Chapter 1
INTRODUCTION

TSP is a general purpose computer language for econometric and statistical data processing and estimation. The program can be used for any of the following tasks:

Applied econometrics, including teaching
Macroeconomic research and forecasting
Sales forecasting
Financial analysis
Cost analysis and forecasting
Monte Carlo simulation
Estimation and simulation of economic models

Currently, TSP is installed on thousands of computers worldwide -- from small stand-alone personal computers to large mainframes and shared systems. Although TSP was originally and continues to be developed primarily by economists, there is nothing in its design limiting it to economic time series. Any data consisting of repeated observations of the same variable for different units may be analyzed with TSP.

The basic data object within TSP is the series. Each series has a name, and you can request operations on all the observations just by mentioning the name of the series. TSP provides convenient ways to enter series, to create new series from existing ones, to display and print series, and to carry out statistical analysis of the relations among series.

Some of the most important TSP features are:

- Both data and commands are entered in free format.
- Data can be transformed by convenient algebraic statements.
- Leads and lags are specified in a natural way.
- There are few restrictions on the order of the operations in a run.
- The output from one statistical procedure can easily be used as the input to another.
- All standard econometric techniques are available in an accurate and efficient form: ordinary least squares, two-stage least squares (instrumental variables), limited information maximum likelihood (LIML), polynomial and Shiller distributed lags, autoregressive correction, and weighted least squares.
- Advanced techniques are available, including nonlinear least squares, estimation of GARCH models, Box-Jenkins estimation, multivariate regression, three stage least squares, GMM, full information maximum likelihood, estimation with qualitative dependent variables, programmable maximum likelihood, and solution of linear and nonlinear models.
- A full set of matrix operations and the analytic differentiation procedures makes it possible for you to program your own estimators easily.
- Panel and cross-section data sets can be handled by TSP as easily as time series. (Some users have gone as far as 1 million observations or more.)

TSP is a large software system and econometric language with many features, and it is not possible or desirable to learn them all at once. This manual is intended to provide an introduction to TSP and its most commonly used features. It does not describe all of the procedures, nor indicate the full power of the program as a language. For detailed information on each TSP command and complete references to the econometric and statistical literature, consult the *TSP Reference Manual*, available where you obtained this manual or from the address at the front of this manual. For more

complex examples and solutions for special problems, see the TSP examples page on the TSP International web site *(http://www.tspintl.com)*. This web site also documents the very latest features of the programs, as well as any known bugs and work arounds.

You may find it helpful to know a little about how this guide is organized. The guide is divided into 4 major sections plus appendices:

Section I: Chapters 1 - 4

Section I covers the basics of TSP. Chapter 2 proceeds on the assumption that you are a complete TSP novice. We introduce some of the most basic ideas of TSP and show you the input and the output for a simple but complete TSP job. Chapter 3 covers the fundamental concepts of TSP in a more thorough way and concludes with a more elaborate example. This example is also included on the installation diskettes, under the name illus44.tsp.

If you are using this program on a personal computer, there are two different ways to work: with a batch input file that you edit before running the program, or in an interactive mode. Chapter 4 introduces the basics ofworking in interactive mode. For working in batch mode, a companion program, *TSP through the Looking Glass* (TLG), provides an interface with all the standard Windows file handling and editing features. You can read more about TLG in Chapter 2, and in the TLG documentation that is included on the installation diskettes.

Section II: Chapters 5 - 6

Section II, entitled Linear Estimation, describes the most commonly used features of the program, such as linear regression models, and printing and plotting the data. Methods discussed include ordinary least squares, two stage least squares (instrumental variables), and obtaining simple statistics on your variables.

Section III: Chapters 7 - 10

In Section III, we present the powerful and extensive range of tools in TSP for nonlinear estimation. Methods covered include nonlinear single and multi-equation least squares, general maximum likelihood, GMM, and qualitative dependent variable models (Probit, Multinomial Logit, Tobit, and sample selection). TSP's nonlinear estimation methods are generally iterative and make use of program-generated analytic gradients of the objective function, which are more accurate and faster than numeric gradients. Section III also discusses hypothesis testing and TSP's flexible equation manipulation system.

Section IV: Chapters 11 - 16

Section IV discusses a series of more specialized and advanced procedures. These include Box-Jenkins (ARIMA) procedures, GARCH estimation, the Kalman filter, VAR estimation, cointegration testing, forecasting and model simulation, matrix computations and controlling the order of execution of your program. This section also treats the storage, reading, and writing of large amounts of data.

Section V: Appendices

The first few appendices give the basic syntax rules of TSP, a complete list of commands and their syntax. These are followed by specific instructions for using TSP on various platforms, such as DOS/Window PC's, Apple Macintosh, and unix.