Department of Economics,
Management and Quantitative Methods

B-74-3-B Time Series Econometrics
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Computer Session 2

Exercise 5: Estimating a regression with autocorrelation consistent estimates of the standard errors.

5.1 Start

Download the file regression.wf1 from the website, and open it.

5.2 Estimate a regression model.

From the Menu *Quick* select *Estimate equation*. You are prompted by the window *Equation Estimation - Specification*. In the cell, you must specify: the dependent variables (y) and the explanatory variables (in this case, only c, the constant, and x) (pay attention to the difference between *y1* and y, *x1* and x). Click *OK*.

5.3 Check for residuals autocorrelation.

We know that if the disturbances are not correlated with the explanatory variables, then the estimates of the coefficients of c and x are consistent. However, the computer always assumes that the disturbances are iid, and computes the estimated standard errors imposing that assumption. On the other hand, if the disturbances are not iid, these estimates of the standard errors are not correct. In order to check if this is the case, check the Portmanteau residual test. In the estimation output window, from the button *View*, select *residual diagnostics* and then *correlogram Q statistics* (for the modified Portmanteau test). (Allow for 12 lags).

5.4 Autocorrelation consistent Standard Errors.

Upon finding autocorrelation in the residuals, we must correct the estimates of the standard errors. To do so, select the button *Estimate* to go back to the window *Equation Estimation*, and select the *Options*: you are prompted with a new window, where in the *Coefficient covariance method* box you can select Heteroskedasticity Autocorrelation (HAC) consistent coefficient covariance estimate, by choosing the *HAC (Newey-West)* version. This is known as HAC (an acronym for Heteroskedasticity and Autocorrelation Consistent). A note of Warning: notice that *White* is not sufficient for us, because it corrects for the heteroskedasticity, but not for the autocorrelation. *Press OK.* (Notice that the estimated standard errors are higher than before. This is typically the case, because the incorrect assumption of iid disturbances usually results in under-estimated standard errors).

5.5 Close.

Close without saving.

Exercise 6: Unit Roots and Cointegration.

6.1 Start

Download the file regression.wf1 from the website, and open it.

6.2 Unit root test, Preliminary inspection of the series.

Select the series *y1*, *x1* and *z1* as a Group and plot them (pay attention to the difference between *y1* and *y*, *x1* and *x*). From the graphical inspection and from the sample autocorrelations, it is possible to conjecture that these series are I(1).

Close group spreadsheet.

6.3 Unit root test

From the Workfile, select the series Y1 (alone).

Click on *View* and choose *Unit Root Test*; *standard unit root tests.*

keep *Augmented Dickey-Fuller* (but notice that other tests are also

available). Test for a unit root in *level*, including an *intercept* only. Select *lag length* using an *automatic criterion* (the *Schwarz info criterion*, which is given by default, is a good choice). Press *OK*. In the output window, we can see that the *t* test statistic takes value --*-0.76*, versus a 5% critical value of *-2.89*, so the null hypothesis is rejected. Additional info can be obtained from this output: for example, one lag is selected in difference; the complete ADF regression is displayed in the bottom half of the output panel. (Close window with the *X* button)
Repeat the exercise for series y. The test statistic takes value -6.26, so the null hypothesis of unit root is rejected.
Repeat the exercise for series x (find I(0)), X1 (find I(1)), Z1 (find I(1)).

6.4 Cointegrating regression, *Z1*.

Regress *y1*, on *c* and *z1*. The estimated coefficient for Z1 is -0.11 and the t-statistic to check that the estimate is significant is -10.46 and therefore significant. However, as we checked before, this procedure is not correct, as this significance could be spurious. Test for cointegration instead.
We must check if the residuals do not have a unit root. For this purpose, we save the residuals. The residuals are automatically saved by the computer in the series *resid*, but we cannot modify this series. We therefore do this by generating another series: pressing the button *genr*, generate the series *ryx=resid*. We can now test for a unit root in *ryx*. Test for a unit root in *ryx*, using Case 1: test statistic takes value -1.93. Notice that the cv given by the computer are not correct, because these are residuals. Given the model (one explanatory variable, intercept and no trend), the correct c.v. is -3.37. Thus, the residuals have a unit root, therefore the estimate are inconsistent and the significance of the estimate of Z1 is spurious.

6.5 Cointegrating regression, *x1*.

Regress *y1*, on *c* and *x1*, and test for a unit root in the residuals. This time the assumption of cointegration is not rejected.

6.6 Close.

Close without saving.

Exercise 7: Cointegration, a faster procedure.

The procedure given above is summarized in eviews in a quick way.

7.1 Start

Download the file regression.wf1 from the website, and open it.

7.2 Perform the Engle Granger cointegration test.

Select the series of interest, for example Y1 and X1. *Open* them *as Group*. Press the button *View*, select *Cointegration test* and *Single equation cointegration test*. You are prompted by the window *Cointegration test specification*. Choose *Engle and Granger* as *test method*. This will set up a regression for Y1 and X1, and we have to choose the equation. In our previous example we had a regression with the intercept but no trends, so in *Equation specification*, *Trend specification*, choose *Constant (level)*. We want to run the regression and test the residuals for unit root with the ADF test, so we also have to choose the number of lags: this is done in *Lag specification*. Default here is the Schwarz IC, we may keep it as that or change it. Press OK. The window changes to *Engle and Granger cointegration test*. Both the regression of Y1 on X1 and the regression of X1 on Y1 are run, and results are presented for X1 and Y1 (see the label *Dependent*): we should only look at one of them and, as we chose the one of Y1 on X1 previously, we should stick with this one. So, we only look at the results for Y1. Eviews gives us the test statistic (tau statistic, for the t-statistic). Eviews does not give us the critical value, but it gives us the P-value: this is correct, ie it takes into account that residuals are used, so we do not reject H0 of unit root

(so, no cointegration) if the Pvalue is larger than 0.05 (as it is the case here).
(Notice: we could run the same test for the pair Y1 and Z1 too: we know from previous check they are not cointegrated. Interesting result, in this case using the residuals of the regression of Y1 on Z1 we conclude for spurious regression; using the regression of Z1 on Y1 the test statistic is ever so slightly above the critical value. These results are conflicting, but considering again also the regression of Y1 on Z1 we should conclude for spurious regression).