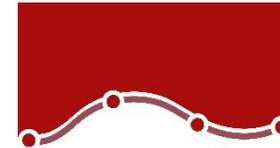**SPSS**

Statistics for Data Analysis

WHO WE ARE

SPS is an Italian center of statistical data analysis with more than 20 years of experience.

SPS was born in 1994 as SPSS Italia and it was the only reseller in Italy for SPSS software suite, authorised by SPSS inc.

Today SPS is an IBM Gold Business Partner, Software Support Provider and Expert Level in Data Science & Business Analytics.

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DATASHEET

Categories

Statistics for Data Analysis

Organizations can solve a wide array of business and research problems with the solution Statistics for Data Analysis.

Compared to other statistical software, the solution is easier to use, has a lower total cost of ownership and more comprehensively addresses the entire analytical process, from planning to data collection to analysis, reporting and deployment.

Organizations of all types rely on Statistics for Data Analysis to help increase revenue, outmaneuver competitors, conduct research and make better decisions. With decades of built-in expertise and innovation, it's a leading choice for reliable statistical analysis.

Statistics Base is part of the solution Statistics for Data Analysis, which consists of:

- Software license
- Add-On
- SPS Service Program

This comprehensive, easy-to-use solution includes many different procedures and tests to help users solve complex business and research challenges.

Statistics for Data Analysis

The solution analytical capabilities to meet the analysis requirements of any type of organization, from basic tools for solving common problems to advanced analytical techniques that enable all type of organization to address complex challenges.

Statistics for Data Analysis can help you:

- Analyze your data with new and advanced statistics, including a variety of new features within UNIANOVA methods
- Integrate better with third-party applications, including stronger integration with Microsoft Office
- Save time and effort with productivity enhancements:
    - More attractive and modern-looking charts in Chartbuilder
    - New groundbreaking features in Statistics Amos 25
    - Data and syntax editor enhancements
    - Accessibility improvements for the visually impaired
    - Updated merge user interface
    - Simplified toolbars

Statistics for Data Analysis can access quickly, manage and analyze any kind of dataset, including survey data, corporate databases or data downloaded from the web.

In addition, the software can process Unicode data. This eliminates variability in data due to language-specific encoding and enables your organization to view, analyze and share data written in multiple languages.

Business Benefit Statistics for Data Analysis

- Support business decisions with data-based analytics for improved outcomes.
- Be more confident in your results by incorporating data from many different sources, including geospatial information, in your analysis and using proven, tested techniques to perform your analysis.
- Save time and effort with capabilities that enable experienced analysts to develop procedures or dialogs that others can use to speed through repetitive tasks.
- Give results greater impact by using visualization capabilities that clearly show others the significance of your findings.

Statistics Categories
Datasheet

Predict outcomes and reveal relationships in categorical data

Unleash the full potential of your data through predictive analysis, statistical learning, perceptual mapping, preference scaling and dimension reduction techniques, including optimal scaling of your variables. Statistics Categories provides you with all the tools you need to obtain clear insight into complex categorical and numeric data, as well as high-dimensional data.

For example, use Statistics Categories to understand which characteristics consumers relate most closely to your product or brand, or to determine customer perception of your products compared to other products that you or your competitors offer.

With Statistics Categories, you can perform regression procedures when both predictor and outcome variables are numeric, ordinal or nominal, and visually interpret data to see how rows and columns relate in large tables of scores, counts, ratings, rankings or similarities. This gives you the ability to:

- Work with and understand ordinal and nominal data using procedures similar to conventional regression, principal components and canonical correlation analyses.

Highlights:

- Visualize and explore complex categorical and numeric data, as well as high-dimensional data.

- Understand information in large two-way and multi-way tables.

- Use biplots, triplots and perceptual maps to see relationships in your data.

Statistics Categories
Datasheet

Easily analyze and interpret multivariate data

The capabilities built into Statistics Categories allow you to easily analyze and interpret your multivariate data and its relationships more completely:

- Categorical regression procedures let you predict the values of a nominal, ordinal, or numerical outcome variable from a combination of numeric and (un)ordered categorical predictor variables.
- Optimal scaling techniques quantify the variables to maximize the Multiple R.
- Dimension reduction techniques help you clearly see relationships in your data using revealing perceptual maps and biplots.
- Summary charts display similar variables or categories, providing you with insight into relationships among more than two variables.

- Deal with non-normal residuals in numeric data or nonlinear relationships between predictor variables and the outcome variable. Use the options for Ridge Regression, the Lasso, the Elastic Net, variable selection and model selection for both numeric and categorical data.
- Use biplots and triplots to represent the relationship between objects (cases), categories and (sets of) variables in correlation analyses.
- Represent similarities between one or two sets of objects as distances in perceptual maps.

Turn your qualitative variables into quantitative ones

The advanced procedures in Statistics Categories enable you to perform additional statistical operations on categorical data.

Use the optimal scaling procedures in Statistics Categories to assign units of measurement and zero-points to your categorical data. This opens up a new set of statistical functions by allowing you to perform analyses on variables of mixed measurement levels—on combinations of nominal, ordinal and numeric variables, for example.

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Statistics Categories
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The ability of Statistics Categories to perform multiple regressions with optimal scaling gives you the opportunity to apply regression when you have mixtures of numerical, ordinal, and nominal predictors and outcome variables. The latest version of Statistics Categories includes state-of-the-art procedures for model selection and regularization. You can perform correspondence and multiple correspondence analyses to numerically evaluate the relationships between two or more nominal variables in your data. You may also use correspondence analysis to analyze any table with nonnegative entries. And, using the principal components analysis procedure, you can reduce your data to important components. Biplots and triplots of objects, categories and variables show their relationships. These options are also available for numeric data. Optimal scaling gives you a correlation matrix based on quantifications of your ordinal and nominal variables. Or you can split your variables into sets and then analyze the relationships between the sets by using nonlinear canonical correlation analysis.

Graphically display underlying relationships

Whatever types of categories you study—market segments, medical diagnoses, subcultures, political parties, or biological species—optimal scaling procedures free you from the restrictions associated with two-way tables, placing the relationships among your variables in a larger frame of reference. You can see a map of your data—not just a statistical report.

Dimension reduction techniques enable you to go beyond unwieldy tables. Instead, you can clarify relationships in your data by using perceptual maps and biplots.

Statistics Categories
Datasheet

- Perceptual maps are high-resolution summary charts that graphically display similar variables or categories close to each other. They provide you with unique insight into relationships between more than two categorical variables.

- Biplots and triplots enable you to look at the relationships among cases, variables, and categories. For example, you can define relationships between products, customers, and demographic characteristics.

By using the preference scaling procedure, you can further visualize relationships among objects. The breakthrough unfolding algorithm on which this procedure is based enables you to perform non-metric analyses for ordinal data and obtain meaningful results. The proximities scaling procedure allows you to analyze similarities between objects and incorporate characteristics for the objects in the same analysis.

How you can use Statistics Categories

The following procedures are available to add meaning to your data analyses:

- Categorical regression (CATREG) predicts the values of a nominal, ordinal or numerical outcome variable from a combination of numeric and (un)ordered categorical predictor variables. You can use regression with optimal scaling to describe, for example, how job satisfaction can be predicted from job category, geographic region and the amount of work-related travel.

Statistics Categories
Datasheet

- Optimal scaling techniques quantify the variables in such a way that the Multiple R is maximized. Optimal scaling may be applied to numeric variables when the residuals are non-normal or when the predictor variables are not linearly related with the outcome variable. Three new regularization methods: Ridge regression, the Lasso and the Elastic Net, improve prediction accuracy by stabilizing the parameter estimates. Automatic variable selection makes it possible to analyze high-volume datasets—more variables than objects. And by using the numeric scaling level, you can do regularization in regression by using the Lasso or the Elastic Net for your numeric data as well.

You can also use CATREG to apply particular Generalized Additive Models (GAM), both for your numeric and categorical data.

- Correspondence analysis (CORRESPONDENCE) enables you to analyze two-way tables that contain some measurement of correspondence between rows and columns, as well as display rows and columns as points in a map. A very common type of correspondence table is a crosstabulation in which the cells contain joint frequency counts for two nominal variables. Statistics Categories displays relationships among the categories of these nominal variables in a visual presentation.

- Multiple correspondence analysis (MULTIPLE CORRESPONDENCE) differs from correspondence analysis in that it allows you to use more than two variables in your analysis. With this procedure, all the variables are analyzed at the nominal level (unordered categories).

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Statistics Categories

Datasheet

For Example, you can use multiple correspondence analysis to explore relationships between favorite television show, age group, and gender. By examining a low-dimensional map created with Statistics Categories, you could see which groups gravitate to each show while also learning which shows are most similar.

- Categorical principal components analysis (CATPCA) uses optimal scaling to generalize the principal components analysis procedure so that it can accommodate variables of mixed measurement levels. It is similar to multiple correspondence analysis, except that you are able to specify an analysis level on a variable-by-variable basis.

For example, you can display the relationships between different brands of cars and characteristics such as price, weight, fuel efficiency, etc. Alternatively, you can describe cars by their class (compact, midsize, convertible, SUV, etc.), and CATPCA uses these classifications to group the points for the cars. By assigning a large weight to the classification variable, the cars will cluster tightly around their class point. Statistics Categories displays complex relationships between objects, groups, and variables in a low-dimensional map that makes it easy to understand their relationships.

- Nonlinear canonical correlation analysis (OVERALS) uses optimal scaling to generalize the canonical correlation analysis procedure so that it can accommodate variables of mixed measurement levels. This type of analysis enables you to compare multiple sets of variables to one another in the same graph, after removing the correlation within sets.

Statistics Categories
Datasheet

For example, you might analyze characteristics of products, such as soups, in a taste study. The judges represent the variables within the sets while the soups are the cases. OVERALS averages the judges' evaluations, after removing the correlations, and combines the different characteristics to display the relationships between the soups. Alternatively, each judge may have used a separate set of criteria to judge the soups. In this instance, each judge forms a set and OVERALS averages the criteria, after removing the correlations, and then combines the scores for the different judges.

The OVERALS procedure can also be used to generalize multiple regression when you have multiple outcome variables to be jointly predicted from a set of predictor variables.

- Multidimensional scaling (PROXSCAL) performs multidimensional scaling of one or more matrices containing similarities or dissimilarities (proximities). Alternatively, you can compute distances between cases in multivariate data as input to PROXSCAL. PROXSCAL displays proximities as distances in a map in order for you to gain a spatial understanding of how objects relate. In the case of multiple proximity matrices—PROXSCAL analyzes the commonalities and plots the differences between them.

For example, you can use PROXSCAL to display the similarities between different cola flavors preferred by consumers in various age groups. You might find that young people emphasize differences between traditional and new flavors, while adults emphasize diet versus non-diet colas.

Statistics Categories
Datasheet

Preference scaling (PREFSCAL) visually examines relationships between two sets of objects, for example, consumers and products. Preference scaling performs multidimensional unfolding in order to find a map that represents the relationships between these two sets of objects as distances between two sets of points. For example, if a group of drivers rated 26 models of cars on ten attributes on a six-point scale, you could find a map with clusters showing which models are similar, and which persons like these models best. This map is a compromise based on the ten different attributes, and a plot of the ten different attributes shows how they differentially weight the dimensions of the map.

Statistics Categories Features

Catreg
- Categorical regression analysis through optimal scaling
  - Specify the optimal scaling level at which you want to analyze each variable. Choose from: Spline ordinal (monotonic), spline nominal (nonmonotonic), ordinal, nominal, multiple nominal or numerical
  - Discretize continuous variables or convert string variables to numeric integer values by multiplying, ranking or grouping values into a preselected number of categories according to an optional distribution (normal or uniform), or by grouping values in a preselected interval into categories. The ranking and grouping options can also be used to recode categorical data
  - Specify how you want to handle missing data. Impute missing data with the variable mode or with an extra category or use listwise exclusion
  - Specify objects to be treated as supplementary
  - Specify the method used to compute the initial solution
  - Control the number of iterations
  - Specify the convergence criterion
  - Plot results, either as:
    - Transformation plots (optimal category quantifications against category indicators)
    - Residual plots
  - Add transformed variables, predicted values and residuals to the working data file
  - Print results, including:
    - Multiple R, R2, and adjusted R2 charts
    - Standardized regression coefficients, standard errors, zero-order correlation, part correlation, partial correlation, Pratt's relative importance measure for the transformed predictors, tolerance before and after transformation and F statistics

- Table of descriptive statistics, including marginal frequencies, transformation type, number of missing values and mode
- Iteration history
- Tables for fit and model parameters: ANOVA table with degrees of freedom according to optimal scaling level; model summary table with adjusted R2 for optimal scaling, t values, and significance levels; a separate table with the zero-order, part and partial correlation and the importance and tolerance before and after transformation
- Correlations of the transformed predictors and eigenvalues of the correlation matrix
- Correlations of the original predictors and eigenvalues of the correlation matrix
- Category quantifications
- Write discretized and transformed data to an external data file
- Three new regularization methods: Ridge regression, the Lasso and the Elastic Net
  - Improve prediction accuracy by stabilizing the parameter estimates
  - Analyze high-volume data (more variables than objects)
  - Obtain automatic variable selection from the predictor set
  - Write regularized models and coefficients to a new dataset for later use
- Two new model selection and predictive accuracy assessment methods: the .632 bootstrap and Cross Validation (CV)
  - Find the model that is optimal for prediction with the .632(+) bootstrap and CV options
  - Obtain nonparametric estimates of the standard errors of the coefficients with the bootstrap
- Systematic multiple starts
  - Discover the global optimal solution when monotonic transformations are involved
  - Write signs of regression coefficients to a new dataset for reuse

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Correspondence

- Correspondence analysis
  - Input data as a case file or directly as table input
  - Specify the number of dimensions of the solution
  - Choose from two distance measures: Chi-square distances for correspondence analysis or Euclidean distances for biplot analysis types
  - Choose from five types of standardization: Remove row means, remove column means, remove row-and-column means, equalize row totals or equalize column totals
  - Five types of normalization: Symmetrical, principal, row principal, column principal and customized
  - Print results
- Correspondence table
  - Summary table: Singular values, inertia, proportion of inertia accounted for by the dimensions, cumulative proportion of inertia accounted for by the dimensions, confidence statistics for the maximum number of dimensions, row profiles and column profiles
  - Overview of row and column points: Mass, scores, inertia, contribution of the points to the inertia of the dimensions and contribution of the dimensions to the inertia of the points
  - Row and column confidence statistics: Standard deviations and correlations for active row and column points

Multiple correspondence

- Multiple correspondence analysis (replaces HOMALS, which was included in versions prior to Statistics Categories 13.0)
  - Specify variable weights
  - Discretize continuous variables or convert string variables to numeric integer values by multiplying, ranking or grouping values into a preselected number of categories according to an optional distribution (normal or uniform) or by grouping values in a preselected interval into categories. The ranking and grouping options can also be used to recode categorical data.

- Specify how you want to handle missing data. Exclude only the cells of the data matrix without valid value, impute missing data with the variable mode or with an extra category or use listwise exclusion.
- Specify objects and variables to be treated as supplementary (full output is included for categories that occur only for supplementary objects)
- Specify the number of dimensions in the solution
- Specify a file containing the coordinates of a configuration and fit variables in this fixed configuration
- Choose from five normalization options: Variable principal (optimizes associations between variables), object principal (optimizes distances between objects), symmetrical (optimizes relationships between objects and variables), independent or customized (user-specified value allowing anything in between variable principal and object principal normalization)
- Control the number of iterations
- Specify convergence criterion
- Print results, including:
  - Model summary
  - Iteration statistics and history
  - Descriptive statistics (frequencies, missing values, and mode)
  - Discrimination measures by variable and dimension
  - Category quantifications (centroid coordinates), mass, inertia of the categories, contribution of the categories to the inertia of the dimensions and contribution of the dimensions to the inertia of the categories
  - Correlations of the transformed variables and the eigenvalues of the correlation matrix for each dimension
  - Correlations of the original variables and the eigenvalues of the correlation matrix
  - Object scores
  - Object contributions: Mass, inertia, contribution of the objects to the inertia of the dimensions and contribution of the dimensions to the inertia of the objects

- Plot results, creating:
  - Category plots: Category points, transformation (optimal category quantifications against category indicators), residuals for selected variables and joint plot of category points for a selection of variables
  - Object scores
  - Discrimination measures
  - Biplots of objects and centroids of selected variables
- Add transformed variables and object scores to the working data file
- Write discretized data, transformed data and object scores to an external data file

Catpca
- Categorical principal components analysis through optimal scaling
  - Specify the optimal scaling level at which you want to analyze each variable. Choose from: Spline ordinal (monotonic), spline nominal (nonmonotonic), ordinal, nominal, multiple nominal or numerical.
  - Specify variable weights
  - Discretize continuous variables or convert string variables to numeric integer values by multiplying, ranking or grouping values into a preselected number of categories according to an optional distribution (normal or uniform), or by grouping values in a preselected interval into categories. The ranking and grouping options can also be used to recode categorical data.
  - Specify how you want to handle missing data. Exclude only the cells of the data matrix without valid value, impute missing data with the variable mode or with an extra category or use listwise exclusion.
  - Print results, including:
    - Model summary
    - Iteration statistics and history
    - Descriptive statistics (frequencies, missing values, and mode)
    - Variance accounted for by variable and dimension

- Component loadings
- Category quantifications and category coordinates (vector and/or centroid coordinates) for each dimension
- Correlations of the transformed variables and the eigenvalues of the correlation matrix
- Correlations of the original variables and the eigenvalues of the correlation matrix
- Object (component) scores
- Plot results, creating:
  - Category plots: Category points, transformations (optimal category quantifications against category indicators), residuals for selected variables and joint plot of category points for a selection of variables
- Plot of the object (component) scores
- Plot of component loadings

Proxscal
- Multidimensional scaling analysis
  - Read one or more square matrices of proximities, either symmetrical or asymmetrical
  - Read weights, initial configurations, fixed coordinates and independent variables
  - Treat proximities as ordinal (non-metric) or numeric (metric); ordinal transformations can treat tied observations as discrete or continuous
  - Specify multidimensional scaling with three individual differences models, as well as the identity model --Specify fixed coordinates or independent variables to restrict the configuration. Additionally, specify the transformations (numerical, nominal, ordinal, and splines) for independent variables

Prefscal

- Visually examine relationships between variables in two sets of objects in order to find a common quantitative scale
    - o Read one or more rectangular matrices of proximities
    - o Read weights, initial configurations and fixed coordinates
    - o Optionally transform proximities with linear, ordinal, smooth ordinal or spline functions
    - o Specify multidimensional unfolding with identity, weighted Euclidean or generalized Euclidean models
    - o Specify fixed row and column coordinates to restrict the configuration

Statistics for Data Analysis solution
Add more analytical power, as you need it, with optional modules and stand-alone software from the Statistics for Data Analysis family.

Statistics Base
Statistics Base includes the core capabilities to take the analytical process from start to finish. It is easy to use and includes a broad range of procedures and techniques to increase revenue, outperform competitors, conduct research and make better decisions.

Statistics Advanced
Statistics Advanced includes these powerful multivariate techniques: generalized linear models (GENLIN), generalized estimating equations (GEE), mixed level models, general linear mixed models (GLMM), variance component estimation, MANOVA, Kaplan-Meier estimation, Cox regression, hiloglinear, loglinear and survival analysis.

Statistics Bootstrapping
Statistics Bootstrapping enables researchers and analysts to use bootstrapping techniques on a number of tests contained in Statistics for Data Analysis modules. This provides an efficient way to ensure that your models are stable and reliable. With Statistics Bootstrapping, you can reliably estimate the standard errors and confidence intervals of a population parameter like a mean, median, proportion, odds ratio, correlation coefficient, regression coefficient and numerous.

Statistics Categories
Unleash the full potential of your categorical data through perceptual maps with optimal scaling and dimension reduction techniques. This add-on module provides you with everything you need to analyze and interpret multivariate data and their relationships more completely.

Statistics Complex Samples
Incorporate complex sample designs into data analysis for more accurate analysis of complex sample data. Statistics Complex Samples, with specialized planning tools and statistics, reduces the risk of reaching incorrect or misleading inferences for stratified, clustered or multistage sampling.

Statistics Conjoint
Statistics Conjoint helps market researchers develop successful products. By performing conjoint analysis, you learn what product attributes are important in the consumer's mind and what the most preferred attribute levels are, and can perform pricing studies and brand equity studies.

Statistics Tables
Use Statistics Tables to present survey, customer satisfaction, polling and compliance reporting results. Features such as a table builder preview, included inferential statistics and data management capabilities make it easy to clearly communicate your results.

Statistics Preparation

With Statistics Preparation, you gain several procedures that facilitate the data preparation process. This add-on module enables you to easily identify suspicious and invalid cases, variables and data values; view patterns of missing data; summarize variable distributions to get your data ready for analysis; and more accurately work with algorithms designed for nominal attributes.

Statistics Decision Trees

Create highly visual classification and decision trees directly within Statistics for Data Analysis for segmentation, stratification, prediction, data reduction and variable screening, interaction identification, category merging and discretizing continuous variables. Highly visual trees enable you to present results in an intuitive manner.

Statistics Direct Marketing

Statistics Direct Marketing helps marketers perform various kinds of analyses easily and confidently, without requiring a detailed understanding of statistics. They can conduct recency, frequency and monetary value (RFM) analysis, cluster analysis, and prospect profiling. They can also improve marketing campaigns through postal code analysis, propensity scoring, and control package testing. And they can easily score new customer data and access pre-built models.

Statistics Exact Tests

Statistics Exact Tests always provides you with correct p values, regardless of your data structure, even if you have a small number of cases, have subset your data into fine breakdowns or have variables where 80 percent or more of the responses are in one category.

Statistics Forecasting

Improve forecasting with complete time-series analyses, including multiple curve-fitting, smoothing models, methods for estimating autoregressive functions and temporal causal modeling. Use the Expert Modeler to automatically determine

which ARIMA (autoregressive integrated moving average) process or exponential smoothing model best fits your time-series and independent variables, eliminating selection through trial and error.

Statistics Missing Values

If values are missing from your data, this module may find some relationships between the missing values and other variables. In addition, the missing values module can estimate what the value would be if data weren't missing.

Statistics Neural Networks

Use the Statistics Neural Networks module to model complex relationships between inputs and outputs or to discover patterns in your data. Choose from algorithms that can be used for classification (categorical outcomes) and prediction (numerical outcomes). The two available algorithms are Multilayer Perceptron and Radial Basis Function.

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Statistics Regression

Predict behavior or events when your data go beyond the assumptions of linear regression techniques. Perform multinomial or binary logistic regression and nonlinear regression, weighted least squares, two-stage least squares and probit analysis.

Complementary product

Use these products with Statistics for Data Analysis to enhance your analytical results.

Statistics Amos

Support your research and theories by extending standard multivariate analysis methods when using this stand-alone software package for structural equation modeling (SEM). Build attitudinal and behavioral models that more realistically reflect complex relationships, because any numeric variable, whether observed or latent, can be used to predict any other numeric variable. The latest release includes a new nongraphical method of model specification that improves accessibility for users who need scripting capabilities and enables large, complicated models to be run more quickly.