

# SAS/STAT® 9.3 Software

## Comprehensive Statistical Capabilities

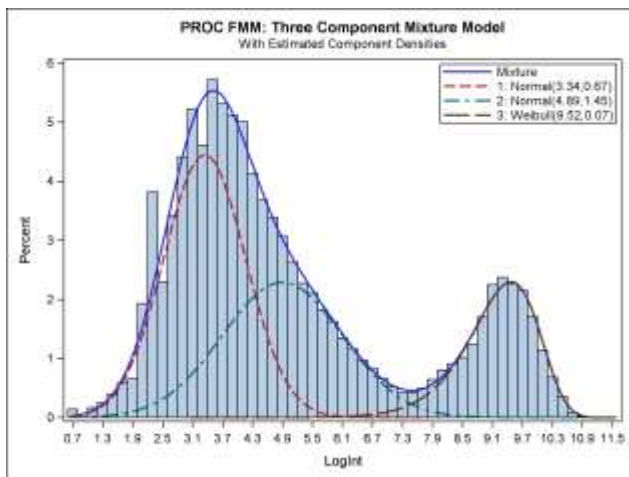
### Overview

SAS/STAT 9.3 introduces the new experimental FMM procedure in addition to many new enhancements for Bayesian analysis, structural equation modeling, multiple imputation, high-performance mixed models, survey data analysis, survival analysis, nonlinear models, and ODS Graphics.

### Finite Mixture Models

The new experimental FMM procedure fits finite mixture models, enabling you to model data for which the distribution of the response is a finite mixture of univariate distributions. PROC FMM fits finite mixtures of regression models and generalized linear models by maximum likelihood or Bayesian methods, and it enables you to model both the component distributions and the mixing probabilities. This flexibility makes PROC FMM ideal for:

- estimating multimodal or heavy-tailed densities
- fitting zero-inflated or hurdle models to count data that contain excess zeros
- modeling overdispersed data
- fitting regression models to data that have complex error distributions
- classifying observations based on predicted component probabilities
- accounting for unobservable omitted variables
- estimating switching regressions



### Bayesian Analysis

The MCMC procedure is a general-purpose Markov chain Monte Carlo simulation procedure that is designed to fit Bayesian models. In previous releases, PROC MCMC provided support for the most commonly used univariate distributions. The MCMC procedure now also supports multivariate distributions, including the Dirichlet, inverse Wishart, multivariate normal, and multinomial distributions.

The new RANDOM statement in the MCMC procedure simplifies the construction of hierarchical random-effects models by enabling you to define random effects that can enter the model in a linear or nonlinear fashion. The statement supports both univariate and multivariate prior distributions. Using the RANDOM statement significantly reduces simulation time and improves model convergence, especially in models that contain a large number of subjects or clusters.

In addition to using the default Metropolis-based algorithms, PROC MCMC now takes advantage of certain forms of conjugacy in the model in order to sample directly from the target conditional distributions. In many situations, the conjugate sampler increases sampling efficiency and provides a substantial reduction in computing time.

### Structural Equation Modeling

The CALIS procedure implements the full information maximum likelihood (FIML) method for treating data that contain random missing values. PROC CALIS provides detailed analysis of the missing patterns such as the coverage statistics of the sample moments, the frequencies and proportions of the missing patterns, and the descriptive statistics of the missing patterns.

PROC CALIS now supports the fitting of some standard covariance and mean patterns without the need to use explicit model specifications. You call these built-in patterns by supplying appropriate keywords to the new COVPATTERN= and MEANPATTERN= options, and then PROC CALIS generates the required covariance and mean structures automatically.

## Multiple Imputation

The experimental FCS statement in the MI procedure enables you to specify a multivariate imputation that uses fully conditional specification (FCS) methods. For data that have an arbitrary missing data pattern, these methods enable you to impute missing values for all variables, assuming that a joint distribution for these variables exists.

## High-Performance Mixed Models

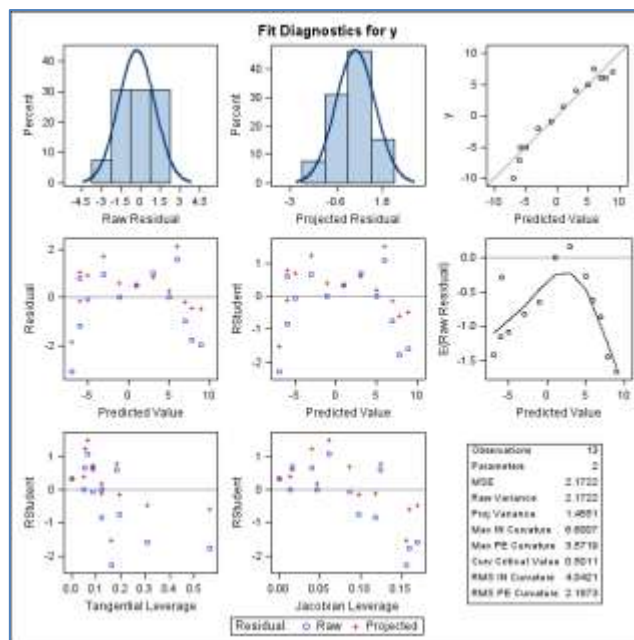
The HPMIXED procedure now provides the REPEATED statement, which defines the repeated effect and the residual covariance structure in the mixed model. Also, the RANDOM statement supports six additional covariance structures: autoregressive, compound symmetry, heterogeneous compound symmetry, uniform correlation, heterogeneous uniform correlation, and unstructured.

## Survey Data Analysis

A number of enhancements to the survey procedures are available in SAS/STAT 9.3. Variance estimation based on replication methods is available for domain analysis with the SURVEYLOGISTIC and SURVEYREG procedures and for quantiles with the SURVEYMEANS procedure. The SURVEYPHREG procedure supports programming statements that enable you to include time-dependent covariates in the model. The SURVEYSELECT procedure enables you to specify the desired margin of error for estimating the overall mean from a stratified sample instead of specifying the total sample size to allocate among the strata. Finally, the SURVEYFREQ procedure produces Rao-Scott chi-square tests with second-order corrections.

## Survival Analysis

The PHREG procedure now fits frailty models with the addition of the RANDOM statement. You often use frailty models when you analyze clustered data and you want to account for the within-cluster correlation with random effects. In addition, the NLOPTIONS statement is available in PROC PHREG, and the Zellner g-prior is available for the piecewise exponential model.



## Nonlinear Models

The NLIN procedure provides several experimental features for diagnosing your nonlinear model fit, including the PLOTS, NLINMEASURES, and BIAS options in the PROC NLIN statement. The PLOTS option enables you to plot the fitted model, fit diagnostics, tangential and Jacobian leverage, and local influence. The NLINMEASURES option displays global measures of nonlinearity, and the BIAS option computes Box's bias statistics for the parameter estimates. Also, you can now add the leverage, local influence, and residual diagnostics in the output data set that is produced by using the OUTPUT statement.

## ODS Graphics

Because graphics are such an indispensable tool for analyzing data, SAS® 9.3 no longer requires a SAS/GRAPH® license to produce graphs by using ODS Graphics. The family of statistical graphics procedures (SGPANEL, SGPLOT, SGRENDER, and SGSCATTER) has moved from the SAS/GRAPH license to the Base SAS® license. You will also find that in the SAS windowing environment, ODS Graphics is now enabled by default and the default ODS destination is now HTML. These new defaults have two main advantages: graphs are integrated with tables, and all output is displayed in the same HTML file using a new style. This new style, HTMLBLUE, is an all-color style that is designed to integrate tables and modern statistical graphics.

## For More Information

For more information, ask your organization's SAS representative to contact the SAS Customer Interaction Center at 1.800.727.0025.