The RATS letter

Estima

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RATS Version 11!!

RATS Version 11 is now available for all three platforms (Windows, Mac and UNIX/Linux). The main changes with Version 11 are described in other stories in this news letter: the new RATS Project file with its associated new formats for graphs and reports, accessibility changes to the interface and support for dark/high-contrast modes. We've added instructions for interacting with other software on the computer (such as Python) and for estimating using penalized least squares (LASSO and Ridge Regression).

Ordinarily, we update the major version number when we rework the documentation. This time, however, the changes to the documentation have been more of a rolling process of converting the old manuals over to the more flexible HTML and linking that into enhanced descriptions of the various examples. If you have not checked that out, we urge you to do so.

Price and order information for updating to RATS version 11 is provided on page 4.

Accessibility Settings

RATS version 11 has several changes which can be helpful to users who would prefer interface elements to appear larger. Some of these apply to all versions, some to Windows specifically (at this point).

First, in addition to the existing ability to adjust the font and size for the editor windows, we have added the ability to change the font size for the text in other windows (report windows, series list windows and series editing windows). This is the "Display Font Size" on the Preferences dialog.

We also have added to the same dialog a checkbox to "Use Accessibility Adjustment". This applies only to Windows. Since Windows 10, there has been an "Text Size" slider included in the Windows Accessbility features. This requests that interface elements be scaled up by the value you choose in the slider. It applies to anything controlled by Windows (such as menus and window titles). Each application can then decide what to do with this information. For RATS, we scale up the fonts on the text windows, all the other "interface" windows and in dialogs. We do not rescale fonts within graphs (which already rescale automatically based upon the size of the window to keep them proportional to the graph itself.)

New Instructions

RATS 11 adds two new instructions: **OS** and **PLS**.

OS (Operating System) interrupts the execution of a RATS program to execute some other operating system command (typically running a different program). This can be used to (for instance) run a Python program to fetch a data set, which can then be brought into RATS using the **DATA** instruction. You can also use **OS** to pass data to another program to, for instance,do specialized graphics.

PLS (Penalized Least Squares) does the calculations required for implementing LASSO (Least Absolute Shrinkage and Selection Operator) and Ridge Regression. These are also known as L1- and L2-penalized least squares. **PLS** estimates a linear model with an objective function which adds to the standard sum of squared residuals a penalty on the size of the coefficients, thus "shrinking" the coefficient vector towards zero. "Tuning" such a model typically requires using some type of cross-validation, splitting the sample between a training sample and a test sample, as least squares would always be the best "predictor" in a unified sample, These are typically used in situations where least squares is likely to produce a poor fit due to overparameterization or multicollinearity.

Detailed examples of the use of this are provided in the Stock and Watson 4th edition examples (Chapter 14).

Changes to Existing Instructions

The most significant change has been to the **SCATTER** instruction, which now will take matrices or vectors as input for the data for the X and Y axes rather than requiring the information to be copied into series.

The **SHUFFLE** option, which greatly simplifies bootstrapping operations, has been added to a number of instructions which did not previously support it..

COPY adds a new DFORMAT option for formatting the date labels for observations.

Quite a few instructions pick up a TITLE option for adding a descriptive title above the standard output.

LINREG and **NLLS** add an HC1 option for doing a degrees of freedom adjustment in robust standard error calculations.

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Projects

RATS 11 adds a new file type called a Project. This is a file with the new extension **RPRJ** which allows you to bundle RATS program files, source files, data files and (if you want) output, report and graph files into a single file.

The project file is a standard zip with an included header with overall information about the project (name, author, description and a space for a URL for detailed help) and a listing of the contents. With the new project files, you will be able to download a fully functioning sample program directly without having to unzip it yourself. And our examples will have the link to the detailed description as well.

This will be helpful for everyone, but particularly will make technical support questions easier, as we often get a program without data, and need to e-mail back for the full information.

More Flexible Sign Restrictions

RATS has long had examples of analyzing impulse responses with sign restrictions. We've recently written a new procedure called **@MCSignRestrict** which does sign restrictions by Monte Carlo methods as described in Uhlig's original paper in 2005, by doing outer draws for the VAR coefficients and inner draws for rotations of a factor of the covariance matrix. However, this extends the simple case to allow for multiple shocks and also allowing the term of the restrictions to change among the variables and shocks. For instance, you can have a shock which only sign-restricts the impact for one variable while restricting another variable for multiple periods.

An example of the use of this is K. Farrant and G. Peersman(2006), "Is the Exchange Rate a Shock Absorber or a Source of shocks? New Empirical Evidence", *Journal of Money, Credit and Banking*, vol 38, no. 4, pp 939-961. This analyzes both a three variable and a four variable model using a full set of sign restrictions (that is, it specifies three orthogonal sign-restricted shocks for the three variable model and four for the four-variable).

Note that it takes a *very* large number of draws to get the full set of restrictions in their four variable model. **@MCSignRestrict** offers an option to "fill in the blanks" with arbitrary orthogonal shocks to finish off a factorization. This only matters if you want to use **@MCFEVDTABLE** to do a decomposition of variance, as that requires a full factorization. While we are skeptical about the use of error bands on the decomposition of variance (they tend to be so wide as to be almost meaningless), we recognize that it's a common request from referees and editors.

New Graph and Report Formats

RATS 11 adds a new format for RATS graphics (file type RGFZ for RATS Graphics Format Zipped) which is a zipped JSON file. The older RGF was a "stream binary file" which didn't easily allow for adding new features. Now if new features are added, a graph can still be viewed with a earlier release of RATS (which can read the RGFZ) as it can simply ignore anything it doesn't recognize.

RATS 11 also adds a format for RATS Reports (file type RRFZ for RATS Report Format Zipped). Like the graph format, this is a zipped JSON format which includes the description of the directives used for generating the report. While it was possible with earlier versions of RATS to export a report in various other formats (Excel, TeX, RTF, etc.), this is the first time we have had a native format that can be used to save and view a report in RATS.

A graph in RGFZ format and a report in RRFZ format can be included in a RATS project. This is most easily done by using a *Project—Add Window(s)* operation, with which you can select windows visible on the screen for inclusion in the project file. You can view those from the project and then, if you need, export or copy/paste into another format.

Documentation

With Version 11, we have finally ended the long tradition of making printed documentation available—there isn't enough demand to justify the per unit cost of printing plus the rather considerable amount of labor required to format specifically for printing. Version 11 still comes with the three "book" set of PDF's (*Introduction*, *Reference Manual* and *Users' Guide*) and those are not print-protected in case you want to print out parts of them. However, the principal documentation is now the HTML help. Over the past few years, we have shifted the contents of the *Introduction* and *User's Guides* over to HTML (the more straightforward *Reference Manual* was done for Version 10). The total content in HTML is now roughly three times what we had in the old manuals, as it's much easier to document examples by including not just direct references to the instructions, but it's also possible to include the output and generated graphs. The HTML documentation is both posted on-line and is included with the software.

All the standard example programs (there are over 150) are now fully annotated as are almost all the standard procedures. We've also done detailed descriptions of about half the "paper replications" and plan to do the rest over the next few months.

New/Updated Examples

This is a list of the examples which were recently written (post 10.1). Note that many of the existing examples and paper replications have updated descriptions in the help added during this update cycle. You might want to check those links to see if examples that you used (or wanted to use) are now better documented.

BOOTARMODEL.RPF

does a parametric bootstrap for an AR(1) model. This is one of the simpler types of parametric bootstraps since it's not unreasonable to assume the residuals can be shuffled as is.

Farrant Peersman JMCB 2006

This identifies shocks in VAR's using sign restrictions, and is an example of the use of the new procedures for handling those.

Kilian AER 2009

Uses Vector Autoregressive techniques to analyze the effects of the (world) oil market on U.S. macro data. This includes two programs: one a relatively straightforward use of VAR techniques; the other uses a less standard technique, employing a distributed lag of growth rates of macro variables on each of the identified shocks with a a block bootstrap to deal with the modest amounts of serial correlation left in the residuals.

LASSO.RPF

is an example of using LASSO (Least Absolute Shrinkage and Selection Operator) to estimate a distributed lag with highly collinear data. It "tunes" the estimates using forecast performance over a hold-back period towards the end of the data.

SHUTDOWN.RPF

is an example of calculating a variant of impulse response in a VAR which shuts down the dynamic response of a variable. This is based upon Bachmann and Sims(2012) with a reconstructed and extended data set.

STARDIAGNOSTICS.RPF

performs diagnostic tests from Eitrheim and Terasvirta(1996). These are diagnostics employed after estimation of a STAR model to check for remaining non-linearities

Stock-Watson JASA 1998

uses an indirect method to estimate the variance of coefficient drift in a time-varying parameters model. If the coefficient drift is relatively small (relative to the observation equation variance), the maximum likelihood estimate is often zero. This also includes a formal testing procedure for drift vs no drift, which is technically difficult because the null of zero variance is on the boundary of the feasible region.

New/Updated Procedures

@FLUX

This procedure, which does general stability tests based upon a set of scores, adds a `U` option for use when the scores are an interaction between residuals or generalized residuals and explanatory variables.

@MCFEVDTABLE

This computes and displays a table of error bands for forecast error variance decompositions from Monte Carlo draws for a VAR. To aid with the use of the updated procedures for Monte Carlo integration for sign restrictions, it will now permit you to show analysis for a reduced set of shocks.

@MCSIGNRESTRICT

This is a new procedure for doing Monte Carlo integration for sign restrictions in a VAR. This was hard-coded into previous examples. The procedure makes this much simpler.

@MCVARDODRAWS

This is the standard procedure for doing Monte Carlo draws for a VAR. It adds a `FACTOR` option and allows `FACTOR` or `FFUNCTION` to produce a reduced number of shocks.

@PLSGRID

This is a new procedure for generating a grid of test values for the tuning parameter in a penalized least squares analysis.

@VARIRF

This is the standard procedure for graphing impulse responses in a VAR. It adds a `PICTURE` option for controlling the appearance of the values in the graph.

Dark/High-Contrast Display Modes

RATS adapts all windows but graphs to the use of dark mode (Macintosh/UNIX) or high-contrast modes (Windows). The background color is typically a very dark gray, while the standard foreground is white. The highlights and various colorized texts are chosen to provide good readability vs the background while also being clearly different from each other and from the foreground. The toolbar icons have been redesigned to look good in either dark or light modes, and are generally a bit larger than before.

Graphs are still done on a white background with the colors requested using the graph styles.

Note that Windows also has a separately selected "dark mode", but that is only partially supported. The main windows will have reversed colors, but dialog boxes are still light gray backgrounds. By contrast, the "high-contrast" modes redefine all the interface colors.

Stock and Watson 4th edition

RATS version 11 includes the example files from the 4th edition of Stock and Watson, *Introduction to Econometrics*. The most significant addition is a chapter on "Big Data", analyzing a regression with a very large set of regressors (potentially more than the number of observations), This is done using LASSO (Least Absolute Shrinkage and Selection Operator), Ridge Regression and Principal Components. The first two of these use the new PLS instruction (Penalized Least Squares) with new features involving SHUFFLE options used for doing cross-validation to select the optimal tuning parameter.

SHUFFLE option

The SHUFFLE option was added with version 10 for implementing various forms of boostrapping. From the very beginning with version 1 of RATS, the design has been to keep just one copy of the data and to handle lags and leads by mapping requests for the data as needed. (Copying data into working matrices as is often done in "math packages" is a very error-prone procedure). The SHUFFLE option was designed to operate in a similar fashion when using randomly assigned entry mappings as is needed in bootstrapping.

It originally applied to a few key instructions such as **LINREG**. With Version 11, we have added it to quite a few other instructions, particularly **SSTATS** and **CMOMENT**. These are used in the implementation of the randomized cross-validation used for selecting the tuning parameter for LASSO and Ridge Regression in the Stock-Watson textbook examples. For instance, the authors propose a 10-fold cross-validation, which involves randomly dividing the data into 10 roughly equally-sized subsets, holding back each in turn and fitting the model over the remaining 90% of the sample then evaluating the mean square error over the held-back subsample. The following uses SHUFFLE to do that: the **SET GROUP** divides the sample into 10 roughly equal groups, **BOOT(NOREPLACE)** fully randomizes the order of the entries, then the **CMOMENT** with **SHUFFLE** and SMPL options computes the cross product matrix over the (roughly) 90% of the sample where the GROUP isn't equal to LEFTOUT.

```
set group = %clock(t,10)
boot(noreplace) shuffle
do leftout=1,10
   cmom(center,shuffle=shuffle,$
     smpl=group<>leftout)
    # x cubes interact testscore
```

.etc.

Prices and Ordering

Users with update subscriptions through version 11.0 (or through March 31, 2025 or later if it's on an annual contract) should have already received instructions for installing version 11.0. If you let your subscription lapse, please check with us about renewing it.

Any single user license version 10.1 or earlier (no matter how old) can be updated to version 11 for just $150. You don't need the older software still installed in order to get an update. You do need to have the serial number. If you cannot find your serial number, contact us at sales@estima.com before placing your order.

If you have the standard version of RATS (a WE or MP serial number) you can upgrade to the Professional version for an additional $125. The Pro version gives you the X12 seasonal adjustment capability, as well as support for reading ODBC/SQL, FAME, and CRSP databases. Under Windows, the Pro version also includes a 64-bit executable in addition to the 32-bit—the 64-bit has almost unlimited capacity, and runs somewhat faster than the 32-bit.

If you would like to switch from Windows to Macintosh (or vice versa), there's no additional charge when you are doing a major update like this.

The prices for updating a single-user license for Windows or Macintosh are shown below. Please contact us if you have questions, or need to update multi-user or UNIX/Linux licenses.

	What you want:	
What you have:	11.0 Std	11.0 Pro
RATS Pro (10.1 or earlier)	—	$150
RATS Std (10.1 or earlier)	$150	$275

The direct link for ordering a single user update is

https://estima.com/shopcart/rats_update.shtml

While you're placing your order, you might want to look into ordering one or more of the "e-courses". All of these have proven to be very popular and can be a great help in understanding both the theory and practice of the covered subjects.

If you have a "version" update subscription which expires with version 11, you can re-up through version 12 for just $125:

https://estima.com/shopcart/update_subs.shtml

The RATSletter

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