Instructions

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

Topic 1. DEV: Development Economics (Matteo Bobba)

1. What is a Natural Experiment in economics? How does this relate to a Randomized Experiments? Pick one of the methods discussed in class (Diff-in-Diff, IV, RDD) and precisely provide the conditions (assumptions) under which it approximates the results of a randomized experiment.
2. In the paper by Banerjee and Duflo (2012) discussed in class, what is the counterfactual scenario that the authors are trying to approximate in order to measure the effects of credit expansions and contractions on firms' outcomes? What features of the data allow the authors to achieve that?

Topic 2. FE: Financial Econometrics (Jihyun Kim)

Consider the CAPM model

$$r_t^i - r^f = \beta_0 + \beta_1(r_t^m - r^f) + u_t,$$

where r_t^i is the return on the ith asset at time t, r_t^m is the marker return and r^f is the risk free rate. Answer the following questions.

1. Find the market price of risk and quantity of risk of asset i.
2. Let

   $$u_t = \rho u_{t-1} + \epsilon_t,$$

   where $\epsilon_t \sim iid\mathcal{N}(0, \sigma^2)$. Construct a test for the null hypothesis of $\rho = 0$.
3. The CAPM is estimated in equation for monthly returns to three United States stocks and gold for the period April 1990 to July 2004. Which statement is false?

Stock	β_0	β_1	$\bar{R}^2$	LM(1)	LM(2)	White
Gold	-0.003 (0.238)	-0.098 (0.066)	0.014	1.452 (0.228)	7.530 (0.023)	2.579 (0.275)
Exxon	0.012 (0.000)	0.502 (0.000)	0.235	0.567 (0.452)	1.115 (0.573)	1.022 (0.600)
GE	0.016 (0.000)	1.144 (0.000)	0.440	5.458 (0.019)	7.014 (0.030)	5.336 (0.069)
MS	0.012 (0.069)	1.447 (0.000)	0.333	3.250 (0.071)	6.134 (0.047)	0.197 (0.906)

Note: The test statistics are the LM(j) test for $j$the order autocorrelation, and White test of heteroskedasticity. Note that p-values are in parenthesis.

A. All estimated models pass the White heteroskedasticity test at 10% level.

B. Gold has the highest proportion of risk that is diversifiable.

C. 44% of variation of movements in GE's excess returns are explained movements in the market returns relative to the risk free rate.

D. The gold and MS CAPMs exhibit second order autocorrelation, but not first autocorrelation at 5% level.

Topic 3. PROD: Production Econometrics and Cost Functions Estimation (Norbert Ladoux)

You have observations on energy quantities consumed by 1000 firms over 10 years. You also observe the corresponding energy prices. You are interested by the possibilities of substitution between the different energy forms (natural gas, oil, coal and electricity). What is the model you are able to estimate with these data? Do you consider that this model is always relevant?

Topic 4. INEQ: Earnings and Consumption Inequalities (Tim Lee)

1. Consider the generic APC (age-period-cohort) regression which includes a dummy coefficient for each age, time and cohort effect:

$$y_{a,t,c} = \xi + \alpha_a + \beta_t + \gamma_c + \epsilon_{a,t,c},$$

where y is the outcome variable, (α, β, γ) are the age, time and cohort effects, respectively, and $\epsilon_{a,t,c}$ is a residual. The constant ξ captures the average of the youngest age $\underline{a}$ observed in the earliest year $\underline{t}$ when they were the oldest cohort $\underline{c}$. Further suppose that in the data, the oldest age observed is A, latest observed year is T, and youngest cohort observed is C groups. So the indices for the dummy coefficients run through

$$\begin{aligned} a &= \underline{a}+1, \underline{a}+2, \ldots, A \\ t &= \underline{t}+1, \underline{t}+2, \ldots, T \\ c &= \underline{c}+1, \underline{c}+2, \ldots, C. \end{aligned}$$

   (a) We learned in class that not all dummy coefficients $(\alpha_a, \beta_t, \gamma_c)$ can be identified. Why? You may explain in words or equations, but extra points will be given to equations.

   (b) How many restrictions are needed in order for all dummy coefficients to be identified? Explain the intuition behind Deaton's method for identifying them all. Although you are welcome to use equations, you will get full credit if you just explain the idea correctly.

2. All following equations are based on Deaton and Paxson (1994)'s study of inequality.

   (a) Income inequality in Taiwan is much higher than earnings inequality, while they are similar in both the U.S. and U.K.. What does this imply for savings in Taiwan in comparison to the U.S. and U.K.? Try to give at least two reasons.

(b) In U.S. and Taiwan, consumption inequality is much lower than both earnings and income inequality. Furthermore, consumption inequality does not increase with age, even though earnings and income inequality do. What does this imply for how U.S. and Taiwan spend their savings, or on what? Try to give at least two reasons.

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

Studying labor supply decisions of married women in the U.S., Angrist and Evans (1998) estimate the following model from a cross-section of individual observations:

$$y_i = \alpha_0' w_i + \alpha_1 s_{1i} + \alpha_2 s_{2i} + \beta x_i + \epsilon_i$$

where y_i is a measure of labor supply (eg: hours worked) for individual i, w_i is a vector of demographic characteristics (mother's age, age at first birth, race), s_1 and s_2 are indicators for male firstborn and second born children, and x_i is a measure of fertility (eg: number of children).

1. Why can x_i be considered as endogeneous in the previous equation?
2. Explain the identification strategy used by the authors to solve this endogeneity issue. Provide different instruments that can be computed from s_1 and s_2.
3. Write the first stage and reduced-form equations from a 2-SLS estimation procedure. Explain how the 2-SLS estimates can be computed from the estimation of first-stage and the reduced form equations.
4. Explain why this identification strategy provides a convincing evidence of the effect of child bearing on female labor supply.

Topic 6. EDUC: Education Economics (François Poinas)

In order to test if education is used as a signal on individual's ability, Bedard (2001)[1] estimates an ordered probit model to explain the schooling attainments of young Americans. The model has the following characteristics:

- The latent utility of schooling is $y_i^* = \sum_s \beta_s X_{is} + \theta_i$, where X is a vector of family background and regional characteristics and $\theta_i \sim \mathcal{N}(0,1)$.
- There are 3 schooling levels: high school drop-out, high school graduate, university enrollee
- κ_h and κ_u are the 2 cutoff points, such that $\kappa_h = \overline{\kappa}_h + \xi A_i$ and $\kappa_u = \overline{\kappa}_u - \xi A_i$, where A_i is an indicator variable equal to 1 if individual i lives close to a university
- Individual i chooses HS graduation if:

$$\kappa_h - \sum_s \beta_s X_{is} < \theta_i < \kappa_u - \sum_s \beta_s X_{is}$$

[1] Bedard, K., 2001, "Human Capital versus Signaling Models: University Access and High School Dropouts", *Journal of Political Economy*, vol. 109 (4), pp. 749-775

1. One empirical prediction of the signaling model presented in the paper is that the High School drop-our rate should be larger in regions that contain a university. This prediction is not valid in a human capital model.
   (a) Explain briefly the theoretical arguments that lead to this prediction.
   (b) Give the expected sign of the parameter(s) that permit to test the prediction.
2. In this model, how can you interpret the sign and the magnitude of parameter β_s?

Topic 7. IO: Industrial Organization (Mathias Reynaert)

1. A firm makes variable profits $V(N, D)$, in which V is a function of N (the number of competitors on the market) and D (demand in the market). To enter a market a firm needs to pay a fixed cost F. Describe two conditions that determine the number of firms N on a market under the assumption that all firms are equal.
2. In the paper by Schaumans and Verboven (2008) we discussed restricted entry in the pharmacy market (e.g. the government decides that $N < D/5$). Explain which of the conditions you wrote down in your previous answer is affected by this and how.

Topic 8. HIST: Economic History (Mohamed Saleh)

1. What are the assumptions needed for an Instrumental Variable (IV) strategy? Explain each assumption in <u>one</u> sentence.
2. "Difference-in-differences (DID) strategy assumes that treatment and control groups would have had the same levels of the dependent variable in the absence of the treatment." Is this statement true or false? Explain why.
3. "In a panel regression, individual fixed effects control for all sources of unobserved heterogeneity between individuals." Is this statement true or false? Explain why.