Visual Numerics®

JMSL™
Numerical Library

Function Catalog

JMSL™ NUMERICAL LIBRARY for Java™ Applications

The JMSL Numerical Library is a pure Java numerical library, providing a

broad range of advanced mathematics, statistics, and charting for the

Java environment. It extends core Java numerics and allows developers

to seamlessly integrate advanced mathematical, statistical, financial,

and charting functions into their Java applications.

IMSL NUMERICAL LIBRARIES

At the heart of the IMSL Numerical Libraries, including the JMSL Numerical Library, lies the comprehensive and trusted IMSL mathematical and statistical numerical algorithms. These libraries free developers from building their own internal code by providing pre-written mathematical and statistical algorithms that can be embedded into C, C++, C#, Visual Basic™ .NET (VB.NET), Java™, and Fortran applications.

CONVENIENCE AND OPEN STANDARDS

The JMSL Numerical Library is a pure Java numerical library that operates in the Java J2SE and J2EE frameworks. The library extends core Java numerics and allows developers to seamlessly integrate advanced mathematical, statistical, financial, and charting functions into their Java applications. Visual Numerics has taken individual algorithms and re-implemented them as object-oriented, 100% Java classes. The JMSL Library is fully thread safe and, like all Visual Numerics products, is fully tested and documented, with code examples included. The JMSL Library also adds financial functions and charting to the library, taking advantage of the collaboration and graphical benefits of Java. The JMSL Library is designed with extensibility in mind; new classes may be derived from existing ones to add functionality to satisfy particular requirements.

ERROR HANDLING

Diagnostic error messages are clear and informative – designed not only to convey the error condition, but also to suggest corrective action if appropriate. These error-handling features:

- Allow faster and easier program debugging
- Provide more productive programming and confidence that the algorithms are functioning properly

COST-EFFECTIVE

The JMSL Library significantly shortens program development time and promotes standardization. Using the JMSL Library saves time in source code development and the design, development, documentation, testing and maintenance of applications.

FULLY TESTED

Visual Numerics has over three decades of experience in testing numerical algorithms for quality and performance across an extensive range of the latest compilers and environments. This experience has allowed Visual Numerics to refine its test methods to a great level of detail. The result of this effort is a robust, sophisticated suite of test methods that allow the IMSL Family Library user to rely on the numerical analysis functionality and focus their bandwidth on application development and testing.

COMPREHENSIVE DOCUMENTATION

Documentation for the JMSL Numerical Library is comprehensive, clearly written and standardized. Detailed information about each function is found in a single source within a chapter and consists of section name, purpose, synopsis, errors, return values and usage examples.

The JMSL Numerical Library includes an Application Quick-Start pack. The Application Quick-Start pack includes a number of very popular working modules of Java code that developers can use to create new applications or to embed within existing applications. It also helps developers get the most out of the JMSL Numerical Library to build better applications, faster.

Working Code Examples Illustrate Combined Use Of:

- Mathematical algorithm functionality

- Charting features

- User interface (Swing) ideas

- Data input/output techniques

- On-screen interactive analysis between the end user
 and the data

UNMATCHED PRODUCT SUPPORT

Behind every Visual Numerics license is a team of
professionals ready to provide expert answers to questions
about the IMSL Family of products. Product support options
include product maintenance and consultation, ensuring
value and performance of your new software. Product
support:

- Gives users direct access to Visual Numerics'
  resident staff of expert product support specialists

- Provides prompt, two-way communication

- Includes product maintenance updates

PROFESSIONAL SERVICES

Visual Numerics offers expert professional services for
algorithm as well as complete application development.
Please contact Visual Numerics to learn more about its
extensive experience in developing custom algorithms,
building algorithms in scalable platforms, and full
applications development.

Functionality Overview
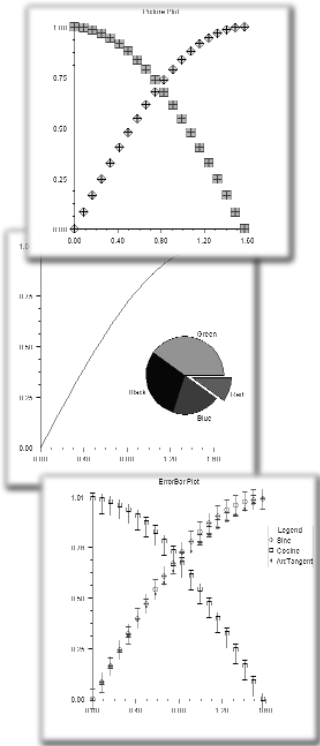
CHARTING FUNCTIONALITY

- Scatter
- Line
- High-Low-Close
- Pie
- Bar
- Histogram
- Log and Semilog
- Polar
- Area
- Function and Spline
- Error Bar
- Support for XML
- Date/Time Support
- Contour Plot
- Box Plot
- Heat Map

MATHEMATICS, STATISTICS, DATA MINING, AND FINANCE FUNCTIONALITY

- Basic Types
- Linear Algebra
- Eigensystems
- Interpolation and Approximation
- Quadrature
- Differential Equations
- Transforms
- Nonlinear Equations
- Optimization
- Special Functions
- Basic Statistics
- Nonparametric Tests
- Regression
- Variances, Covariances, and Correlations
- Analysis of Variance
- Time Series and Forecasting
- Goodness of Fit
- Distribution Functions
- Random Number Generation
- Neural Networks
- Finance and Bond Calculations

IMSL Libraries are also available for C, C# and Fortran

IMSL C Numerical Library

The IMSL C Library is a comprehensive set of pre-built thread safe mathematical and statistical analysis functions that C or C++ programmers can embed directly into their numerical analysis applications. It significantly reduces program development time by taking full advantage of the intrinsic characteristics and desirable features of the C language. Variable argument lists simplify calling sequences. The concise set of required arguments contains only the information necessary for usage. Optional arguments provide added functionality and power to each function. Using the IMSL C Library saves significant effort in source code development and in the design, development, testing and maintenance of applications. These advanced mathematical capabilities enable applications ranging from Monte Carlo simulations for financial market and scientific simulations to derivatives pricing and engineering models.

IMSL C# Numerical Library

The IMSL C# Library is a 100% C# analytics library, providing broad coverage of advanced mathematics and statistics for the Microsoft® .NET Framework. The IMSL C# Library delivers a new level of embeddable and scalable analytics capability to Visual Studio™ users that was once only found in traditional high performance computing environments. This offers C# and Visual Basic.NET (VB.NET) developers seamless accessibility to advanced analytics capabilities in the most integrated language for the .NET environment with the highest degree of programming productivity and ease of use with Visual Studio. Visual Numerics has taken C# to a new level by extending the mathematical framework of the language, significantly increasing the high performance analytics capabilities available for the .NET Framework. Classes such as a complex numbers class, a matrix class, as well as advanced random number generator classes provide a foundation from which advanced mathematics can be built.

IMSL Fortran Numerical Library and IMSL Thread Safe Fortran Numerical Library

The IMSL Fortran Library is used by technical professionals for high performance computing engineering, and education applications. The IMSL Fortran Library is a single package that incorporates all of the algorithms and features from the IMSL family of Fortran libraries. The IMSL Fortran Library allows users to utilize the fast, convenient optional arguments of the modern Fortran syntax throughout the library, in all areas where optional arguments can apply, while maintaining full backward compatibility. The IMSL Thread Safe Fortran Library is a 100% thread safe edition of the entire IMSL Fortran Library allowing the convenience and performance of multi-threading on selected environments. The IMSL Fortran Library and the IMSL Thread Safe Fortran Library include all of the algorithms from the IMSL family of Fortran libraries including the former IMSL F90 Library, the IMSL Fortran 77 Library, and the IMSL parallel processing features.

com.imsl

The package com.imsl contains basic informational and error handling classes.

Class or Method Name	Description
Messages	Retrieve and format message strings.
Version	Print version information.
Warning	Handle warning messages.
WarningObject	Handle warning messages.

com.imsl.math

PACKAGE

The package com.imsl.math contains a wide range of mathematical classes. Beginning with basic data types such as complex numbers and matrices and progressing to advanced numerical analysis classes.

• In selected cases a list of methods has been included in order to illustrate the coverage of the class.

BASIC TYPES

Class or Method Name	Description
Complex	Implements complex numbers, providing the basic operations (addition, subtraction, multiplication, division) as well as a set of complex functions.
Matrix	Matrix manipulation functions.
ComplexMatrix	Complex matrix manipulation functions.

LINEAR ALGEBRA

Class or Method Name	Description
LU	Solves a real general system of linear equations $Ax = b$. Includes methods for inverse, determinant and condition number.
ComplexLU	Solves a complex general system of linear equations $Ax = b$. Includes methods for inverse, determinant and condition number.
Cholesky	Solves a real symmetric positive definite system of linear equations $Ax = b$.
QR	Solves a linear least-squares problem $Ax = b$.
SVD	Computes the singular value decomposition of a real rectangular matrix A.

EIGENSYSTEMS

Class or Method Name	Description
Eigen	Computes the eigenexpansion of a real matrix A.
SymEigen	Computes the eigenexpansion of a real symmetric matrix A.

INTERPOLATION AND APPROXIMATION

Class or Method Name	Description
Spline	A collection of spline functions. Includes methods to evaluate, integrate and compute derivatives of splines.
CsInterpolate	Extension of the Spline class to compute a cubic spline interpolant with specified derivative endpoint conditions.
CsAkima	Extension of the Spline class to compute an Akima cubic spline interpolant.
CsPeriodic	Extension of the Spline class to compute a cubic spline interpolant with periodic boundary conditions. CsShape Extension of the Spline class to compute a cubic spline interpolant consistent with the concavity of the data.
CsSmooth	Extension of the Spline class to construct a smooth cubic spline to noisy data.
CsSmoothC2	Extension of the Spline class to construct a smooth cubic spline to noisy data using cross-validation to estimate the smoothing parameter.
Bspline	A collection of B-Spline functions, including methods to evaluate, integrate, and compute derivatives of B-Splines, plus conversion of B-Splines to piecewise polynomials for charting.
BsInterpolate	Extension of the BSpline class to interpolate data points.
BsLeastSquares	Extension of the BSpline class to compute a least squares B-spline approximation to data points.
RadialBasis	Computes a least-squares fit to scattered data over multiple dimensions.

QUADRATURE

Class or Method Name	Description
Quadrature	A general-purpose integrator that uses a globally adaptive scheme to reduce the absolute error.
HypercubeQuadrature	Integrates a function on a hyper-rectangle using a quasi-Monte-Carlo method.

DIFFERENTIAL EQUATIONS

Class or Method Name	Description
OdeRungeKutta	Solves an initial-value problem for ordinary differential equations using the Runge-Kutta-Verner fifth-order and sixth-order method.

TRANSFORMS

Class or Method Name	Description
FFT	Discrete Fourier transform of a real sequence.
ComplexFFT	Discrete Fourier transform of a complex sequence.

NONLINEAR EQUATIONS

Class or Method Name	Description
ZeroPolynomial	Finds the zeros of a polynomial with complex coefficients using Aberth's method.
ZeroFunction	Finds the real zeros of a real function using Müller's method.
ZeroSystem	Solves a system of n nonlinear equations $f(x) = 0$ using a modified Powell hybrid algorithm.

OPTIMIZATION

Class or Method Name	Description
MinUncon	Finds the minimum point of a smooth function $f(x)$ of a single variable.
MinUnconMultiVar	Minimizes a function $f(x)$ of n variables using a quasi-Newton method.
NonlinLeastSquares	Solves a nonlinear least-squares problem using a modified Levenberg-Marquardt algorithm.
LinearProgramming	Solves a linear programming problem using the revised simplex algorithm.
QuadraticProgramming	Solves a quadratic programming problem subject to linear equality or inequality constraints.
MinConGenLin	Minimizes a general objective function subject to linear equality/inequality constraints.
BoundedLeastSquares	Solves a nonlinear least-squares problem subject to bounds on the variables using a modified Levenberg-Marquardt algorithm.
MinConNLP	Solves a general nonlinear programming problem using a sequential equality constrained quadratic programming method.

SPECIAL FUNCTIONS

Class or Method Name	Description
Sfun	Collection of special functions, including the methods:
- beta	Evaluates the value of the Beta function.
- betaIncomplete	Evaluates the incomplete Beta function ratio.

SPECIAL FUNCTIONS (con't)

- cot	Evaluates the cotangent.
- erf	Evaluates the error function.
- erfc	Evaluates the complementary error function.
- erfcInverse	Evaluates the inverse of the complementary error function.
- erfInverse	Evaluates the inverse of the error function.
- fact	Evaluates the factorial of an integer.
- gamma	Evaluates the Gamma function of a double.
- log10	Evaluates the common (base 10) logarithm.
- logBeta	Evaluates the logarithm of the Beta function.
- logGamma	Evaluates the logarithm of the absolute value of the Gamma function.
- poch	Evaluates a generalization of Pochhammer's symbol.
- sign	Evaluates the value of *x* with the sign of *y*.
Bessel	Collection of Bessel functions.
- I	Evaluates a sequence of modified Bessel functions of the first kind with real order and real argument.
- I	Evaluates a sequence of modified Bessel functions of the first kind with integer order and real argument.
- J	Evaluates a sequence of Bessel functions of the first kind with real order and real argument.
- J	Evaluates a sequence of Bessel functions of the first kind with integer order and real argument.
- K	Evaluates a sequence of modified Bessel functions of the third kind with real order and real argument.
- K	Evaluates a sequence of modified Bessel functions of the third kind with integer order and real argument.
- scaledK	Evaluates a sequence of exponentially scaled modified Bessel functions of the third kind with fractional order and real argument.
- Y	Evaluates a sequence of Bessel functions of the second kind with real nonnegative order and real positive argument.

com.imsl.stat

The package com.imsl.stat contains a wide range of statistical classes, including summary statistics, regression, ANOVA.

• In selected cases a list of methods has been included in order to illustrate the coverage of the class.

BASIC STATISTICS

Class or Method Name	Description
Summary	Computes basic univariate statistics, including methods:
- ConfidenceMean	Evaluates the confidence interval for the mean (assuming normality).
- ConfidenceVariance	Evaluates the confidence interval for the variance (assuming normality).
- Kurtosis	Evaluates the kurtosis of the given data set and associated weights.
- Maximum	Evaluates the maximum of the given data set.
- Mean	Evaluates the mean of the given data set with associated weights.
- Median	Evaluates the median of the given data set.
- Minimum	Evaluates the minimum of the given data set.
- Mode	Evaluates the mode of the given data set.
- SampleStandardDeviation	Evaluates the sample standard deviation of the given data set and associated weights.
- SampleVariance	Evaluates the sample variance of the given data set and associated weights.
- Skewness	Evaluates the skewness of the given data set and associated weights.
- StandardDeviation	Evaluates the population standard deviation of the given data set and associated weights.
- Variance	Evaluates the population variance of the given data set and associated weights.

BASIC STATISTICS (con't)

NormOneSample	Computes statistics for mean and variance inferences using a sample from a normal population.
NormTwoSample	Computes statistics for mean and variance inferences using samples from two normal populations.
TableOneWay	Tallies observations into a one-way frequency table.
TableTwoWay	Tallies observations into a two-way frequency table.
TableMultiWay	Tallies observations into a multi-way frequency table.
Sort	Sorts observations by specified keys.
Ranks	Computes the ranks, normal scores, or exponential scores for a vector of observations.

VARIANCES, COVARIANCES, AND CORRELATIONS

Class or Method Name	Description
Covariances	Computes the sample variance-covariance or correlation matrix.

REGRESSION

Class or Method Name	Description
LinearRegression	Computes a new linear regression object using least squares.
NonlinearRegression	Fits a multivariate nonlinear regression model using least squares.
UserBasisRegression	Generates summary statistics using user supplied functions in a nonlinear regression model.
RegressionBasis	Public interface for user supplied function to UserBasisRegression object.
SelectionRegression	Selects the best multiple linear regression models.
StepwiseRegression	Builds multiple linear regression models using forward selection, backward selection, or stepwise selection.

ANALYSIS OF VARIANCE

Class or Method Name	Description
ANOVA	Provides an analysis of Variance table and related statistics.
ANOVAFactorial	Analyzes a balanced factorial design with fixed effects.
MultipleComparisons	Performs Student-Newman-Keuls multiple comparisons test.

CATEGORICAL AND DISCRETE DATA ANALYSIS

Class or Method Name	Description
ContingencyTable	Performs a chi-squared analysis of a two-way contingency table.
CategoricalGenLinModel	Analyzes categorical data using logistic, probit, Poisson, and other generalized linear models.

NONPARAMETRIC STATISTICS

Class or Method Name	Description
SignTest	Performs a sign test.
WilcoxonRankSum	Performs a Wilcoxon rank sum test.

GOODNESS OF FIT

Class or Method Name	Description
ChiSquaredTest	Chi-squared goodness-of-fit test.
NormalityTest	Performs a test for normality.

TIME SERIES AND FORECASTING

Class or Method Name	Description
AutoCorrelation	Computes the sample autocorrelation function of a stationary time series.
CrossCorrelation	Computes the sample cross-correlation function of two stationary time series.
MultiCrossCorrelation	Computes the multichannel cross-correlation function of two mutually stationary multichannel time series.
ARMA	Computes least-square estimates of parameters for an $ARMA$ model. Also computes forecasts and their associated probability limits for an $ARMA$ model.
Difference	Differences a seasonal or nonseasonal time series.
GARCH	Computes estimates of the parameters of a $GARCH(p, q)$ model.
KalmanFilter	Performs Kalman filtering and evaluates the likelihood function for the state-space model.

MULTIVARIATE ANALYSIS

Class or Method Name	Description
ClusterKMeans	Performs a K-means (centroid) cluster analysis.
Dissimilarities	Computes a matrix of dissimilarities (or similarities) between the columns (or rows) of a matrix.

MULTIVARIATE ANALYSIS (con't)

ClusterHierarchical	Performs a hierarchical cluster analysis given a distance matrix.
FactorAnalysis	Performs Principal Component Analysis or Factor Analysis on a covariance or correlation matrix.
DiscriminantAnalysis	Performs a linear or a quadratic discriminant function analysis among several known groups.

PROBABILITY DISTRIBUTION FUNCTIONS AND INVERSES

Class or Method Name	Description
Cdf	Cumulative distribution functions, and inverses, including the methods:
- Beta	Evaluates the beta probability distribution function.
- Binomial	Evaluates the binomial distribution function.
- BinomialProb	Evaluates the binomial probability function.
- Chi	Evaluates the chi-squared distribution function.
- F	Evaluates the F probability distribution function.
- Gamma	Evaluates the gamma distribution function.
- Hypergeometric	Evaluates the hypergeometric distribution function.
- HypergeometricProb	Evaluates the hypergeometric probability function.
- InverseBeta	Evaluates the inverse of the beta probability distribution function.
- InverseChi	Evaluates the inverse of the chi-squared distribution function.
- InverseF	Evaluates inverse of the F probability distribution function.
- InverseGamma	Evaluates the inverse of the gamma distribution function.
- InverseNormal	Evaluates the inverse of the normal (Gaussian) distribution function.
- InverseStudentsT	Evaluates inverse of the Student's t distribution function.
- Normal	Evaluates the normal (Gaussian) distribution function.
- Poisson	Evaluates the Poisson distribution function.
- PoissonProb	Evaluates the Poisson probability function.

- StudentsT	Evaluates the Student's t distribution function.
- Weibull	Evaluates the Weibull distribution function.
- InverseCdf	Evaluates the inverse of a user-supplied cumulative distribution function.

RANDOM NUMBER GENERATION

Class or Method Name	Description
FaureSequence	Computes a low-discrepancy shuffled Faure sequence.
Random	Random number generators, with support for several distributions, including the methods:
- NextBeta	Generates a pseudorandom number from a beta distribution.
- NextBinomial	Generates a pseudorandom number from a binomial distribution.
- NextCauchy	Generates a pseudorandom number from a Cauchy distribution.
- NextChiSquared	Generates a pseudorandom number from a Chi-squared distribution.
- NextExponential	Generates a pseudorandom number from a standard exponential distribution.
- NextExponentialMix	Generates a pseudorandom number from a mixture of two exponential distributions.
- NextGamma	Generates a pseudorandom number from a standard gamma distribution.
- NextGeometric	Generates a pseudorandom number from a geometric distribution.
- NextHypergeometric	Generates a pseudorandom number from a hypergeometric distribution.
- NextLogarithmic	Generates a pseudorandom number from a logarithmic distribution.
- NextLogNormal	Generates a pseudorandom number from a lognormal distribution.
- NextMultivariateNormal	Generates pseudorandom numbers from a multivariate normal distribution.
- NextNegativeBinomial	Generates a pseudorandom number from a negative binomial distribution.
- NextNormal	Generates a pseudorandom number from a standard normal distribution using an inverse CDF method.
- NextNormalAR	Generates a pseudorandom number from a standard normal distribution using an acceptance/rejection method.

RANDOM NUMBER GENERATION (con't)

- NextPoisson	Generates a pseudorandom number from a Poisson distribution.
- NextStudentsT	Generates a pseudorandom number from a Student's t distribution.
- NextTriangular	Generates a pseudorandom number from a triangular distribution on the interval (0,1).
- NextVonMises	Generates a pseudorandom number from a von Mises distribution.
- NextWeibull	Generates a pseudorandom number from a Weibull distribution.
- SetMultiplier	Sets the multiplier for a linear congruential random number generator.
- SetSeed	Sets the seed.
- Skip	Resets the seed to skip ahead in the base linear congruential generator.

com.imsl.datamining.neural

PACKAGE

The package com.imsl.datamining.neural contains feed forward multilayer neural network training and forecasting engines plus algorithms to facilitate data pre- and post-processing.

Class or Method Name	Description
Network	A neural network.
FeedForwardNetwork	A feed forward neural network.
Layer	The base class for the input, hidden, and output layers in a neural network.
InputLayer	The input layer in a neural network.
HiddenLayer	The hidden layer in a neural network.
OutputLayer	The output layer in a neural network.
Node	A node with an input node or perceptron in a neural network.
InputNode	A node in the input layer.
Perceptron	A perceptron node in a neural network.
OutputPerceptron	A perceptron in the output layer.
Activation	An activation function.
Link	A link in the neural network between two network nodes.
Trainer	Trains the neural net.
QuasiNewtonTrainer	Trains a feed forward network using quasi-Newton optimization.
LeastSquaresTrainer	Trains a feed forward network using the Levenberg-Marquardt nonlinear least squares algorithm.
EpochTrainer	A two-stage trainer. Stage I trains using epochs of randomly selected training patterns. Stage II uses alltraining patterns and is optional.

(con't)

ScaleFilter	Scales or unscales continuous data prior to its use in neural network training, testing, or forecasting.
UnsupervisedNominalFilter	Encodes nominal data into a series of binary columns for input into a neural network. It also decodes binary columns in a single column of nominal values.
UnsupervisedOrdinalFilter	Encodes ordinal data into cumulative percentages. It also decodes cumulative percentages into an ordinal variable.
TimeSeriesFilter	Converts time series data to a format used for neural network training by lagging an input series into several columns, one for each lag requested.
TimeSeriesClassFilter	Converts categorized time series data to a format used for neural network training. An input series is lagged into several columns, one for each lag requested. Lagging is calculated within each class of a nominal variable.

com.imsl.finance

The com.imsl.finance package contains a set of classes covering a variety of investment calculations including an extensive collection of bond functions.

• In selected cases a list of methods has been included in order to illustrate the coverage of the class.

CLASSES

Class or Method Name	Description
DayCountBasis	Rules for computing the number or days between two dates or number of days in a year. For many securities, computations are based on rules other than on the actual calendar. Computations can be based on: • The assumption of 30 days per month and 360 days per year. • The number of days in a month based on the actual calendar value and the number of days, but assuming 360 days per year. • The number of days in a month based on the actual calendar value and the number of days, but assuming 365 days per year. • The actual calendar. • The assumption of 365 days per year.
Bond	Collection of bond functions, including the methods:
- Accrint	Returns the interest which has accrued on a security that pays interest periodically.
- Accrintm	Returns the interest which has accrued on a security that pays interest at maturity.
- Amordegrc	Evaluates the depreciation for each accounting period. During the evaluation of the function a depreciation coefficient based on the asset life is applied.
- Amorlinc	Returns the depreciation for each accounting period.
- Convexity	Returns the convexity for a security.
- Coupdaybs	Returns the number of days starting with the beginning of the coupon period and ending with the settlement date.
- Coupdays	Returns the number of days in the coupon period containing the settlement date.

CLASSES (con't)

- Db	Returns the depreciation of an asset using the fixed-declining balance method.
- Ddb	Returns the depreciation of an asset using the double-declining balance method.
- Dollarde	Converts a fractional price to a decimal price.
- Dollarfr	Converts a decimal price to a fractional price.
- Effect	Returns the effective annual interest rate.
- Fv	Returns the future value of an investment.
- Fvschedule	Returns the future value of an initial principal taking into consideration a schedule of compound interest rates.
- Ipmt	Returns the interest payment for an investment for a given period.
- Irr	Returns the internal rate of return for a schedule of cash flows.
- Mirr	Returns the modified internal rate of return for a schedule of periodic cash flows.
- Nominal	Returns the nominal annual interest rate.
- Nper	Returns the number of periods for an investment for which periodic, and constant payments are made and the interest rate is constant.
- Npv	Returns the net present value of a stream of equal periodic cash flows, which are subject to a given discount rate.
- Pmt	Returns the periodic payment for an investment.
- Ppmt	Returns the payment on the principal for a specified period.
- Pv	Returns the net present value of a stream of equal periodic cash flows, which are subject to a given discount rate.
- Rate	Returns the interest rate per period of an annuity.
- Sln	Returns the depreciation of an asset using the straight line method.
- Syd	Returns the depreciation of an asset using the sum-of-years digits method.
- Ydb	Returns the depreciation of an asset for any given period using the variable-declining balance method.
- Xirr	Returns the internal rate of return for a schedule of cash flows.
- Xnpv	Returns the present value for a schedule of cash flows.

com.imsl.chart

PACKAGE

The com.imsl.chart package is designed to allow the creation of highly customizable charts. Supported chart types include:

- Scatter plots
- Candlestick charts
- Line plots
- Pie Charts

- Area plots
- Bar Charts
- Function and Spline Plots
- Histograms

- Log and Semilog plots
- Polar plots
- Error Bars
- Contour Plot

- High-Low-Close-Open charts
- Box plot
- Heat Map

The JMSL chart package can be used in several different ways, for example:

- A JMSL chart can be the output of a stand-alone Java application or Applet.

- A JMSL chart can be returned as images from a web server using servlets. This allows JMSL to be used as the "chart engine" for a website, either on the internet or a company intranet.

- A JMSL chart tree can be created from an XML file. XML (Extensible Markup Language) is a universal format for structured data. The use of XML allows for charts to be generated without writing a Java program for the desired chart.

- Flexible axis transformations are supported, including full Date/Time capabilities.

CLASSES

Class or Method Name	Description
Axis	The axis node provides the mapping for all of its children from the user coordinate space to the device (screen) space.
Axis1D	Controls an x-axis or a y-axis.
AxisLabel	Controls the labels on an axis.
AxisLine	Controls the axis line.
AxisR	Controls the R-axis in a polar plot.
AxisRLabel	Controls the labels on an axis.
AxisRLine	Controls the radius axis line in a polar plot.

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CLASSES (con't)

AxisRMajorTick	Controls the major tick marks for the radius axis in a polar plot.
AxisTheta	Controls the angular axis in a polar plot.
AxisTitle	Controls the title on an axis.
AxisUnit	Controls the unit title on an axis.
AxisXY	Controls the axes for an *x-y* chart.
Background	Controls the background of a chart.
Bar	A bar chart.
BarItem	Controls a single bar in a bar chart.
BarSet	Controls a set of bars in a bar chart.
Boxplot	Draws a multi-group box plot.
Candlestick	Candlestick plot of stock data.
CandlestickItem	Controls a candlestick for the up days or the down days.
Chart	The root node of the chart tree.
ChartNode	The base class of all of the nodes in the chart tree.
ChartServlet	The base class for chart servlets.
ChartSpline	Wraps a spline into a ChartFunction to be plotted.
ChartTitle	Controls the main title of a chart.
Contour	A contour chart shows level curves of surface data.
Data	Draws a data node.
Draw	Chart tree renderer. Draws the chart tree to the output device.
DrawMap	Creates an HTML client-side imagemap from a chart tree.
DrawPick	Pick an object in a chart.
ErrorBar	Data points with error bars.

CLASSES (con't)

FillPaint	A collection of methods to create Paint objects for fill areas.
Grid	Draws the grid lines perpendicular to an axis.
GridPolar	Draws the grid lines for a polar plot.
HighLowClose	High-low-close plot of stock data.
JFrameChart	JFrameChart is a JFrame that contains a chart.
JPanelChart	A swing JPanel that contains a chart.
JspBean	Helper class to create charts in a Java Server Page that are later rendered using the ChartServlet.
Legend	Controls the chart legend.
MajorTick	Controls the major tick marks.
MinorTick	Controls the minor tick marks.
PickEvent	An event that indicates that a chart element has been selected.
Pie	A pie chart.
PieSlice	Control one wedge of a pie chart.
Polar	This axis node is used for polar charts.
SplineData	A data set created from a Spline.
Text	The value of the attribute "Title".
ToolTip	A ToolTip for a chart element.
Transform	Defines a custom transformation along an axis.
TransformDate	Defines a transformation along an axis that skips weekend dates.
Heatmap	Creates a chart from an array of RGB color values, combined with the data range represented by that array.
ColorMap	Maps from a unit interval to Colors, creating a one dimensional parameterized path through the color cube.

com.imsl.chart.xml

Class or Method Name	Description
ChartXML	Creates a Chart from an XML file.

com.imsl.io

Class or Method Name	Description
AbstractFlatFile	Reads a text or a binary file as a ResultSet.
FlatFile	Reads a text file as a ResultSet.
Tokenizer	Breaks a line into tokens.