



Two-Day Seminar from Sierra Information Services

# Analyzing and Forecasting Time Series Data with the SAS® System

*This two-day seminar equips you with the practical and statistical skills to apply a variety of SAS/ETS® software tools that create effective analyses and forecasts of your time series data.*

After taking this seminar you will be able to:

- Understand how SAS works with date and time data, and how to prepare your time series values for analysis by SAS/ETS module procedures
- “Clean up” your time series data with PROC EXPAND
- Understand the concept of autocorrelation in a time series and how to assess it using SAS/ETS procedures
- Use PROC FORECAST to generate seasonal, exponential smoothing and stepwise autoregressive models
- Create Box-Jenkins models using PROC ARIMA
- Apply the Time Series Forecasting System in SAS/ETS to generate automatic forecasts from your time series data
- Assess the need to address non-stationary series mean and other problems with your time series BEFORE starting a forecasting project.

## Overview

This two-day session is designed to teach you the core principles of forecasting time series data using SAS/ETS and BASE SAS software tools. By attending this class you will learn how to prepare your data for analysis by statistical forecasting tools, select a “best” forecast from many possible forecasts, and understand key terms such as stationarity, autocorrelation, realization, and “white noise.”

## Audience

The materials presented in assume you a working knowledge of basic SAS programming concepts such as data set, procedure step, variable, observation, format and function. In order to get the most value from this class you should also understand statistical concepts such as slope, intercept, confidence interval, parameter and -p-value. Attendees receive about 500 printed Power Point slide images of the course notes, including code examples and output, as well as a CD with example data sets, code samples and other materials for further self-study

## Seminar Topics

### Getting Ready for Time Series Analysis and Forecasting Using SAS

- Date and Time Variables in the SAS System
- Using PROC EXPAND to Prepare Your Time Series for Analysis
  - Using ODS Statistical Graphics with PROC EXPAND
- Looking at Your Time Series with PROCs PLOT and TIMEPLOT

### Key Terms and Concepts for Time Series Analysis

- Process, Realization, Sampling Frequency and Periodicity
- Stationary vs. Non-Stationary Mean, Differencing, Unit Root Tests
- Random-Walk Models, Trend and Seasonality, Intervention Model
- Moving Average, Exponential Smoothing, Autocorrelation

### Forecasting with PROC FORECAST

- Implementing Autoregressive, Exponential Smoothing and Seasonal Models
- Which Modeling Method is Appropriate to Which Types of Time Series?
- Assessing Model “Fit” to the Historical Time Series
- Working with PROC FORECAST’s Output Data Sets

### Using the SAS/ETS® Time Series Forecasting System

- Automating the Selection of a “Best” Model
- Understanding the Output Generated by the TSFS
- Comparing Competing Models Created by the TSFS
- Using TSFS Output in Other Parts of Your Project

### A Brief Look at Seasonal Decomposition and Modeling Using PROCs X11 & X12

- How to Implement Analysis of Seasonal Data Using PROCs X11 and X12
- Understanding and Using Data Sets Created by PROC X11 and X12
  - Using ODS Statistical Graphics with PROCs X11 and X12

### Using PROC ARIMA

- The Box-Jenkins Approach to Time Series Analysis
- Model Identification, Estimation and Forecasting
- Model Diagnostics and Generating Forecasts in PROC ARIMA
- Implementing Intervention and Transfer Function Models in PROC ARIMA
  - Using ODS Statistical Graphics with PROC ARIMA

**Contact Sierra Information Services For More Information:**

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## About the Instructor

This seminar is written and presented by Andrew Karp, who started his own SAS Software consulting and training firm, Sierra Information Services, in 1994. Prior to starting Sierra he used SAS Software to manage and analyze data while holding positions with PriceWaterhouseCoopers, Federal Express Corporation, Pacific Gas & Electric Company and Kaiser Foundation Health Plan. A 25-year SAS user, Andrew is a SAS Certified Profesional™ who has presented this, and other, training seminars to SAS users in the United States, England, Scotland, Belgium, Australia, New Zealand and the People's Republic of China.

He has served on the technical review teams for seven books published by SAS Institute and has been an invited speaker at twelve consecutive SGF/SUGI conferences, as well as other events for SAS users in seven countries. Andrew earned undergraduate and graduate degrees from The George Washington University and taught SAS classes for UC Berkeley's Extension Division from 1989 to 1995. He has also been a visiting lecturer in the Dept. of Experimental Statistics at Louisiana State University and at the University of Auckland in New Zealand.

## About Sierra Information Services

**Sierra Information Services is a leading independent provider of SAS Software consulting and training services.** Our firm is based in the California Wine Country region north of San Francisco but **travel** both domestically and internationally to **work with clients and present training seminars.** **Sierra offers** clients a **wide range of support**, including **SAS programming**, data **analysis/data mining** with SAS tools, as well as the **design and delivery of customized SAS Software training solutions tailored to the client's** individual needs. Since its inception in 1994 Sierra has provided consulting and/or training services to, among others, Wells Fargo Bank, Bear Creek Corporation, Limited Brands, IBM, American Honda Motor Company, Lloyd's Bank/TSB, Omnium Worldwide, Capital One Financial Services, Inc., Discover Financial Services, Inc., the US Department of Commerce and the US Federal Communications Commission. We have also provided consulting and training for **numerous public and private sector** entities in the United Kingdom, Belgium, Australia and New Zealand,

In addition to training solutions developed by Sierra's founder, Andrew Karp (see instructor's bio above), Sierra also works with other leading SAS experts to offer their training seminars around the United States. Sierra is proud to have well-known experts such as Art Carpenter, Michael Raitchel, Dr. Paul Allison, and David Cassell present their training seminars under our auspices.

For the most current list of our public seminars, or to learn more about how Sierra can assist you and your organization, please visit our web site at [www.SierraInformation.com](http://www.SierraInformation.com) or call us at (707) 360 5383. We look forward to hearing from you soon!



*...Maximizing your investment in the SAS® System...  
and those in your organization who use it...*

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