

# > Improve Predictions with Regression Software

Use the range of nonlinear modeling procedures in PASW Regression\* to apply more sophisticated models to your data, whether you work in business, academia, or government.

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

## **Predict categorical outcomes with more than two categories**

With multinomial logistic regression (MLR), you are free from constraints such as yes/no answers. For example, you can model which factors predict if the customer buys product A, product B, or product C.

## **Easily classify your data into two groups**

Use binary logistic regression to predict dichotomous variables such as buy or not buy and vote or not vote. This procedure offers stepwise methods to select the main and interaction effects that best predict your response variable.

## **Control your model**

Have more control over your model and your model expression by using constrained and unconstrained

nonlinear regression procedures. These procedures provide two methods for estimating parameters of nonlinear models. The Levenberg-Marquardt algorithm analyzes unconstrained models. The sequential quadratic programming algorithm enables you to specify constraints on parameter estimates, provide your own loss function, and get bootstrap estimates of standard errors.

## **Use alternative procedures to meet assumptions**

When your data do not meet the statistical assumptions for ordinary least squares, use weighted least squares (WLS) or two-stage least squares (2SLS). Give more weight to measurements within a series by using WLS. 2SLS helps control for correlations between predictor variables and error terms that often occur with time-based data.

## **Find the best stimuli**

Perform probit and logit response modeling to analyze the potency of responses to stimuli, such as medicine doses, prices, or incentives. Probit evaluates the value of the stimuli using a logit or probit transformation of the proportion responding.

## **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).

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

## Features

### Multinomial logistic regression (MLR)

Regresses a categorical dependent variable with more than two categories on a set of independent variables

- Control the values of the algorithm-tuning parameters using the CRITERIA subcommand
- Include interaction terms
- Customize hypotheses by directly specifying null hypotheses as linear combinations of parameters, using the TEST subcommand
- Specify the dispersion scaling value by using the SCALE subcommand
- Build equations with or without a constant
- Use a confidence interval for odds ratios
- Save the following statistics: Predicted probability, predicted response category, probability of the predicted response category, and probability of the actual response category
- Specify the reference category in the dependent variables
- Handle very large problems
- Find the best predictor from dozens of possible predictors using stepwise functionality
  - Find predictors using forward entry, backward elimination, forward stepwise, or backward stepwise
  - Opt to select a rule for effect entry or removal from the analysis
  - Base entry or removal on satisfying the hierarchy requirement for all effects, for factor-only effects, or for satisfying the containment requirement for all effects
  - Optionally, perform entry or removal without satisfying the hierarchy or containment requirement for any effects in the model
- Use Score and Wald methods, which help you more quickly reach results if you have a large number of predictors

- Assess model fit using Akaike information criterion (AIC) and Bayesian information criterion (BIC; also called Schwarz Bayesian Criterion, or SBC)
- Choose from the following diagnostics for the classification table:
  - Percent concordance
  - Percent ties
  - Percent discordance
  - C-value for logistic mode
  - Somer's D
  - Gamma
  - Tau-a statistics

### Binary logistic regression

Regresses a dichotomous dependent variable on a set of independent variables

- Use forward/backward stepwise and forced entry modeling
- Transform categorical variables by using deviation contrasts, simple comparison, difference (reverse Helmert) contrasts, Helmert contrasts, polynomial contrasts, comparison of adjacent categories, user-defined contrasts, or indicator variables
- Select criteria for model building: Probability of score statistic for entry, probability of Wald, or likelihood ratio statistic for removal
- Save the following statistics: Predicted probability and group, residuals, deviance values, logit, Studentized and standardized residuals, leverage value, analog of Cook's influence statistic, and difference in Beta
- Export the model using XML

### Constrained nonlinear regression (CNLR)

Uses linear and nonlinear constraints on any combination of parameters

- Save predicted values, residuals, and derivatives
- Choose numerical or user-specified derivatives

### Nonlinear regression (NLR)

Estimates models with arbitrary relationships between independent and dependent variables using iterative estimation algorithms

- Specify loss function options
- Use bootstrap estimates of standard errors

### Weighted least squares (WLS)

Gives more weight to measurements within a series

- Calculate weights based on source variable and Delta values or apply from an existing series
- Select output for calculated weights: Log-likelihood functions for each value of Delta; R, R<sup>2</sup>, adjusted R<sup>2</sup>, standard errors, analysis of variance, and *t* tests of individual coefficient for Delta value with maximized log-likelihood function
- Display output in pivot tables

### Two-stage least squares (2SLS)

Helps control for correlations between predictor variables and error terms

- Use structural equations and instrumental variables
- Set control for correlations between predictor variables and error terms
- Display output in pivot tables

### Probit

Evaluates the value of stimuli using a logit or probit transformation of the proportion responding

- Transform predictors: Base 10, natural, or user-specified base (including none)
- Allow for natural response rate estimates or specify them yourself
- Use algorithm control parameters: Convergence, iteration limit, and heterogeneity criterion probability
- Select from the following statistics: Frequencies, fiducial confidence intervals, relative median potency, test of parallelism, plots of observed probits, or logits
- Display output in pivot tables

### 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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