

Econometrics Test

2015 - 09 - 10

Name: _____

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1. Say if the following statements are unambiguously true (TRUE), unambiguously false (FALSE) or impossible to classify the way they are stated (CAN'T SAY). Write the motivations to your answers **only** in the space provided. A "CAN'T SAY" answer with no motivations will be considered wrong.

- (a) If A is a square, positive definite matrix and $B - A$ is also positive definite, then B is positive definite too.

TRUE ☐ FALSE ☐ CAN'T SAY ☐

- (b) If $E(Y|X) \neq E(Y)$ then Y and X cannot be independent.

TRUE ☐ FALSE ☐ CAN'T SAY ☐

- (c) If $\hat{\theta}$ is an unbiased estimator then $E(\hat{\theta})$ may not exist.

TRUE ☐ FALSE ☐ CAN'T SAY ☐

- (d) The technical meaning of the phrase "a parameter estimate is significant", as commonly used in applied economics, is "we can safely exclude that the true value of that parameter is zero".

TRUE ☐ FALSE ☐ CAN'T SAY ☐

- (e) If, in a linear regression model, $R^2 = 1$, then Wald-type tests cannot be computed.

TRUE ☐ FALSE ☐ CAN'T SAY ☐

2. Suppose you estimate, on a dataset with 400 observations, the two following models:

$$y_i = \beta_0 + \beta_1 x_{1,i} + \beta_2 x_{2,i} + \varepsilon_i \quad (1)$$

$$y_i - x_{1,i} = \gamma_0 + \gamma_1 (x_{2,i} - x_{1,i}) + u_i \quad (2)$$

and that you obtain a sum of squared residuals equal to 496 for model (1) and 518 for model (2), respectively. Call R_u^2 and R_r^2 the centred R^2 index for model (1) and (2), respectively.

- (a) Is it possible to compute R_u^2 with the data given above?
☐ YES ☐ NO
- (b) Is it possible to compute R_r^2 with the data given above?
☐ YES ☐ NO
- (c) Is it possible to say that $R_u^2 > R_r^2$?
☐ YES ☐ NO
- (d) Is it possible to test the hypothesis $\beta_1 + \beta_2 = 1$?
☐ YES ☐ NO
- (e) If the answer to the question above was YES, perform the test:

$H_0 : \beta_1 + \beta_2 = 1$ $W =$ _____
 Decision: ACCEPT ☐ REJECT ☐

If the answer to the question above was NO, say why in the space provided below:

The answer is NO because _____

3. Table 1 contains a model for revenue from indirect taxes for the Italian government as a function of GDP (quarterly data from ISTAT). Variables are as follows:

Variable name	Description
itax	log of indirect taxes collected
gdp	log of GDP
time	time trend

Answer the following points, making use of the numerical estimates that you find in table 1:

- Comment on the sign, magnitude and significance of the coefficient associated to the variable **time**.
- Comment on the adequacy of the dynamic specification.
- Calculate the instantaneous elasticity of tax revenues with respect to GDP.
- TEST the hypothesis that the instantaneous elasticity of tax revenues with respect to GDP is equal to 1.
- Calculate the long-run elasticity of tax revenues with respect to GDP.

OLS, using observations 1999:4–2014:4 ($T = 61$)

Dependent variable: itax

	Coefficient	Std. Error	<i>t</i> -ratio	p-value
const	1.727	1.070	1.6143	0.1123
time	0.002	0.001	3.4965	0.0010
itax(-1)	0.565	0.100	5.6599	0.0000
gdp	1.037	0.097	10.6592	0.0000
gdp(-1)	-0.084	0.118	-0.7188	0.4754
gdp(-2)	-0.206	0.088	-2.3438	0.0228
gdp(-3)	-0.518	0.084	-6.1730	0.0000
Mean dependent var	10.88338	S.D. dependent var	0.115051	
Sum squared resid	0.034990	S.E. of regression	0.025455	
R^2	0.955943	Adjusted R^2	0.951048	
$F(6, 54)$	195.2809	P-value(F)	9.10e-35	

Godfrey test up to order 1 – p-value = 0.461249

Godfrey test up to order 4 – p-value = 0.526196

Table 1: ADL model for indirect taxes