SAS® Visual Forecasting 8.3: Overview

What’s New in SAS Visual Forecasting 8.3

The following features and enhancements are introduced in this release of SAS Visual Forecasting.

Events

You can improve the accuracy of your model by adding events. An event is an incident that disrupts the normal flow of a process that generates the time series. Examples of events are holidays, retail promotions, and natural disasters. Defining an event enables you to model the effect that special events have on the dependent time series.

For more information about this feature, see “Adding Events to Your Project” in SAS Visual Forecasting: User’s Guide.

Segmentation

You can partition the input data for a project into different segments based on the nature of the data (for example, slow moving items, new products, and so on). Using segmentation, you can break time series data into segments of similar time series and then model each segment separately in the pipelines. This enables users to tune the modeling strategies to better model the patterns or characteristics of the time series in each segment.

For more information about this feature, see “Segmenting Project Data” in SAS Visual Forecasting: User’s Guide.

User Interface Improvements

- The Data tab has been updated to improve the workflow when you are working with different data sources within a project. Users can perform variable assignments and change settings without having to launch separate dialog boxes. Users can launch SAS Visual Analytics to view and explore any data source for the project.

  For more information about the Data tab, see “Using the Data Tab” in SAS Visual Forecasting: User’s Guide.

- SAS Home is replaced by SAS Drive. SAS Drive is a full function, extensible content management application for SAS Viya. SAS Drive provides an easy way to create, manage, and share content and administer content permissions. Content can include reports, projects, code, and more. For more information, see SAS Drive: Getting Started.
New Model Strategy Nodes

Three new modeling strategies that require a license for SAS Visual Data Mining and Machine Learning can be used in the pipelines for a forecasting project.

Panel Series Neural Network

The Panel Series Neural Network modeling strategy provides forecasts by training a neural network based on user settings. Neural networks consist of predictors (input variables), hidden layers, an output layer, and the connections between each of those.

Multistage-forecasting

The multistage modeling strategy provides a general framework that combines time series models and feature extraction techniques to build a hierarchy-based forecasting system in three stages.

Stacked Model (NN + TS) Forecasting

The stacked modeling strategy generates forecasts using stacked models that consist of a neural network model (NN) and a time series model (TS). The time series model applies to the residuals of the neural network forecasts. This modeling strategy captures the nonlinear relationship between the dependent and independent variables as well as time series characteristics in the data, such as seasonality and trend.

For more information, see “Modeling Strategy Nodes Using Neural Networks” in SAS Visual Forecasting: User’s Guide.

Note: To use these modeling strategies, the site must have a license for SAS Visual Data Mining and Machine Learning.

About SAS Visual Forecasting

What Is SAS Visual Forecasting?

SAS Visual Forecasting is the next generation forecasting product from SAS. It includes a web-based user interface for creating and running projects to generate forecasts from historical data. SAS Visual Forecasting provides automation and analytical sophistication to generate millions of forecasts in the turnaround time that is necessary to run your business. Forecasters can create projects using visual flow diagrams, or pipelines, running multiple models on the same data set and choosing a champion model based on the results.

SAS Visual Forecasting is built on SAS Viya, an analytic platform powered by Cloud Analytic Services (CAS). As a result, it is designed to effectively model and forecast time series on a large scale with its highly parallel and distributed architecture. This essentially provides a platform for the speed and scalability needed to create the models and generate forecasts for millions of time series. Massive parallel processing within a distributed architecture is one of the key advantages in SAS Visual Forecasting for large-scale time series forecasting.

Forecasters can develop forecasting projects with data from individual session-scoped or shared CAS libraries. You can also easily share data, modeling components, and forecasting results without moving data in the CAS environment.

Use this application to do the following tasks:

- Perform automatic model and variable selection from your source data.
- Generate forecasts automatically by using modeling strategies that are shipped with SAS Visual Forecasting.
- Create your own modeling strategies.
- Perform hierarchical forecasting.
- Visually analyze and diagnose time series data.
Create attribute-based filters to view subsets of historical and forecast data.

Override forecasts using attribute-based filters.

Run disaggregation of overrides using an optimization model with automatic conflict resolution or manual resolution by the user.

Export projects as SAS or Python code for processing in a batch environment.

This documentation is intended for forecast analysts, demand planners, and managers and executives who oversee the forecast process. Users of SAS Visual Forecasting are more successful if they are familiar with forecasting methods and concepts, such as the following:

- Time series models used for forecasting, such as ARIMA and exponential smoothing models (ESM)
- The difference in long-term trends, seasonal patterns, and cyclic patterns in data
- Measures to evaluate forecast accuracy, including mean absolute error (MAE), root mean square error (RMSE), and mean absolute percentage error (MAPE)

If you do not have a background in the principles of forecasting, SAS Visual Forecasting provides tools that apply different forecasting methods and that determine which methods are most appropriate for the data you are working with. For more information about forecasting, see these resources.

- Forecasting: principles and practice
- Forecasting Principles
- Business Forecasting: Practical Problems and Solutions
- Demand-Driven Forecasting: A Structured Approach to Forecasting, Second Edition

**How SAS Visual Forecasting Works**

Given a time-stamped data set, the software provides the following automatic forecasting process:

1. accumulates the time-stamped data to form a fixed-interval time series.
2. aggregates the time series to form a hierarchical time series, if requested by the user.

For each time series in the hierarchy, SAS Visual Forecasting performs these steps:

1. diagnoses the time series using time series analysis techniques.
2. creates a list of candidate model specifications based on the diagnostics.
3. fits each candidate model specification to the time series.
4. generates forecasts for each candidate fitted model.
5. selects the most appropriate model specification based on either in-sample or holdout sample evaluation using a model selection criterion.
6. refits the selected model specification to the entire historical range of the time series.
7. generates forecasts from the fitted model.
8. evaluates the forecast using in-sample analysis and provides for out-of-sample analysis of forecast performance.

The actual data processing runs on a CAS server. In a distributed CAS environment, the time series are delineated and shuffled based on the distinct combination of values for the BY variables. The time series data is processed in parallel. It is written out to CAS tables on each worker node. Furthermore, threads are used on each worker node to process the time series vectors that are loaded onto a node concurrently.
How SAS Visual Forecasting Relates to Other SAS Software

SAS Visual Forecasting contains much of the same functionality as SAS Forecast Studio. The main differences are that the performance time is much faster running in the CAS environment and the user interface runs in your web browser. The user interface is shared with other SAS products in Model Studio, which provides a common interactive framework for predictive modeling and analytics. From a single data source, you can create multiple pipelines that contain multiple models in a single project.

Users of SAS Forecast Studio can export their existing projects and upload them to SAS Visual Forecasting. For more information, see "Working with Projects" in SAS Visual Forecasting: User’s Guide.

Using SAS Visual Forecasting

Accessing SAS Visual Forecasting

To access SAS Visual Forecasting, direct your browser to the SAS Drive URL as shown here and log on:

http://host:port/SASDrive

SAS Drive enables you to access Model Studio. Model Studio provides a common interface for you to work with your data in one or more of the following products, depending on your site license.

- SAS Visual Forecasting
- SAS Visual Data Mining and Machine Learning
- SAS Visual Text Analytics

After you log on, you can access Model Studio from the side menu. Click ⌁ in the upper left corner of SAS Drive. Here is an example of what you might see in the side menu:
Click **Build Models**. You are presented with a list of projects that have been previously created. The project type indicates which application is used for the project.

If no projects are shown, follow the instructions in "Creating a Forecasting Project" in SAS Visual Forecasting: User's Guide.

To see a list of the supported web browsers for Model Studio, click ⋄ in the SAS Drive banner, select **About**, and click the link for Supported Browsers and Platforms.

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**Working with Model Studio**

Model Studio provides a common interface between analytic products on SAS Viya. Before you open a project, the following pages are used to manage your projects.

**Projects**

When you first log on to Model Studio, the Projects page is opened with a list of projects that have been created. Each project is typed according to the product that is used for the project. Many projects can share the same data source.

The projects are initially displayed as a series of tiles. Click the table view icon over the list to view the projects and their attributes listed in a table.

Use the menu icon ( ⬇️) over the right side of the project list to open, edit, upload, download, or delete any of the selected projects in the list. The available actions depend on your access rights to the projects. To open a project, you must also have access to the data source for the project. You can also open a project by clicking the link on the project name.

You can also download the batch code needed to run the project outside of the application. For more information, see "Running Batch Code" in SAS Visual Forecasting: User's Guide.

If you are the owner of a project, then you can also share the project with other groups of users. For more information, see "Sharing Projects" in SAS Visual Forecasting: User's Guide.

Some projects might display a lock indicator. This means that the project is currently being edited and you cannot open it. The lock is removed after the user closes the project.

Click **Open The Exchange**.

**The Exchange**

The Exchange displays a list of templates used for project pipelines and modeling nodes. Each template listed includes a description, the product type, the name of the owner who created the template, and the date on which it was last modified.

Use the menu icon ( ⬇️) over the right side of The Exchange to delete, duplicate, edit, or download any of the templates selected in the list. You can also upload any templates from your workstation into The Exchange. For more information, see "Working with Projects" in SAS Visual Forecasting: User's Guide.

**Overview of Forecasting Projects**

To open a project, click the link on the project name. The project is opened displaying the Data tab.

**Data**

The Data tab provides information about your input data set. You can select the following data sources for your project.
Time Series
For data from an input data source, the variables from the input data set are listed here. The table also shows the attributes of those variables, such as the variable’s role in the project. You can assign the variable roles for the project, including time variable, dependent variable, and any BY variables. You can also define independent variables and leave any variables that are not needed for this forecasting project as unassigned.

External Forecast
Projects can be created using output data from another forecasting project rather than a time series. You cannot access the variables table to change any variable roles.

Attributes
Selecting Attributes shows the BY variables that are defined for the project. Use attributes to work with subsets of the time series and forecasts based on specific values of those attributes.

Events
An event is an incident that disrupts the normal flow of a process that generates the time series. You can add events that are already defined by SAS Visual Forecasting or you can add your own.

Pipelines
Use the Pipelines tab to create an executable process flow for your project. Each pipeline consists of a set of nodes that are executed sequentially when you run your project.

The Data node represents the input data source of the project.

Each Modeling node assesses the data to determine the best models to use for forecasting and to generate the forecasts for the forecast horizon. Select a modeling strategy from the nodes, such as hierarchical or naive models. You can select multiple models and run them within the same pipeline.

The Model Comparison node selects a champion model when you insert more than one modeling strategy in a pipeline. You can select a different modeling node as champion. You can also view summary statistics for each modeling node in the pipeline, even if only one is used.

The Output node represents the output of a pipeline after it has been successfully run.

Pipelines can also be split into multiple swim lanes for different segments of the project data. For more information, see “Working with Pipelines” in SAS Visual Forecasting: User’s Guide.
Pipeline Comparison

If you build multiple pipelines for a project, use this tab to compare pipeline MAPE distribution and summary statistics. A champion pipeline is automatically identified in the list based on the selection criteria that you choose in the project settings. You can set another pipeline as the champion based on other assessments. It is important to make sure that the best pipeline and model have been selected as champion before creating overrides. For more information, see “Selecting a Champion Pipeline” in SAS Visual Forecasting: User’s Guide.

If you have only one pipeline in your project, you can still use this tab to view the MAPE distribution and summary statistics for that pipeline.

Overrides

The Overrides tab shows the results of the champion pipeline, including the historical and forecast data. From this tab, you can select and specify filters to view segments of the forecast results and enter any overrides to replace forecasted values for different time series. You can create an override using a percentage difference with the forecasted value, a range of values, or by entering a specific value.

You can create filters based on any set of attributes, such as location, brand, category, size, color, or any other variables that are part of your input table. Filters enable you to subset the data so that you can work with these subsets based on specific combinations of attribute values. Here is an example:

- **Location** = Northeast
- **Product Category** = Cosmetics

You can name each filter so that you can select that filter again for future use. When you submit overrides, SAS Visual Forecasting detects any conflicts with overrides created for other filters. Use the Override Management view to resolve these conflicts or choose to resolve them automatically. For complete information, see “Working with Overrides” in SAS Visual Forecasting: User’s Guide.

You can use the following views on the Overrides tab:

- **Overrides**
  - Use this view to create filters and overrides.
- **Override Management**
  - Use this view to manage overrides and resolve any conflicts between overrides.

Accessibility

For information about the accessibility of this product, see Model Studio: Accessibility Features.