Name: _____

Matricola: _____ email: _____

ECONOMETRICS - 06/09/2019 - 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) Given that $A = \begin{bmatrix} 0 & -1 \\ 1 & 0 \end{bmatrix}$, then $A^{-1} = A'$.

   True ◯ False ◯ Not necessarily ◯

   (b) If an estimator does not have a limit in probability, it cannot be consistent.

   True ◯ False ◯ Not necessarily ◯

   (c) The support for the χ^2_2 distribution is $[0, \infty)$.

   True ◯ False ◯ Not necessarily ◯

   (d) If the model $y_i = x_i\beta + \varepsilon_i$ is a correct representation of the data, the elasticity of y with respect to x is not constant.

   True ◯ False ◯ Not necessarily ◯

   (e) The null hypothesis for the Chow test is absence of autocorrelation.

   True ◯ False ◯ Not necessarily ◯

2. Suppose you have the following model

$$\log y_i = \beta_0 + \beta_1 \log x_i - \beta_2 (\log x_i)^2 + \varepsilon_i$$

and you have the following estimates:

$$\hat{\boldsymbol{\beta}} = \begin{bmatrix} 10 \\ 1.25 \\ -0.1 \end{bmatrix} \qquad V(\hat{\boldsymbol{\beta}}) = \begin{bmatrix} 1 & -0.1 & -0.4 \\ & 0.36 & 0 \\ & & 0.25 \end{bmatrix}$$

(a) Test the hypothesis $H_0 : \beta_1 = 0$:

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

(b) Test the hypothesis $H_0 : \beta_1 = 1$:

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

(c) Test the hypothesis $H_0 : \beta_2 = 0$:

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

(d) Compute a test for the hypothesis that the elasticity of y with respect to x is a constant.

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

(e) Compute a test for the hypothesis that the elasticity of y with respect to x is constant and equal to 1.

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

3. Table 1 shows an ADL(p, q) model, estimated via OLS on a dataset which contains U.S. quarterly data from 1948 onwards (source: St. Louis FED). The two variables in the model are `unrate`, the seasonally adjusted unemployment rate and `ogap`, a conventional measure of the economic cycle,[1] and are plotted in Figure 1.

(a) Identify, from the estimates reported in table 1, the numbers p and q:

$p =$ _____ $q =$ _____

(b) Calculate the long-run coefficient:

$$c = \frac{B(1)}{A(1)} = \quad \text{_____}$$

[1] To be precise, it's the HP filtered log GDP at constant prices.

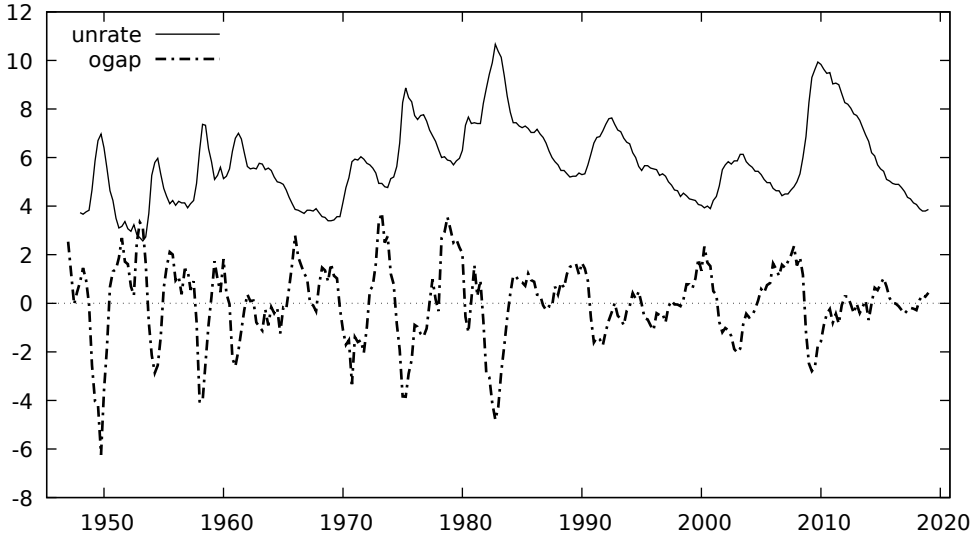

Figure 1: Unemployment and output gap through time

OLS, using observations 1948:3–2019:1 ($T = 283$)
Dependent variable: unrate

	Coefficient	Std. Error	t-ratio	p-value
const	0.1141	0.0575	1.9848	0.0481
ogap	−0.2157	0.0177	−12.2208	0.0000
ogap_1	0.1360	0.0264	5.1435	0.0000
ogap_2	0.0745	0.0202	3.6927	0.0003
unrate_1	1.3686	0.0517	26.4613	0.0000
unrate_2	−0.3884	0.0505	−7.6861	0.0000

Mean dependent var	5.770907	S.D. dependent var	1.631803
Sum squared resid	13.02802	S.E. of regression	0.216870
R^2	0.982650	Adjusted R^2	0.982337
$F(5, 277)$	3137.724	P-value(F)	1.7e–241
Log-likelihood	34.02619	Akaike criterion	−56.05237
Schwarz criterion	−34.17969	Hannan–Quinn	−47.28218
$\hat{\rho}$	−0.061802	Durbin's h	−2.109071

Godfrey test up to order 4: Test statistic: LMF = 1.97399, p-value = 0.0987

Table 1: ADL model: unemployment and output gap

(c) Comment on the sign and magnitude of the long-run coefficient. Do they match your economic intuition?

(d) Comment on the Godfrey test reported at the end of Table 1.

(e) Figure 2 plots the dynamic multipliers for the model over a horizon of 3 years. Give an economic interpretation of the figure.

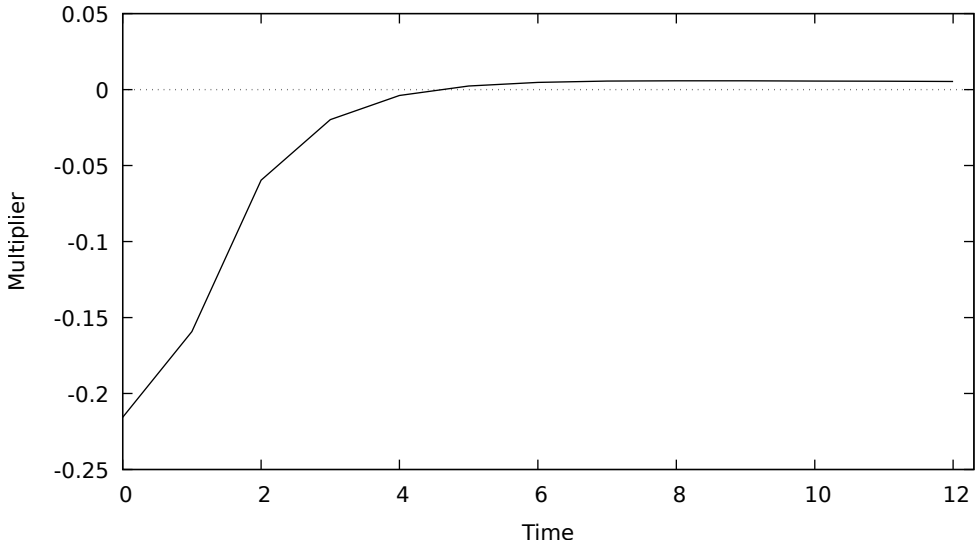

Figure 2: Dynamic multipliers