

Latest Release: SAS/STAT® 9.22 Software

Comprehensive Statistical Capabilities

Overview

Now available is a new release of SAS/STAT software which includes significant new features. Two new procedures, completely revised software for structural equations modeling, and substantial new coverage in postfitting inference are just some of the many enhancements. The following are highlights of this new release.

Postfitting Inference

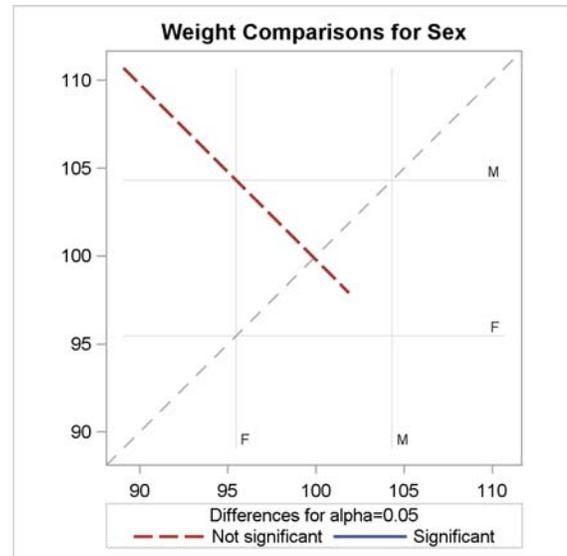
One of the strengths of SAS/STAT linear modeling procedures is the breadth of postfitting analyses available once you have fitted your model and estimated its parameters. Statements such as the ESTIMATE, LSMEANS, and LSMESTIMATE statements provide this functionality. In STAT 9.22, over thirty additional postfitting statements have been added to procedures such as GENMOD, LOGISTIC, MIXED, ORTHOREG, and PHREG. For example, the MIXED procedure now supports the LSMESTIMATE statement and the SLICE statement, and the PHREG procedure now supports the ESTIMATE, LSMEANS, LSMESTIMATE, and SLICE statements.

In addition, the new PLM procedure performs postfitting inference with model fit information stored from these same procedures with the new STORE statement. PROC PLM inputs this information, saved as a SAS item store, and performs tasks such as testing hypotheses and scoring a new data set. These tasks are specified with the usual postfitting statements. Thus, you can perform additional analyses without refitting your model, and you can use PROC PLM to specify analyses not available in some of the modeling procedures.

The PLM procedure offers the most advanced postfitting inference techniques available in SAS/STAT software, including new techniques such as step-down multiplicity adjustments for p -values, F tests with order restrictions, analysis of means (ANOM), and sampling-based linear inference based on Bayes posterior estimates.

For example, if you stored model information from PROC GLM for a model in which height is predicted by weight and sex, you might request an analysis of the difference of means. The following statements would produce a graph in addition to tabular results.

```
proc plm restore=sasuser.StudyResults;
  lsmeans Sex/ diff;
run;
```



Cox Models for Survey Data

The experimental SURVEYPHREG procedure fits the Cox model for proportional hazards to sample survey data. The procedure provides design-based variance estimates, confidence intervals, and hypothesis tests concerning the model parameters and model effects. For statistical inference, PROC SURVEYPHREG incorporates complex survey sample designs, including designs with stratification, clustering, and unequal weighting. PROC SURVEYREG provides both Taylor series and replication variance estimation procedures, and it also provides domain analysis through the DOMAIN statement. In addition, PROC SURVEYREG offers postfitting inference as performed with the ESTIMATE, LSMEANS, LSMESTIMATE, and SLICE statements. You can save model information with the STORE statement for further use with the new PLM procedure.

Note that SAS/STAT 9.22 also brings additional features to the survey analysis procedures. Variance estimation based on replication methods is available for all analyses, and the SURVEYFREQ procedure now produces a number of plots.

Structural Equation Modeling

The CALIS procedure performs structural equation modeling. This procedure has been completely redesigned to provide much more powerful and customizable modeling. Most of these updates were introduced in SAS/STAT 9.2 with the TCALIS procedure, and those updates have now been rolled into the production CALIS procedure. These capabilities include new modeling languages

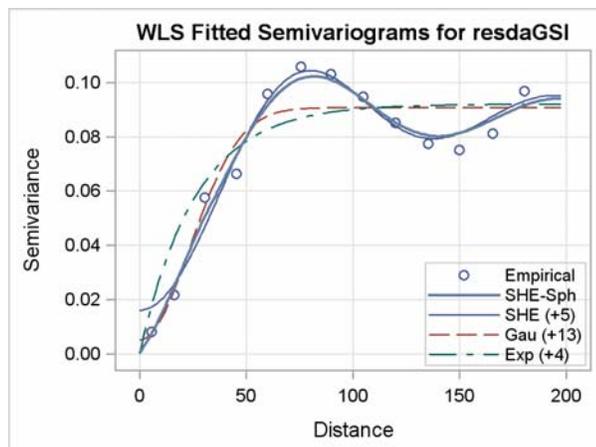
such as LISMOD, MSTRUCT, and PATH; multiple group analysis, improved mean structure analysis, general parametric function testing; and Improved effect analysis.

In addition, PROC CALIS introduces several experimental features in SAS/STAT 9.22, including the full information maximum likelihood method (FIML), mean structure analysis with the COSAN model, unnamed free parameter specification, and an extended path modeling language.

Spatial Analysis

SAS/STAT software now provides seamless analysis and prediction of spatial processes. New features include:

- More correlation models
- Automated semivariogram fitting
- Item stores for passing semivariogram information to the KRIGE2D or SIM2D procedures
- Customizable graphics for spatial data exploration and display of resulting predictions and simulations



Bayesian Analysis

Bayesian capabilities continue to grow in SAS/STAT software. The capabilities provided by the BAYES statement in the GENMOD, LIFEREG, and PHREG procedures have been updated with new sampling methods. Conjugate sampling for linear regression is now the default in the GENMOD procedure, reducing computation time. You can specify either the Gamerman algorithm or the independent Metropolis algorithm in PROC GENMOD for other generalized linear models. You can choose the random-walk Metropolis algorithm as an alternative sampling method in the PHREG procedure as well as specify the Zellner g-prior for the regression coefficients.

The MCMC procedure introduces the PREDDIST statement, which enables you to create random samples from the posterior predictive distribution of the response variables. The posterior

predictive distribution is the distribution of unobserved observations (predictions) conditional on the observed data.

More Modeling Enhancements

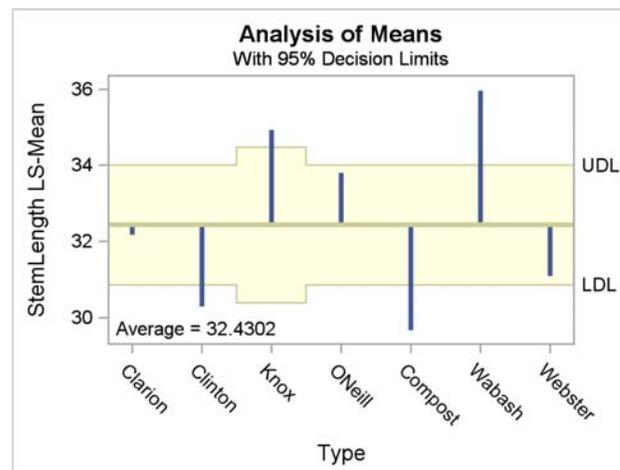
The experimental EFFECT statement, which defines a richer class of linear models, is now available in 11 procedures. With this statement, you can define effect types such as splines, multi-class effects, lag effects, and polynomial effects. The EFFECTPLOT statement creates plots of model effects in the GENMOD, LOGISTIC, and ORTHOREG procedures.

The ROBUSTREG procedure includes a CLASS statement, and the GLMSELECT procedure now provides model averaging for high dimension prediction. If you specify multiple quantiles in a MODEL statement in PROC QUANTREG, analyses such as those specified in the TEST statement are produced for each quantile specified. In addition, rank tests are now available with the QUANTREG procedure.

The GENMOD procedure now offers exact Poisson regression as well as zero-inflated negative binomial regression.

ODS Statistical Graphics

The majority of SAS/STAT procedures now produce graphics as systematically as they produce tables, with over 400 easily-specified graphs. The SURVEYFREQ and TPSPLINE procedures now produce plots, and new graphs are available in the FREQ, SIM2D, KRIGE2D, and VARIOGRAM procedures as well.



For More Information

SAS/STAT 9.22 is installed with the third maintenance release of SAS 9.2 and replaces SAS/STAT 9.2. For more information, see support.sas.com/statistics/