



## SAS® Forecast Server

Automatically produces statistically based forecasts you can trust

### What does SAS® Forecast Server do?

SAS Forecast Server generates large quantities of high-quality forecasts quickly and automatically. This enables organizations to plan more efficiently and effectively for the future.

### Why is SAS® Forecast Server important?

The automation and scalability of SAS Forecast Server enable even the largest enterprise to operate more efficiently by producing forecasts for a broad range of organizational planning challenges as well as allowing forecasters to focus their efforts on the most important forecasts.

### For whom is SAS® Forecast Server designed?

It is designed for organizations in any industry that need large-scale forecasting and/or require automation because of the large number of forecasts or a lack of skilled forecasters.

The target audience ranges from analysts responsible for the actual creation of the forecasts, to the managers and directors responsible for overseeing the success of forecasting and planning processes.

For organizations needing to produce numerous forecasts with huge volumes of data, the forecasting process can be problematic. There may be too few skilled analysts or too many forecasts for existing staff to analyze within a reasonable time frame. Another issue may be that current software lacks the automation or the scalability required to produce the number of forecasts needed. In too many cases, shortcuts are taken and accuracy is sacrificed, which can lead to excess inventory, poor customer service and other consequences of inadequate planning.

SAS Forecast Server alleviates these problems by combining a graphical user interface for ease of use (SAS Forecast Studio) with SAS software's sophisticated forecasting capabilities in an incredibly scalable and automated way.

SAS Forecast Server generates large quantities of forecasts quickly and automatically without the need for human intervention unless so desired. The software automatically chooses the most appropriate forecasting model, optimizes the model parameters and produces the forecasts. Time series data management capabilities are also included. Transactional data can be converted to a time series format and forecast all in one step, or the converted data can be fed into a forecasting data mart as part of an overall data-processing function. The ability to preprocess transactional data can save organizations significant time and resources. In addition, SAS Forecast Server operates in both interactive and batch environments. User and project requirements will determine which method is most appropriate.

### Key Benefits

- Provides quick and timely forecasts from a user-friendly GUI.** SAS Forecast Server automatically produces high-quality forecasts with the ability to modify models interactively. This makes large forecasting processes manageable and allows analysts to focus their time on the most important forecasts. Forecasting requires less manual input, reducing the chance that organizational politics or personal agendas will contaminate the forecasts.
- Delivers forecasts that reflect the realities of the business, improving your ability to plan future events with confidence.** SAS Forecast Server automatically selects the business drivers, holidays or events that aid in the forecasting process from variables supplied to the system in the modeling process. As a result, forecasts can better reflect the intricacies of the business. SAS Forecast Server automatically builds the most appropriate model for your data and delivers forecasts that are as accurate as can reasonably be expected, given the nature of the behavior being forecast.
- Potentially improves forecasting performance across all products and locations, at any level of aggregation.** A virtually unlimited model repository makes it possible to create more appropriate forecasting models for a wider range of behaviors. In addition, planners can test what-if scenarios and determine how they are likely to affect future demand. Graphical displays provide visualization of the effects of holidays, sales promotions and unexpected events to help forecast and better plan future organizational activities.



## Product Overview

SAS Forecast Server is a large-scale automatic forecasting solution that offers unsurpassed scalability. It enables automatic diagnostics and statistical forecasting in batch mode or through the interactive graphical user interface. For each item being forecast, SAS Forecast Server automatically constructs the most appropriate forecasting model, mathematically optimizes all model parameters and generates high-quality forecasts.

### Easy-to-use GUI

SAS Forecast Server includes the SAS Forecast Studio GUI to provide the power of SAS forecasting models and analysis without having to know SAS programming. More advanced users can access additional forecasting power using the SAS programming language.

### Automatic forecasting

SAS Forecast Server can automatically determine the forecasting models that are most suitable for the historical data. An appropriate model is generated for each item being forecast based on user-defined criteria, and model parameters are automatically optimized. Any number of business drivers and events (regressors) can be supplied and will be automatically considered for inclusion in the models. Holdout samples can be

specified so that forecasting models are selected not only by how well they fit the past data, but how well they are likely to predict the future.

### New Project wizard

Novice forecasters can set up the automatic forecasting process quickly and easily using the New Project wizard. The wizard guides users through data selection, assigning roles to variables in the data set, setting up a forecasting hierarchy and selecting important automatic forecasting criteria. Forecasters can specify criteria for automatic outlier detection, holdout samples, forecast horizons, whether forecasts are allowed to go below zero and more. Exception rules can be set to flag potentially problematic forecasts.

### Hierarchical forecast reconciliation

Every series in the hierarchy (each lowest-level series and all higher levels of aggregation) is modeled and forecast individually. Forecasts are then reconciled across the full hierarchy, per user's choice of top-down, bottom-up or middle-out reconciliation. Reconciliation preserves forecasts that have been "locked" by the user and will identify any locking inconsistencies.

### User override facility

With SAS Forecast Studio, forecasters can override the statistical forecast to

incorporate judgment or outside information into the forecasting process.

### The Scenario Analyzer

With the Scenario Analyzer, planners can test what-if scenarios, such as changes to pricing or promotions, and determine their likely effect on future demand. This is very useful in designing sales and marketing programs across a variety of industries to help proactively drive customer demand into more favorable patterns.

### Flexible, user-customizable hierarchies

SAS Forecast Server allows users to define whatever hierarchy is most appropriate for each forecasting task. A user in sales planning may create a hierarchy based on customers, territories and sales regions, while a user in production planning could define a hierarchy based on items, distribution centers and manufacturing sites. Users can easily create new hierarchies whenever they are needed.

### Optimized model parameters

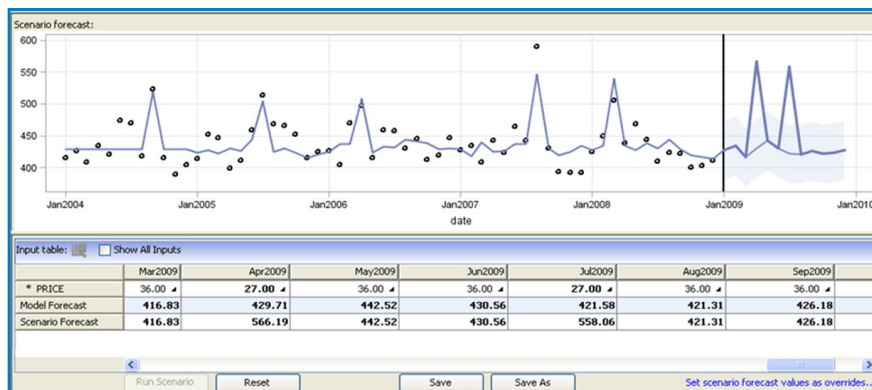
Mathematically optimized model parameters are provided so users don't have to guess and manually enter model parameters or perform a cumbersome grid search for reasonable estimates. Optimized parameters provide models and forecasts that more accurately reflect the data.

### Exception rule settings

SAS Forecast Server lets users set up business rules for flagging potentially problematic forecasts. Upon completion of the automatic forecasting process, forecasters can quickly identify the forecasts that violate a defined rule so they can focus attention where it is most needed.

### Events management console

Events, such as sales promotions, unusual weather, etc., can greatly af-



*The Scenario Analyzer lets planners test what-if scenarios, such as changes to pricing or promotions, and determine their likely effect on future demand.*

fect forecasts. An events management console allows users to create event definitions, assign events to selected series in the project and delete events. Event definitions also can be imported and shared across projects.

### **Automatic regressor/event selection and model specification**

SAS Forecast Server automatically selects the regressors (causal variables) or events that aid in the forecasting process. Regressors and events are selected from any number of variables supplied to the system. In addition to selecting the most useful regressors and events, SAS Forecast Server automatically determines how they are specified in the model. The system not only examines the contemporaneous relationships of the regressors and events to the items being forecast, it also determines whether lagged and/or dynamic relationships are present. It automatically computes variable transformations, lags and transfer function definitions.

### **Automatic outlier detection**

SAS Forecast Server examines the history of each item being forecast and automatically identifies outliers and shifts in the data. Subsequent forecasts can be adjusted appropriately.

### **Temporal reconciliation**

This new feature allows models built at different time levels (e.g., hourly, daily, weekly, yearly) to be reconciled to take advantage of the unique seasonal patterns at each interval. This is an especially important capability in forecasting things such as electricity demand, call center staffing, etc. where demand cycles vary by time interval.

### **Code generation for batch processing**

SAS Forecast Server generates SAS code through the interactive graphical interface. All work performed within SAS Forecast Studio is captured as

## **Key Features**

### **Easy-to-use GUI**

- Set up the hierarchy, parameters and business rules through an interactive graphical interface for automated enterprise forecasting.
- Generate automatic forecasts in batch or interactively using the Project Setup wizard.
- Reconcile up and down the hierarchy, for bottom-up, top-down or middle-out forecasting.
- Identify exceptions automatically and generate exception reports based on sound statistical logic and business rules.
- Overrule models using manual override to statistically forecast values, with the ability to lock the overrides.
- Publish results automatically via hard copy, company portal or Internet.
- Test what-if scenarios, such as changes to pricing or promotions, and determine their likely effect on future demand using the Scenario Analyzer.

### **Scalability**

- Choose the level of automation for the forecasting process.
  - Rediagnose and identify candidate models, re-estimate existing model parameters or generate forecasts using existing models and parameters.
- Facilitate ongoing and repeatable forecasting as part of your overall planning process by surfacing more effective statistically based forecasting methods that can be used throughout the entire organization.
- Create more appropriate forecasting models for a wide range of behaviors using an extensible model repository that includes intermittent demand models, unobserved components models, ARIMAX models, dynamic regression, exponential smoothing models with optimized parameters, as well as user-defined models.
- Client/server architecture makes SAS Forecast Server suitable for large-scale enterprise forecasting problems.

### **Easy manageability**

- Access the superior forecasting capabilities of SAS through SAS Forecast Studio, the user-friendly interactive graphical interface. No programming is required. Users just point and click their way to powerful forecasting capabilities.
- Incorporate forecasting as an ongoing and repeated process that fits into your organization's planning workflow.
- Customize several aspects of the large-scale forecasting process with control over model selection, event identification and exception reporting.
- Create and manage events definitions with a specialized events management console.
- Incorporate individual judgment or outside information using the manual override console that includes override locking.
- Improve the forecasting process using automatic regressor and events selection.
- Adjust forecasts for outliers with automatic outlier detection.
- Build and reconcile models at different time intervals with temporal reconciliation features.
- Generate code for batch processing using the code generation GUI.

### **Trustworthy forecasts**

- Automatically perform large-scale enterprise forecasting tasks.
- Perform automatic hierarchical forecasting. Define the hierarchy, parameters and business rules through an interactive graphical interface.
- Reconcile up and down the hierarchy, preserving locked forecast values.
- Reconcile by time intervals.
- Create ensemble models by combining two or more other models, often leading to more accurate forecasts.

SAS code. Users can export the code to edit the project in a program editor, schedule and run projects in a batch mode or create SAS Stored Processes.

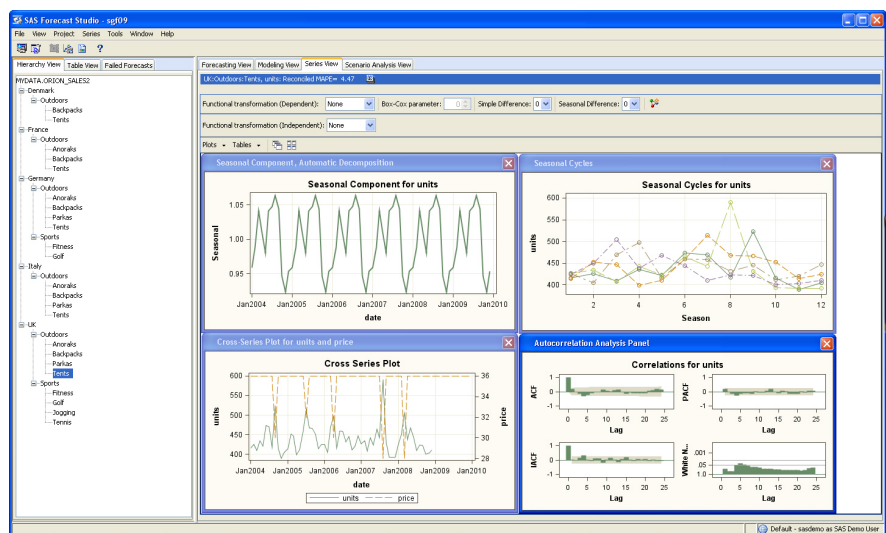
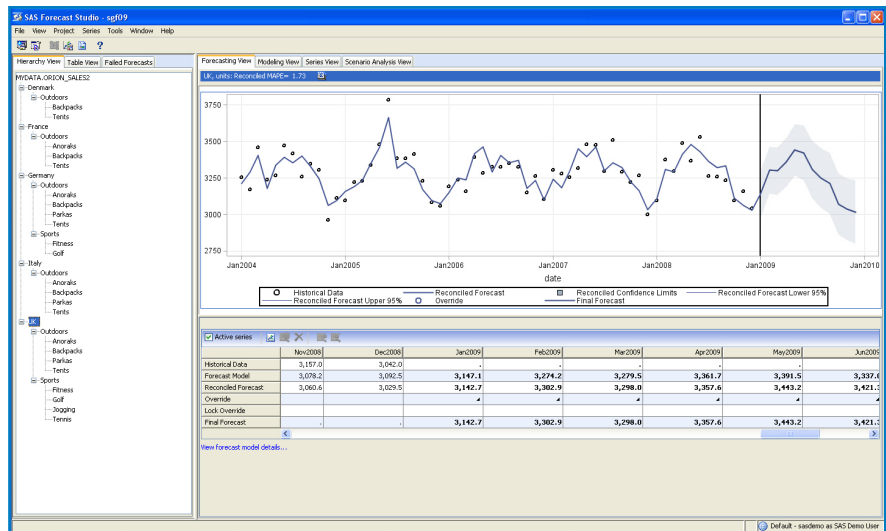
### Choice of automation level

Users can choose the automation level for the forecasting process. If the best forecasting model for each item is unknown or if the models are outdated, users may choose a maximum level of automation. If suitable models have previously been determined, users may choose to keep the current models and simply re-estimate the model parameters. For maximum processing speed, users may keep the previously selected models and model parameter estimates and simply generate forecasts.

## SAS® Forecast Server System Requirements

To learn more about SAS Forecast Server system requirements, download white papers, view screenshots and see other related material, please visit [www.sas.com/forecastserver](http://www.sas.com/forecastserver).

To learn more about the large-scale forecasting engine that powers SAS Forecast Server, please visit [www.sas.com/hpf](http://www.sas.com/hpf).



*SAS Forecast Server provides a quick and easy way to manage forecasting through the SAS Forecast Studio graphical user interface. It allows forecasters to focus their attention on addressing exceptions and high-value forecasts.*