicates the outside option; ϵ_{imj} are type I extreme values.

- (a) Please derive the probability that i in market m chooses product $j \ (j \neq 0)$.
- (b) Suppose we have data from m = 1, ..., M markets and the distribution of income (y_{im}) from each market $(F_m(y_{im}))$. Under the assumption that each market is large, please derive the predicted market share of $j \ (j \neq 0)$ in market m, which is denoted by S_{mj} .
- (c) Please derive the price elasticity of S_{mj} with respect to p_j .
- 2. Suppose that in a market all firms are identical and earn the following profits:

$$\pi(N) = V(N, \mathbf{Z}, \mathbf{W}, \alpha, \beta) S(\mathbf{Y}, \lambda) - F(\mathbf{W}, \gamma) + \epsilon \equiv V(N)S - F + \epsilon,$$

where

• N is the number of incumbent firms in a given market.

- S is the potential market size (e.g. population).
- V(N) are the variable profits per firm and per capita.
- F are fixed costs.
- **Z**, **W**, **Y** are observed market characteristics.
- ϵ unobserved market-level heterogeneity.

We assume that firms enter as long as it is profitable. Please derive the probability of observing no more than n firms in a given market.

TOPIC 3. FE: Financial Econometrics (Jihyun Kim)

1. Suppose that one estimates the forward premium regression

$$s_{t+1} - s_t = \alpha + \beta (f_t - s_t) + u_t,$$

where s_t and f_t be logarithm of spot and forward exchange rates, respectively.

(a) Explain briefly the no arbitrage condition in the exchange rate market.

(b) What is a proper null hypothesis H_0 for testing the no arbitrage condition in the exchange rate market?

2. Consider a return process

$$r_t = \bar{r} + u_t,$$

where $\mathbb{E}[u_t] = 0$.

(a) Suppose that the return is unpredictable. What is $\mathbb{E}[u_t u_s]$ for $t \neq s$?

(b) The null hypothesis of no return predictability can be tested by the variance ratio test suggested by Lo and MacKinlay (1988). What is the test statistic for the variance ratio test? Do you need the homoskedasticity condition, $\mathbb{E}[u_t^2] = \sigma^2$ for all t, for the test?

TOPIC 4. PROD: Production Econometrics and Cost Functions Estimation (Norbert Ladoux)

In a article entitled "Engineering and econometric interpretations of energy-capital complementarity", E. Berndt and D. Wood have shown that the econometric estimations of the elasticities of substitution can be biased when inputs used in the production process are excluded from the econometric analysis. Briefly explain why it is the case.

TOPIC 5. FAM: Economics of the Family (Nicolas Pistolesi)

In the paper entitled "Changes in the Labor Supply Behavior of Married Women" (2006) Blau and Khan estimate labor supply models using cross-sectional micro-data on individuals. They estimate the following equation

$$h_i = \alpha_0 + \alpha_1 \ln W_{1i} + \alpha_2 I_i + \beta' X_i + u_i$$

Where h_i is hours worked, W_i is own hourly wage offer, I_i is family asset income plus spouse's earnings, X_i is a vector of control variables for individual i.

- 1. Explain what is a sample selection problem.
- 2. Explain the approach proposed by Heckman (1979) to solve for sample selection issues.
- 3. In the paper how do the authors solve for the sample selection problem? Which exclusion restriction do they use?
- 4. Describe the main findings of this paper.

TOPIC 6. EDUC: Education Economics (François Poinas)

You are asked to estimate the causal impact of class size on a certain schooling outcome. Let's consider the following linear model for a pupil i attending school in class j:

schooling outcome_{ij} =
$$\alpha + \beta \cdot class \ size_i + \gamma \cdot x_i + \delta \cdot z_i + \varepsilon_{ij}$$

where $schooling outcome_{ij}$ is a measure of schooling outcome (e.g. grade), $class \ size_j$ denotes the number of pupils registered in class j, x_i is a set of individual characteristics (gender, family background, etc.) and z_j a set of class characteristics (class composition, teacher quality, etc.).

- 1. Explain the potential endogeneity problem that may give an inconsistent estimate of β .
- 2. Describe the empirical strategy employed by Bandiera, Larcinese, Rasul (2010)¹ to tackle the endoegenity problem. You are expected to describe the data used in the paper, write the econometric model and justify the approach adopted.
- 3. Propose an alternative empirical strategy that could be employed to tackle the endoegenity problem. You are expected to describe the data that you would use, write the econometric model and justify the approach you would adopt.

¹Bandiera, O., Larcinese, V., Rasul, I., 2010, "Heterogeneous Class Size Effects: New Evidence from a Panel of University Students", *The Economic Journal*, vol. 120 (December), pp. 1365-1398