***EViews* Exercises for Chapter 3**

**EXAMPLE 3.1: An ARMA process for the NAO**

This example uses the workfile nao.wf1. To obtain the various summary statistics and the Jarque-Bera test statistic, open the series nao and click ***View/Descriptive Statistics & Tests/Histogram and Stats***.

The white noise series shown in Figure 3.6 along with nao can be obtained with the command

genr a = nrnd

To obtain the SACF and SPACF of nao, click ***View/Correlogram…*** and change ‘Lags to include’ to 12 (if desired) before OK-ing. To obtain the standard errors shown in Table 3.1, first copy the ACF column to the clipboard. Next, click ***New Page/Specify by Frequency/Range…***, change ‘Workfile structure type’ to ‘Unstructured/Undated’ and insert ‘12’ in ‘Observations’ (or the number of autocorrelations copied). This sets up a new page of undated observations. Now click ***Quick/Empty Group (Edit Series)*** and paste from the clipboard into the first column of the group. The name of the series can be changed from the default SER01 to ACF. Close the group and run the program Bartlett\_se.prg, which will produce the sequence of standard errors as the series se:

scalar t = 816

series s = acf

!1 = @obs(s)

smpl 1 1

genr v = (1/t)

smpl 2 !1

genr v = v(-1) + (2/t)\*s(-1)^2

smpl 1 !1

genr se = v^0.5

On returning to the original page, the AR(1) model may be estimated by OLS with the command

ls nao nao(-1)

or, if a constant is required,

ls nao c nao(-1)

Alternatively, if ML estimates are preferred, the command

ls nao ar(1)

may be used. The command

ls nao ma(1)

will produce ML estimates of the MA(1) model. To obtain CLS estimates, in the Equation view click ***Estimate/Options*** and change ‘Method’ to ‘CLS’.

The residual SACFs and portmanteau statistics may be obtained in the Equation view by clicking ***View/Residual Diagnostics/Correlogram-Q-statistics…*** and choosing the desired number of lags to include.

**EXAMPLE 3.2: Modelling the U.K. interest rate spread**

This example uses the workfile interest\_rates.wf1 and, as before, focuses on the spread, calculated with the command

genr spread = r20 - rs

Table 3.2 is constructed in the same way as Table 3.1, although when using the program Bartlett\_se.prg the first line of code should be changed to scalar t = 786 to allow the correct sample size to be used in the calculation of the standard errors.

The OLS regression of the AR(2) model is obtained with the command

ls spread c spread(-1 to -2)

However, to obtain the mean and its standard error, the alternative command

ls spread c ar(1) ar(2)

should be used, and this will also provide estimates of the autoregressive roots (the final row of the results table labelled ‘Inverted AR roots’). To investigate model adequacy, the over-fitted models are estimated with

ls spread c spread(-1 to -3)

and

ls spread c spread(-1 to -2) ma(1)

**EXAMPLE 3.3: Modelling the sunspot number**

This example uses the workfile sunspots.wf1. Figure 3.7 is constructed in the following way. The SACF and SPACF for the series sunspot are obtained for 50 included lags and pasted into a new page as before with the names, say, acf and pacf. The program Bartlett\_se.prg may then be run (with t = 318) to obtain the series of standard errors se. 95% upper and lower confidence bands are then obtained with the sequence of commands

genr acf\_upp = 1.96\*se

genr acf\_low = -acf\_upp

genr pacf\_upp = 1.96/sqr(318)

genr pacf\_low = -pacf\_upp

To construct the top panel of Figure 3.7, open the series acf, acf\_upp and acf\_low as a group, click ***View/Graph*** and select ‘Mixed’ from the ‘Specific’ list. Now select ‘Mixed settings’ as the ‘Graph Type’ and in the box that now appears, select ‘Spike’ as the ‘Type’ for series acf. This graph may then be frozen and amended as desired. A similar procedure using the series pacf, pacf\_upp and pacf\_low will obtain the bottom panel of Figure 3.7.

Returning to the original page, Table 3.3 can be constructed automatically using the program sunspot\_ar\_models.prg:

matrix(20,3) criteria

!count =0

for !1 = -1 to -20 step -1

ls sunspot c sunspot(-1 to !1)

scalar a = @aic

scalar b = @schwarz

!count = !count + 1

criteria(!count,1) = -!1

criteria(!count,2) = a

criteria(!count,3) = b

next

This sets up the matrix criteria, the first column of which gives the AR order, the second the associated *AIC* and the third the *BIC*.

These statistics may also be generated automatically by opening the series sunspot and clicking ***Proc/Automatic ARIMA Forecasting…***. In the Specification window check ‘None’ for the transformation and in the Options window set ‘Max differencing’ to 0, ‘Max AR’ to 12 (the maximum order allowed) and ‘Max MA’ to 0. On checking ‘ARMA criteria table’, ‘ARMA criteria graph’ and ‘Equation Output Table’ the *AIC* values for each AR model will be displayed in both tabular and graphical form along with the selected model. To obtain the *BIC* values repeat on selecting ‘Schwarz Info. Criterion’.

The AR(9) fit reported as the first column of Table 3.4 is obtained with the command

ls sunspot c ar(1 to 9)

on choosing the CLS estimation option. The F-test of the restrictions is obtained in the Equation view by clicking ***View/Coefficient Diagnostics/Wald Test-Coefficient Restrictions…*** and entering

c(4) = c(5) = c(6) = c(7) = c(8) = c(9) = 0

into the restrictions box.

The second and third columns of Table 3.4 are obtained with

ls sunspot c ar(1) ar(2) ar(9)

and

ls sunspot c ar(1) ar(2)

respectively.