

Introduction

1.1 Description

‘RATS’ stands for *Regression Analysis of Time-Series*. Although, as the title suggests, the program was initially developed for the estimation of time-series econometric models, recent versions of the software have a wide range of features which would be of use in the analysis of cross-sectional or panel data.

RATS is an econometric modelling package that enables the researcher to transform, analyse and estimate models for actual data, and also to conduct simulations using artificial data created in almost any way he chooses. The advantage of RATS over more traditional programming languages is that you do not have to ‘re-invent the wheel’ since most of the tasks that are of interest will be available by issuing just a couple of commands. Thus, RATS provides a useful bridge between simple but inflexible packages which are entirely menu driven, and full programming languages (such as FORTRAN or C/C++), which would require you to code up even OLS regressions yourself. The advantage of instruction-based programs such as this is that they make it quick and easy to replicate a set of results or to repeat the same analysis using a large number of different series; both would be more troublesome and time-consuming with pure menu-driven packages.

Recent versions of RATS have made the software even more powerful and yet simpler for novices to get to grips with via the use of ‘Wizards’, which will be described in detail below. Over the past 12 years, I have used RATS for much of my empirical research, and have co-authored two software reviews that feature RATS and focus on the estimation of models for volatility – Brooks *et al.* (2001, 2003).¹

¹ See Chapter 8 of this handbook for a discussion of how to estimate such models.

While this book has made use of version 7 of RATS throughout, most of the procedures are also available in older versions of the software. The discussion below assumes that the reader has obtained a licensed version of the package and has loaded it onto a computer. While there are broadly four platforms for RATS (Windows, Mac, UNIX and a command prompt from a PC), this guide assumes throughout that WinRATS, the Windows version, is used. In all three cases, the researcher is required to write a set of instructions and to run them. The interfaces are also similar.

1.2 RATSDATA

RATSDATA is a simple-to-use, menu-based program for handling data. It can be used to import data into files which have a special RATS format with a '.RAT' suffix, and also to export data from RATS to another format or to print or plot variables in the dataset. A principal advantage that previously existed in converting data files to RATS format was the increase in speed of reading and writing the data; now that computers are faster, this hardly matters and many of the features of RATSDATA are incorporated into RATS itself. Hence this book will not use RATSDATA or discuss it further.

1.3 Accomplishing simple tasks in RATS

There are essentially two ways to run programs in RATS: *interactively* or in *batch mode*. To use interactive mode, you write the instructions in the RATS Editor and RATS will execute each line after you have typed it and hit <ENTER>. Using batch mode involves writing all of the commands together and then running them in a single go. Any text editor could be used to write the instructions, including the RATS Editor, and there are also various ways to run them. These will be discussed in detail below.

1.4 Further reading

Readers who wish to learn more about the functionality of the software should consult the *RATS User Guide*, which is a highly detailed but surprisingly readable description of the features and working of RATS, including numerous examples and technical details. Enders' (2003) *RATS Programming Manual* is also useful for those already familiar with the software and who want to enhance their knowledge of how to write RATS programs. Finally, the *RATS Reference Manual* provides an alphabetical listing of all of the instructions and functions available in RATS. All three of

these are distributed electronically with the software and hence should be freely available to all readers.

1.5 Other sources of information and programs

The Estima web site (www.estima.com) provides links to a long list of RATS procedures, which make the implementation of many complex tasks very easy. Some of these procedures will be described in subsequent chapters of this book.

Estima’s site also includes a link to the RATS web-based discussion forum (www.estima.com/forum), where users can post or respond to questions about aspects of the software or programs, and there is also an e-mail-based discussion group, to which users can subscribe and make postings.

1.6 Opening the software

To load RATS from Windows, choose **Start, All Programs, WinRATS 7.0** and again **WinRATS 7.0**. An empty window called ‘NONAME00.TXT{io}’ will be opened. {io} denotes ‘input-output’, i.e. this file is both an input file (for writing instructions and telling RATS what to do) and an output file (for RATS to write the results in). The screen will appear like the one below.

Screenshot 1.1



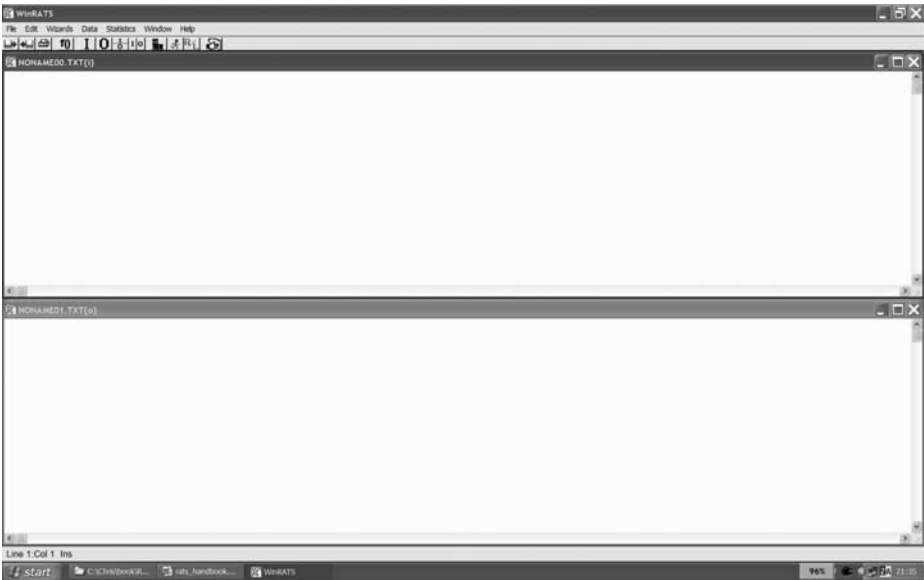
However, it is often desirable to have two separate files open on the screen at the same time – an input file where the program will be written and an output file where the results will be displayed. To achieve this,

click on the **File menu** and choose **New**. A second file will be displayed on the screen called 'NONAME01.TXT'. Go into the **Window menu** and choose '**Use for Output**' – you will notice that the name has changed to 'NONAME01.TXT{o}' as shown on the left-hand side of the file tab. This will be the output file that the results will be placed in. If you look at the first file, the name has now changed to 'NONAME01.TXT{i}' – this is the program file where the commands will be written.













It is a good idea to save the files frequently. With RATS, you must save the input and output files separately (unless of course you do not want to save the output). The way to do this is to go into the **File menu** and choose '**Save As**'. Note that RATS will then be saving in a file the display window that is on the top, which is the output window. Assuming that you want to save the input file instead, click **Cancel** and select the **tab of the input window** underneath. Click '**File**' and '**Save As**' again and **save the open file 'NONAME00.PRG{i,o}' as *XX.prg***. Replace '**XX**' with any file name you consider appropriate. It is usually best to keep file names to a maximum of eight characters.

Finally, to have a nice window display so that you can see both the input and output files at the same time, click on the $\frac{I}{O}$ button. This is equivalent to going to the **Window menu** and choosing '**Tile Horizontal**' rather than '**Tile Vertical**'. The former will put the input window above the output window, while the latter will put the input window on the left and the output window on the right. The screen should now appear as shown below.

Screenshot 1.2



The 12 icons (buttons) that appear near the top of the window by default have the following functions (which are also available by clicking on the appropriate menu item):

-  Open file
-  Save file
-  Print the contents of the active window (the window on top)
-  Function look-up, which opens up the functions wizard
-  Use this window for input
-  Use this window for output
-  Tile windows horizontally (one below another)
-  Tile windows vertically (side by side)
-  Edit – select all
-  (RUNNING PERSON) Runs the selected instructions, or the instruction on the cursor line, if any (equivalent to hitting <ENTER>). Disabled if the active window is not the input window.
-  Ready/Local (R/L) – this is a toggle switch. Clicking on this icon switches RATS from Ready to Local (L/R) mode and clicking again would switch RATS back to (R/L). Instructions are keyed in when RATS is in local mode, and clicking on the L/R button will then enable the program to be run by clicking on the RUNNING PERSON. The RUNNING PERSON button is unavailable when RATS is in local mode. The R/L button is disabled if the active window is not the input window.
-  Clear program – this clears the memory.

1.7 Types of RATS files

The convention is to name program files (that is, files containing RATS instructions) with the extension ‘.PRG’ or, less commonly, ‘.RTS’ and the output files with the extension ‘.OUT’. It is usually best to follow this convention so that the file type is obvious from the extension. In the RATS directory, there are also files with the extension ‘.SRC’. These are special pre-programmed sets of instructions, known as *RATS procedures*, which can

be called from within a program file to do certain tasks (e.g. testing for a unit root), rather like sub-routines in a programming language. Note that both input and output files are always saved as raw text (i.e. *ASCII format*), whatever they are called.

1.8 Reading (loading) data in RATS

Before performing any formal analysis, the data must be loaded into the software. Suppose that the data consist of monthly observations on Vodafone's Share Price (Vodafone) and the FTSE All Share Price Index (FTALL) from November 1984 to February 2007. Suppose also that the data file is in ASCII (i.e. raw text) format, has two columns of length 268 observations and is called THEDATA.DAT (initially saved in the WinRATS Directory).

The CALENDAR instruction will be the one that will read in the data. In previous versions of RATS, it was necessary to type these instructions manually in an editor, but now the Data Entry Wizard can be employed to do the job. The following example will show how to achieve that but first, various usages of CALENDAR are highlighted. The basic structure is CALENDAR(frequency) start date e.g.

```
CALENDAR(M) 1998:4
```

would be used for monthly data starting in April 1998;

```
CALENDAR(Q) 1980:1
```

would be used for quarterly data starting in quarter 1, 1980;

```
CALENDAR(7) 2002:8:16
```

would be used for daily data with 7 days per week starting on 16 August 2002;

```
CALENDAR(A) 1985:1
```

would be used for annual data starting in 1985. With annual data, the number after the colon must always be 1.

Note that this command, like most others in RATS, can be abbreviated to its first three letters, CAL, or the whole command can be used.

The ALLOCATE command works with CALENDAR and tells RATS when the sample period finishes. For example,

```
ALLOCATE 1999:10
```

would be used for data finishing in October 1999;

```
ALLOCATE 2007:10:30
```

would be used for data finishing on 30 October 2007.

Note that it is also possible to use numbers rather than dates with the ALLOCATE command. For example, if the series in the data file each contained 180 observations, it would be possible to use

```
ALLOCATE 180
```

Now that the arrays to store the data have been established with the CALENDAR and ALLOCATE instructions, the OPEN command can be used to open a new or existing file. For example

```
OPEN DATA C:\WINRATS\THEDATA.DAT  
DATA(FORMAT=FREE,ORG=OBS) / VODAFONE FTALL
```

In this case, RATS opens the data file THEDATA.DAT that has been saved in the WINRATS directory on the C drive. Note that if the data file is saved elsewhere, you would have to specify the correct path, e.g. for data on a pen drive attached to a USB port that was named E:\

```
OPEN DATA E:\THEDATA.DAT
```

DATA reads data series from an external file into the working memory. The general 'syntax' (form of the command) is

```
DATA(options) start end list of series
```

where '*start end*' is the range of entries to read and '*list of series*' is the list of series names for RATS to read from the file. The following options are available on how the data are arranged in the file:

ORG=[VAR]/OBS: this tells whether the data are blocked horizontally by series – i.e. in rows (ORG=VAR) – or by observations – i.e. in columns (ORG=OBS). Note that the term appearing in square brackets is always the default.

Organised by Observation implies that the series appear in separate columns:

X1	X2
100.0	405.0
105.3	905.2
103.9	630.1
206.7	890.2
200.1	332.2

Organised by Variable implies that the series occur one at a time in blocks:

X1	100.0	105.3	103.9	206.7	200.1
X2	405.0	905.2	630.1	890.2	332.2

FORMAT=[FREE]/PRN/WKS/DBF/RATS/XLS '(FORTRAN Format)'

This tells RATS which format to use for your data set. For instance, if your data are in an ASCII (text) file, then you would use FREE and if your data are in a Lotus worksheet, use WKS, Microsoft Excel (XLS), etc. For text-based files, RATS assumes that there are no series labels (e.g. X1 or X2), so that the data file contains only data and no strings of row or column headers.

Putting this all together, the four lines of code below will load the data and assign the name VODAFONE to the first column of observations and FTALL to the second for monthly data starting in November 1984 and finishing in February 2007.

```
CALENDAR(M) 1984:11
ALLOCATE 2007:02
OPEN DATA C:\WINRATS\THEDATA.DAT
DATA(FORMAT=FREE,ORG=OBS) / VODAFONE FTALL
```

1.9 Reading in data on UK house prices

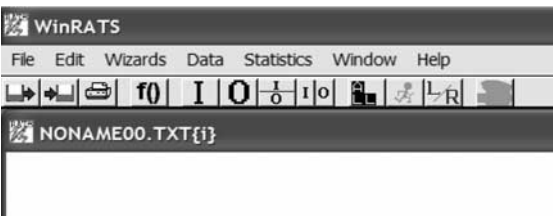
Open RATS version 7 and click File, New. Then click on the 'I' icon (I) to use this as the input window, so that the other window will become that to receive the output. Next, tile the windows horizontally by clicking the 'I|O' icon. It is probably easier to be able to write several lines of code and then to run them in a batch rather than allowing RATS to run each line after we hit <ENTER>. Your screen should probably look like the one in Screenshot 1.3.

Screenshot 1.3



Note in particular that the ‘R/L’ button has R first and the running man icon is in darkened blue typeface on the screen. This means that RATS is in ‘ready’ or ‘run’ mode and will run instructions line by line. To switch this off, click the ‘R/L’ button. This will switch RATS to ‘local’ mode, where R/L will become L/R and the running man will be in grey, denoting that this button is now not operational. The top left part of the screen will now appear as

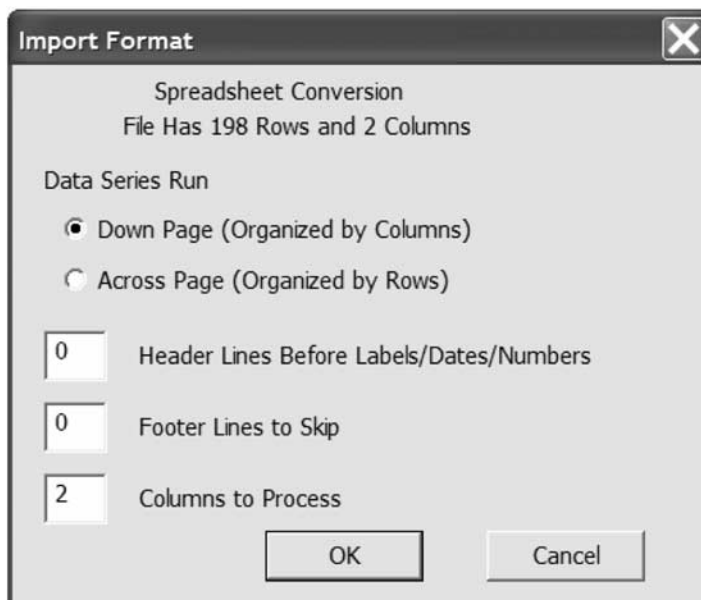
Screenshot 1.4



RATS is now in a position to be able to write a set of instructions together and then they will be run in a batch.

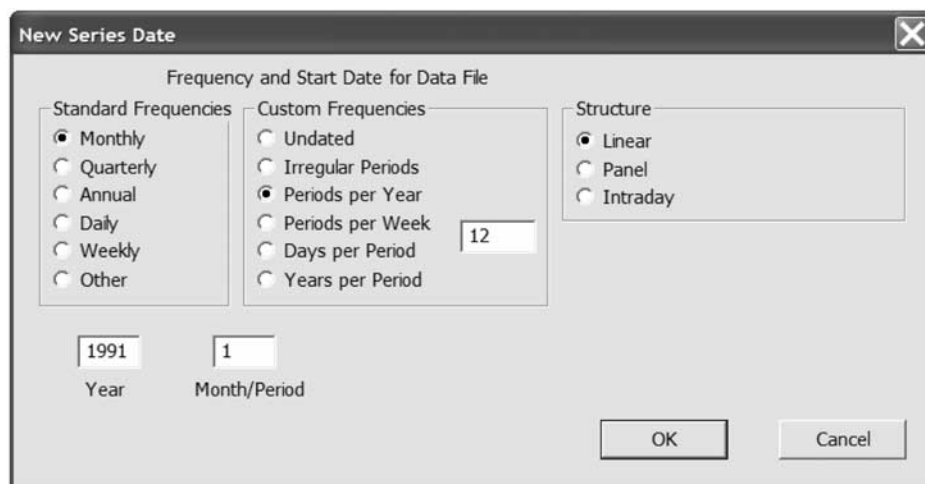
The first task is to read in (import) a series of UK average house prices from a Microsoft Excel spreadsheet called ‘UKHPR.XLS’. There are 197 monthly observations running from January 1991 to May 2007. From inside RATS, click on **Data** and then **Data (Other Formats)**. You will then be asked to find the directory that the file has been placed in and the name of the file. Make sure you **change the file type** from ‘Text Files (*.*)’ to ‘Excel Files(*.XLS)’. Once you have done this, click **Open** and the ‘Import Format’ Screenshot 1.5 will be observed.

Screenshot 1.5



RATS has peeked inside the file and determined how the data are organised. Usually, it will do this correctly, but just to check: the data are indeed organised in columns and there are two columns of data to process (including the dates column). There are no header lines before the series labels and no footer lines, so click OK. Then the 'New Series Date' window will appear.

Screenshot 1.6



RATS has again peeked inside the file and correctly identified that we have monthly time-series data, so verify again that the window is