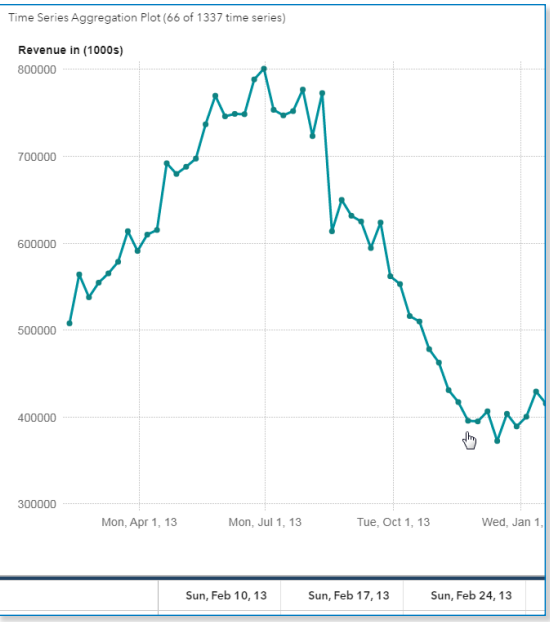
SAS® Visual Forecasting

Quickly and automatically generate large numbers of trustworthy forecasts so your organization can operate more efficiently and effectively



What does SAS® Visual Forecasting do?

SAS Visual Forecasting generates large quantities of forecasts quickly, automatically and as accurately as can be reasonably expected given the nature of the behavior being forecast. Organizations can better plan for the future.

Why is SAS® Visual Forecasting important?

It provides an open forecasting ecosystem. The automation and scalability of SAS Visual Forecasting enable even the largest enterprise to operate an efficient and effective forecasting process for a broad range of planning challenges.

For whom is SAS® Visual Forecasting designed?

It is designed for any organization that needs large-scale forecasting and/or requires automation because of the large number of forecasts or a lack of skilled forecasters. This can range from analysts responsible for the creation of the forecasts to the managers and directors responsible for overseeing the forecasting and planning processes.

Many organizations need to process large numbers of time series for analysis, decomposition, forecasting, monitoring and data mining. SAS Visual Forecasting provides a resilient, distributed and optimized generic time series analysis scripting environment for cloud computing.

This solution includes automatic forecast model generation, automatic variable and event selection, automatic parameter optimization, automatic model selection and automatic forecast generation. It also provides advanced support for time series analysis (time domain and frequency domain), time series decomposition, time series modeling, signal analysis and anomaly detection (for IoT).

With SAS Visual Forecasting, you pick up the data once and run everything you need, taking advantage of in-memory, large-scale distributed processing. A scripting language optimizes and compiles your forecast based on where it is running.

Benefits

- **Streamline your forecasting process.** The vast majority of time series can be forecast automatically. SAS Visual Forecasting automatically produces large-scale time series analysis and hierarchical forecasting with no human involvement. It requires fewer resources and reduces management tasks, while generating forecasts that are often as good as or better than those from a more manual process. Less manual intervention also decreases the chance of personal bias in the forecasting process.
- **Focus efforts on high-value situations.** Forecast analysts don't have to build and monitor forecasting models for every time series. They can focus their efforts on strategic, high-value forecasts or problems that aren't suitable for automation.
- **Improve planning.** Manage your organizational planning challenges by generating forecasts on an enterprise scale, as quickly and accurately as can reasonably be expected given the nature of the behavior being forecast. The software delivers results for millions of forecasts at breakthrough speeds so you can plan more efficiently and effectively for the future.
- **Deliver forecasts that reflect reality.** SAS Visual Forecasting automatically selects the business drivers, holidays or events that aid in the forecasting process from variables supplied to the system. At the same time, a flexible new capability enables you to manually override forecasts based on groups that are defined using attributes instead of hierarchical variables. As a result, forecasts better reflect the intricacies of the situation.

Overview

SAS Visual Forecasting automatically analyzes large numbers of time series so forecasters don't have to diagnose each series. The software determines the forecasting models that are most suitable for the historic data. When doing hierarchical forecasting, holdout samples can be specified so that forecasting models are selected not only by how well they fit past data, but how well they are likely to predict the future.

An appropriate model is generated for each entity being forecast, based on user-defined criteria. Model parameters are automatically optimized. Any number of business drivers and events can be supplied and will be considered for inclusion in the models.

While other vendors provide some level of automatic forecasting, SAS has the ability to scale to even the largest organizations. No other forecasting solution can provide this level of automation, scalability and statistical sophistication.

Scripting language enables distributed processing

SAS Visual Forecasting provides a resilient, distributed and optimized generic time series analysis scripting environment. It supports fast, in-memory time series analysis.

By nature, distributed systems break up large files and process each piece separately. This is problematic for time series analysis where the ordering of data is crucial. Time series analysis typically requires that time series data is stored contiguously in memory and in sorted order.

SAS Visual Forecasting shuffles the data so that each time series (or BY group) is copied into the memory of a single computing node. Each time series is executed on one thread of a node, and each node executes the compiled script for each of its assigned series. This makes time series analysis and forecasting possible on an enormous scale.

And the scripting language is optimized and compiled for the machine it is running on, so users don't have to rewrite code for different machines.

Automatic time series analysis and forecasting

The TSMODEL procedure includes several function packages, each designed to perform a particular task in the time series analysis process.

The TSMODEL procedure can convert time-stamped transactional data into a time series format, and then generate forecast models automatically. It can execute user-defined programs.

And it uses flexible hierarchies, so you can organize and manipulate data to achieve better, more targeted results.

Highly flexible forecast override

Many forecasting software packages allow users to make manual adjustments to system-generated forecasts, but only through the forecasting hierarchy.

SAS Visual Forecasting adds a powerful, new capability that enables manual overrides to be made to a specific filter or group of time series defined by attributes, not just by hierarchical variables.

A highly flexible override capability reduces the level of manual effort required when making overrides on nonhierarchical variables.

Interactive time series exploration and analysis helps you understand the structure of your data prior to forecasting.

For example, an analyst in the apparel industry may want to adjust a forecast for all products of a certain color that is expected to be popular. Color is not typically a level of the forecasting hierarchy. With the override capability, a custom filter can be defined of products meeting the color attribute. Without this feature, if you wanted to apply an override to all products of a certain color, you would have to manually enter the override to each product.

Another example is sentiment, determined by text analysis of online reviews or user surveys. An analyst may want to increase (or decrease) forecasts for all products that have favorable (or unfavorable) sentiment. Creating filters saves a lot of time and manual effort when overriding nonhierarchical variables.

API support for working with open source

While SAS Visual Forecasting has a broad range of forecasting models built-in, users can create their own customized models that perform well with their data. Also, with REST APIs, other applications can call SAS forecasting models.

Hierarchical reconciliation

Each series in the hierarchy is modeled and forecast individually. Forecasts are then reconciled at multiple levels of the hierarchy in a top-down fashion. Users can adjust a forecast at any level and apportion it to lower levels so the hierarchy maintains consistency, and individual forecasts (by products, locations, etc.) roll up to the top number. Without reconciliation, lower-level forecasts won't add up to the top-level forecast.

Includes additional forecasting procedures

SAS Visual Forecasting includes access to SAS Forecast Server Procedures as well as procedures in SAS/ETS, enabling you to address virtually any forecasting and time series analysis challenge.

Key Features

Large-scale time series analysis and forecasting

- Automatically generates large quantities of statistically based forecasts in a distributed, in-memory environment.
- Scripting language enables distributed, in-memory time series analysis.
- Shuffles the data so that each time series is copied into the memory of a single computing node.
- Executes each time series on one thread of a node, and each node executes the compiled script for each of its assigned time series.
- Is optimized for the machine it is running on, so users don't have to rewrite code for different machines.

Flexible override facility

- Make customized forecast adjustments, which are not limited by the structure of the forecasting hierarchy.
- Select filters based on attributes, such as location, brand, category, size, color, sentiment, quality, etc.
- Define override specifications, by filter and time period(s), for all time series contained within a filter.
- Faceted search filters.
- Disaggregation of override using optimization model.
- Batch execution and incremental data updates.

API support for working with open source

- Implement your own models using REST APIs.
- Analytical actions, SAS procedures and APIs are callable from SAS, Python, R, Java, JavaScript and Lua.

Time series analysis

- Autocorrelation analysis.
- Cross-correlation analysis.
- Seasonal decomposition and adjustment analysis.
- Count series analysis.
- Diagnostic tests for seasonality, stationarity, intermittency and tentative ARMA order selection.

Time frequency analysis

- Windowing functions.
- Fourier analysis for real and complex time series.
- Short-time Fourier analysis.
- Discrete Hilbert transform.
- Pseudo Wigner-Ville distribution.

Time series modeling

- ARIMA models (dynamic regression and transfer functions).
- Exponential smoothing models.
- Unobserved component models.
- State-space models.
- Intermittent demand models with Croston's method.

Automatic time series modeling

- Automatic time series model generation.
- Automatic input variable and event selection.
- Automatic model selection.

TO LEARN MORE »

To learn more about SAS Visual Forecasting, view screenshots and see other related materials, please visit sas.com/visualforecasting.

Key Features (continued)

- Automatic parameter optimization.
- Automatic forecasting.

Singular spectrum analysis (SSA)

- Univariate SSA decomposition and forecasting.
- Multivariate SSA.
- Automatic SSA.

Time interval evaluation

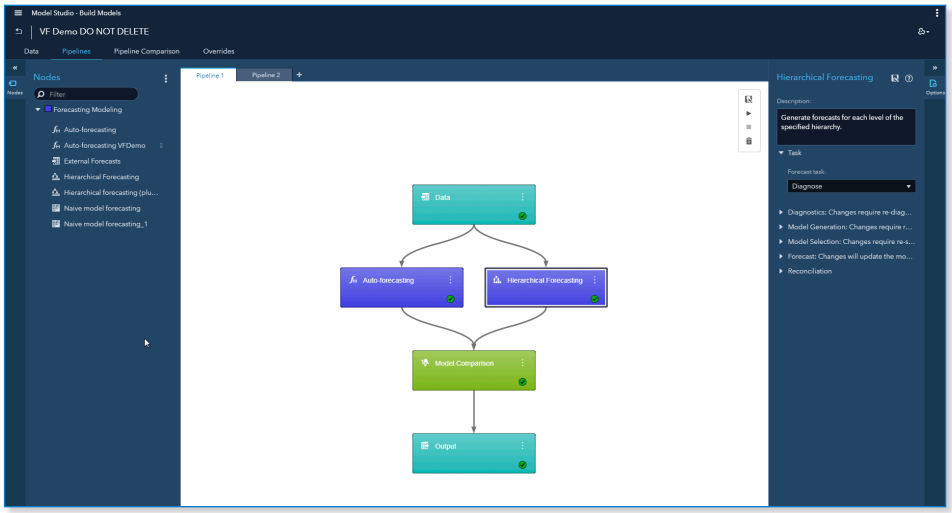
- Evaluate a variable in an input table for suitability as a time ID variable.
- Assess how well a time interval specification fits date/datetime values or observation numbers used to index a time series.
- Can be either specified explicitly as input to PROC TSMODEL or inferred by the procedure based on values of the time ID variable.

Hierarchical reconciliation

- Models and forecasts each series in the hierarchy individually.
- Reconciles forecasts at multiple levels of the hierarchy.

Distributed, accessible and cloud-ready

- Runs on SAS® Viya,® a scalable and distributed in-memory engine of the SAS Platform.
- Distributes analysis and data tasks across multiple computing nodes.
- Provides fast, concurrent, multiuser access to data in memory.
- Includes fault tolerance for high availability.
- Lets you add the power of SAS Analytics to other applications using SAS Viya REST APIs.



Interactively add nodes to a pipeline in a SAS Visual Forecasting process workflow.

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

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