Appendix 2: Computer Programs

This appendix briefly describes the computer software used for the estimations and model solutions discussed in the book. The main workhorse is the program to simulate nonlinear rational expectations models.

Solution of Rational Expectations Models

The simulations of the multicountry model discussed in the book were conducted using a program written in Fortran 77 that implements the Fair-Taylor extended path algorithm described in Chapter 1. This program and instructions for its use are available from the author. The program is written so that one with access to a UNIX-based workstation or mainframe with a Fortran compiler can recreate the simulations discussed in the book along with variants thereof. Knowledge of the Fortran language and the internal workings of the algorithm are not required.

The files for running the program include Fortran source code files with an "f" extension and data files with a "dat" extension. The file "extpath.f" contains the extended path algorithm program. In a sense, this file does all the work. The file "files.f" tells the program where the data files are located on the computer's hard disk. The default settings assume that all the files are located in the same directory. The data file "bl.dat" contains the baseline variable values used by the simulations. The files "coefs.dat," "ratio.dat," and "wage.dat" contain the estimated coefficients for the equations making up the model. The file "vcov.dat" contains the estimated variance-covariance matrix for the residuals from the estimated equations making up the model. The files "dlist.dat" and "print.dat" provide information to the program regarding the ordering of variables in the equations and for the printout. An additional file "job.dat" can be used to supply the program with simulation specifications when the user wishes to dispense with the interactive part of the program.

In order to use the program, the files "extpath.f" and "files.f" must be compiled and linked using a Fortran compiler. This need only be done once. When the program is run, the user only needs to respond to a number of prompted questions

regarding the type of simulation and then the program runs automatically until completion. Among the options the user can choose from are whether the simulation is deterministic or stochastic, the type of instrument change or the type of policy rule simulated, and the nature of the shocks to the economy. These choices are made from a list provided with the program and include all the simulations presented in the book and variants on these simulations. In addition, the response coefficients in the policy rules can easily be adjusted. Thus, it is possible to investigate how sensitive the results of the simulations are to changes in the parameters or policy regime. Other changes—such as modifying the estimated coefficients of the equations of the model—require that the Fortran code of the program be changed.

The program requires approximately 4 Mb of RAM to operate. Successful completion of a single deterministic simulation on a Sun Sparcstation 1 workstation takes approximately 4 minutes and 15 seconds.

The output of the program consists of time series for all the variables in the model. This output is written to a file that can be read by commercial spreadsheet or plotting programs. The user can then analyze the data using available software.

The single-country model of Chapter 2 was solved using the Dagli-Taylor factorization method programmed in the VARMA computer software program by C. Ates Dagli. It could also be solved using the extended path method.

Estimation of Rational Expectations Model

1. Limited-Information Estimation

The estimation of all equations of the multicountry model, with the exception of the wage equations, was performed using the TSP program. In estimating the equations of the multicountry model, a subroutine was written to implement Hansen's generalized method of moments (GMM) estimation procedure within TSP. The subroutine also calculates the Sargan test statistic for overidentifying restrictions.

2. Maximum-Likelihood Estimation

The single-country model of Chapter 2 and the wage equations of the multicountry model were estimated using maximum likelihood. In order to evaluate the likelihood function at each function evaluation, the single-country model was solved using the Dagli-Taylor factorization method in the VARMA program written by C. Ates Dagli. The estimation of the wage equations was performed using a program written by Andrew Levin that also used the Dagli-Taylor method.

Stochastic Simulation

The variance-covariance matrix was factored using a modified Choleski method implemented in the TSP routine YLDFAC. A vector of standard normal variables is then constructed using a random-number generating algorithm. Multiplication of the triangular matrix resulting from the factorization by the vector of standard normals yields a vector of random variables with a variance-covariance matrix equal to the variance-covariance matrix of the structural residuals. This vector of residuals is then added to the equations of the multicountry model each quarter.