Environmental Stats for S-PLUS: A COMPREHENSIVE SOFTWARE PACKAGE FOR ENVIRONMENTAL STATISTICS

The first choice for environmental data analysis. EnvironmentalStats for S-PLUS, an add-on module to S-PLUS, provides a set of powerful yet simple-to-use pull-down menus and functions for performing graphical and statistical analyses of environmental data. The software brings the major environmental statistical methods found in the literature and regulatory guidance documents into one statistical package, along with an extensive hypertext help system that explains what these methods do, how to use these methods, and where to find them in the environmental statistics literature. Also included are numerous built-in data sets from regulatory guidance documents and the environmental statistics literature.

EnvironmentalStats for S-PLUS will be useful to anyone who has to make sense of environmental data, including hydrologists, soil scientists, atmospheric scientists, geochemists, environmental engineers and consultants, hazardous and solid waste site managers, and regulatory agency analysts and enforcement officers. Parts of EnvironmentalStats for S-PLUS incorporate statistical methods that have appeared in the environmental literature but are not commonly found in any statistical software package. Parts of EnvironmentalStats for S-PLUS are specifically aimed at users who are required to collect and analyze environmental monitoring data in order to comply with federal and state Superfund, RCRA, CERCLA, and Subtitle D regulations. All of the functions in EnvironmentalStats for S-PLUS, however, are useful to anyone who needs to analyze environmental data.

Not just for environmental data. By extending the statistical capabilities of S-PLUS, EnvironmentalStats for S-PLUS is also useful to practitioners outside the field. Anyone who uses S-PLUS will find all sorts of useful functions in EnvironmentalStats for S-PLUS, including functions to plot probability and cumulative distribution functions, a standardized set of functions for estimating distribution parameters and quantiles and computing confidence intervals, new functions and methods for Goodness-of-Fit tests (including Shapiro-Wilk), functions to compute prediction and tolerance intervals, functions to estimate and test for trend, functions to easily create power and sample size plots, functions to handle Type I censored data, and functions to perform probabilistic risk assessment. Furthermore, the glossary of statistical terms is a valuable tool to anyone who wishes to use S-PLUS to learn or teach Statistics.

EnvironmentalStats for S-PLUS includes a comprehensive reference manual and detailed documentation. Comprehensive statistical methods and accompanying literature found in a single environment improving productivity

- Invaluable tools for study design from an easy-to-use GUI make it easy to become productive quickly
- Documentation, extensive help files and industry-specific examples
- Advanced visualization tools for analyzing and interpreting results
- Ability to program functions to meet unique organizational needs

- Use pull-down menus to easily perform statistical analyses.
- Compute quantities associated with probability distributions (probability density functions, cumulative distribution functions, quantiles), and generate random numbers from these distributions. (Several distributions have been added to the ones already available in S-PLUS.)
- Plot probability distributions so you can see how they change with the value of the distribution parameters.
- Compute several different kinds of summary statistics. (Several additional summary statistics have been added to the ones already available in S-PLUS.)
- Estimate distribution parameters and quantiles and compute confidence intervals for commonly used probability distributions.
- Perform and plot the results of a Goodness-of-Fit test:
    - Observed and Fitted Distributions
    - Quantile-Quantile Plots

    - Results of Shaprio-Wilk, Kolmogorov-Smirnov, etc.
- Compute optimal Box-Cox data transformations.
- Compute parameteric and non-parametric prediction and tolerance intervals.
- Easily perform several kinds of hypothesis tests, including ones not already built into S-PLUS such as:
    - Chen's modified one-sided t-Test for skewed distributions
    - Fisher's one-sample randomization (permutation) test for location
    - Quantile test to detect a shift in the tail of one population relative to another
    - Two-sample linear rank tests
    - Test for serial correlation based on von Neumann rank test
    - Nonparametric estimation and tests for seasonal trend
- Create power and sample size computations and plots.
- Perform calibration based on a machine signal to determine decision and detection limits and report estimated concentrations along with confidence intervals.
- Handle singly and multiply censored (less-than-detection-limit) data:
    - Empirical CDF and Quantile-Quantile Plots
    - Parameter/Quantile Estimation and Confidence Intervals
    - Prediction and Tolerance Intervals
    - Goodness-of-Fit Tests
    - Optimal Box-Cox Transformations
    - Two-Sample Rank Tests
- Perform probabilistic risk assessment.
- Look up statistical methods in the environmental literature in a hypertext help system that explains the equations, links the equations to the original reference, includes abstracts of selected references, and contains a glossary of statistical and environmental terms.
- Reproduce specific examples in EPA guidance documents by using built-in data sets from these documents.

Feature List

Pull-Down Menus and Dialogs: Perform Your Analyses via the New Pull-Down Menus
Probability Distributions: Compute Densities, Probabilities, Quantiles, and Random Numbers for the Following Distributions

- Continuous Distributions: Beta, Cauchy, Chi (square root of a chisquare), Chisquare, Empirical, Exponential, Extreme Value, Generalized Extreme Value, F (central and non-central), Gamma, Logistic, Lognormal, 3-Parameter Lognormal, Mixture of Two Lognormals, Truncated Lognormal, Normal, Mixture of Two Normals, Truncated Normal, Pareto, Stable, Student's t (central and non-central), Triangular, Uniform, Weibull
- Discrete Distributions: Binomial, Empirical, Geometric, Hypergeometric, Negative Binomial, Poisson, Wilcoxon
- Mixtures of Continuous and Distrete Distributions: Zero-Modified Lognormal (Also Called the Delta Distribution; Lognormal with positive mass at 0), Zero-Modified Normal (Normal with positive mass at 0)

Probability Density and Cumulative Distribution Plots

- Plot PDFs and CDFs so you can see how they change with the value of the distribution parameter(s)

Summary Statistics: Several additional summary statistics have been added to the ones already available in S-PLUS

Q-Q Plots for All Probability Distributions: Includes Standard Q-Q Plots and Tukey Mean-Difference Plots

Q-Q Plot Gestalt Function That Produces Numerous "Typical" Q-Q Plots for a Specified Distribution: Allows You to Build Up a Visual Memory of "Typical" Q-Q Plots

Estimation of Distribution Parameters and Quantiles

- Several Estimation Methods Available: Maximum Likelihood, Minimum Variance Unbiased, Method of Moments, Method of L-Moments, etc.
- Results Printed in "Nice" Format: Data Set Name, Sample Size, Method of Estimation, Optional Confidence Interval

Confidence Intervals for Distribution Parameters

- Binomial: Exact, Normal Approximation
- Exponential: Exact
- Extreme Value: Normal Approximation
- Lognormal: Exact (Land, 1971), Parkin et al.'s (1990) Approximation, Cox's
- Approximation (Land, 1972), Normal Approximation
- Three-Parameter Lognormal: Normal Approximation, Likelihood Profile, Zero
- Skewness (Royston, 1992b)
- Normal: Exact
- Poisson: Exact, Pearson-Hartley Approximation, Normal Approximation
- Zero-Modified Lognormal (Delta): Normal Approximation
- Zero-Modified Normal: Normal Approximation

Confidence Intervals for Distribution Quantiles

- Lognormal, Normal, Poisson, Nonparametric

Goodness-of-Fit Tests (New and Updated)

- Chi-Square, Kolmogorov-Smirnov, Probability Plot Correlation Coefficient, Shapiro-Francia, Shapiro-Wilk
- Allow User to Estimate the Distribution Parameters
- Results Printed in "Nice" Format: Data Set Name, Hypothesized Distribution, Estimated Parameters, Test Method
- Results Can Be Plotted. Optional Plots Include: Histogram with Overlaid Fitted Distribution, Q-Q Plot, CDF Plots of Observed and Fitted Distribution, Test Results

Optimal Box-Cox Transformations: Determine Optimal Power Transformation Based on Probability Plot using Correlation Coefficient or Other Criteria, Prediction and Tolerance Intervals

- Lognormal , Normal, Poisson , Nonparametric

Special Hypothesis Tests

- Chen's Modified One-Sided t-Test for Skewed Distributions
- Fisher's One-Sample Randomization (Permutation) Test for Location
- Quantile Test (Detects Shifts in Tail of Distribution)
- Two-Sample Linear Rank Tests
- Test for Serial Correlation Based on von Neumann Rank Test
- Seasonal Kendall Test for Trend

Power and Sample Size Calculations for Standard Hypothesis Tests

- Includes Sample Size, Power, Minimal Detectable Difference, and Significance Level Functions to Easily Plot These Quantities

Calibration

- Fit a Calibration Line or Curve
- Predict Concentrations Based on Fitted Calibration Curve and Compute Associated Confidence Intervals
- Determine Decision and Detection Limits

Methods for Type I Censored Data

- Empirical Cumulative Distribution Plots, Quantile-Quantile (Probability) Plots, Goodness-of-Fit Tests, Parameter/Quantile Estimation and Confidence Intervals, Prediction and Tolerance Intervals, Hypothesis Testing

Tools for Probabilistic Risk Assessment

- Simple Random Sampling and Latin Hypercube Sampling
- Generate Random Numbers from a Multivariate Normal Distribution
- Generate a Multivariate Matrix from One or More Specified Distributions with a
- Specified Rank Correlation
- Create an Output Distribution of Exposure or Risk

Built-In Data Sets

- Data Sets Appearing in Selected EPA Guidance Documents
- Selected Data Sets from the Environmental Statistics Literature

Extensive Hypertext Help System

- Cross-Referenced Help Files that Clearly Explain Each Procedure and Provide Specific, Detailed Examples
- Detailed Abstracts of Selected Literature in Environmental Statistics
- A Fully Cross-Referenced, Hypertext Glossary of Statistical and Environmental Terms
- EnvironmentalStats for S-PLUS version 2.0 module
- S-PLUS Professional or S-PLUS Standard for Windows Version 6 or higher
- 20 MB additional disk space

Supported Platforms

- Microsoft Windows 98, ME, 2000, NT or XP