SAS® Visual Forecasting 8.2: Overview

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:

- 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 squared 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 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 are processed in parallel and they are 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 containing 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 “Uploading and Downloading Projects” in SAS Visual Forecasting: User’s Guide.

Using SAS Visual Forecasting

Accessing SAS Visual Forecasting
To access the SAS Visual Forecasting, direct your browser to the SAS Home URL and log on:

http://host:port/SASHome

SAS Home 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 the menu icon (≡) in the upper left corner of SAS Home. Here is an example of what you might see in the side menu:

Click **Build Models** to open SAS Visual Forecasting. 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.

Minimum Requirements
The latest versions of the following browsers have been shown to work with SAS Visual Forecasting.

- Apple Safari
- Google Chrome
Working with Model Studio

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

Projects

When you first log on to Model Studio, the Projects view 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 download the batch code needed to run the project outside of the application. For more information, see “Running Batch Code for SAS Visual Forecasting” in SAS Visual Forecasting: User’s Guide.

If you are the owner of a project, then you can also share the project to 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 View My Tools to access the Model Studio Toolbox.

Toolbox

The Toolbox displays a list of templates used for project pipelines and modeling nodes. Each template listed includes a description, the product type for the project, 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 toolbox 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 toolbox. For more information, see “Working with Projects” in SAS Visual Forecasting: User’s Guide.

Overview of Forecasting Projects

Click on a forecasting project in the Model Studio project list. The project opens with the following set of tabs.

Data

The Data tab provides information about your input data set. You can use the following views for settings related to your input data set.

Time Series

For data from an input data source, this view lists the variables from the input data set and the attributes of those variables, such as the variable’s role in the project. Use this view to assign the variable roles for the project, including time variable, dependent variable, and any classification (BY) variables. You can also
define independent variables and leave any variables that are not needed for this forecasting project as unassigned.

External Forecast
For output data from another forecasting project, this view shows the variables in the output data set. You cannot access the variables table to change any variable roles.

Attributes
This view shows the BY variables that are defined for the project. You can add additional attributes that can be used to filter the forecasted values when working with overrides.

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 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.

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 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, for 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.