

Name: _____

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ECONOMETRICS - 2022-08-31 - 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 adequate motivation will be considered wrong.

- (a) If a matrix is symmetric, then it must be square.

True ☐ False ☐ Not necessarily ☐

- (b) If the support of a random variable X is $(0, \infty)$, then $E(X) > 0$.

True ☐ False ☐ Not necessarily ☐

- (c) In the model $y_i = \beta_0 + \beta_1 x_i + \varepsilon_i$, the marginal effect of x_i on y_i is constant.

True ☐ False ☐ Not necessarily ☐

- (d) In the model $y_i = \beta_0 + \beta_1 x_i + \varepsilon_i$, if $V(\varepsilon_i | x_i) = \exp(0.1 \cdot x_i)$, then the model is heteroskedastic.

True ☐ False ☐ Not necessarily ☐

- (e) In a dynamic regression model, the long-run multiplier may be positive or negative, but not 0.

True ☐ False ☐ Not necessarily ☐

2. You are using a CAN estimator for a vector of two parameters, a and b . Your estimates are

$$\begin{bmatrix} \hat{a} \\ \hat{b} \end{bmatrix} = \begin{bmatrix} 0.4 \\ 0.9 \end{bmatrix} \quad \hat{V} = \begin{bmatrix} 0.09 & 0.03 \\ 0.03 & 0.05 \end{bmatrix}$$

where \hat{V} is the estimated covariance matrix of the estimator.

Test the following hypotheses:

- (a) $H_0 : a$ is not significant

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

- (b) $H_0 : b = 1$

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

- (c) $H_0 : a = b$

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

- (d) $H_0 : b/a = 2$

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

3. Figure 1 displays daily series for the natural gas price (TTF Amsterdam) and for the electricity wholesale prices in Italy (PUN) in the year 2022. Both series are in natural logarithms.

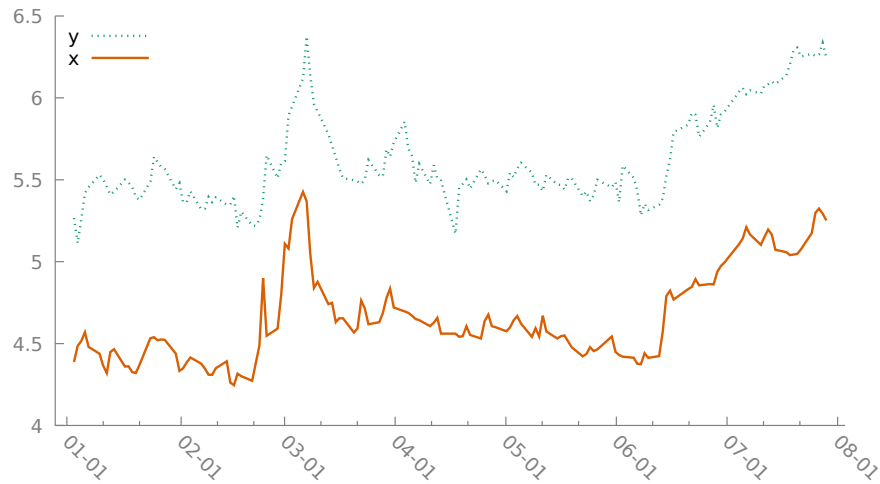


Figure 1: Natural gas (x) and electricity wholesale prices (y); natural logarithms

An ADL(1,2) model was estimated using the variables above. Table 1 contains the estimates in ECM form.

Table 1: Electricity price as a function of natural gas price

OLS, using observations 2022-01-05–2022-07-29 ($T = 144$)

Dependent variable: Δy_t

	Coefficient	Std. Error	t-ratio	p-value
const	0.375511	0.129557	2.898	0.0044
Δx_t	0.143437	0.0718331	1.997	0.0478
Δx_{t-1}	0.156412	0.0887346	1.763	0.0802
y_{t-1}	-0.406619	0.0617963	-6.580	0.0000
x_{t-1}	0.410439	0.0646060	6.353	0.0000
Mean dependent var	0.007873	S.D. dependent var	0.098672	
Sum squared resid	0.815181	S.E. of regression	0.076581	
R^2	0.414495	Adjusted R^2	0.397646	
$F(4, 139)$	24.60044	P-value(F)	2.08e-15	
$\hat{\rho}$	-0.108629	Durbin-Watson	2.213380	

Godfrey test: Test statistic: LMF = 2.09446, p -value = 0.0698971

Coefficients covariance matrix ($\times 10000$)

	const	Δx_t	Δx_{t-1}	y_{t-1}	x_{t-1}
const	167.850	-7.089	-16.978	-41.468	14.057
Δx_t	-7.089	51.600	-9.203	-3.985	6.273
Δx_{t-1}	-16.978	-9.203	78.738	31.679	-34.604
y_{t-1}	-41.468	-3.985	31.679	38.188	-37.131
x_{t-1}	14.057	6.273	-34.604	-37.131	41.739

Answer the following questions:

(a) Discuss the Godfrey test.

(b) Compute the following short-run multipliers

$$d_0 = \quad d_1 = \quad d_2 =$$

(c) Compute the long-run multiplier

$$LRM =$$

(d) Test the hypothesis $LRM = 1$ and discuss its economic implications:

Test type: _____ Distribution: _____ Test statistic: _____

Decision: ☐ Reject ☐ Don't reject
