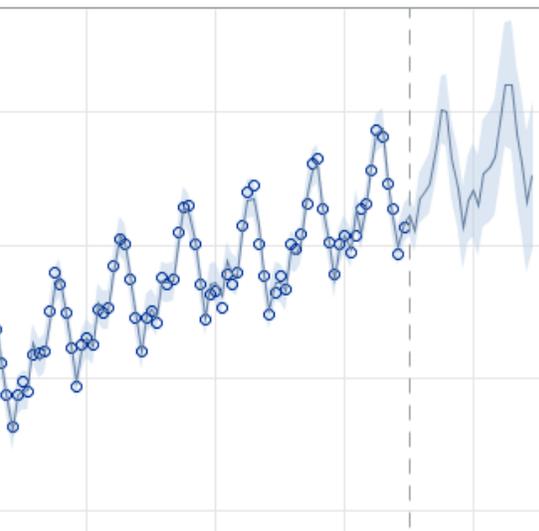


SAS/ETS® Software

Model, forecast and simulate processes with econometric and time series analysis



Forecasts for xlog



Measuring the impact of economic and marketplace factors, and getting a view of the future, are key elements for successful planning. You must be able to model and simulate any business process, and the factors that affect those processes - no matter how complex.

SAS/ETS software provides a wide range of integrated capabilities for econometrics and systems modeling, time series analysis, forecasting and financial analysis with direct access to commercial financial databases.

Factors that affect your business - such as the economy, market conditions, customer demographics and marketing activities - can be identified, quantified and included in your forecasting and planning processes to improve results.

What does SAS/ETS® software do?

SAS/ETS offers a broad array of econometric, time series and forecasting techniques so you can model, forecast and simulate business processes on observational data for improved strategic and tactical planning. High-performance econometric procedures take advantage of all available threads on a single machine for faster processing.

Why is SAS/ETS® software important?

SAS/ETS equips you to address difficult, real-life questions by providing techniques to model complex business scenarios and analyze the dynamic impact that specific events might have over time. It can help you understand the impact of factors such as economic and market conditions, customer demographics, pricing decisions and marketing activity have on your business. Forecasting processes can help organizations be more proactive and shape their destinies toward a profitable future.

For whom is SAS/ETS® software designed?

It's designed for econometricians, forecasters and high-end data analysts responsible for or supplying information to business planning processes and decisions. Users also include analysts responsible for supporting a planning process, or the manager of that process.

Key Benefits

- Analyze the impact of promotions and events.** Determine the effectiveness of promotions and events so you can better allocate marketing dollars in the future. Advanced time series analysis, time series forecasting and econometric capabilities offer a variety of ways to gauge promotional lift. And the SAS modeling environment has the depth and flexibility to accommodate any business scenario.
- Model customer choices and price elasticities.** Get the most out of your marketing efforts by understanding which product features appeal to a particular audience. Modeling customer choices based on their attributes helps improve strategy by predicting customer decisions. Adjust marketing strategies or fees to target the right population.
- Measure and predict marketing investment activities.** Understand which key business drivers are affecting consumer demand. Model demand based on marketing or media mix activities that measure the impact of different activities. Use simulation and optimization tools to make investments that will drive profitable volume growth.
- Make better staffing decisions.** Forecast demand for services so you can allocate staff resources appropriately. Seasonal fluctuations and trends can be automatically accounted for, and the best method is selected for generating the demand forecasts. Efficient staff allocations enable you to meet customer needs with no wasted resources.
- Model risk factors and predict economic outcomes.** Copula methods and compound distribution modeling let you model multivariate dimensions of risk factors. This is valuable when you have to model many correlated risk factors that are non-normally distributed. SAS/ETS can fit probability distributions for the severity (magnitude) of random events, such as the distribution of insurance claims.

Overview

SAS/ETS software provides econometric, time series and forecasting techniques so you can model, forecast and simulate business processes for improved strategic and tactical planning. It includes techniques for modeling complex business scenarios and analyzing the dynamic effect that specific events might have on your organization over time.

Econometric analysis

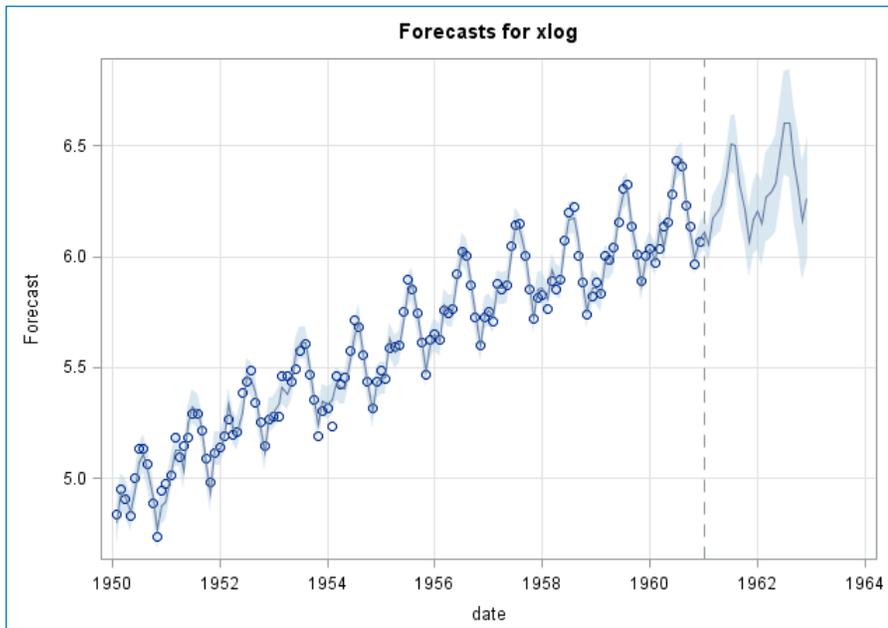
Econometric analysis is the application of statistical techniques to “economic” problems. SAS/ETS includes many econometric analysis capabilities, ranging from linear and nonlinear modeling of simultaneous equations to discrete choice models. SAS/ETS provides techniques for analysis of small data sets, limited and discrete dependent variables, and sample selection bias – all common problems in the real world.

High-performance econometrics

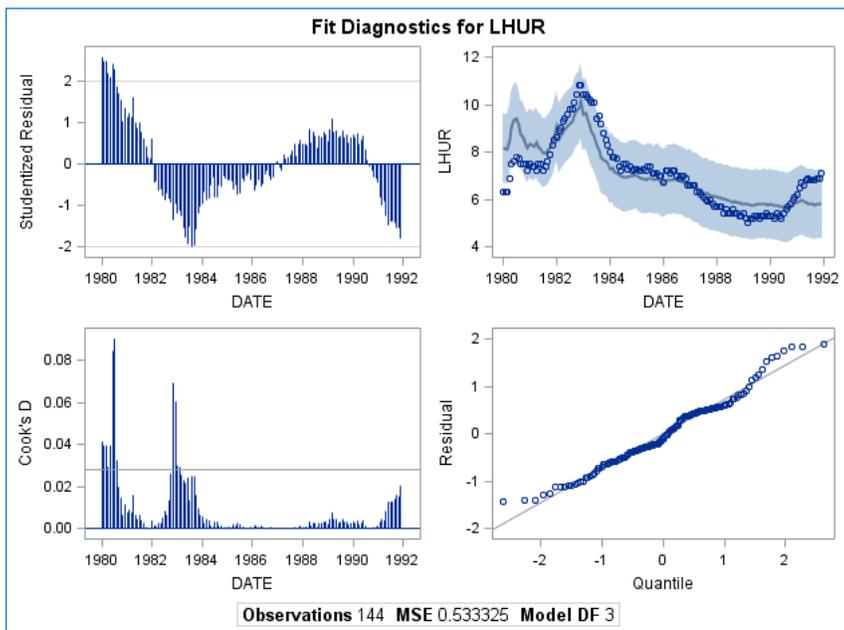
A number of high-performance econometric procedures take advantage of all the threads available on a single machine. These new procedures allow for estimation of models on increasingly large data sets as well as estimation of computationally difficult problems. SAS/ETS provides high-performance procedures for loss modeling, count data regression models, compound distribution models, Copula simulation models, panel regression models, and censored and truncated regression models. The censored and truncated models also allow for Bayesian estimation.

Explore time-stamped data for insight

By providing graphical and analytical exploration capabilities for time-recorded data, SAS/ETS software helps you uncover and quantify previously undetected trends. Time-stamped data can be decomposed into separate subcomponents – trend, seasonal and “unexplained” components – so you can understand and diagnose what is happening over time and what is expected to happen in the future. Time series decomposition can be performed using classical decomposition, unobserved components models, or the X11-ARIMA and X12-ARIMA methods developed and popularized by the US Census Bureau and Statistics Canada.



SAS/ETS can automatically select the most appropriate method for generating forecasts.



Trend analysis: SAS/ETS produces default diagnostic plots for the MODEL procedure.

Forecasting methods

SAS/ETS provides analysts with the broadest array of methods to suit any forecasting problem. The forecasting capabilities in SAS/ETS can be accessed either through SAS procedures or from the interactive Time Series Forecasting System user interface. SAS/ETS contains popular forecasting methods such as regression, unobserved components models, trend extrapolation, exponential smoothing, Winters' method, ARIMA (Box-Jenkins), and dynamic or transfer function models. For forecasting multiple time series jointly, SAS provides VARMAX and general state space models.

Singular spectrum analysis

Singular spectrum analysis (SSA) is a technique for decomposing a time series into additive components and categorizing these components based on the magnitudes of their contributions. SSA uses a single parameter, the window length, to quantify patterns in a time series without relying on preconceived notions about the structure of the time series. Both similarity analysis and singular spectrum analysis are exploratory tools for large numbers of time series with unknown structure.

Similarity analysis for sets of time series

SAS/ETS computes similarity measures for time-stamped transactional data (transactions) with respect to time by accumulating the data into a time series format, and it computes similarity measures for sequentially ordered numeric data (sequences) by respecting the ordering of the data. It also provides similarity measures that “slide” the target sequence with respect to the input sequence. The “slides” can be by observation index (sliding-sequence similarity measures) or by seasonal index (seasonal-sliding-sequence similarity measures). Similarity analysis results are useful for large-scale time series analysis, analogous time series forecasting, new product forecasting or time series (temporal) data mining.

Modeling severity of events

You can now fit models for statistical distributions of the severity (magnitude) of events, such as insurance loss payments or intermittent demand for products. A set of predefined models for commonly used distributions (Burr, exponential, gamma, inverse Gaussian, lognormal, Pareto, generalized Pareto and Weibull) is included, and can be extended to fit any continuous parametric distributions.

Simulation for strategic forecasting and planning

For strategic planning, SAS/ETS provides a variety of means for modeling business processes within what-if and Monte Carlo simulation analyses. Complex systems and processes can be simulated and a variety of

Key Features

Econometric analysis

- Regression with correction for autocorrelated errors.
- Fitting, analyzing and simulation for simultaneous systems of linear and nonlinear regression models.
- Multinomial discrete choice analysis.
- What-if, Monte Carlo simulation.
- Time series cross-sectional analysis.
- Support for multivariate Bayesian econometric models.
- Qualitative and limited dependent variable models with endogenous explanatory variables.
- Spatial econometric models for cross-sectional data where observations are spatially referenced or georeferenced.

High-performance econometrics

- Procedures enabled for high-performance in a single-server SMP environment:
 - HPCOUNTREG for high-performance count regression.
 - HPSEVERITY for high-performance loss distribution/severity.
 - HPQLIM for high-performance qualitative and limited independent variable models.
 - HPCDM for high-performance compound distribution modeling.
 - HPCOPULA for high-performance Copula simulation.
 - HPPANEL for high-performance panel data models.
- The TMODEL procedure (experimental) incorporates high-performance computing techniques and offers new features that enhance the functionality of PROC MODEL

Full range of forecasting, time series and exploratory methods

- Trend extrapolation; exponential smoothing; Winters' method (additive and multiplicative); ARIMA (Box-Jenkins).
- Structural time series models or unobserved components models.
- Dynamic regression or transfer function models.
- Joint forecasting of multiple time series using vector time series analysis and general state space models.
- Automatic outlier and event detection.
- Time series decomposition and seasonal adjustment.
- Spectral and cross-spectral analysis for finding periodicities or cyclical patterns in data.
- Singular spectrum analysis.
- Similarity analysis for sets of time series.
- Estimate model parameters and simulate random data from fitted Copula distributions.
- Fits loss distribution models for the severity (magnitude) of events.

State space modeling

- Linear state space modeling and forecasting of time series and longitudinal data.
- Enhanced capabilities for analyzing panel data.

Time series data management and preparation

- Conversion of time series from one sampling frequency to another.
- Interpolation of missing values.
- Aggregation of time-stamped transactional data into time series.
- More than 100 time series transformation operations.
- Custom time intervals (functionality provided in Base SAS).

scenarios can be tested, giving you a safe means for evaluating and fine-tuning proposed policies before actually putting them into practice.

State space modeling

A state space modeling language makes it easy to define very complex models. It can fit state space models for irregularly spaced data, even with replicate measurements for time points, and for longitudinal data where different subjects are measured repeatedly but at different times. Models for panel data can also be specified easily.

Data management and preparation

SAS/ETS software provides special data management capabilities for time-recorded data. Data coming from transactional systems, which is typically recorded without regard to a particular time frequency, can be aggregated to form a time series of equally spaced observations (one for each time period) for subsequent analysis. Any time series frequency can be calculated from the same transactional data. Data can also be converted from one time frequency to another. Automatic outlier and intervention (or event) detection are provided in many procedures, and several options are available for specifying how missing values are to be interpreted or replaced.

Specialized access to commercial and government databases

It's easy to access commercially available economic and financial time series data with SAS/ETS software. Data can be extracted directly from files supplied by government and commercial data vendors and then converted to SAS data sets. Time series data can be extracted from commercial data vendors, US government data, international agencies and organizations such as the Center for Research in Security Prices.

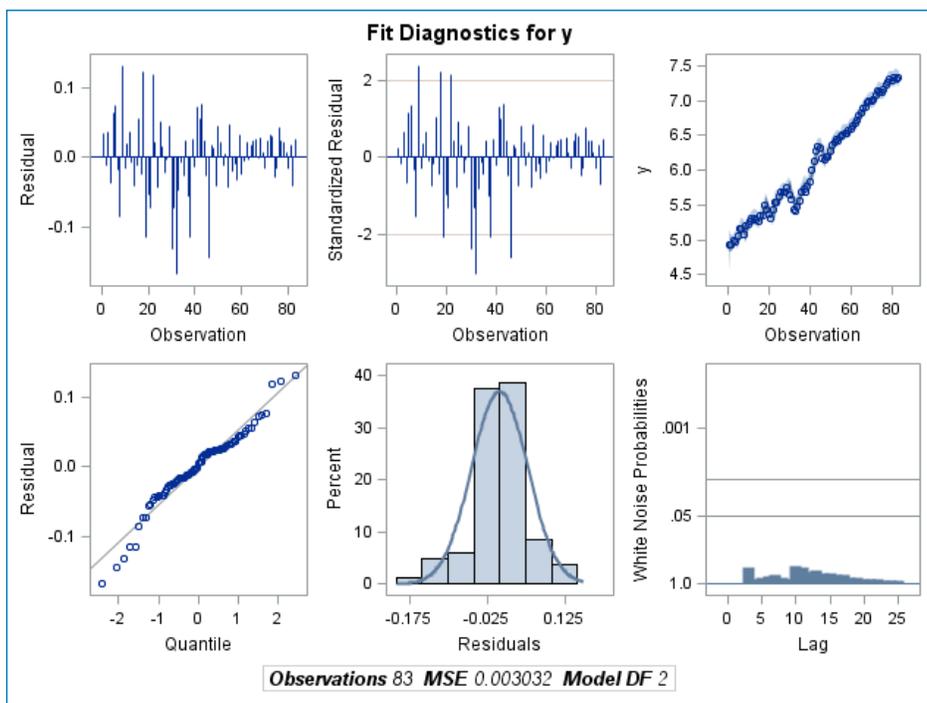
Key Features (continued)

Financial analysis

- Interactive analysis system for time-value-of-money analysis.

Access to many commercial and government databases

- Commercial database vendors: FAME, DRI, Standard & Poor's (COMPUSTAT), FactSet, Haver Analytics DLX and CRSP.
- Federal Reserve Economic Data (FRED).
- US government data: Bureau of Economic Analysis, Bureau of Labor Statistics.
- International agency data: International Monetary Fund (IMF), Organization for Economic Cooperation and Development (OECD) and World Bank Group Open.
- Weather-related databases: World Weather Online, NOAA Severe Weather Data Inventory (SWDI) web service.
- SAS/ACCESS® interfaces and SAS Data Surveyors (licensed separately) provide seamless read, write and update access to other data sources.



SAS/ETS produces default diagnostic plots for the AUTOREGRESSION procedure.

TO LEARN MORE »

To learn more about SAS/ETS system requirements, download white papers, view screenshots and see other related material, please visit sas.com/ets.

SAS/ETS takes advantage of the SAS®9 engine, part of the SAS Platform. The SAS Platform integrates analytical silos, addresses diverse needs, scales to any analytical question and is trusted by organizations worldwide. For more information, visit sas.com/platform.

To contact your local SAS office, please visit: sas.com/offices

