IDL Analyst

List of Routines and Functions

Regression

Multiple Linear Regression

IMSL_REGRESSORS	Generates regressors for a general linear model.
IMSL_MULTIREGRESS	Fits a multiple linear regression model and optionally produces summary statistics for a regression model.
IMSL_MULTIPREDICT	Computes predicted values, confidence intervals, and diagnostics.

Variable Selection

IMSL_ALLBEST	All best regressions.
IMSL_STEPWISE	Stepwise regression.

Polynomial and Nonlinear Regression

IMSL_POLYREGRESS	Fits a polynomial regression model.
IMSL_POLYPREDICT	Computes predicted values, confidence intervals, and diagnostics.
IMSL_NONLINREGRESS	Fits a nonlinear regression model.

Multivariate Linear Regression—Statistical Inference and Diagnostics

IMSL_HYPOTH_PARTIAL	Construction of a completely testable hypothesis.
IMSL_HYPOTH_SCPH	Sums of cross products for a multivariate hypothesis.
IMSL_HYPOTH_TEST	Tests for the multivariate linear hypothesis.

Polynomial and Nonlinear Regression

IMSL_NONLINOPT	Fit a nonlinear regression model using Powell's algorithm.

Alternatives to Least Squares Regression

IMSL_LNORMREGRESS	LAV, Lpnorm, and LMV criteria regression.

Correlation and Covariance

IMSL_COVARIANCES	Variance-covariance or correlation matrix.
IMSL_PARTIAL_COV	Partial correlations and covariances.
IMSL_POOLED_COV	Pooled covariance matrix.
IMSL_ROBUST_COV	Robust estimate of covariance matrix.

Analysis of Variance

IMSL_ANOVA1	Analyzes a one-way classification model.
IMSL_ANOVAFACT	Analyzes a balanced factorial design with fixed effects.
IMSL_MULTICOMP	Performs Student-Newman-Keuls multiple comparisons test.
IMSL_ANOVANESTED	Nested random model.
IMSL_ANOVABALANCED	Balanced fixed, random, or mixed model.

Transforms

IMSL_FFTCOMP	Real or complex FFT.
IMSL_FFTINIT	Real or complex FFT initialization.
IMSL_CONVOL1D	Compute discrete convolution.
IMSL_CORR1D	Compute discrete correlation.
IMSL_LAPLACE_INV	Approximate inverse Laplace transform of a complex function.

Nonlinear Equations

Zeros of a Polynomial

IMSL_ZEROPOLY	Real or complex coefficients.

Zeros of a Function

IMSL_ZEROFCN	Real zeros of a function.

Root of a System of Equations

IMSL_ZEROSYS	Powell's hybrid method.

Optimization

Unconstrained Minimization

IMSL_FMIN	(Univariate Function) Using function and possibly first derivative values.
IMSL_FMINV	(Multivariate Function) Using quasi-Newton method.
IMSL_NLINLSQ	(Nonlinear Least Squares) Using Levenberg-Marquardt algorithm.

Linearly Constrained Minimization

IMSL_LINPROG	Dense linear programming.
IMSL_QUADPROG	Quadratic programming.

Nonlinearly Constrained Minimization

IMSL_MINCONGEN	Minimize a general objective function.
IMSL_CONSTRAINED_NLP	Using a sequential equality constrained quadratic programming method.

Special Functions

Error Functions

IMSL_ERF	Error function.
IMSL_ERFC	Complementary error function.
IMSL_BETA	Beta function.
IMSL_LNBETA	Logarithmic beta function.
IMSL_BETAI	Incomplete beta function.

Gamma Functions

IMSL_LNGAMMA	Logarithmic gamma function.
IMSL_GAMMA_ADV	Real gamma function.
IMSL_GAMMAI	Incomplete gamma function.

Special Functions (continued)

Bessel Functions with Real Order and Complex Argument

IMSL_BESSI	Modified Bessel function of the first kind.
IMSL_BESSJ	Bessel function of the first kind.
IMSL_BESSK	Modified Bessel function of the second kind.
IMSL_BESSY	Bessel function of the second kind.
IMSL_BESSI_EXP	Bessel function e-|x|I0(x), Bessel function e-|x|I1(x).
IMSL_BESSK_EXP	Bessel function exK0(x), Bessel function exK1(x).

Elliptic Integrals

IMSL_ELK	Complete elliptic integral of the first kind.
IMSL_ELE	Complete elliptic integral of the second kind.
IMSL_ELRF	Carlson's elliptic integral of the first kind.
IMSL_ELRD	Carlson's elliptic integral of the second kind.
IMSL_ELRJ	Carlson's elliptic integral of the third kind.
IMSL_ELRC	Special case of Carlson's elliptic integral.

Fresnel Integrals

IMSL_FRESNEL_COSINE	Cosine Fresnel integral.
IMSL_FRESNEL_SINE	Sine Fresnel integral.

Airy Functions

IMSL_AIRY_AI	Airy function, and derivative of the Airy function.
IMSL_AIRY_BI	Airy function of the second kind, and derivative of the Airy function of the second kind.

Kelvin Functions

IMSL_KELVIN_BER0	Kelvin function ber of the first kind, order 0, and derivative of the Kelvin function ber.
MSL_KELVIN_BEI0	Kelvin function bei of the first kind, order 0, and derivative of the Kelvin function bei.
IMSL_KELVIN_KER0	Kelvin function ker of the second kind, order 0, and derivative of the Kelvin function ker.
IMSL_KELVIN_KEI0	Kelvin function kei of the second kind, order 0 and derivative of the Kelvin function kei.

Basic Statistics and Random Number Generators

Simple Summary Statistics

IMSL_SIMPLESTAT	Univariate summary statistics.
IMSL_NORM1SAMP	Mean and variance inference for a single normal population.
IMSL_NORM2SAMP	Inferences for two normal populations.

Tabulate, Sort, and Rank

IMSL_FREQTABLE	Tallies observations into a one-way frequency table.
IMSL_SORTDATA	Sorts data with options to tally cases into a multiway frequency table.
IMSL_RANKS	Ranks, normal scores, or exponential scores.

Interpolation and Approximation

Cubic Spline Interpolation

IMSL_CSINTERP	Derivative end conditions.
IMSL_CSSHAPE	Shape preserving.

B-spline Interpolation

IMSL_BSINTERP	One-dimensional and two-dimensional interpolation.
IMSL_BSKNOTS	Knot sequence given interpolation data.

B-spline and Cubic Spline Evaluation and Integration

IMSL_SPVALUE	Evaluation and differentiation.
IMSL_SPINTEG	Integration.

Least-squares Approximation and Smoothing

IMSL_FCNLSQ	General functions.
IMSL_BSLSQ	Splines with fixed knots.
IMSL_CONLSQ	Constrained spline fit.
IMSL_CSSMOOTH	Cubic-smoothing spline.
IMSL_SMOOTHDATA1D	Smooth one-dimensional data by error detection.

Scattered Data Interpolation

IIMSL_SCAT2DINTERP	Akima's surface-fitting method.
IMSL_RADBF	Computes a fit using radial-basis functions.
IMSL_RADBE	Evaluates a radial-basis fit.

Quadrature

Univariate and Bivariate Quadrature

IMSL_INTFCN	Integration of a user-defined univariate or bivariate function.

Arbitrary Dimension Quadrature

IMSL_INTFCNHYPER	Iterated integral on a hyper-rectangle.
IMSL_INTFCN_QMC	Intergrates a function on a hyper-rectangle using a Quasi Monte Carlo method.

Gauss Quadrature

IMSL_GQUAD	Gauss quadrature formulas.

Differentiation

IMSL_FCN_DERIV	First, second, or third derivative of a function.

Differential Equations

IMSL_ODE	Adams-Gear or Runge-Kutta method.
IMSL_PDE_MOL	Solves a system of partial differential equations using the method of lines.
IMSL_POISSON2D	Solves Poisson's or Helmholtz's equation on a two-dimensional rectangle.

Categorical and Discrete Data Analysis

Statistics in the Two-Way Contingency Table

IMSL_CONTINGENCY	Two-way contingency table analysis.
IMSL_EXACT_ENUM	Exact probabilities in a table; total enumeration.
IMSL_EXACT_NETWORK	Exact probabilities in a table.

Generalized Categorical Models

IMSL_CAT_GLM	Generalized linear models.

Nonparametric Statistics

One Sample Tests—Nonparametric Statistics

IMSL_SIGNTEST	Sign test.
IMSL_WILCOXON	Wilcoxon rank sum test.
IMSL_NCTRENDS	Noehter’s test for cyclical trend.
IMSL_CSTRENDS	Cox and Stuarts’ sign test for trends in location and dispersion.
IMSL_TIE_STATS	Tie statistics.

Two or More Samples Tests—Nonparametric Statistics

IMSL_KW_TEST	Kruskal-Wallis test.
IMSL_FRIEDMANS_TEST	Friedman’s test.
IMSL_COCHRANQ	Cochran's Q test.
IMSL_KTRENDS	K-sample trends test.

Goodness of Fit

General Goodness of Fit Tests

IMSL_CHISQTEST	Chi-squared goodness of fit test.
IMSL_NORMALITY	Shapiro-Wilk W test for normality.
IMSL_KOLMOGOROV1	One-sample continuos data Kolmogorov-Smirnov.
IMSL_KOLMOGOROV2	Two-sample continuos data Kolmogorov-Smirnov.
IMSL_MVAR_NORMALITY	Mardia’s test for multivariate normality.

Tests for Randomness

IMSL_RANDOMNESS_TEST	Runs test, Paris-serial test, d2 test or triplets tests.

Time Series and Forecasting

IMSL_ARMA Models

IMSL_ARMA	Computes least-squares or method-of-moments estimates of parameters and optionally computes forecasts and their associated probability limits.
IMSL_DIFFERENCE	Performs differencing on a time series.
IMSL_BOXCOXTRANS	Perform a Box-Cox transformation.
IMSL_AUTOCORRELATION	Sample autocorrelation function.
IMSL_PARTIAL_AC	Sample partial autocorrelation function.
IMSL_LACK_OF_FIT	Lack-of-fit test based on the corrleation function.
IMSL_GARCH	Compute estimates of the parameters of a GARCH(p,q) model.
IMSL_KALMAN	Performs Kalman filtering and evaluates the likelihood function for the statespace model.

Multivariate Analysis

IMSL_K_MEANS	Performs a K-means (centroid) cluster analysis.
IMSL_PRINC_COMP	Computes principal components.
IMSL_FACTOR_ANALYSIS	Extracts factor-loading estimates.
IMSL_DISCR_ANALYSIS	Perform discriminant function analysis.

Survival Analysis

IMSL_SURVIVAL_GLM	Analyzes survival data using a generalized linear model and estimates using various parametric modes.

Probability Distribution Functions and Inverses

IMSL_NORMALCDF	Normal (Gaussian) distribution function.
IMSL_BINORMALCDF	Bivariate normal distribution.
IMSL_CHISQCDF	Chi-squared distribution function.
IMSL_FCDF	F distribution function.
IMSL_TCDF	Student's t distribution function.
IMSL_GAMMACDF	Gamma distribution function.
IMSL_BETACDF	Beta distribution function.
IMSL_BINOMIALCDF	Binomial distribution function.
IMSL_BINOMIALPDF	Binomial probability function.
IMSL_HYPERGEOCDF	Hypergeometric distribution function.
IMSL_POISSONCDF	Poisson distribution function.

Random Number Generation

Random Numbers

IMSL_RANDOMOPT	Retrieves uniform (0, 1) multiplicative, congruential pseudorandom-number generator.
IMSL_RANDOM_TABLE	Sets or retrieves the current table used in either the shuffled or GFSR random number generator.
IMSL_RANDOM	Generates pseudorandom numbers.
IMSL_RANDOM_NPP	Generates pseudorandom numbers from a nonhomo geneous Poisson process.
IMSL_RANDOM_ORDER	Generates pseudorandom order statistics from a uniform (0, 1) distribution, or optionally from a standard normal distribution.
IMSL_RAND_TABLE_2WAY	Generates a pseudorandom two-way table.
IMSL_RAND_ORTH_MAT	Generates a pseudorandom orthogonal matrix or a correlation matrix.
IMSL_RANDOM_SAMPLE	Generates a simple pseudorandom sample from a finite population.
IMSL_RAND_FROM_DATA	Generates pseudorandom numbers from a multivariate distribution determined from a given sample.
IMSL_CONT_TABLE	Sets up table to generate pseudorandom numbers from a general continuous distribution.
IMSL_RAND_GEN_CONT	Generates pseudorandom numbers from a general continuous distribution.
IMSL_DISCR_TABLE	Sets up table to generate pseudorandom numbers from a general discrete distribution.
IMSL_RAND_GEN_DISCR	Generates pseudorandom numbers from a general discrete distribution using an alias method or optionally a table lookup method.

Random Number Generation (continued)

Stochastic Processes

IMSL_RANDOM_ARMA	Generate pseudorandom IMSL_ARMA process numbers.

Low-discrepancy Sequences

IMSL_FAURE_INIT	Initializes the structure used for computing a shuffled Faure sequence.
IMSL_FAURE_NEXT_PT	Generates a shuffled Faure sequence.

Math and Statistics Utilities

Dates

IMSL_DAYSTODATE	Days since epoch to date.
IMSL_DATETODAYS	Date to days since epoch.

Constants and Data Sets

IMSL_CONSTANT	Natural and mathematical constants.
IMSL_MACHINE	Machine constants.
IMSL_STATDATA	Commonly analyzed data sets.

Binomial Coefficient

IMSL_BINOMIALCOEF	Evaluates the binomial coefficient.

Geometry

IMSL_NORM	Vector norms.

Matrix Norm

IMSL_MATRIX_NORM	Real coordinate matrix.

Matrix Entry and Display

PM	Formatted output of arrays using the standard linear algebraic convention: "row" refers to the first index of the array and "column" refers to the second.
RM	Formatted input of arrays using the standard linear algebraic convention: "row" refers to the first index of the array and "column" refers to the second.

Linear Systems

Matrix Inversion

IMSL_INV	General matrix inversion.

Linear Equations with Full Matrices

IMSL_LUSOL	Systems involving general matrices.
IMSL_LUFAC	LU factorization of general matrices.
IMSL_CHSOL	Systems involving symmetric positive definite matrices.
IMSL_CHFAC	Factorization of symmetric positive definite matrices.

Linear Least Squares with Full Matrices

IMSL_QRSOL	Least-squares solution.
IMSL_QRFAC	Least-squares factorization.
IMSL_SVDCOMP	Singular Value Decomposition (SVD) and generalized inverse.
IMSL_CHNNDSOL	Solve and generalized inverse for positive semidefinite matrices.
IMSL_CHNNDFAC	Factor and generalized inverse for positive semidefinite matrices.
IMSL_LINLSQ	Linear constraints.

Sparse Matrices

IMSL_SP_LUSOL	Solve a sparse system of linear equations Ax=b.
IMSL_SP_LUFAC	Compute an LU factorization of a sparse matrix stored in either coordinate format or CSC format.
IMSL_SP_BDSOL	Solve a general band system of linear equations Ax = b.
IMSL_SP_BDFAC	Compute the LU factorization of a matrix stored in band storage mode.
IMSL_SP_PDSOL	Solve a sparse symmetric positive definite system of linear equations Ax = b.
IMSL_SP_PDFAC	Compute a factorization of a sparse symmetric positive definite system of linear equations Ax = b.
IMSL_SP_BDPDSOL	Solve a symmetric positive definite system of linear equations Ax = b in band symmetric storage mode.
IMSL_SP_BDPDFAC	Compute the RTR Cholesky factorization of symmetric positive definite matrix, A, in band symmetric storage mode.
IMSL_SP_GMRES	Solve a linear system Ax = b using the restarted generalized minimum residual (GMRES) method.
IMSL_SP_CG	Solve a real symmetric definite linear system using a conjugate gradient method.
IMSL_SP_MVMUL	Compute a matrix-vector product involving a sparse matrix and a dense vector.

Eigensystem Analysis

Linear Eigensystem Problems

IMSL_EIG	General and symmetric matrices.

Generalized Eigensystem Problems

IMSL_EIGSYMGEN	Real symmetric matrices and B positive definite.
IMSL_GENEIG	General eigenexpansion of $Ax=\lambda Bx$.

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