

Name: _____

Matricola: _____ email: _____

ELEMENTI DI ECONOMETRIA - 18/01/2019 - Time: 2 h 30'

1. Say if the following statements are unambiguously true (True), unambiguously false (False) or impossible to classify the way they are stated (Not necessarily). Write the motivations to your answers **only** in the space provided. A “Not necessarily” answer with no motivations will be considered wrong.

(a) The matrix $\begin{bmatrix} 0 & 0 \\ 0 & 1 \end{bmatrix}$ is singular.

True False Not necessarily

(b) If an estimator has a limit in probability, it is consistent.

True False Not necessarily

(c) The support for the χ_2^2 distribution is the whole real line.

True False Not necessarily

(d) If you add explanatory variables to an OLS regression, the sum of squared residuals cannot increase.

True False Not necessarily

(e) The null hypothesis for the Chow test is homoskedasticity.

True False Not necessarily

2. Given the dynamic model

$$y_t = 0.8y_{t-4} + 1.5x_t + 0.2x_{t-1} - 0.7x_{t-4} + \varepsilon_t$$

(a) Compute the dynamic multipliers (simple and cumulated) up to order 4:

k	δ_k	c_k
0		
1		
2		
3		
4		

where $\delta_k = \frac{\partial y_t}{\partial x_{t-k}}$ and $c_k = \sum_{i=0}^k \delta_i$.

(b) Calculate $c = \lim_{k \rightarrow \infty} c_k$

$c =$ _____

3. Card (1995)¹ used wage and education data for a sample of men in 1976 to estimate the return to education. We use the same dataset, and here is a brief description of the variables:

Variable name	Description
lwage	log(wage)
exper	work experience
exper2	work experience, squared
black	dummy, 1 if black
south	dummy, 1 if in south, 1976
smsa	dummy, 1 if in metropolitan area, 1976
educ	years of schooling, 1976
nearc4	dummy, 1 if lived near college, 1966
motheduc	mother's schooling
fatheduc	father's schooling

Consider tables 1 and 2, and answer the following questions:

(a) According to the OLS estimate, is the effect of education on wage significant?

¹Card, D. (1995), "Using Geographic Variation in College Proximity to Estimate the Return to Schooling," in *Aspects of Labour Market Behavior: Essays in Honour of John Vanderkamp*, ed. L. N. Christophides, E. K. Grant, and R. Swidinsky, 201–222. Toronto: University of Toronto Press.

(b) According to the OLS estimate, what is the effect of experience on wages?

(c) Is the IV model over-identified?

YES NO

(d) According to the IV estimate, is the effect of education on wage significant?

(e) According to the IV estimate, can you see evidence of racial discrimination?

(f) What is your economic interpretation of the results for the Hausman test in Table 2?

Table 1: OLS model for `lwage`

OLS, using observations 1–2220
Dependent variable: `lwage`

	Coefficient	Std. Error	<i>t</i> -ratio	p-value
<code>const</code>	4.66724	0.0785337	59.43	0.0000
<code>exper</code>	0.0886591	0.00791891	11.20	0.0000
<code>exper2</code>	−0.00240584	0.000397591	−6.051	0.0000
<code>black</code>	−0.172145	0.0233737	−7.365	0.0000
<code>south</code>	−0.113928	0.0176191	−6.466	0.0000
<code>smsa</code>	0.163353	0.0184394	8.859	0.0000
<code>educ</code>	0.0760787	0.00407375	18.68	0.0000
Mean dependent var	6.285423	S.D. dependent var	0.439693	
Sum squared resid	315.6327	S.E. of regression	0.377659	
R^2	0.264259	Adjusted R^2	0.262264	
$F(6, 2213)$	132.4750	P-value(F)	1.5e−143	

Table 2: IV model for `lwage`

TSLS, using observations 1–2220
Dependent variable: `lwage`
Instrumented: `educ`
Instruments: `const exper exper2 black south smsa nearc4 motheduc fatheduc`

	Coefficient	Std. Error	<i>t</i> -ratio	p-value
<code>const</code>	4.26151	0.216814	19.66	0.0000
<code>exper</code>	0.0989510	0.00948206	10.44	0.0000
<code>exper2</code>	−0.00244901	0.000401274	−6.103	0.0000
<code>black</code>	−0.150449	0.0259116	−5.806	0.0000
<code>south</code>	−0.107236	0.0180663	−5.936	0.0000
<code>smsa</code>	0.150846	0.0195977	7.697	0.0000
<code>educ</code>	0.100088	0.0126301	7.924	0.0000
Mean dependent var	6.285423	S.D. dependent var	0.439693	
Sum squared resid	320.5867	S.E. of regression	0.380612	
R^2	0.259351	Adjusted R^2	0.257343	
$F(6, 2213)$	83.66444	P-value(F)	1.21e−94	

Hausman test: $\chi^2(1) = 4.12446$ (p-value = 0.0422675)
Sargan over-identification test: $\chi^2(2) = 2.05774$ (p-value = 0.357411)
Weak instrument test: First-stage $F(3, 2211) = 87.0773$