

# > Build Expert Forecasts— in a Flash

Forecasts provide a solid foundation for your organization's planning. PASW Forecasting\* offers a number of capabilities that enable both novice and experienced users to quickly develop reliable forecasts using time-series data. PASW Forecasting is a fully integrated module of PASW® Statistics\*, so you have all of PASW Statistics' capabilities at your disposal, plus features specifically designed to support forecasting.

Because they help you develop and manage plans affecting a number of operational areas, forecasts have a major impact on profits. They enable your organization to better anticipate revenues; control staffing, inventory, and other costs; and manage other business processes more precisely—all improvements that lead to a healthier bottom line. However, working with the time-series data needed to develop forecasts can be challenging.

PASW Forecasting has the advanced techniques you need without the drawbacks of traditional methods. Unlike spreadsheet programs, PASW Forecasting enables you to use advanced statistical methods in creating forecasts. But you don't need expert statistical knowledge to do so.

People new to forecasting can create sophisticated forecasts that take into account multiple variables. And experienced forecasters can use PASW Forecasting to validate their models. You get the information you need faster because PASW Forecasting helps you every step of the way.

## Efficiently generate and update models

Instead of laboriously building forecasts by re-setting parameters and re-estimating models, variable by variable, you can speed through the process with PASW Forecasting. You'll save hours, even days, of valuable time, with no compromise in the quality or reliability of your forecasts.

With PASW Forecasting, you can:

- Develop reliable forecasts quickly, no matter how large the dataset or how many variables are involved
- Reduce forecasting error by automating the selection of the appropriate models and their parameters
- Update and manage forecasting models efficiently, so you can devote more time to exploring why some models diverge from the norm
- Allow a broader group of people in your organization to generate forecasts
- Give experienced forecasters control over choices affecting models, parameters, and output
- Deliver understandable and useful information to your organization's decision makers

You have tremendous flexibility in creating forecasts. For example, you can easily convert transactional data into time-series data, and convert existing time-series data to the time intervals that best suit your organization's planning needs, with PASW Forecasting.

You can create forecasts at exactly the level of detail you need—for example, for each product line, for individual products, and across geographic and functional areas. Then, using PASW Forecasting's Expert Modeler, you can:

- Automatically determine the best-fitting ARIMA or exponential smoothing model for your time-series data
- Model hundreds of different time series at once, rather than having to run the procedure for one variable at a time

\* PASW Statistics, PASW Forecasting and PASW Statistics Base, formerly called SPSS Statistics, SPSS Forecasting and SPSS Statistics Base, are part of SPSS Inc.'s Predictive Analytics Software portfolio.

You can also:

- Save models to an XML file so that when data changes, forecasts can be updated without having to re-set parameters or re-estimate the model
- Write scripts so that updates can be performed automatically

### Guides novice forecasters

If you're new to modeling time-series data, or create time-series models only occasionally, you benefit from PASW Forecasting's ability to choose the appropriate model for your data and guide you through the model-building process. Using PASW Forecasting, you can:

- Generate reliable models, even if you're not sure how to choose exponential smoothing parameters or ARIMA orders, or how to achieve stationarity
- Automatically test your data for seasonality, intermittency, and missing values, and select appropriate models
- Detect outliers and prevent them from influencing parameter estimates
- Generate graphs of your data, showing confidence intervals and the model's goodness of fit

After your models are created and validated, you can share them with others by incorporating them into Microsoft® Office applications. Or, by using the PASW Statistics Output Management System (OMS), write output in HTML or XML formats for posting on corporate intranets. You can also save models as PASW Statistics data files. This enables you to continue exploring the files for characteristics such as each model's goodness of fit.

### Provides control for experts

If you are an experienced forecaster, you benefit from PASW Forecasting because you can create models from time-series data more efficiently while still controlling key aspects of the process.

For example, you can limit the choice of models to ARIMA models only, or to exponential smoothing models only, through PASW Forecasting's Expert Modeler. You can opt out of the Expert Modeler and choose every parameter

of the model yourself. Alternatively, use the Expert Modeler recommendations as a starting point for your selections, or to check your work.

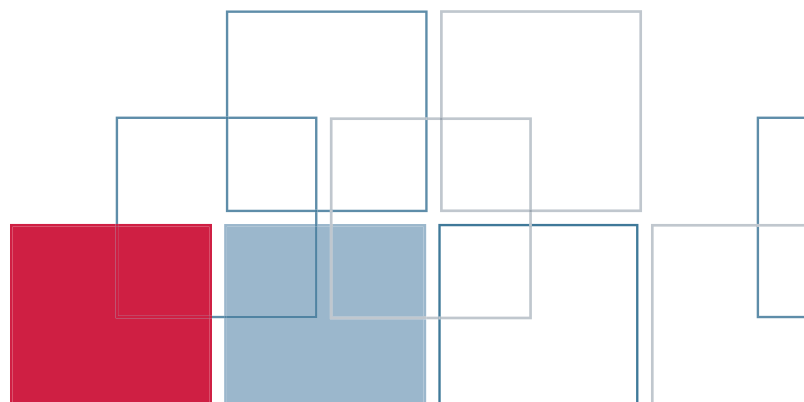
You can limit output so that you see only the worst-fitting models—those that require further examination. This enables you to uncover problems with your data or models quickly and efficiently.

Every module in the PASW Statistics family can now be installed and run separately or in conjunction with any other modules. PASW® Statistics Base\* is no longer a requirement, since capabilities such as data access and management and charting have been added to every module. This gives you greater flexibility in how you install and use this versatile software. PASW Statistics Base is still available and will continue to form the basis of many deployments, since it contains statistical tests and procedures that are fundamental to many analyses.

PASW Forecasting is available for installation as client-only software but, for greater performance and scalability, a server-based version is also available.

### Gain greater value with collaboration

To share and re-use assets efficiently, protect them in ways that meet internal and external compliance requirements, and publish results so that a greater number of business users can view and interact with them, consider augmenting your PASW Statistics software with PASW® Collaboration and Deployment Services (formerly SPSS Predictive Enterprise Services™). More information about these valuable capabilities can be by downloading the "Collaboration" brochure at [www.spss.com/software/deployment/cds](http://www.spss.com/software/deployment/cds).



### Forecasting in retail

Greg is an inventory manager for a major retailer. He has responsibility for more than 5,000 products and uses PASW Forecasting to develop inventory forecasts three months out for each product. Because PASW Forecasting automates the modeling of thousands of variables, the process of generating initial forecasts takes only a few hours, instead of several days. And the process of updating models also can be done efficiently.

His company's data warehouse is refreshed monthly with actual sales data, so Greg runs forecasts as a batch job once a month. By doing so, he incorporates the new data and extends his forecast horizon one more month into the future. He is able to do this without re-estimating his models, which speeds the process.

To check model performance, Greg includes PASW Statistics command syntax in the batch job to identify any series having time points with observed sales outside the confidence intervals established by the original model. For these series, he runs another batch job to identify a new model that better fits the revised data.

By using PASW Forecasting, Greg conducts sophisticated forecasting efficiently and improves his company's ability to plan effectively.



## Features

### TSMODEL

Model a set of time-series variables by using the Expert Modeler or by specifying the structure of autoregressive integrated moving average (ARIMA) or exponential smoothing models

- Allow Expert Modeler to select the best-fitting predictor variables and models
  - Limit search space to ARIMA models only, or to exponential smoothing models only
  - Treat independent variables as events
- Specify custom ARIMA models, which produce maximum likelihood estimates for seasonal and non-seasonal univariate models
  - Work with general or constrained models specified by autoregressive or moving average order, order of differencing, seasonal autoregressive or moving average order, and seasonal differencing
  - Use two dependent variable transformations: square root and natural log
  - Automatically detect or specify outliers: additive, level shift, innovational, transient, seasonal additive, local trend, and additive patch
  - Specify seasonal and non-seasonal numerator, denominator, and difference transfer function orders and transformations for each independent variable
- Specify custom exponential smoothing models
  - Four non-seasonal model types: simple, Holt's linear trend, Brown's linear trend, and damped trend
  - Three seasonal model types: simple seasonal, Winters' additive, and Winters' multiplicative
  - Two dependent variable transformations: Square root and natural log

- Display forecasts, fit measures, Ljung-Box statistic, parameter estimates, and outliers by model
- Generate tables and plots to compare statistics across all models
- Choose from eight available goodness-of-fit measures:  $R^2$ , stationary  $R^2$ , root mean square error, mean absolute percentage error, mean absolute error, maximum absolute percentage error, maximum absolute error, and normalized Bayes information criterion (BIC)
- Create tables and plots of residual autocorrelation function (ACF) and partial autocorrelation function (PACF)
- Plot observed values, forecasts, fit values, and confidence intervals for forecasts, and fit values for each series
- Filter output to a fixed number or percentage of best- or worst-fitting models
- Save predicted values, lower confidence limits, upper confidence limits, and noise residuals for each series back to the dataset
- Specify forecast period, treatment of user-missing values, and confidence intervals
- Export models to an XML file for later use by TSAPPLY

### TSAPPLY

Apply saved models to new or updated data

- Simultaneously apply models from multiple XML files created with TSMODEL
- Re-estimate model parameters and goodness-of-fit measures from the data, or load them from the saved model file
- Selectively choose saved models to apply
- Override the periodicity (seasonality) of the active dataset
- Choose from the same output, fit measure, statistics, and options as TSMODEL
- Export re-estimated models to an XML file

### SEASON

Estimate multiplicative or additive seasonal factors for periodic time series

- Choose either a multiplicative or an additive model
- Calculate moving averages, ratios, seasonal and seasonal adjustment factors, seasonally adjusted series, smoothed trend-cycle components, and irregular components

### SPECTRA

Decompose a time series into its harmonic components, a set of regular periodic functions at different wavelengths or periods

- Produce/plot univariate or bivariate periodogram and spectral density estimates
- Produce/plot bivariate spectral analyses
- Smooth periodogram values with weighted moving averages
- Smooth, using available spectral data windows: Tukey-Hamming, Tukey, Parzen, Bartlett, equal weight, no smoothing, and user-specified weights
- Produce high-resolution charts: Periodogram, spectral and cospectral density estimate, squared coherency, quadrature spectrum estimate, phase spectrum, cross amplitude, and gain

### System requirements

- Requirements vary according to platform. For details, see [www.spss.com/statistics](http://www.spss.com/statistics).

*Features subject to change based on final product release.*

To learn more, please visit [www.spss.com](http://www.spss.com). For SPSS office locations and telephone numbers, go to [www.spss.com/worldwide](http://www.spss.com/worldwide).

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