1. Use the data in FERTIL3.RAW:

(i) Test whether there is AR(1) serial correlation in the errors of the following finite DL model, in first differences (changes): $\Delta gfr_t = \gamma_0 + \delta_0 \Delta pe_t + \delta_1 \Delta pe_{t-1} + \delta_2 \Delta pe_{t-2} + u_t$

(ii) Reestimate the model in part (i) adding the lagged dependent variable as a regressor and test whether there is serial correlation of order 1 in the error term. Compare the results with those obtained in part (i) and comment.

2. Consider the model $y_t = \beta_0 + \beta_1 x_t + \beta_2 z_t + u_t$, with $u_t = \rho u_{t-1} + e_t$, where $e_t \overset{iid}{\sim} N\left(0,\sigma^2\right)$, $|\rho| < 1$ and $\rho \neq 0$. Modify the specification of the model in such a way that the error term of the new model is not serially correlated.

3. Consider the following OLS linear regression:

$$\widehat{lrec_t} = 8.965 + 0.016t + 0.062\,Q2_t + 0.062\,Q3_t + 0.049\,Q4_t \qquad (1)$$

where $\widehat{lrec_t}$ is the fitted value of the logarithm of the state revenues and Qj_t are quarterly dummies, with $j = 2,3,4$.

(i) Interpret the estimates of the coefficients.

(ii) With the residuals of regression (1), $\hat{u}_t$, one has obtained the following test regression,

$$\hat{u}_t = 0.0057 + 0.0001t + 0.0016\,Q2_t - 0.0783\,Q3_t + 0.0015\,Q4_t + 0.7121\hat{u}_{t-1} + 0.2139\,\hat{u}_{t-2}$$

with $n = 35$, $SSR = 23.84$ and $R^2 = .235$. Specify the test of hypothesis inherent to this regression and conclude. What can you say about the OLS estimation and inference of equation (1)?

4. With a sample of 56 annual observations the following equations were estimated:

$$\widehat{\log(inv_t)} = \underset{}{16.52} + \underset{(.009)}{.029t} + \underset{(.051)}{.120\log(phab_t)}, \qquad t = 1,2,\ldots,56$$

$$\hat{u}_t = -.009 - \underset{(.008)}{.005t} + \underset{(.044)}{.026\log(phab_t)} + \underset{(.121)}{.579\hat{u}_{t-1}}, \qquad R^2 = .31,\ F = 7.65$$

where *inv* is the investment in housing in a given country and *phab* is the average price of housing.

(i) Give the command in *EViews* that allows to generate the trend *t* and interpret the coefficient estimate of *t* and $\log(phab)$.

(ii) The second equation aims to perform a test. Identify that test, write the null hypothesis, the test statistic and conclude.

5. Admit that there is no seasonality in y_t. Specify the auxiliary regression that allows to test for serial correlation of order 3 in the errors u_t. If the *R*-squared of that regression is equal to 0.103 what can you conclude?