Name: _____

Matricola: _____ email: _____

ECONOMETRICS - 5-4-2019 - 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 $\begin{bmatrix} 1 & -1 \\ 2 & -2 \end{bmatrix}$ is singular.

   True ◯ False ◯ Not necessarily ◯

   (b) If $\hat{\theta}$ is a consistent estimator for a parameter whose true value is 0, then $P[\hat{\theta} = 1] \to 0$

   True ◯ False ◯ Not necessarily ◯

   (c) A covariance matrix cannot be singular.

   True ◯ False ◯ Not necessarily ◯

   (d) In a linear regression model, the uncentred version of the R^2 index cannot be smaller that the centred version.

   True ◯ False ◯ Not necessarily ◯

   (e) When testing hypotheses in a linear model, the t statistic may be negative, but the corresponding p-value is always positive.

   True ◯ False ◯ Not necessarily ◯

2. You estimate a linear model (call it model A) on a sample with $n = 256$ observations and $k_A = 12$ variables, and get a centred R^2 index equal to $R^2_A = 60\%$; then you re-estimate the same model on the same data, but this time you only use $k_B = 9$ of your original variables (call this model B), and the R^2 index drops to $R^2_B = 59\%$.

   (a) Compute[1] the W statistic: $W =$ _____ ;

   (b) How many degrees of freedom does the test have? $p =$ _____ ;

   (c) Test the hypothesis implicit in the model reduction

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

   (d) Now suppose you got exactly the same results on a larger sample ($n = 1024$); would your conclusion change? Why?

3. The plot in Figure 1 depicts two monthly series, with the industrial (pre-tax) price of diesel in Italy (d_t) and the price of Brent crude oil (b_t). Both series are in logarithm of current Euros.

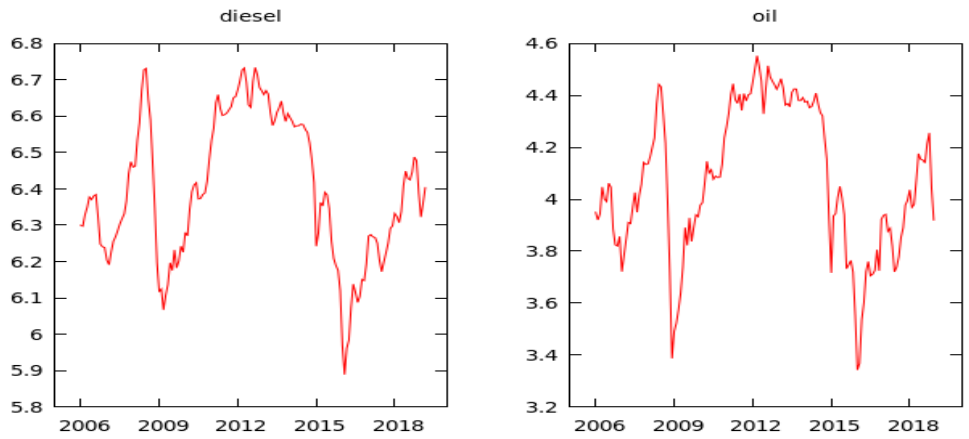

Figure 1: Data series for oil and diesel

Running an ADL model on data from January 2006 to December 2018 yielded the following results:

[1] Hint: express R^2 as a function of the SSR.

$$\widehat{d}_t = \underset{(0.146)}{0.600} + \underset{(0.040)}{0.821}\, d_{t-1} + \underset{(0.019)}{0.343}\, b_t - \underset{(0.033)}{0.020}\, b_{t-1} - \underset{(0.025)}{0.188}\, b_{t-2} \tag{1}$$

(standard errors in parentheses)

$$T = 154 \quad \bar{R}^2 = 0.9908 \quad F(4, 149) = 4119.0 \quad \hat{\sigma} = 0.019047$$

$$\text{Godfrey test with 12 lags} : 12.989520,\ pval = 0.37 \tag{2}$$

$$\text{Test for } H_0 : \alpha + \beta_0 + \beta_1 + \beta_2 = 1 : W = 10.7549,\ pval = 0.0012948 \tag{3}$$

(a) Comment on the result of the Godfrey test (2):

(b) Rewrite the model in ECM form:

$$\widehat{\Delta d_t} = \_\_\_\_\_ + \_\_\_\_\_\ \Delta b_t + \_\_\_\_\_\ \Delta b_{t-1} +$$

$$+ \_\_\_\_\_\ d_{t-1} + \_\_\_\_\_\ b_{t-1}$$

(c) Write the estimated value of the first short-run multiplier:

$$\delta_0 = \_\_\_\_\_$$

(d) Write the estimated value of the long-run multiplier:

$$c = \_\_\_\_\_$$

(e) Discuss on the implications of the hypothesis test (3) for the long-run multiplier c: