Time Series Analysis for the Social Sciences: Software Appendix

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Software for Time Series Analysis

There are a number of packages available for time series analysis. It is a good development for the field that more packages routinely incorporate functionality for time series and that the options available have greatly advanced in the last five years or so. Prior to that, only specialized time series software allowed one to implement recent statistical advances. We briefly discuss these software packages below.

1 STATA

The software package STATA (http://www.stata.com/, Stata Corporation, College Station, TX) is a comprehensive statistical package widely used in social science. The time series capabilities have recently been greatly expanded such that one can easily teach a social science time series course and have students use Stata for all the assignments. A plus then is that there is great familiarity with STATA in the social science community. STATA supports both univariate and multivariate time series analyses such as ARIMA, ARCH, GARCH, VAR, VECM, handles and displays high frequency data and provides a series of diagnostics and tests including correlograms, periodograms, white-noise tests, unit root and fractional integration tests. STATA comes in 4 different "flavors" which differ in the data size that each can analyze. STATA is available for Windows, Macintosh and UNIX systems. Virtually all of the examples in this book were computed in STATA. Data and STATA replication code available at: http://politicalscience.osu.edu/faculty/jbox/tsass.

2 RATS

RATS (http://www.estima.com/, Estima, Evanston, IL) stands Regression Analysis of Time Series and is a comprehensive time series analysis package. RATS provides a range of time series procedures including ARIMA models with multiplicative seasonal models, intervention models, ARCH, GARCH, VARs, impulse responses, ECMs. It has both a point and click interface and command driven programming. Its high quality graphs are one of RATS strengths. Optional add-ons are also available including CATS (cointegration analysis) and X11 (seasonal adjustment routines and database support). RATS is available for Windows, Macintosh, UNIX and Linux systems. This

package used to dominate the time series analysis market, but there are serious rivals now. RATS still is a program of choice for many when implementing new procedures and the helpfulness of Estima is a big plus.

3   R

R (http://www.r-project.org/, R Foundation for Statistical Computing, Vienna, Austria) is a programming language and environment for statistical computations and graphics. It provides a wide variety of statistical techniques and is readily extendable. Users can download "packages" written by various authors or write their own packages and make them available to the community. There are many "ready-made" time series packages including timsac (TIMe Series Analysis and Control package), tseriesChaos (Analysis of nonlinear time series), vars (VAR Modelling), and MSBVAR (Markov-Switching Bayesian Vector Autoregression Models). R can produce publication quality graphs including mathematical symbols and formulae and is available for free of charge. It runs on UNIX, Linux, Windows and Mac.

3.1   MSBVAR

MSBVAR is an R package written by Patrick T. Brandt (assistant professor of political science, University of Texas, Dallas) and available at http://www.utdallas.edu/ pbrandt/. MSBVAR supports both frequentiest and Bayesian VAR models and provides methods for the generating posterior inferences for VAR forecasts, impulse responses and forecast error decompositions. It also includes utility functions for plotting forecasts and impulse responses, and generating draws from Wishart distribution and singular multivariate normal densities.

4   Ox with TSM

TSM (http://www.timeseriesmodelling.com/) is a comprehensive package for linear and nonlinear time series modeling developed by James Davison (professor of econometrics, University of Exter). It estimates and forecasts basic time series models (ARIMA, ARFIMA, GARCH and its variants, bilinear, Markov-switching and smooth transition models), dynamic models (VARs, simultaneous systems, error correction systems, multivariate GARCH and regime switching), and others (nonparametric, log-periodogram, regressions, cointegration analysis). It also allows flexible combinations and simulations of these models. TSM also provides a comprehensive set of diagnostic tools and tests. The program comes with a platform-independent graphical user interface and comprehensive graphics capabilities. Alternatively, TSM can be called from a user's Ox program and return the results to the console or a text file. Davidson's responsiveness and helpfulness is a big plus for the program.

While TSM runs under Jurgen Doornik's Ox 4 programming system, knowledge of Ox (http://www.doornik.com) is not a requirement. Ox Console is freeware for academic teaching and research purposes.

5 EVIEWS

EVIEWS (http://www.eviews.com/, Quantitative Micro Software, Irvine, CA) is a Windows based econometric and forecasting software and features easy to use, user friendly interface. It supports most of the time series and forecasting models including ARIMA, ARCH/GARCH, VAR, VEC and multivariate ARCH with a full series of tests and optional functions. Its graphics are particularly good.

6 TSP

TSP - "Time Series Processor" (http://www.tspintl.com/, TSP International, Palo Alto, CA) is a language for the estimation and simulation of econometric models primarily developed by economists. It allows easy input of commands and data, and supports most of time series models, including Box Jenkins methods, Kalman Filter, ARCH/GARCH varieties, VAR and Cointegration analysis. TSP offers a choice between interactive use and full programming language for econometric methods development. It also features extensive diagnostics and testing facilities.

7 SPSS

SPSS (http://www.spss.com/, SPSS Inc., Chicago, IL) is a widely used statistical software. While it provides basic regression models, SPSS base does not support many time series models. For time series models and forecasts, users need to purchase optional add-on software, SPSS Trends and it is still quite limited. The newest version of SPSS base, SPSS 16.0, features the SPSS Programmability Extension which allows users to access the statistical routines created in R and use them within SPSS. SPSS is available in multiple languages and runs in Linux, Windows and Mac systems.

8 SAS

SAS (http://www.sas.com/, SAS Institute Inc., Cary, NC) is a complete statistical program geared toward more business oriented analysis such as forecasting. SAS offers a broad array of time series, forecasting and more general econometric techniques. Especially, it provides graphical and analytical explorations of data, the point and click time series forecasting system, and extensive array of time series forecasting methods. It can be useful for users without extensive knowledge about time series analysis, as it can automatically generate time series forecasting models and detect and adjust for outliers.

9 SHAZAM

SHAZAM (http://econometrics.com/, Northwest Econometrics Ltd., Gibsons, British Columbia, Canada) the primary strength of SHAZAM is for the estimation and testing of many types of regression models, but it can also estimate some time series models, such as ARIMA, ARCH/GARCH

models. The SHAZAM command language is flexible and provides capabilities for programming procedures. SHAZAM provides an interface to GNUPLOT (http://www.gnuplot.info/) to produce high quality graphics.

10 Maple

Maple (http://www.maplesoft.com/, Maplesoft, Waterloo, Ontario, Canada) is a mathematical tool for researchers in any technical discipline. It lets users explore, visualize, and solve even the most complex mathematical problems, and provides greater insight into the math and help to reduce errors. For the time series analysis, Maple can solve complicated difference equations.

11 Mathematica

Mathematica (http://www.wolfram.com/products/mathematica/index.html, Wolfram Research Inc., Champaign, IL) has been recognized as one of the most powerful mathematical software system. Mathematica has steadily grown in breadth and depth to include functions such as numerical computations, information visualization, and statistics.

12 Matlab

MATLAB (http://www.mathworks.com/products/matlab/, The MathWorks Inc., Natick, MA) is a high-level language and interactive environment that enables users to perform computationally intensive tasks faster than with traditional programming languages such as C, C++, and Fortran. MATLAB also allows a number of features for documenting and sharing one's work. For instance, users can integrate MATLAB code with other languages and applications, and distribute MATLAB algorithms and applications.