The RATSletter

Estima

RATS Version 7.3

Version 7.3 of RATS is now available! Users with current Update Subscriptions will receive 7.3 on CD automatically.

If you don't have an Update Subscription, you can update from 7.0 or later for just $25, or purchase an update subscription for $150, which will give you 7.3 now, and Version 8 when it is released.

For more information, including prices for updating older versions or multi-user licenses, please visit our website at www.estima.com, email us at sales@estima.com, or call us 800-822-8038.

Here's an overview of what you'll find in this new release:

More Powerful Data Wizard

The *Data Wizard* for spreadsheet, text, and similar files now allows you to preview the contents of the file you want to read, making it easier to choose the proper settings, deal with any header or footer lines, and so on. The Wizard also makes it easier to compact or expand data to a different frequency.

Faster Computations

Building on the significant speed increases in 7.2, the 7.3 release offers even faster computations in many cases, particularly for state space models.

Reads Data from Excel 2007, Stata, Eviews

RATS 7.3 supports reading data from Excel® 2007 "xlsx" format spreadsheets, as well as Stata® data files and EViews® workbook files.

Recursive Least Squares Wizard

We've added a new Wizard interface for the **RLS** (Recursive Least Squares) estimation instruction.

DISPLAY Instruction

DISPLAY has a new option for delimiting output with tabs, commas, or semicolons. Also, you can now use **DISPLAY** to show the contents of a parameter set or an equation.

DLM Instruction

The PRESAMPLE option has a new DIFFUSE choice, and PRESAMPLE=ERGODIC can now handle automatically models with a mix of stationary and non-stationary states. There are two new options: MU, which allows for a shift in the observable equation, and LIMIT, which limits the number of times certain matrices are recomputed—significantly reducing the computation time required for large, time-invariant state space models.

The Bank of Canada's DSGE Models

By Stephen Murchison, Bank of Canada

The Bank uses the **DSGE** command in conjunction with ToTEM[1], its main projection and policy analysis model for the Canadian economy, for several reasons.

Certainly there are other software programs that feature algorithms for (a) linearizing DSGE models and (b) solving systems of linear, forward-looking difference equations. To our knowledge, however, none combines these features with the vast array of dedicated time series commands found in RATS. In addition, many of these commands can be used directly with the reduced-form model generated by **DSGE**. A particularly useful combination for ML estimation is the **DSGE** and **DLM** commands, in conjunction with the **FIND(method=simplex)** optimization command.[2]

Second, with the recent addition of the ETZ option to **DSGE** (March 2009 *RATSletter*), it is possible to more effectively control agents' information set in ToTEM. For instance, ETZ can be used to impose judgement on a forecast in some future period (through one or more "shocks"), and allow agents to respond immediately to the judgement, via model-consistent expectations.

DSGE(ETZ) was recently used to generate the "fan charts" for inflation featured in the Bank's April Monetary Policy Report. The asymmetry of the bands reflects the influence of a binding lower bound on the policy interest rate. Shocks to the monetary-policy rule were used to enforce the lower bound in ToTEM, and ETZ was employed to render future shocks part of agents' *time-t* information set.

Finally, we have combined **DBOX** with **DSGE** and **DLM** to develop a comprehensive, menu-driven program that permits the user to change ToTEM's calibration, generate impulse response functions and variance decompositions, and produce model-based forecasts. This tool will soon be made available to all interested Bank staff.

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[1] ToTEM (Terms of Trade Economic Model) is a multi-sector, open-economy dynamic stochastic general equilibrium model of the Canadian economy. Documentation is available at:
http://bankofcanada.ca/en/res/tr/2006/tr97-e.html.

[2] Our experience is that the Simplex algorithm is more robust than derivative-based algorithms, which often get stuck

New and Revised Procedures Example Programs

Version 7.3 ships with dozens of new example programs and procedures. The examples replicate results from important econometrics papers and textbooks, and in most cases are supplied with the necessary data files. The easiest way to get these is to update to Version 7.3—you'll receive all of these new files on the RATS CD, along with hundreds of other examples and procedures. However, you can also download individual files from our website (see the "Resources" section).

Three Significant Example Programs

The first three collections below address three of the topics that have generated a great deal of discussion on our web forum and support hotlines recently: Estimating DSGE (dynamic stochastic general equilibrium) models; computing impulse responses with sign restrictions; and estimating FAVAR (factor augmented VAR) models.

BBEQJE2005.zip
This demonstrates the Gibbs Sampling technique, and replicates Bernanke, Boivin & Eliasz (2005), "Measuring the Effects of Monetary Policy: A Factor-augmented Vector Autoregressive (FAVAR) Approach," *Quarterly Journal of Economics*, vol. 120(1), pp. 387-422.

IrelandJEDC2004.zip
This demonstrates the use of the **DSGE** and **DLM** instructions to estimate a dynamic model. From Ireland (2004), "A Method for Taking Models to the Data", *Journal of Economic Dynamics and Control*, vol. 28, no. 6, pp. 1205-1226.

MountfordUhligJAE2009.zip
This demonstrates computing impulse responses with sign constraints and sign + zero constraints. Replicates results from Mountford and Uhlig (2009), "What are the Effects of Fiscal Policy Shocks?", *J. of Applied Econometrics*, vol. 24(6), pp. 960-992.

Other New Example Programs

Most of the other new example programs listed below deal with State Space or VAR models, and, like the examples above, were originally developed and presented as part of Web-based courses devoted to those topics (see page 4).

Commandeur and Koopman Textbook
We've written example programs for Commandeur and Koopman's *An Introduction to State Space Time Series Analysis* (Oxford Univ. Press, 2007).

BernankeMihovQJE1998.zip
Replication code for Bernanke & Mihov (1998), "Measuring Monetary Policy", *QJE*, vol. 113, no. 3, pp. 869-902. Includes ML estimation of structural VAR's, Markov switching estimate of an SVAR, and Monte Carlo integration of a just-identified SVAR.

BlanchardQuahAER1989.zip
Replicates Blanchard and Quah (1989), "The Dynamic Effects of Aggregate Demand and Supply Disturbances", *AER*, vol. 79, no. 4, pp. 655-673. Covers these VAR topics: historical decomposition, recovery of structural shocks, long-run restrictions.

DRA-JOE_2006.zip
Replicates state space models from Diebold, Rudebusch & Aruoba (2006), "The Macroeconomy and the Yield Curve: A Dynamic Latent Factor Approach," *J. of Econometrics*, vol. 131(1-2), 309-338.

EHLJME2000.prg
Demonstrates a DSGE model from Erceg, Henderson & Levin (2000), "Optimal monetary policy with staggered wage and price contracts," *Journal of Monetary Economics*, vol. 46, no. 2, 281-313.

FabianiMestre_EE_2004.zip
Replication for Fabiani & Mestre (2004), "A system approach for measuring the euro area NAIRU," *Empirical Economics*, vol. 29, no. 2, pages 311-341. State-space model with multiple observables.

GaliQJE1992.zip
Replicates Jordi Gali (1992), "How Well Does the IS–LM Model Fit Postwar U.S. Data", *QJE*, vol. 107, no. 2, pp. 709-738 using VAR's with short and long run restrictions, the instruction **CVMODEL**, and the ShortandLong procedure.

MNZ_ReStat_2003.zip
State space model from Morley, Nelson & Zivot (2003), "Why Are the Beveridge-Nelson and Unobserved-Components Decompositions of GDP So Different?," *The Review of Economics and Statistics*, vol. 85(2), pages 235-243.

PerronWada_JME_2009.zip
State space model, replicating Perron & Wada (2009), "Let's take a break: Trends and Cycles in US Real GDP", *Journal of Monetary Economics*, vol 56, 749-765.

SimsZhaECM1999.zip
Includes most analysis in Sims and Zha (1999), "Error Bands for Impulse Responses", *Econometrica*, vol. 67, no. 5, pp. 1113-1156: calculating error bands using Monte Carlo, bootstrapping, and IRF's for a structural VAR.

SinclairJMCB2009.zip
State space example replicating Sinclair (2009), "The Relationships between Permanent and Transitory Movements in U.S. Output and the Unemployment Rate," *Journal of Money, Credit and Banking*, vol. 41(2-3), pages 529-542.

TsayJASA1998.zip
Replication file for Tsay (1998), "Testing and Modeling Multivariate Threshold Models", *JASA*,

vol. 93, no. 443, pp. 1188-1202. Demonstrates **RLS** (recursive least squares) and **SWEEP** instructions.

New/Revised Procedures

BaiPerron.src

Major updates to this procedure for multiple structural change analysis, as described in Bai and Perron (2003), "Computation and Analysis of Multiple Structural Change Models", *Journal of Applied Econometrics*, vol. 18, 1-22.

BQDoDraws.src

Alternate to MCVARDoDraws. Does Monte Carlo draws for a 2-variable BQ factorization, from Blanchard and Quah (1989).

CusumTests.src

Performs CUSUM and CUSUMQ tests of the input series (series of recursive residuals). Based on: Brown, Durbin & Evans (1975), "Techniques for Testing the Constancy of Regression Relationships over Time", *JRSS-B*, vol. 37, 149-192.

Exactinverse.src

Computes exact (limit) inverse of $\mathbf{A} + \kappa\mathbf{B}$ as κ goes to infinity, for p.s.d. symmetric matrices $\mathbf{A}$ and $\mathbf{B}$, giving a matrix of the form $\mathbf{C} + \kappa^{-1}\mathbf{D}$.

GLSDetrend.src

Local to unity GLS detrending routine. Includes the ERS cases (no constant, constant, constant and trend) as well as the Perron and Rodriguez cases (constant and trend with a single break). This just does the detrending, not the actual unit root test(s).

Elliott, Rothenberg and Stock (1996), "Efficient Tests for an Autoregressive Unit Root", *Econometrica*, vol. 64, no. 4, pp. 813-836; Perron and Rodriguez (2003), "GLS Detrending, Efficient Unit Root Tests and Structural Change", *Journal of Econometrics*, vol. 115, pp. 1-27.

MCFEVDTable.src

Computes error bands for a VAR forecast error variance decomposition, using the information already computed. Note: it assumes that the shocks used are orthogonal and produce a complete factorization of the covariance matrix. It cannot be used with isolated shocks (e.g., from sign restrictions).

MCGraphIRF.src

Graphs error bands for impulse response functions using the information computed by another procedure (such as MCVARDoDraws). This has many options for controlling the general layout and content.

MCMCPostProc.src

Post processor for Markov Chain Monte Carlo statistics. Computes means, standard errors, numerical standard errors and CD measures.

MCVARDoDraws.src

Computes impulse response functions for a VAR using Monte Carlo simulation. Assumes the model is

an OLS VAR estimated with **ESTIMATE**. This uses a Choleski factorization, though it can be modified fairly easily to do any just-identified factorization.

NBERCycles.src

Generates dummy variables for quarterly or monthly data based upon the NBER business cycle reference dates. See: www.nber.org/cycles.html

PerronNgMtests.src

Computes one or more of the Perron-Ng "M" unit root tests. Perron and Ng (1996), "Useful Modifications to Some Unit Root Tests with Dependent Errors and Their Local Asymptotic Properties", *Review of Economic Studies*, vol. 63, pp. 435-463.

PerronRodriguez.src

Does the Perron-Rodriguez (2003) test for unit roots using GLS detrending, allowing for a break point at an unknown date. Perron and Rodriguez (2003), "GLS Detrending, Efficient Unit Root Tests and Structural Change", *Journal of Econometrics*, vol. 115, pp. 1-27.

SURGibbsSetup.src

A collection of procedures for setting up a Gibbs sampler for a (linear) SUR, such as a near-VAR. An example and a further explanation are provided in the "Bayesian Econometrics" web course workbook.

VARIRF.src

New options added to this very useful procedure, which organizes graphs of impulse responses for an estimated VAR.

Handbook for *Cointegrated VAR Model*

Katarina Juselius' *The Cointegrated VAR Model* is a wonderful resource for anyone interested in the field of cointegration analysis, and especially for anyone using CATS and RATS.

We've recently posted part one of a free RATS Handbook (in PDF format) that works through the various RATS instructions and CATS menu operations required to reproduce the results and graphs shown in the text.

This initial version of the Handbook covers Chapters 1 through 10 of the text. A revised version covering the remaining chapters will be forthcoming. The accompanying RATS program files and data files are provided along with the PDF file.

We would like to thank Katarina Juselius for providing her original code and data files. Although we've revised that code and added extensive comments, most of the code is essentially unchanged.

For links to the handbook, see:

www.estima.com/Cointegrated_VAR_Model_Book.shtml

our forum, or our Procedure Browser:

http://www.estima.com/cgi-bin/procbrowser.cgi

RATS Web Course Materials

You can now purchase the course materials from the three "web courses" we presented last year.

For each course, you receive a PDF workbook with all of the lessons and examples from the course, plus copies of the example program files, data sets, and procedures. The materials are normally delivered by email (as a Zip file), although we can provide them on disk on request.

The price for each course is $50. The available packages are listed below. Please see our website www.estima.com/courses_completed.shtml for details. You can order these online, or by phone or email.

Bayesian Econometrics

The course materials cover many important methods, including Gibbs sampling, Metropolis-Hastings and importance sampling, with applications to a broad range of topics, include time series, cross-section and panel data. The presentation is based largely on Gary Koop's *Bayesian Econometrics* (also available from Estima), but also covers additional topics.

State Space and DSGE Models

The "State Space" portion is based largely on Durbin and Koopman's *Time Series Analysis by State Space Methods* book, supplemented by material from Harvey's *Forecasting, Structural Time Series Models and the Kalman Filter*, and from West and Harrison's *Bayesian Forecasting and Dynamic Models*. The DSGE (Dynamic Stochastic General Equilibrium) portion covers basic concepts of formulating and estimating these models, and presents selected examples from the literature.

We do recommend that participants have a copy of the Durbin and Koopman book, which is available for purchase through Estima.

Vector Autoregression Models,

This course focuses on the "flat prior" types of analysis (informative BVAR's in a future course on forecasting). Topics include parametric SVAR's, sign-restrictions, short-and-long run restrictions, factor augmented VAR's.

RATS Forum, Twitter Feeds

Licensed users of RATS and CATS can register as users on our web forum to participate in discussions and to receive help with questions and problems. See: **www.estima.com/forum**

We've also created a Twitter® account (username **ratssoftware**), which we'll use to provide product announcements and other news. See the link on our site, or visit: **twitter.com/ratssoftware**

RATS Version 7.3, *continued*

DSGE Instruction

`DSGE` offers some important new options for capturing additional output and controlling aspects of the model.

NPREG and DENSITY

Both now have `SMOOTHING` options which scale the default kernel width up or down.

Reports

The *Report Windows* operation replaces the old *Restore Report* operation, and applies to many more of the reports generated automatically by RATS, including the tables of regression coefficients from estimation instructions. Also, rather than restoring reports in the order they were generated, you can now select the desired report from a list.

You can now export report windows as TeX tables, in addition to the text file, spreadsheet, HTML, and other formats supported already. Finally, the new `TITLE` option on **REPORT** allows you to provide your own titles for user-generated reports.

New Functions

RATS 7.3 includes several new built-in functions:

`%bicdf(x0,y0,rho)`
    Returns $P(x \leq x_0, y \leq y_0)$ for a bivariate standard Normal with correlation coefficient *rho*.

`%dlminit(A,SW,F,Z)`
    Returns a full solution for initial conditions for a state space model given the input matrices.

`%logdensitydiag(V,U)`
    Diagonal multivariate log Normal density with diagonal covariance matrix.

`%logtdensitystd(V,U,nu)`
    Standardized log multivarate *t* density.

`%parmslabels(parmset)`
    Returns labels of variables in a parameter set

`%ranmvt(f,nu)`
    Random draw from multivariate *t* distribution.

`%ranTruncate(mu,sigma,lower,upper)`
    Uses rejection method to generate draws from a truncated Normal.

`%tcdf(x,nu)`
    Returns the CDF for a *t* distribution.

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