Name: _____

Matricola: _____ email: _____

ECONOMETRICS - 22-06-2018 - 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) A nonzero matrix with 1 row and 1 column is always invertible.

   True ◯ False ◯ Not necessarily ◯

   (b) The projection matrix $\mathbf{P_X}$ is always square.

   True ◯ False ◯ Not necessarily ◯

   (c) If $X_n \xrightarrow{\text{p}} 0.5$, then $\ln(X_n) - \ln(1 - X_n) \xrightarrow{\text{p}} 1$.

   True ◯ False ◯ Not necessarily ◯

   (d) If $\sqrt{n}(X_n - 0.5) \xrightarrow{\text{d}} N(0, 0.25)$, then $\sqrt{n}\left[\ln(X_n) - \ln(1 - X_n)\right] \xrightarrow{\text{d}} N(0, 4)$.

   True ◯ False ◯ Not necessarily ◯

   (e) The GLS estimator

   $$\tilde{\beta} = \left(X'\Sigma^{-1}X\right)^{-1} X'\Sigma^{-1}y$$

   is rarely applicable in practice because the matrix Σ is normally unobservable.

   True ◯ False ◯ Not necessarily ◯

2. You estimated a dynamic model

$$A(L)y_t = \text{const} + B(L)x_t + \varepsilon_t;$$

the sample size is 202, and the estimates are as follows:

$$y_t = -0.0046 + 0.9681y_{t-1} + 0.4613x_t - 0.2747x_{t-1} - 0.1541x_{t-2};$$

a robust estimate of the parameters covariance matrix is

$$\hat{V} = \frac{1}{100000}\begin{bmatrix} 12 & 23 & 7 & -61 & 30 \\ 23 & 102 & 0 & -97 & -6 \\ 7 & 0 & 488 & -682 & 193 \\ -61 & -97 & -682 & 1600 & -814 \\ 30 & -6 & 193 & -814 & 624 \end{bmatrix}$$

(a) Identify the orders of the polynomials $A(L)$ and $B(L)$:

order of $A(L) =$ _____ order of $B(L) =$ _____

(b) Calculate the estimate of the speed of adjustment:

$A(1) =$ _____

(c) Test the hypothesis $H_0 : A(1) = 0.05$

Test type: _____ Distribution: _____ Test statistic: _____
Decision: ◯ Reject ◯ Don't reject

(d) Compute the dynamic multipliers (simple and cumulated) up to order 2:

k	δ_k	c_k
0		
1		
2		

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

(e) Calculate $c = \lim_{k\to\infty} c_k$

$c =$ _____

(f) Test the hypothesis $H_0 : A(1) - B(1) = 0$

Test type: _____ Distribution: _____ Test statistic: _____
Decision: ◯ Reject ◯ Don't reject

(g) What is the implication of the hypothesis above for the long-run coefficient c?

3. Table 1 contains the estimates of a wage equation, where data on 4165 US workers were used; the variables are as follows:

Name	**Description**
`lnyhour`	log hourly wage (dependent variable)
`sex`	gender dummy (1 for female)
`ed`	education (in years)
`exp`	work experience (in years)
`married`	dummy
`black`	dummy
`south`	dummy (1 if lives in the South)
`smsa`	dummy (1 if lives in a metropolitan area)
`union`	dummy (1 if membero of a trade union)
`bluecol`	dummy (1 if blue collar)

Table 1: OLS: dependent variable: `lnyhour`

	coeff	robust std. err.	t-ratio	p-value
`Intercept`	5.9126	0.0672	87.9975	0.0000
`sex`	−0.3818	0.0232	−16.4651	0.0000
`ed`	0.0550	0.0027	20.2506	0.0000
`exp`	0.0409	0.0022	18.8545	0.0000
`exp`^{2}	−0.0007	0.0000	−14.3320	0.0000
`married`	−0.0529	0.0204	−2.5858	0.0097
`black`	−0.1710	0.0209	−8.1770	0.0000
`south`	0.0597	0.0126	4.7190	0.0000
`smsa`	0.1538	0.0121	12.6854	0.0000
`union`	0.0851	0.0120	7.0779	0.0000
`bluecol`	−0.1334	0.0149	−8.9454	0.0000
R^2:	0.424		R^2_{adj}:	0.423
White's test for heteroskedasticity				
LM test:	183.883		p-value (χ^2_{57})	0.000

(a) Comment on the coefficient associated to the variable `sex`, suggesting an economic interpretation

(b) Comment on the coefficient associated to the variable `ed`, suggesting an economic interpretation

(c) Comment on the coefficients associated to the variable `exp`, suggesting an economic interpretation

(d) Comment on the heteroskedasticity test