NAG Fortran SMP Library, Release 2, Library Contents

Chapter A00 – Library Identification

A00AAF Prints details of the NAG Fortran Library implementation

Chapter A02 – Complex Arithmetic

A02AAF Square root of complex number
A02ABF Modulus of complex number
A02ACF Quotient of two complex numbers

Chapter C02 – Zeros of Polynomials

C02AFF All zeros of complex polynomial, modified Laguerre method
C02AGF All zeros of real polynomial, modified Laguerre method
C02AHF All zeros of complex quadratic
C02AJF All zeros of real quadratic

Chapter C05 – Roots of One or More Transcendental Equations

C05ADF Zero of continuous function in given interval, Bus and Dekker algorithm
C05AGF Zero of continuous function, Bus and Dekker algorithm, from given starting value, binary search for interval
C05AJF Zero of continuous function, continuation method, from a given starting value
C05AVF Binary search for interval containing zero of continuous function (reverse communication)
C05AXF Zero of continuous function by continuation method, from given starting value (reverse communication)
C05AZF Zero in given interval of continuous function by Bus and Dekker algorithm (reverse communication)
C05NBF Solution of system of nonlinear equations using function values only (easy-to-use)
C05NCF Solution of system of nonlinear equations using function values only (comprehensive)
C05NDF Solution of system of nonlinear equations using function values only (reverse communication)
C05PBF Solution of system of nonlinear equations using first derivatives (easy-to-use)
C05PCF Solution of system of nonlinear equations using first derivatives (comprehensive)
C05PDF Solution of system of nonlinear equations using first derivatives (reverse communication)
C05ZAF Check user's routine for calculating first derivatives

Chapter C06 – Summation of Series

C06BAF Acceleration of convergence of sequence, Shanks' transformation and epsilon algorithm
C06DBF Sum of a Chebyshev series
C06EAF Single one-dimensional real discrete Fourier transform, no extra workspace
C06EBF Single one-dimensional Hermitian discrete Fourier transform, no extra workspace
C06ECF Single one-dimensional complex discrete Fourier transform, no extra workspace
C06EKF Circular convolution or correlation of two real vectors, no extra workspace
C06FAF Single one-dimensional real discrete Fourier transform, extra workspace for greater speed
C06FBF Single one-dimensional Hermitian discrete Fourier transform, extra workspace for greater speed
C06FCF Single one-dimensional complex discrete Fourier transform, extra workspace for greater speed
C06FFF One-dimensional complex discrete Fourier transform of multi-dimensional data
C06FJF Multi-dimensional complex discrete Fourier transform of multi-dimensional data
C06FKF Circular convolution or correlation of two real vectors, extra workspace for greater speed
C06FPF Multiple one-dimensional real discrete Fourier transforms
C06FQF Multiple one-dimensional Hermitian discrete Fourier transforms
C06FRF Multiple one-dimensional complex discrete Fourier transforms
C06FUF Two-dimensional complex discrete Fourier transform
C06FXF Three-dimensional complex discrete Fourier transform
C06GBF Complex conjugate of Hermitian sequence

C06GCF Complex conjugate of complex sequence
C06GQF Complex conjugate of multiple Hermitian sequences
C06GSF Convert Hermitian sequences to general complex sequences
C06HAF Discrete sine transform
C06HBF Discrete cosine transform
C06HCF Discrete quarter-wave sine transform
C06HDF Discrete quarter-wave cosine transform
C06LAF Inverse Laplace transform, Crump's method
C06LBF Inverse Laplace transform, modified Weeks' method
C06LCF Evaluate inverse Laplace transform as computed by C06LBF
C06PAF Single one-dimensional real and Hermitian complex discrete Fourier transform, using complex data format for Hermitian sequences
C06PCF Single one-dimensional complex discrete Fourier transform, complex data format
C06PFF One-dimensional complex discrete Fourier transform of multi-dimensional data (using complex data type)
C06PJF Multi-dimensional complex discrete Fourier transform of multi-dimensional data (using complex data type)
C06PKF Circular convolution or correlation of two complex vectors
C06PPF Multiple one-dimensional real and Hermitian complex discrete Fourier transforms, using complex data format for Hermitian sequences
C06PQF Multiple one-dimensional real and Hermitian complex discrete Fourier transforms, using complex data format for Hermitian sequences and sequences stored as columns
C06PRF Multiple one-dimensional complex discrete Fourier transforms using complex data format
C06PSF Multiple one-dimensional complex discrete Fourier transforms using complex data format and sequences stored as columns
C06PUF Two-dimensional complex discrete Fourier transform, complex data format
C06PXF Three-dimensional complex discrete Fourier transform, complex data format
C06RAF Discrete sine transform (easy-to-use)
C06RBF Discrete cosine transform (easy-to-use)
C06RCF Discrete quarter-wave sine transform (easy-to-use)
C06RDF Discrete quarter-wave cosine transform (easy-to-use)

Chapter D01 – Quadrature

D01AHF One-dimensional quadrature, adaptive, finite interval, strategy due to Patterson, suitable for well-behaved integrands
D01AJF One-dimensional quadrature, adaptive, finite interval, strategy due to Piessens and de Doncker, allowing for badly-behaved integrands
D01AKF One-dimensional quadrature, adaptive, finite interval, method suitable for oscillating functions
D01ALF One-dimensional quadrature, adaptive, finite interval, allowing for singularities at user-specified break-points
D01AMF One-dimensional quadrature, adaptive, infinite or semi-infinite interval
D01ANF One-dimensional quadrature, adaptive, finite interval, weight function $\cos(\omega x)$ or $\sin(\omega x)$
D01APF One-dimensional quadrature, adaptive, finite interval, weight function with end-point singularities of algebraico-logarithmic type
D01AQF One-dimensional quadrature, adaptive, finite interval, weight function $1/(x-c)$, Cauchy principal value (Hilbert transform)
D01ARF One-dimensional quadrature, non-adaptive, finite interval with provision for indefinite integrals
D01ASF One-dimensional quadrature, adaptive, semi-infinite interval, weight function $\cos(\omega x)$ or $\sin(\omega x)$
D01ATF One-dimensional quadrature, adaptive, finite interval, variant of D01AJF efficient on vector machines
D01AUF One-dimensional quadrature, adaptive, finite interval, variant of D01AKF efficient on vector machines
D01BAF One-dimensional Gaussian quadrature
D01BBF Pre-computed weights and abscissae for Gaussian quadrature rules, restricted choice of rule
D01BCF Calculation of weights and abscissae for Gaussian quadrature rules, general choice of rule
D01BDF One-dimensional quadrature, non-adaptive, finite interval
D01DAF Two-dimensional quadrature, finite region
D01EAF Multi-dimensional adaptive quadrature over hyper-rectangle, multiple integrands

D01FBF Multi-dimensional Gaussian quadrature over hyper-rectangle
D01FCF Multi-dimensional adaptive quadrature over hyper-rectangle
D01FDF Multi-dimensional quadrature, Sag–Szekeres method, general product region or n-sphere
D01GAF One-dimensional quadrature, integration of function defined by data values, Gill–Miller method
D01GBF Multi-dimensional quadrature over hyper-rectangle, Monte Carlo method
D01GCF Multi-dimensional quadrature, general product region, number-theoretic method
D01GDF Multi-dimensional quadrature, general product region, number-theoretic method, variant of D01GCF efficient on vector machines
D01GYF Korobov optimal coefficients for use in D01GCF or D01GDF, when number of points is prime
D01GZF Korobov optimal coefficients for use in D01GCF or D01GDF, when number of points is product of two primes
D01JAF Multi-dimensional quadrature over an n-sphere, allowing for badly-behaved integrands
D01PAF Multi-dimensional quadrature over an n-simplex

Chapter D02 – Ordinary Differential Equations

D02AGF ODEs, boundary value problem, shooting and matching technique, allowing interior matching point, general parameters to be determined
D02BGF ODEs, IVP, Runge–Kutta–Merson method, until a component attains given value (simple driver)
D02BHF ODEs, IVP, Runge–Kutta–Merson method, until function of solution is zero (simple driver)
D02BJF ODEs, IVP, Runge–Kutta method, until function of solution is zero, integration over range with intermediate output (simple driver)
D02CJF ODEs, IVP, Adams method, until function of solution is zero, intermediate output (simple driver)
D02EJF ODEs, stiff IVP, BDF method, until function of solution is zero, intermediate output (simple driver)
D02GAF ODEs, boundary value problem, finite difference technique with deferred correction, simple nonlinear problem
D02GBF ODEs, boundary value problem, finite difference technique with deferred correction, general linear problem
D02HAF ODEs, boundary value problem, shooting and matching, boundary values to be determined
D02HBF ODEs, boundary value problem, shooting and matching, general parameters to be determined
D02JAF ODEs, boundary value problem, collocation and least-squares, single nth-order linear equation
D02JBF ODEs, boundary value problem, collocation and least-squares, system of first-order linear equations
D02KAF Second-order Sturm–Liouville problem, regular system, finite range, eigenvalue only
D02KDF Second-order Sturm–Liouville problem, regular/singular system, finite/infinite range, eigenvalue only, user-specified break-points
D02KEF Second-order Sturm–Liouville problem, regular/singular system, finite/infinite range, eigenvalue and eigenfunction, user-specified break-points
D02LAF Second-order ODEs, IVP, Runge–Kutta–Nystrom method
D02LXF Second-order ODEs, IVP, set-up for D02LAF
D02LYF Second-order ODEs, IVP, diagnostics for D02LAF
D02LZF Second-order ODEs, IVP, interpolation for D02LAF
D02MVF ODEs, IVP, DASSL method, set-up for D02M–N routines
D02MZF ODEs, IVP, interpolation for D02M–N routines, natural interpolant
D02NBF Explicit ODEs, stiff IVP, full Jacobian (comprehensive)
D02NCF Explicit ODEs, stiff IVP, banded Jacobian (comprehensive)
D02NDF Explicit ODEs, stiff IVP, sparse Jacobian (comprehensive)
D02NGF Implicit/algebraic ODEs, stiff IVP, full Jacobian (comprehensive)
D02NHF Implicit/algebraic ODEs, stiff IVP, banded Jacobian (comprehensive)
D02NJF Implicit/algebraic ODEs, stiff IVP, sparse Jacobian (comprehensive)
D02NMF Explicit ODEs, stiff IVP (reverse communication, comprehensive)
D02NNF Implicit/algebraic ODEs, stiff IVP (reverse communication, comprehensive)
D02NRF ODEs, IVP, for use with D02M–N routines, sparse Jacobian, enquiry routine
D02NSF ODEs, IVP, for use with D02M–N routines, full Jacobian, linear algebra set-up
D02NTF ODEs, IVP, for use with D02M–N routines, banded Jacobian, linear algebra set-up
D02NUF ODEs, IVP, for use with D02M–N routines, sparse Jacobian, linear algebra set-up

D02NVF ODEs, IVP, BDF method, set-up for D02M–N routines
D02NWF ODEs, IVP, Blend method, set-up for D02M–N routines
D02NXF ODEs, IVP, sparse Jacobian, linear algebra diagnostics, for use with D02M–N routines
D02NYF ODEs, IVP, integrator diagnostics, for use with D02M–N routines
D02NZF ODEs, IVP, set-up for continuation calls to integrator, for use with D02M–N routines
D02PCF ODEs, IVP, Runge–Kutta method, integration over range with output
D02PDF ODEs, IVP, Runge–Kutta method, integration over one step
D02PVF ODEs, IVP, set-up for D02PCF and D02PDF
D02PWF ODEs, IVP, resets end of range for D02PDF
D02PXF ODEs, IVP, interpolation for D02PDF
D02PYF ODEs, IVP, integration diagnostics for D02PCF and D02PDF
D02PZF ODEs, IVP, error assessment diagnostics for D02PCF and D02PDF
D02QFF ODEs, IVP, Adams method with root-finding (forward communication, comprehensive)
D02QGF ODEs, IVP, Adams method with root-finding (reverse communication, comprehensive)
D02QWF ODEs, IVP, set-up for D02QFF and D02QGF
D02QXF ODEs, IVP, diagnostics for D02QFF and D02QGF
D02QYF ODEs, IVP, root-finding diagnostics for D02QFF and D02QGF
D02QZF ODEs, IVP, interpolation for D02QFF or D02QGF
D02RAF ODEs, general nonlinear boundary value problem, finite difference technique with deferred correction, continuation facility
D02SAF ODEs, boundary value problem, shooting and matching technique, subject to extra algebraic equations, general parameters to be determined
D02TGF nth-order linear ODEs, boundary value problem, collocation and least-squares
D02TKF ODEs, general nonlinear boundary value problem, collocation technique
D02TVF ODEs, general nonlinear boundary value problem, set-up for D02TKF
D02TXF ODEs, general nonlinear boundary value problem, continuation facility for D02TKF
D02TYF ODEs, general nonlinear boundary value problem, interpolation for D02TKF
D02TZF ODEs, general nonlinear boundary value problem, diagnostics for D02TKF
D02XJF ODEs, IVP, interpolation for D02M–N routines, natural interpolant
D02XKF ODEs, IVP, interpolation for D02M–N routines, C_1 interpolant
D02ZAF ODEs, IVP, weighted norm of local error estimate for D02M–N routines

Chapter D03 – Partial Differential Equations

D03EAF Elliptic PDE, Laplace's equation, two-dimensional arbitrary domain
D03EBF Elliptic PDE, solution of finite difference equations by SIP, five-point two-dimensional molecule, iterate to convergence
D03ECF Elliptic PDE, solution of finite difference equations by SIP for seven-point three-dimensional molecule, iterate to convergence
D03EDF Elliptic PDE, solution of finite difference equations by a multigrid technique
D03EEF Discretize a second-order elliptic PDE on a rectangle
D03FAF Elliptic PDE, Helmholtz equation, three-dimensional Cartesian co-ordinates
D03MAF Triangulation of plane region
D03PCF General system of parabolic PDEs, method of lines, finite differences, one space variable
D03PDF General system of parabolic PDEs, method of lines, Chebyshev C^0 collocation, one space variable
D03PEF General system of first-order PDEs, method of lines, Keller box discretisation, one space variable
D03PFF General system of convection-diffusion PDEs with source terms in conservative form, method of lines, upwind scheme using numerical flux function based on Riemann solver, one space variable
D03PHF General system of parabolic PDEs, coupled DAEs, method of lines, finite differences, one space variable
D03PJF General system of parabolic PDEs, coupled DAEs, method of lines, Chebyshev C^0 collocation, one space variable
D03PKF General system of first-order PDEs, coupled DAEs, method of lines, Keller box discretisation, one space variable
D03PLF General system of convection-diffusion PDEs with source terms in conservative form, coupled DAEs, method of lines, upwind scheme using numerical flux function based on Riemann solver, one space variable

D03PPF General system of parabolic PDEs, coupled DAEs, method of lines, finite differences, remeshing, one space variable
D03PRF General system of first-order PDEs, coupled DAEs, method of lines, Keller box discretisation, remeshing, one space variable
D03PSF General system of convection-diffusion PDEs with source terms in conservative form, coupled DAEs, method of lines, upwind scheme using numerical flux function based on Riemann solver, remeshing, one space variable
D03PUF Roe's approximate Riemann solver for Euler equations in conservative form, for use with D03PFF, D03PLF and D03PSF
D03PVF Osher's approximate Riemann solver for Euler equations in conservative form, for use with D03PFF, D03PLF and D03PSF
D03PWF Modified HLL Riemann solver for Euler equations in conservative form, for use with D03PFF, D03PLF and D03PSF
D03PXF Exact Riemann Solver for Euler equations in conservative form, for use with D03PFF, D03PLF and D03PSF
D03PYF PDEs, spatial interpolation with D03PDF or D03PJF
D03PZF PDEs, spatial interpolation with D03PCF, D03PEF, D03PFF, D03PHF, D03PKF, D03PLF, D03PPF, D03PRF or D03PSF
D03RAF General system of second-order PDEs, method of lines, finite differences, remeshing, two space variables, rectangular region
D03RBF General system of second-order PDEs, method of lines, finite differences, remeshing, two space variables, rectilinear region
D03RYF Check initial grid data in D03RBF
D03RZF Extract grid data from D03RBF
D03UAF Elliptic PDE, solution of finite difference equations by SIP, five-point two-dimensional molecule, one iteration
D03UBF Elliptic PDE, solution of finite difference equations by SIP, seven-point three-dimensional molecule, one iteration

Chapter D04 – Numerical Differentiation

D04AAF Numerical differentiation, derivatives up to order 14, function of one real variable

Chapter D05 – Integral Equations

D05AAF Linear non-singular Fredholm integral equation, second kind, split kernel
D05ABF Linear non-singular Fredholm integral equation, second kind, smooth kernel
D05BAF Nonlinear Volterra convolution equation, second kind
D05BDF Nonlinear convolution Volterra–Abel equation, second kind, weakly singular
D05BEF Nonlinear convolution Volterra–Abel equation, first kind, weakly singular
D05BWF Generate weights for use in solving Volterra equations
D05BYF Generate weights for use in solving weakly singular Abel-type equations

Chapter E01 – Interpolation

E01AAF Interpolated values, Aitken's technique, unequally spaced data, one variable
E01ABF Interpolated values, Everett's formula, equally spaced data, one variable
E01AEF Interpolating functions, polynomial interpolant, data may include derivative values, one variable
E01BAF Interpolating functions, cubic spline interpolant, one variable
E01BEF Interpolating functions, monotonicity-preserving, piecewise cubic Hermite, one variable
E01BFF Interpolated values, interpolant computed by E01BEF, function only, one variable
E01BGF Interpolated values, interpolant computed by E01BEF, function and first derivative, one variable
E01BHF Interpolated values, interpolant computed by E01BEF, definite integral, one variable
E01DAF Interpolating functions, fitting bicubic spline, data on rectangular grid
E01RAF Interpolating functions, rational interpolant, one variable
E01RBF Interpolated values, evaluate rational interpolant computed by E01RAF, one variable
E01SAF Interpolating functions, method of Renka and Cline, two variables
E01SBF Interpolated values, evaluate interpolant computed by E01SAF, two variables
E01SEF Interpolating functions, modified Shepard's method, two variables

E01SFF Interpolated values, evaluate interpolant computed by E01SEF, two variables
E01SGF Interpolating functions, modified Shepard's method, two variables
E01SHF Interpolated values, evaluate interpolant computed by E01SGF, function and first derivatives, two variables
E01TGF Interpolating functions, modified Shepard's method, three variables
E01THF Interpolated values, evaluate interpolant computed by E01TGF, function and first derivatives, three variables

Chapter E02 – Curve and Surface Fitting

E02ACF Minimax curve fit by polynomials
E02ADF Least-squares curve fit, by polynomials, arbitrary data points
E02AEF Evaluation of fitted polynomial in one variable from Chebyshev series form (simplified parameter list)
E02AFF Least-squares polynomial fit, special data points (including interpolation)
E02AGF Least-squares polynomial fit, values and derivatives may be constrained, arbitrary data points
E02AHF Derivative of fitted polynomial in Chebyshev series form
E02AJF Integral of fitted polynomial in Chebyshev series form
E02AKF Evaluation of fitted polynomial in one variable from Chebyshev series form
E02BAF Least-squares curve cubic spline fit (including interpolation)
E02BBF Evaluation of fitted cubic spline, function only
E02BCF Evaluation of fitted cubic spline, function and derivatives
E02BDF Evaluation of fitted cubic spline, definite integral
E02BEF Least-squares cubic spline curve fit, automatic knot placement
E02CAF Least-squares surface fit by polynomials, data on lines
E02CBF Evaluation of fitted polynomial in two variables
E02DAF Least-squares surface fit, bicubic splines
E02DCF Least-squares surface fit by bicubic splines with automatic knot placement, data on rectangular grid
E02DDF Least-squares surface fit by bicubic splines with automatic knot placement, scattered data
E02DEF Evaluation of fitted bicubic spline at a vector of points
E02DFF Evaluation of fitted bicubic spline at a mesh of points
E02GAF L_1-approximation by general linear function
E02GBF L_1-approximation by general linear function subject to linear inequality constraints
E02GCF L_∞-approximation by general linear function
E02RAF Padé-approximants
E02RBF Evaluation of fitted rational function as computed by E02RAF
E02ZAF Sort two-dimensional data into panels for fitting bicubic splines

Chapter E04 – Minimizing or Maximizing a Function

E04ABF Minimum, function of one variable using function values only
E04BBF Minimum, function of one variable, using first derivative
E04CCF Unconstrained minimum, simplex algorithm, function of several variables using function values only (comprehensive)
E04DGF Unconstrained minimum, preconditioned conjugate gradient algorithm, function of several variables using first derivatives (comprehensive)
E04DJF Read optional parameter values for E04DGF from external file
E04DKF Supply optional parameter values to E04DGF
E04FCF Unconstrained minimum of a sum of squares, combined Gauss–Newton and modified Newton algorithm using function values only (comprehensive)
E04FYF Unconstrained minimum of a sum of squares, combined Gauss–Newton and modified Newton algorithm using function values only (easy-to-use)
E04GBF Unconstrained minimum of a sum of squares, combined Gauss–Newton and quasi-Newton algorithm using first derivatives (comprehensive)
E04GDF Unconstrained minimum of a sum of squares, combined Gauss–Newton and modified Newton algorithm using first derivatives (comprehensive)
E04GYF Unconstrained minimum of a sum of squares, combined Gauss–Newton and quasi-Newton algorithm, using first derivatives (easy-to-use)

`E04GZF` Unconstrained minimum of a sum of squares, combined Gauss–Newton and modified Newton algorithm using first derivatives (easy-to-use)
`E04HCF` Check user's routine for calculating first derivatives of function
`E04HDF` Check user's routine for calculating second derivatives of function
`E04HEF` Unconstrained minimum of a sum of squares, combined Gauss–Newton and modified Newton algorithm, using second derivatives (comprehensive)
`E04HYF` Unconstrained minimum of a sum of squares, combined Gauss–Newton and modified Newton algorithm, using second derivatives (easy-to-use)
`E04JYF` Minimum, function of several variables, quasi-Newton algorithm, simple bounds, using function values only (easy-to-use)
`E04KDF` Minimum, function of several variables, modified Newton algorithm, simple bounds, using first derivatives (comprehensive)
`E04KYF` Minimum, function of several variables, quasi-Newton algorithm, simple bounds, using first derivatives (easy-to-use)
`E04KZF` Minimum, function of several variables, modified Newton algorithm, simple bounds, using first derivatives (easy-to-use)
`E04LBF` Minimum, function of several variables, modified Newton algorithm, simple bounds, using first and second derivatives (comprehensive)
`E04LYF` Minimum, function of several variables, modified Newton algorithm, simple bounds, using first and second derivatives (easy-to-use)
`E04MFF` LP problem (dense)
`E04MGF` Read optional parameter values for E04MFF from external file
`E04MHF` Supply optional parameter values to E04MFF
`E04MZF` Converts MPSX data file defining LP or QP problem to format required by E04NKF
`E04NCF` Convex QP problem or linearly-constrained linear least-squares problem (dense)
`E04NDF` Read optional parameter values for E04NCF from external file
`E04NEF` Supply optional parameter values to E04NCF
`E04NFF` QP problem (dense)
`E04NGF` Read optional parameter values for E04NFF from external file
`E04NHF` Supply optional parameter values to E04NFF
`E04NKF` LP or QP problem (sparse)
`E04NLF` Read optional parameter values for E04NKF from external file
`E04NMF` Supply optional parameter values to E04NKF
`E04UCF` Minimum, function of several variables, sequential QP method, nonlinear constraints, using function values and optionally first derivatives (forward communication, comprehensive)
`E04UDF` Read optional parameter values for E04UCF or E04UFF from external file
`E04UEF` Supply optional parameter values to E04UCF or E04UFF
`E04UFF` Minimum, function of several variables, sequential QP method, nonlinear constraints, using function values and optionally first derivatives (reverse communication, comprehensive)
`E04UGF` NLP problem (sparse)
`E04UHF` Read optional parameter values for E04UGF from external file
`E04UJF` Supply optional parameter values to E04UGF
`E04UNF` Minimum of a sum of squares, nonlinear constraints, sequential QP method, using function values and optionally first derivatives (comprehensive)
`E04UQF` Read optional parameter values for E04UNF from external file
`E04URF` Supply optional parameter values to E04UNF
`E04XAF` Estimate (using numerical differentiation) gradient and/or Hessian of a function
`E04YAF` Check user's routine for calculating Jacobian of first derivatives
`E04YBF` Check user's routine for calculating Hessian of a sum of squares
`E04YCF` Covariance matrix for nonlinear least-squares problem (unconstrained)
`E04ZCF` Check user's routines for calculating first derivatives of function and constraints

Chapter F01 – Matrix Factorizations

`F01ABF` Inverse of real symmetric positive-definite matrix using iterative refinement
`F01ADF` Inverse of real symmetric positive-definite matrix
`F01BLF` Pseudo-inverse and rank of real m by n matrix ($m \geq n$)
`F01BRF` LU factorization of real sparse matrix
`F01BSF` LU factorization of real sparse matrix with known sparsity pattern

F01BUF $ULDL^TU^T$ factorization of real symmetric positive-definite band matrix
F01BVF Reduction to standard form, generalized real symmetric-definite banded eigenproblem
F01CKF Matrix multiplication
F01CRF Matrix transposition
F01CTF Sum or difference of two real matrices, optional scaling and transposition
F01CWF Sum or difference of two complex matrices, optional scaling and transposition
F01LEF LU factorization of real tridiagonal matrix
F01LHF LU factorization of real almost block diagonal matrix
F01MCF LDL^T factorization of real symmetric positive-definite variable-bandwidth matrix
F01QGF RQ factorization of real m by n upper trapezoidal matrix ($m \leq n$)
F01QJF RQ factorization of real m by n matrix ($m \leq n$)
F01QKF Operations with orthogonal matrices, form rows of Q, after RQ factorization by F01QJF
F01RGF RQ factorization of complex m by n upper trapezoidal matrix ($m \leq n$)
F01RJF RQ factorization of complex m by n matrix ($m \leq n$)
F01RKF Operations with unitary matrices, form rows of Q, after RQ factorization by F01RJF
F01ZAF Convert real matrix between packed triangular and square storage schemes
F01ZBF Convert complex matrix between packed triangular and square storage schemes
F01ZCF Convert real matrix between packed banded and rectangular storage schemes
F01ZDF Convert complex matrix between packed banded and rectangular storage schemes

Chapter F02 – Eigenvalues and Eigenvectors

F02BJF All eigenvalues and optionally eigenvectors of generalized eigenproblem by QZ algorithm, real matrices (Black Box)
F02EAF All eigenvalues and Schur factorization of real general matrix (Black Box)
F02EBF All eigenvalues and eigenvectors of real general matrix (Black Box)
F02ECF Selected eigenvalues and eigenvectors of real nonsymmetric matrix (Black Box)
F02FAF All eigenvalues and eigenvectors of real symmetric matrix (Black Box)
F02FCF Selected eigenvalues and eigenvectors of real symmetric matrix (Black Box)
F02FDF All eigenvalues and eigenvectors of real symmetric-definite generalized problem (Black Box)
F02FHF All eigenvalues of generalized banded real symmetric-definite eigenproblem (Black Box)
F02FJF Selected eigenvalues and eigenvectors of sparse symmetric eigenproblem (Black Box)
F02GAF All eigenvalues and Schur factorization of complex general matrix (Black Box)
F02GBF All eigenvalues and eigenvectors of complex general matrix (Black Box)
F02GCF Selected eigenvalues and eigenvectors of complex nonsymmetric matrix (Black Box)
F02GJF All eigenvalues and optionally eigenvectors of generalized complex eigenproblem by QZ algorithm (Black Box)
F02HAF All eigenvalues and eigenvectors of complex Hermitian matrix (Black Box)
F02HCF Selected eigenvalues and eigenvectors of complex Hermitian matrix (Black Box)
F02HDF All eigenvalues and eigenvectors of complex Hermitian-definite generalized problem (Black Box)
F02SDF Eigenvector of generalized real banded eigenproblem by inverse iteration
F02WDF QR factorization, possibly followed by SVD
F02WEF SVD of real matrix (Black Box)
F02WUF SVD of real upper triangular matrix (Black Box)
F02XEF SVD of complex matrix (Black Box)
F02XUF SVD of complex upper triangular matrix (Black Box)

Chapter F03 – Determinants

F03AAF Determinant of real matrix (Black Box)
F03ABF Determinant of real symmetric positive-definite matrix (Black Box)
F03ACF Determinant of real symmetric positive-definite band matrix (Black Box)
F03ADF Determinant of complex matrix (Black Box)
F03AEF LL^T factorization and determinant of real symmetric positive-definite matrix
F03AFF LU factorization and determinant of real matrix

Chapter F04 – Simultaneous Linear Equations

F04AAF Solution of real simultaneous linear equations with multiple right-hand sides (Black Box)
F04ABF Solution of real symmetric positive-definite simultaneous linear equations with multiple right-hand sides using iterative refinement (Black Box)
F04ACF Solution of real symmetric positive-definite banded simultaneous linear equations with multiple right-hand sides (Black Box)
F04ADF Solution of complex simultaneous linear equations with multiple right-hand sides (Black Box)
F04AEF Solution of real simultaneous linear equations with multiple right-hand sides using iterative refinement (Black Box)
F04AFF Solution of real symmetric positive-definite simultaneous linear equations using iterative refinement (coefficient matrix already factorized by F03AEF)
F04AGF Solution of real symmetric positive-definite simultaneous linear equations (coefficient matrix already factorized by F03AEF)
F04AHF Solution of real simultaneous linear equations using iterative refinement (coefficient matrix already factorized by F03AFF)
F04AJF Solution of real simultaneous linear equations (coefficient matrix already factorized by F03AFF)
F04AMF Least-squares solution of m real equations in n unknowns, rank $= n$, $m \geq n$ using iterative refinement (Black Box)
F04ARF Solution of real simultaneous linear equations, one right-hand side (Black Box)
F04ASF Solution of real symmetric positive-definite simultaneous linear equations, one right-hand side using iterative refinement (Black Box)
F04ATF Solution of real simultaneous linear equations, one right-hand side using iterative refinement (Black Box)
F04AXF Solution of real sparse simultaneous linear equations (coefficient matrix already factorized)
F04EAF Solution of real tridiagonal simultaneous linear equations, one right-hand side (Black Box)
F04FAF Solution of real symmetric positive-definite tridiagonal simultaneous linear equations, one right-hand side (Black Box)
F04FEF Solution of the Yule–Walker equations for real symmetric positive-definite Toeplitz matrix, one right-hand side
F04FFF Solution of real symmetric positive-definite Toeplitz system, one right-hand side
F04JAF Minimal least-squares solution of m real equations in n unknowns, rank $\leq n$, $m \geq n$
F04JDF Minimal least-squares solution of m real equations in n unknowns, rank $\leq n$, $m \geq n$
F04JGF Least-squares (if rank $= n$) or minimal least-squares (if rank $< n$) solution of m real equations in n unknowns, rank $\leq n$, $m \geq n$
F04JLF Real general Gauss–Markov linear model (including weighted least-squares)
F04JMF Equality-constrained real linear least-squares problem
F04KLF Complex general Gauss–Markov linear model (including weighted least-squares)
F04KMF Equality-constrained complex linear least-squares problem
F04LEF Solution of real tridiagonal simultaneous linear equations (coefficient matrix already factorized by F01LEF)
F04LHF Solution of real almost block diagonal simultaneous linear equations (coefficient matrix already factorized by F01LHF)
F04MCF Solution of real symmetric positive-definite variable-bandwidth simultaneous linear equations (coefficient matrix already factorized by F01MCF)
F04MEF Update solution of the Yule–Walker equations for real symmetric positive-definite Toeplitz matrix
F04MFF Update solution of real symmetric positive-definite Toeplitz system
F04QAF Sparse linear least-squares problem, m real equations in n unknowns
F04YAF Covariance matrix for linear least-squares problems, m real equations in n unknowns
F04YCF Norm estimation (for use in condition estimation), real matrix
F04ZCF Norm estimation (for use in condition estimation), complex matrix

Chapter F05 – Orthogonalisation

F05AAF Gram–Schmidt orthogonalisation of n vectors of order m

Chapter F06 – Linear Algebra Support Routines

F06HBF	Broadcast scalar into complex vector
F06HCF	Multiply complex vector by complex diagonal matrix
F06HDF	Multiply complex vector by complex scalar, preserving input vector
F06HGF	Negate complex vector
F06HPF	Apply complex plane rotation
F06HQF	Generate sequence of complex plane rotations
F06HRF	Generate complex elementary reflection
F06HTF	Apply complex elementary reflection
F06JDF	(CSSCAL/ZDSCAL) Multiply complex vector by real scalar
F06JJF	(SCNRM2/DZNRM2) Compute Euclidean norm of complex vector
F06JKF	(SCASUM/DZASUM) Sum absolute values of complex vector elements
F06JLF	(ISAMAX/IDAMAX) Index, real vector element with largest absolute value
F06JMF	(ICAMAX/IZAMAX) Index, complex vector element with largest absolute value
F06KCF	Multiply complex vector by real diagonal matrix
F06KDF	Multiply complex vector by real scalar, preserving input vector
F06KFF	Copy real vector to complex vector
F06KJF	Update Euclidean norm of complex vector in scaled form
F06KLF	Last non-negligible element of real vector
F06KPF	Apply real plane rotation to two complex vectors
F06PAF	(SGEMV/DGEMV) Matrix-vector product, real rectangular matrix
F06PBF	(SGBMV/DGBMV) Matrix-vector product, real rectangular band matrix
F06PCF	(SSYMV/DSYMV) Matrix-vector product, real symmetric matrix
F06PDF	(SSBMV/DSBMV) Matrix-vector product, real symmetric band matrix
F06PEF	(SSPMV/DSPMV) Matrix-vector product, real symmetric packed matrix
F06PFF	(STRMV/DTRMV) Matrix-vector product, real triangular matrix
F06PGF	(STBMV/DTBMV) Matrix-vector product, real triangular band matrix
F06PHF	(STPMV/DTPMV) Matrix-vector product, real triangular packed matrix
F06PJF	(STRSV/DTRSV) System of equations, real triangular matrix
F06PKF	(STBSV/DTBSV) System of equations, real triangular band matrix
F06PLF	(STPSV/DTPSV) System of equations, real triangular packed matrix
F06PMF	(SGER/DGER) Rank-1 update, real rectangular matrix
F06PPF	(SSYR/DSYR) Rank-1 update, real symmetric matrix
F06PQF	(SSPR/DSPR) Rank-1 update, real symmetric packed matrix
F06PRF	(SSYR2/DSYR2) Rank-2 update, real symmetric matrix
F06PSF	(SSPR2/DSPR2) Rank-2 update, real symmetric packed matrix
F06QFF	Matrix copy, real rectangular or trapezoidal matrix
F06QHF	Matrix initialisation, real rectangular matrix
F06QJF	Permute rows or columns, real rectangular matrix, permutations represented by an integer array
F06QKF	Permute rows or columns, real rectangular matrix, permutations represented by a real array
F06QMF	Orthogonal similarity transformation of real symmetric matrix as a sequence of plane rotations
F06QPF	QR factorization by sequence of plane rotations, rank-1 update of real upper triangular matrix
F06QQF	QR factorization by sequence of plane rotations, real upper triangular matrix augmented by a full row
F06QRF	QR or RQ factorization by sequence of plane rotations, real upper Hessenberg matrix
F06QSF	QR or RQ factorization by sequence of plane rotations, real upper spiked matrix
F06QTF	QR factorization of UZ or RQ factorization of ZU, U real upper triangular, Z a sequence of plane rotations
F06QVF	Compute upper Hessenberg matrix by sequence of plane rotations, real upper triangular matrix
F06QWF	Compute upper spiked matrix by sequence of plane rotations, real upper triangular matrix
F06QXF	Apply sequence of plane rotations, real rectangular matrix
F06RAF	1-norm, ∞-norm, Frobenius norm, largest absolute element, real general matrix
F06RBF	1-norm, ∞-norm, Frobenius norm, largest absolute element, real band matrix
F06RCF	1-norm, ∞-norm, Frobenius norm, largest absolute element, real symmetric matrix
F06RDF	1-norm, ∞-norm, Frobenius norm, largest absolute element, real symmetric matrix, packed storage
F06REF	1-norm, ∞-norm, Frobenius norm, largest absolute element, real symmetric band matrix
F06RJF	1-norm, ∞-norm, Frobenius norm, largest absolute element, real trapezoidal/triangular matrix

F06RKF	1-norm, ∞-norm, Frobenius norm, largest absolute element, real triangular matrix, packed storage
F06RLF	1-norm, ∞-norm, Frobenius norm, largest absolute element, real triangular band matrix
F06RMF	1-norm, ∞-norm, Frobenius norm, largest absolute element, real Hessenberg matrix
F06SAF	(CGEMV/ZGEMV) Matrix-vector product, complex rectangular matrix
F06SBF	(CGBMV/ZGBMV) Matrix-vector product, complex rectangular band matrix
F06SCF	(CHEMV/ZHEMV) Matrix-vector product, complex Hermitian matrix
F06SDF	(CHBMV/ZHBMV) Matrix-vector product, complex Hermitian band matrix
F06SEF	(CHPMV/ZHPMV) Matrix-vector product, complex Hermitian packed matrix
F06SFF	(CTRMV/ZTRMV) Matrix-vector product, complex triangular matrix
F06SGF	(CTBMV/ZTBMV) Matrix-vector product, complex triangular band matrix
F06SHF	(CTPMV/ZTPMV) Matrix-vector product, complex triangular packed matrix
F06SJF	(CTRSV/ZTRSV) System of equations, complex triangular matrix
F06SKF	(CTBSV/ZTBSV) System of equations, complex triangular band matrix
F06SLF	(CTPSV/ZTPSV) System of equations, complex triangular packed matrix
F06SMF	(CGERU/ZGERU) Rank-1 update, complex rectangular matrix, unconjugated vector
F06SNF	(CGERC/ZGERC) Rank-1 update, complex rectangular matrix, conjugated vector
F06SPF	(CHER/ZHER) Rank-1 update, complex Hermitian matrix
F06SQF	(CHPR/ZHPR) Rank-1 update, complex Hermitian packed matrix
F06SRF	(CHER2/ZHER2) Rank-2 update, complex Hermitian matrix
F06SSF	(CHPR2/ZHPR2) Rank-2 update, complex Hermitian packed matrix
F06TFF	Matrix copy, complex rectangular or trapezoidal matrix
F06THF	Matrix initialisation, complex rectangular matrix
F06TMF	Unitary similarity transformation of Hermitian matrix as a sequence of plane rotations
F06TPF	QR factorization by sequence of plane rotations, rank-1 update of complex upper triangular matrix
F06TQF	$QRxk$ factorization by sequence of plane rotations, complex upper triangular matrix augmented by a full row
F06TRF	QR or RQ factorization by sequence of plane rotations, complex upper Hessenberg matrix
F06TSF	QR or RQ factorization by sequence of plane rotations, complex upper spiked matrix
F06TTF	QR factorization of UZ or RQ factorization of ZU, U complex upper triangular, Z a sequence of plane rotations
F06TVF	Compute upper Hessenberg matrix by sequence of plane rotations, complex upper triangular matrix
F06TWF	Compute upper spiked matrix by sequence of plane rotations, complex upper triangular matrix
F06TXF	Apply sequence of plane rotations, complex rectangular matrix, real cosine and complex sine
F06TYF	Apply sequence of plane rotations, complex rectangular matrix, complex cosine and real sine
F06UAF	1-norm, ∞-norm, Frobenius norm, largest absolute element, complex general matrix
F06UBF	1-norm, ∞-norm, Frobenius norm, largest absolute element, complex band matrix
F06UCF	1-norm, ∞-norm, Frobenius norm, largest absolute element, complex Hermitian matrix
F06UDF	1-norm, ∞-norm, Frobenius norm, largest absolute element, complex Hermitian matrix, packed storage
F06UEF	1-norm, ∞-norm, Frobenius norm, largest absolute element, complex Hermitian band matrix
F06UFF	1-norm, ∞-norm, Frobenius norm, largest absolute element, complex symmetric matrix
F06UGF	1-norm, ∞-norm, Frobenius norm, largest absolute element, complex symmetric matrix, packed storage
F06UHF	1-norm, ∞-norm, Frobenius norm, largest absolute element, complex symmetric band matrix
F06UJF	1-norm, ∞-norm, Frobenius norm, largest absolute element, complex trapezoidal/triangular matrix
F06UKF	1-norm, ∞-norm, Frobenius norm, largest absolute element, complex triangular matrix, packed storage
F06ULF	1-norm, ∞-norm, Frobenius norm, largest absolute element, complex triangular band matrix
F06UMF	1-norm, ∞-norm, Frobenius norm, largest absolute element, complex Hessenberg matrix
F06VJF	Permute rows or columns, complex rectangular matrix, permutations represented by an integer array
F06VKF	Permute rows or columns, complex rectangular matrix, permutations represented by a real array
F06VXF	Apply sequence of plane rotations, complex rectangular matrix, real cosine and sine

F06YAF (SGEMM/DGEMM) Matrix-matrix product, two real rectangular matrices
F06YCF (SSYMM/DSYMM) Matrix-matrix product, one real symmetric matrix, one real rectangular matrix
F06YFF (STRMM/DTRMM) Matrix-matrix product, one real triangular matrix, one real rectangular matrix
F06YJF (STRSM/DTRSM) Solves system of equations with multiple right-hand sides, real triangular coefficient matrix
F06YPF (SSYRK/DSYRK) Rank-k update of real symmetric matrix
F06YRF (SSYR2K/DSYR2K) Rank-2k update of real symmetric matrix
F06ZAF (CGEMM/ZGEMM) Matrix-matrix product, two complex rectangular matrices
F06ZCF (CHEMM/ZHEMM) Matrix-matrix product, one complex Hermitian matrix, one complex rectangular matrix
F06ZFF (CTRMM/ZTRMM) Matrix-matrix product, one complex triangular matrix, one complex rectangular matrix
F06ZJF (CTRSM/ZTRSM) Solves system of equations with multiple right-hand sides, complex triangular coefficient matrix
F06ZPF (CHERK/ZHERK) Rank-k update of complex Hermitian matrix
F06ZRF (CHER2K/ZHER2K) Rank-2k update of complex Hermitian matrix
F06ZTF (CSYMM/ZSYMM) Matrix-matrix product, one complex symmetric matrix, one complex rectangular matrix
F06ZUF (CSYRK/ZSYRK) Rank-k update of complex symmetric matrix
F06ZWF (CSYR2K/ZHER2K) Rank-2k update of complex symmetric matrix

Chapter F07 – Linear Equations (LAPACK)

F07ADF (SGETRF/DGETRF) LU factorization of real m by n matrix
F07AEF (SGETRS/DGETRS) Solution of real system of linear equations, multiple right-hand sides, matrix already factorized by F07ADF
F07AGF (SGECON/DGECON) Estimate condition number of real matrix, matrix already factorized by F07ADF
F07AHF (SGERFS/DGERFS) Refined solution with error bounds of real system of linear equations, multiple right-hand sides
F07AJF (SGETRI/DGETRI) Inverse of real matrix, matrix already factorized by F07ADF
F07ARF (CGETRF/ZGETRF) LU factorization of complex m by n matrix
F07ASF (CGETRS/ZGETRS) Solution of complex system of linear equations, multiple right-hand sides, matrix already factorized by F07ARF
F07AUF (CGECON/ZGECON) Estimate condition number of complex matrix, matrix already factorized by F07ARF
F07AVF (CGERFS/ZGERFS) Refined solution with error bounds of complex system of linear equations, multiple right-hand sides
F07AWF (CGETRI/ZGETRI) Inverse of complex matrix, matrix already factorized by F07ARF
F07BDF (SGBTRF/DGBTRF) LU factorization of real m by n band matrix
F07BEF (SGBTRS/DGBTRS) Solution of real band system of linear equations, multiple right-hand sides, matrix already factorized by F07BDF
F07BGF (SGBCON/DGBCON) Estimate condition number of real band matrix, matrix already factorized by F07BDF
F07BHF (SGBRFS/DGBRFS) Refined solution with error bounds of real band system of linear equations, multiple right-hand sides
F07BRF (CGBTRF/ZGBTRF) LU factorization of complex m by n band matrix
F07BSF (CGBTRS/ZGBTRS) Solution of complex band system of linear equations, multiple right-hand sides, matrix already factorized by F07BRF
F07BUF (CGBCON/ZGBCON) Estimate condition number of complex band matrix, matrix already factorized by F07BRF
F07BVF (CGBRFS/ZGBRFS) Refined solution with error bounds of complex band system of linear equations, multiple right-hand sides
F07FDF (SPOTRF/DPOTRF) Cholesky factorization of real symmetric positive-definite matrix
F07FEF (SPOTRS/DPOTRS) Solution of real symmetric positive-definite system of linear equations, multiple right-hand sides, matrix already factorized by F07FDF

`F07FGF` (SPOCON/DPOCON) Estimate condition number of real symmetric positive-definite matrix, matrix already factorized by F07FDF

`F07FHF` (SPORFS/DPORFS) Refined solution with error bounds of real symmetric positive-definite system of linear equations, multiple right-hand sides

`F07FJF` (SPOTRI/DPOTRI) Inverse of real symmetric positive-definite matrix, matrix already factorized by F07FDF

`F07FRF` (CPOTRF/ZPOTRF) Cholesky factorization of complex Hermitian positive-definite matrix

`F07FSF` (CPOTRS/ZPOTRS) Solution of complex Hermitian positive-definite system of linear equations, multiple right-hand sides, matrix already factorized by F07FRF

`F07FUF` (CPOCON/ZPOCON) Estimate condition number of complex Hermitian positive-definite matrix, matrix already factorized by F07FRF

`F07FVF` (CPORFS/ZPORFS) Refined solution with error bounds of complex Hermitian positive-definite system of linear equations, multiple right-hand sides

`F07FWF` (CPOTRI/ZPOTRI) Inverse of complex Hermitian positive-definite matrix, matrix already factorized by F07FRF

`F07GDF` (SPPTRF/DPPTRF) Cholesky factorization of real symmetric positive-definite matrix, packed storage

`F07GEF` (SPPTRS/DPPTRS) Solution of real symmetric positive-definite system of linear equations, multiple right-hand sides, matrix already factorized by F07GDF, packed storage

`F07GGF` (SPPCON/DPPCON) Estimate condition number of real symmetric positive-definite matrix, matrix already factorized by F07GDF, packed storage

`F07GHF` (SPPRFS/DPPRFS) Refined solution with error bounds of real symmetric positive-definite system of linear equations, multiple right-hand sides, packed storage

`F07GJF` (SPPTRI/DPPTRI) Inverse of real symmetric positive-definite matrix, matrix already factorized by F07GDF, packed storage

`F07GRF` (CPPTRF/ZPPTRF) Cholesky factorization of complex Hermitian positive-definite matrix, packed storage

`F07GSF` (CPPTRS/ZPPTRS) Solution of complex Hermitian positive-definite system of linear equations, multiple right-hand sides, matrix already factorized by F07GRF, packed storage

`F07GUF` (CPPCON/ZPPCON) Estimate condition number of complex Hermitian positive-definite matrix, matrix already factorized by F07GRF, packed storage

`F07GVF` (CPPRFS/ZPPRFS) Refined solution with error bounds of complex Hermitian positive-definite system of linear equations, multiple right-hand sides, packed storage

`F07GWF` (CPPTRI/ZPPTRI) Inverse of complex Hermitian positive-definite matrix, matrix already factorized by F07GRF, packed storage

`F07HDF` (SPBTRF/DPBTRF) Cholesky factorization of real symmetric positive-definite band matrix

`F07HEF` (SPBTRS/DPBTRS) Solution of real symmetric positive-definite band system of linear equations, multiple right-hand sides, matrix already factorized by F07HDF

`F07HGF` (SPBCON/DPBCON) Estimate condition number of real symmetric positive-definite band matrix, matrix already factorized by F07HDF

`F07HHF` (SPBRFS/DPBRFS) Refined solution with error bounds of real symmetric positive-definite band system of linear equations, multiple right-hand sides

`F07HRF` (CPBTRF/ZPBTRF) Cholesky factorization of complex Hermitian positive-definite band matrix

`F07HSF` (CPBTRS/ZPBTRS) Solution of complex Hermitian positive-definite band system of linear equations, multiple right-hand sides, matrix already factorized by F07HRF

`F07HUF` (CPBCON/ZPBCON) Estimate condition number of complex Hermitian positive-definite band matrix, matrix already factorized by F07HRF

`F07HVF` (CPBRFS/ZPBRFS) Refined solution with error bounds of complex Hermitian positive-definite band system of linear equations, multiple right-hand sides

`F07MDF` (SSYTRF/DSYTRF) Bunch–Kaufman factorization of real symmetric indefinite matrix

`F07MEF` (SSYTRS/DSYTRS) Solution of real symmetric indefinite system of linear equations, multiple right-hand sides, matrix already factorized by F07MDF

`F07MGF` (SSYCON/DSYCON) Estimate condition number of real symmetric indefinite matrix, matrix already factorized by F07MDF

`F07MHF` (SSYRFS/DSYRFS) Refined solution with error bounds of real symmetric indefinite system of linear equations, multiple right-hand sides

`F07MJF` (SSYTRI/DSYTRI) Inverse of real symmetric indefinite matrix, matrix already factorized by F07MDF

`F07MRF` (CHETRF/ZHETRF) Bunch–Kaufman factorization of complex Hermitian indefinite matrix

`F07MSF` (CHETRS/ZHETRS) Solution of complex Hermitian indefinite system of linear equations, multiple right-hand sides, matrix already factorized by F07MRF

`F07MUF` (CHECON/ZHECON) Estimate condition number of complex Hermitian indefinite matrix, matrix already factorized by F07MRF

`F07MVF` (CHERFS/ZHERFS) Refined solution with error bounds of complex Hermitian indefinite system of linear equations, multiple right-hand sides

`F07MWF` (CHETRI/ZHETRI) Inverse of complex Hermitian indefinite matrix, matrix already factorized by F07MRF

`F07NRF` (CSYTRF/ZSYTRF) Bunch–Kaufman factorization of complex symmetric matrix

`F07NSF` (CSYTRS/ZSYTRS) Solution of complex symmetric system of linear equations, multiple right-hand sides, matrix already factorized by F07NRF

`F07NUF` (CSYCON/ZSYCON) Estimate condition number of complex symmetric matrix, matrix already factorized by F07NRF

`F07NVF` (CSYRFS/ZSYRFS) Refined solution with error bounds of complex symmetric system of linear equations, multiple right-hand sides

`F07NWF` (CSYTRI/ZSYTRI) Inverse of complex symmetric matrix, matrix already factorized by F07NRF

`F07PDF` (SSPTRF/DSPTRF) Bunch–Kaufman factorization of real symmetric indefinite matrix, packed storage

`F07PEF` (SSPTRS/DSPTRS) Solution of real symmetric indefinite system of linear equations, multiple right-hand sides, matrix already factorized by F07PDF, packed storage

`F07PGF` (SSPCON/DSPCON) Estimate condition number of real symmetric indefinite matrix, matrix already factorized by F07PDF, packed storage

`F07PHF` (SSPRFS/DSPRFS) Refined solution with error bounds of real symmetric indefinite system of linear equations, multiple right-hand sides, packed storage

`F07PJF` (SSPTRI/DSPTRI) Inverse of real symmetric indefinite matrix, matrix already factorized by F07PDF, packed storage

`F07PRF` (CHPTRF/ZHPTRF) Bunch–Kaufman factorization of complex Hermitian indefinite matrix, packed storage

`F07PSF` (CHPTRS/ZHPTRS) Solution of complex Hermitian indefinite system of linear equations, multiple right-hand sides, matrix already factorized by F07PRF, packed storage

`F07PUF` (CHPCON/ZHPCON) Estimate condition number of complex Hermitian indefinite matrix, matrix already factorized by F07PRF, packed storage

`F07PVF` (CHPRFS/ZHPRFS) Refined solution with error bounds of complex Hermitian indefinite system of linear equations, multiple right-hand sides, packed storage

`F07PWF` (CHPTRI/ZHPTRI) Inverse of complex Hermitian indefinite matrix, matrix already factorized by F07PRF, packed storage

`F07QRF` (CSPTRF/ZSPTRF) Bunch–Kaufman factorization of complex symmetric matrix, packed storage

`F07QSF` (CSPTRS/ZSPTRS) Solution of complex symmetric system of linear equations, multiple right-hand sides, matrix already factorized by F07QRF, packed storage

`F07QUF` (CSPCON/ZSPCON) Estimate condition number of complex symmetric matrix, matrix already factorized by F07QRF, packed storage

`F07QVF` (CSPRFS/ZSPRFS) Refined solution with error bounds of complex symmetric system of linear equations, multiple right-hand sides, packed storage

`F07QWF` (CSPTRI/ZSPTRI) Inverse of complex symmetric matrix, matrix already factorized by F07QRF, packed storage

`F07TEF` (STRTRS/DTRTRS) Solution of real triangular system of linear equations, multiple right-hand sides

`F07TGF` (STRCON/DTRCON) Estimate condition number of real triangular matrix

`F07THF` (STRRFS/DTRRFS) Error bounds for solution of real triangular system of linear equations, multiple right-hand sides

`F07TJF` (STRTRI/DTRTRI) Inverse of real triangular matrix

`F07TSF` (CTRTRS/ZTRTRS) Solution of complex triangular system of linear equations, multiple right-hand sides

F07TUF (CTRCON/ZTRCON) Estimate condition number of complex triangular matrix
F07TVF (CTRRFS/ZTRRFS) Error bounds for solution of complex triangular system of linear equations, multiple right-hand sides
F07TWF (CTRTRI/ZTRTRI) Inverse of complex triangular matrix
F07UEF (STPTRS/DTPTRS) Solution of real triangular system of linear equations, multiple right-hand sides, packed storage
F07UGF (STPCON/DTPCON) Estimate condition number of real triangular matrix, packed storage
F07UHF (STPRFS/DTPRFS) Error bounds for solution of real triangular system of linear equations, multiple right-hand sides, packed storage
F07UJF (STPTRI/DTPTRI) Inverse of real triangular matrix, packed storage
F07USF (CTPTRS/ZTPTRS) Solution of complex triangular system of linear equations, multiple right-hand sides, packed storage
F07UUF (CTPCON/ZTPCON) Estimate condition number of complex triangular matrix, packed storage
F07UVF (CTPRFS/ZTPRFS) Error bounds for solution of complex triangular system of linear equations, multiple right-hand sides, packed storage
F07UWF (CTPTRI/ZTPTRI) Inverse of complex triangular matrix, packed storage
F07VEF (STBTRS/DTBTRS) Solution of real band triangular system of linear equations, multiple right-hand sides
F07VGF (STBCON/DTBCON) Estimate condition number of real band triangular matrix
F07VHF (STBRFS/DTBRFS) Error bounds for solution of real band triangular system of linear equations, multiple right-hand sides
F07VSF (CTBTRS/ZTBTRS) Solution of complex band triangular system of linear equations, multiple right-hand sides
F07VUF (CTBCON/ZTBCON) Estimate condition number of complex band triangular matrix
F07VVF (CTBRFS/ZTBRFS) Error bounds for solution of complex band triangular system of linear equations, multiple right-hand sides

Chapter F08 – Least-squares and Eigenvalue Problems (LAPACK)

F08AEF (SGEQRF/DGEQRF) QR factorization of real general rectangular matrix
F08AFF (SORGQR/DORGQR) Form all or part of orthogonal Q from QR factorization determined by F08AEF or F08BEF
F08AGF (SORMQR/DORMQR) Apply orthogonal transformation determined by F08AEF or F08BEF
F08AHF (SGELQF/DGELQF) LQ factorization of real general rectangular matrix
F08AJF (SORGLQ/DORGLQ) Form all or part of orthogonal Q from LQ factorization determined by F08AHF
F08AKF (SORMLQ/DORMLQ) Apply orthogonal transformation determined by F08AHF
F08ASF (CGEQRF/ZGEQRF) QR factorization of complex general rectangular matrix
F08ATF (CUNGQR/ZUNGQR) Form all or part of unitary Q from QR factorization determined by F08ASF or F08BSF
F08AUF (CUNMQR/ZUNMQR) Apply unitary transformation determined by F08ASF or F08BSF
F08AVF (CGELQF/ZGELQF) LQ factorization of complex general rectangular matrix
F08AWF (CUNGLQ/ZUNGLQ) Form all or part of unitary Q from LQ factorization determined by F08AVF
F08AXF (CUNMLQ/ZUNMLQ) Apply unitary transformation determined by F08AVF
F08BEF (SGEQPF/DGEQPF) QR factorization of real general rectangular matrix with column pivoting
F08BSF (CGEQPF/ZGEQPF) QR factorization of complex general rectangular matrix with column pivoting
F08FCF (SSYEVD/DSYEVD) All eigenvalues and optionally all eigenvectors of real symmetric matrix, using divide and conquer
F08FEF (SSYTRD/DSYTRD) Orthogonal reduction of real symmetric matrix to symmetric tridiagonal form
F08FFF (SORGTR/DORGTR) Generate orthogonal transformation matrix from reduction to tridiagonal form determined by F08FEF
F08FGF (SORMTR/DORMTR) Apply orthogonal transformation determined by F08FEF
F08FQF (CHEEVD/ZHEEVD) All eigenvalues and optionally all eigenvectors of complex Hermitian matrix, using divide and conquer
F08FSF (CHETRD/ZHETRD) Unitary reduction of complex Hermitian matrix to real symmetric tridiagonal form

`F08FTF` (CUNGTR/ZUNGTR) Generate unitary transformation matrix from reduction to tridiagonal form determined by F08FSF
`F08FUF` (CUNMTR/ZUNMTR) Apply unitary transformation matrix determined by F08FSF
`F08GCF` (SSPEVD/DSPEVD) All eigenvalues and optionally all eigenvectors of real symmetric matrix, packed storage, using divide and conquer
`F08GEF` (SSPTRD/DSPTRD) Orthogonal reduction of real symmetric matrix to symmetric tridiagonal form, packed storage
`F08GFF` (SOPGTR/DOPGTR) Generate orthogonal transformation matrix from reduction to tridiagonal form determined by F08GEF
`F08GGF` (SOPMTR/DOPMTR) Apply orthogonal transformation determined by F08GEF
`F08GQF` (CHPEVD/ZHPEVD) All eigenvalues and optionally all eigenvectors of complex Hermitian matrix, packed storage, using divide and conquer
`F08GSF` (CHPTRD/ZHPTRD) Unitary reduction of complex Hermitian matrix to real symmetric tridiagonal form, packed storage
`F08GTF` (CUPGTR/ZUPGTR) Generate unitary transformation matrix from reduction to tridiagonal form determined by F08GSF
`F08GUF` (CUPMTR/ZUPMTR) Apply unitary transformation matrix determined by F08GSF
`F08HCF` (SSBEVD/DSBEVD) All eigenvalues and optionally all eigenvectors of real symmetric band matrix, using divide and conquer
`F08HEF` (SSBTRD/DSBTRD) Orthogonal reduction of real symmetric band matrix to symmetric tridiagonal form
`F08HQF` (CHBEVD/ZHBEVD) All eigenvalues and optionally all eigenvectors of complex Hermitian band matrix, using divide and conquer
`F08HSF` (CHBTRD/ZHBTRD) Unitary reduction of complex Hermitian band matrix to real symmetric tridiagonal form
`F08JCF` (SSTEVD/DSTEVD) All eigenvalues and optionally all eigenvectors of real symmetric tridiagonal matrix, using divide and conquer
`F08JEF` (SSTEQR/DSTEQR) All eigenvalues and eigenvectors of real symmetric tridiagonal matrix, reduced from real symmetric matrix using implicit QL or QR
`F08JFF` (SSTERF/DSTERF) All eigenvalues of real symmetric tridiagonal matrix, root-free variant of QL or QR
`F08JGF` (SPTEQR/DPTEQR) All eigenvalues and eigenvectors of real symmetric positive-definite tridiagonal matrix, reduced from real symmetric positive-definite matrix
`F08JJF` (SSTEBZ/DSTEBZ) Selected eigenvalues of real symmetric tridiagonal matrix by bisection
`F08JKF` (SSTEIN/DSTEIN) Selected eigenvectors of real symmetric tridiagonal matrix by inverse iteration, storing eigenvectors in real array
`F08JSF` (CSTEQR/ZSTEQR) All eigenvalues and eigenvectors of real symmetric tridiagonal matrix, reduced from complex Hermitian matrix, using implicit QL or QR
`F08JUF` (CPTEQR/ZPTEQR) All eigenvalues and eigenvectors of real symmetric positive-definite tridiagonal matrix, reduced from complex Hermitian positive-definite matrix
`F08JXF` (CSTEIN/ZSTEIN) Selected eigenvectors of real symmetric tridiagonal matrix by inverse iteration, storing eigenvectors in complex array
`F08KEF` (SGEBRD/DGEBRD) Orthogonal reduction of real general rectangular matrix to bidiagonal form
`F08KFF` (SORGBR/DORGBR) Generate orthogonal transformation matrices from reduction to bidiagonal form determined by F08KEF
`F08KGF` (SORMBR/DORMBR) Apply orthogonal transformations from reduction to bidiagonal form determined by F08KEF
`F08KSF` (CGEBRD/ZGEBRD) Unitary reduction of complex general rectangular matrix to bidiagonal form
`F08KTF` (CUNGBR/ZUNGBR) Generate unitary transformation matrices from reduction to bidiagonal form determined by F08KSF
`F08KUF` (CUNMBR/ZUNMBR) Apply unitary transformations from reduction to bidiagonal form determined by F08KSF
`F08LEF` (SGBBRD/DGBBRD) Reduction of real rectangular band matrix to upper bidiagonal form
`F08LSF` (CGBBRD/ZGBBRD) Reduction of complex rectangular band matrix to upper bidiagonal form
`F08MEF` (SBDSQR/DBDSQR) SVD of real bidiagonal matrix reduced from real general matrix
`F08MSF` (CBDSQR/ZBDSQR) SVD of real bidiagonal matrix reduced from complex general matrix

`F08NEF` (SGEHRD/DGEHRD) Orthogonal reduction of real general matrix to upper Hessenberg form

`F08NFF` (SORGHR/DORGHR) Generate orthogonal transformation matrix from reduction to Hessenberg form determined by F08NEF

`F08NGF` (SORMHR/DORMHR) Apply orthogonal transformation matrix from reduction to Hessenberg form determined by F08NEF

`F08NHF` (SGEBAL/DGEBAL) Balance real general matrix

`F08NJF` (SGEBAK/DGEBAK) Transform eigenvectors of real balanced matrix to those of original matrix supplied to F08NHF

`F08NSF` (CGEHRD/ZGEHRD) Unitary reduction of complex general matrix to upper Hessenberg form

`F08NTF` (CUNGHR/ZUNGHR) Generate unitary transformation matrix from reduction to Hessenberg form determined by F08NSF

`F08NUF` (CUNMHR/ZUNMHR) Apply unitary transformation matrix from reduction to Hessenberg form determined by F08NSF

`F08NVF` (CGEBAL/ZGEBAL) Balance complex general matrix

`F08NWF` (CGEBAK/ZGEBAK) Transform eigenvectors of complex balanced matrix to those of original matrix supplied to F08NVF

`F08PEF` (SHSEQR/DHSEQR) Eigenvalues and Schur factorization of real upper Hessenberg matrix reduced from real general matrix

`F08PKF` (SHSEIN/DHSEIN) Selected right and/or left eigenvectors of real upper Hessenberg matrix by inverse iteration

`F08PSF` (CHSEQR/ZHSEQR) Eigenvalues and Schur factorization of complex upper Hessenberg matrix reduced from complex general matrix

`F08PXF` (CHSEIN/ZHSEIN) Selected right and/or left eigenvectors of complex upper Hessenberg matrix by inverse iteration

`F08QFF` (STREXC/DTREXC) Reorder Schur factorization of real matrix using orthogonal similarity transformation

`F08QGF` (STRSEN/DTRSEN) Reorder Schur factorization of real matrix, form orthonormal basis of right invariant subspace for selected eigenvalues, with estimates of sensitivities

`F08QHF` (STRSYL/DTRSYL) Solve real Sylvester matrix equation $AX + XB = C$, A and B are upper quasi-triangular or transposes

`F08QKF` (STREVC/DTREVC) Left and right eigenvectors of real upper quasi-triangular matrix

`F08QLF` (STRSNA/DTRSNA) Estimates of sensitivities of selected eigenvalues and eigenvectors of real upper quasi-triangular matrix

`F08QTF` (CTREXC/ZTREXC) Reorder Schur factorization of complex matrix using unitary similarity transformation

`F08QUF` (CTRSEN/ZTRSEN) Reorder Schur factorization of complex matrix, form orthonormal basis of right invariant subspace for selected eigenvalues, with estimates of sensitivities

`F08QVF` (CTRSYL/ZTRSYL) Solve complex Sylvester matrix equation $AX + XB = C$, A and B are upper triangular or conjugate-transposes

`F08QXF` (CTREVC/ZTREVC) Left and right eigenvectors of complex upper triangular matrix

`F08QYF` (CTRSNA/ZTRSNA) Estimates of sensitivities of selected eigenvalues and eigenvectors of complex upper triangular matrix

`F08SEF` (SSYGST/DSYGST) Reduction to standard form of real symmetric-definite generalized eigenproblem $Ax = \lambda Bx$, $ABx = \lambda x$ or $BAx = \lambda x$, B factorized by F07FDF

`F08SSF` (CHEGST/ZHEGST) Reduction to standard form of complex Hermitian-definite generalized eigenproblem $Ax = \lambda Bx$, $ABx = \lambda x$ or $BAx = \lambda x$, B factorized by F07FRF

`F08TEF` (SSPGST/DSPGST) Reduction to standard form of real symmetric-definite generalized eigenproblem $Ax = \lambda Bx$, $ABx = \lambda x$ or $BAx = \lambda x$, packed storage, B factorized by F07GDF

`F08TSF` (CHPGST/ZHPGST) Reduction to standard form of complex Hermitian-definite generalized eigenproblem $Ax = \lambda Bx$, $ABx = \lambda x$ or $BAx = \lambda x$, packed storage, B factorized by F07GRF

`F08UEF` (SSBGST/DSBGST) Reduction of real symmetric-definite banded generalized eigenproblem $Ax = \lambda Bx$ to standard form $Cy = \lambda y$, such that C has the same bandwidth as A

`F08UFF` (SPBSTF/DPBSTF) Computes a split Cholesky factorization of real symmetric positive-definite band matrix A

`F08USF` (CHBGST/ZHBGST) Reduction of complex Hermitian-definite banded generalized eigenproblem $Ax = \lambda Bx$ to standard form $Cy = \lambda y$, such that C has the same bandwidth as A

`F08UTF` (CPBSTF/ZPBSTF) Computes a split Cholesky factorization of complex Hermitian positive-definite band matrix A

Chapter F11 – Sparse Linear Algebra

`F11BAF` Real sparse nonsymmetric linear systems, set-up for F11BBF
`F11BBF` Real sparse nonsymmetric linear systems, preconditioned RGMRES, CGS or Bi-CGSTAB
`F11BCF` Real sparse nonsymmetric linear systems, diagnostic for F11BBF
`F11BDF` Real sparse nonsymmetric linear systems, set-up for F11BEF
`F11BEF` Real sparse nonsymmetric linear systems, preconditioned RGMRES, CGS, Bi-CGSTAB or TFQMR method
`F11BFF` Real sparse nonsymmetric linear systems, diagnostic for F11BEF
`F11BRF` Complex sparse non-Hermitian linear systems, set-up for F11BSF
`F11BSF` Complex sparse non-Hermitian linear systems, preconditioned RGMRES, CGS, Bi-CGSTAB or TFQMR method
`F11BTF` Complex sparse non-Hermitian linear systems, diagnostic for F11BSF
`F11DAF` Real sparse nonsymmetric linear systems, incomplete *LU* factorization
`F11DBF` Solution of linear system involving incomplete *LU* preconditioning matrix generated by F11DAF
`F11DCF` Solution of real sparse nonsymmetric linear system, RGMRES, CGS or Bi-CGSTAB method, preconditioner computed by F11DAF (Black Box)
`F11DDF` Solution of linear system involving preconditioning matrix generated by applying SSOR to real sparse nonsymmetric matrix
`F11DEF` Solution of real sparse nonsymmetric linear system, RGMRES, CGS or Bi-CGSTAB method, Jacobi or SSOR preconditioner (Black Box)
`F11DKF` Real sparse nonsymmetric linear systems, line Jacobi preconditioner
`F11DNF` Complex sparse non-Hermitian linear systems, incomplete *LU* factorization
`F11DPF` Solution of complex linear system involving incomplete *LU* preconditioning matrix generated by F11DNF
`F11DQF` Solution of complex sparse non-Hermitian linear system, RGMRES, CGS, Bi-CGSTAB or TFQMR method, preconditioner computed by F11DNF (Black Box)
`F11DRF` Solution of linear system involving preconditioning matrix generated by applying SSOR to complex sparse non-Hermitian matrix
`F11DSF` Solution of complex sparse non-Hermitian linear system, RGMRES, CGS, Bi-CGSTAB or TFQMR method, Jacobi or SSOR preconditioner (Black Box)
`F11GAF` Real sparse symmetric linear systems, set-up for F11GBF
`F11GBF` Real sparse symmetric linear systems, preconditioned conjugate gradient or Lanczos
`F11GCF` Real sparse symmetric linear systems, diagnostic for F11GBF
`F11GDF` Real sparse symmetric linear systems, set-up for F11GEF
`F11GEF` Real sparse symmetric linear systems, preconditioned conjugate gradient or Lanczos, threadsafe
`F11GFF` Real sparse symmetric linear systems, diagnostic for F11GEF
`F11JAF` Real sparse symmetric matrix, incomplete Cholesky factorization
`F11JBF` Solution of linear system involving incomplete Cholesky preconditioning matrix generated by F11JAF
`F11JCF` Solution of real sparse symmetric linear system, conjugate gradient/Lanczos method, preconditioner computed by F11JAF (Black Box)
`F11JDF` Solution of linear system involving preconditioning matrix generated by applying SSOR to real sparse symmetric matrix
`F11JEF` Solution of real sparse symmetric linear system, conjugate gradient/Lanczos method, Jacobi or SSOR preconditioner (Black Box)
`F11JNF` Complex sparse Hermitian matrix, incomplete Cholesky factorization
`F11JPF` Solution of complex linear system involving incomplete Cholesky preconditioning matrix generated by F11JNF
`F11JQF` Solution of complex sparse Hermitian linear system, conjugate gradient/Lanczos method, preconditioner computed by F11JNF (Black Box)
`F11JRF` Solution of linear system involving preconditioning matrix generated by applying SSOR to complex sparse Hermitian matrix
`F11JSF` Solution of complex sparse Hermitian linear system, conjugate gradient/Lanczos method, Jacobi or SSOR preconditioner (Black Box)
`F11XAF` Real sparse nonsymmetric matrix vector multiply
`F11XEF` Real sparse symmetric matrix vector multiply
`F11XNF` Complex sparse non-Hermitian matrix vector multiply
`F11XSF` Complex sparse Hermitian matrix vector multiply

F11ZAF Real sparse nonsymmetric matrix reorder routine
F11ZBF Real sparse symmetric matrix reorder routine
F11ZNF Complex sparse non-Hermitian matrix reorder routine
F11ZPF Complex sparse Hermitian matrix reorder routine

Chapter G01 – Simple Calculations and Statistical Data

G01AAF Mean, variance, skewness, kurtosis, etc, one variable, from raw data
G01ABF Mean, variance, skewness, kurtosis, etc, two variables, from raw data
G01ADF Mean, variance, skewness, kurtosis, etc, one variable, from frequency table
G01AEF Frequency table from raw data
G01AFF Two-way contingency table analysis, with χ^2/Fisher's exact test
G01AGF Lineprinter scatterplot of two variables
G01AHF Lineprinter scatterplot of one variable against Normal scores
G01AJF Lineprinter histogram of one variable
G01ALF Computes a five-point summary (median, hinges and extremes)
G01ARF Constructs a stem and leaf plot
G01ASF Constructs a box and whisker plot
G01BJF Binomial distribution function
G01BKF Poisson distribution function
G01BLF Hypergeometric distribution function
G01DAF Normal scores, accurate values
G01DBF Normal scores, approximate values
G01DCF Normal scores, approximate variance-covariance matrix
G01DDF Shapiro and Wilk's W test for Normality
G01DHF Ranks, Normal scores, approximate Normal scores or exponential (Savage) scores
G01EAF Computes probabilities for the standard Normal distribution
G01EBF Computes probabilities for Student's t-distribution
G01ECF Computes probabilities for χ^2 distribution
G01EDF Computes probabilities for F-distribution
G01EEF Computes upper and lower tail probabilities and probability density function for the beta distribution
G01EFF Computes probabilities for the gamma distribution
G01EMF Computes probability for the Studentized range statistic
G01EPF Computes bounds for the significance of a Durbin–Watson statistic
G01ERF Computes probability for von Mises distribution
G01EYF Computes probabilities for the one-sample Kolmogorov–Smirnov distribution
G01EZF Computes probabilities for the two-sample Kolmogorov–Smirnov distribution
G01FAF Computes deviates for the standard Normal distribution
G01FBF Computes deviates for Student's t-distribution
G01FCF Computes deviates for the χ^2 distribution
G01FDF Computes deviates for the F-distribution
G01FEF Computes deviates for the beta distribution
G01FFF Computes deviates for the gamma distribution
G01FMF Computes deviates for the Studentized range statistic
G01GBF Computes probabilities for the non-central Student's t-distribution
G01GCF Computes probabilities for the non-central χ^2 distribution
G01GDF Computes probabilities for the non-central F-distribution
G01GEF Computes probabilities for the non-central beta distribution
G01HAF Computes probability for the bivariate Normal distribution
G01HBF Computes probabilities for the multivariate Normal distribution
G01JCF Computes probability for a positive linear combination of χ^2 variables
G01JDF Computes lower tail probability for a linear combination of (central) χ^2 variables
G01MBF Computes reciprocal of Mills' Ratio
G01NAF Cumulants and moments of quadratic forms in Normal variables
G01NBF Moments of ratios of quadratic forms in Normal variables, and related statistics

Chapter G02 – Correlation and Regression Analysis

G02GAF Fits a generalized linear model with Normal errors
G02GBF Fits a generalized linear model with binomial errors
G02GCF Fits a generalized linear model with Poisson errors
G02GDF Fits a generalized linear model with gamma errors
G02GKF Estimates and standard errors of parameters of a general linear model for given constraints
G02GNF Computes estimable function of a generalized linear model and its standard error
G02HAF Robust regression, standard M-estimates
G02HBF Robust regression, compute weights for use with G02HDF
G02HDF Robust regression, compute regression with user-supplied functions and weights
G02HFF Robust regression, variance-covariance matrix following G02HDF
G02HKF Calculates a robust estimation of a correlation matrix, Huber's weight function
G02HLF Calculates a robust estimation of a correlation matrix, user-supplied weight function plus derivatives
G02HMF Calculates a robust estimation of a correlation matrix, user-supplied weight function

Chapter G03 – Multivariate Methods

G03AAF Performs principal component analysis
G03ACF Performs canonical variate analysis
G03ADF Performs canonical correlation analysis
G03BAF Computes orthogonal rotations for loading matrix, generalized orthomax criterion
G03BCF Computes Procrustes rotations
G03CAF Computes maximum likelihood estimates of the parameters of a factor analysis model, factor loadings, communalities and residual correlations
G03CCF Computes factor score coefficients (for use after G03CAF)
G03DAF Computes test statistic for equality of within-group covariance matrices and matrices for discriminant analysis
G03DBF Computes Mahalanobis squared distances for group or pooled variance-covariance matrices (for use after G03DAF)
G03DCF Allocates observations to groups according to selected rules (for use after G03DAF)
G03EAF Computes distance matrix
G03ECF Hierarchical cluster analysis
G03EFF K-means cluster analysis
G03EHF Constructs dendrogram (for use after G03ECF)
G03EJF Computes cluster indicator variable (for use after G03ECF)
G03FAF Performs principal co-ordinate analysis, classical metric scaling
G03FCF Performs non-metric (ordinal) multidimensional scaling
G03ZAF Produces standardized values (z-scores) for a data matrix

Chapter G04 – Analysis of Variance

G04AGF Two-way analysis of variance, hierarchical classification, subgroups of unequal size
G04BBF Analysis of variance, randomized block or completely randomized design, treatment means and standard errors
G04BCF Analysis of variance, general row and column design, treatment means and standard errors
G04CAF Analysis of variance, complete factorial design, treatment means and standard errors
G04DAF Computes sum of squares for contrast between means
G04DBF Computes confidence intervals for differences between means computed by G04BBF or G04BCF
G04EAF Computes orthogonal polynomials or dummy variables for factor/classification variable

Chapter G05 – Random Number Generators

G05CAF Pseudo-random real numbers, uniform distribution over (0,1)
G05CBF Initialise random number generating routines to give repeatable sequence
G05CCF Initialise random number generating routines to give non-repeatable sequence
G05CFF Save state of random number generating routines
G05CGF Restore state of random number generating routines
G05DAF Pseudo-random real numbers, uniform distribution over (a, b)
G05DBF Pseudo-random real numbers, (negative) exponential distribution

G05DCF Pseudo-random real numbers, logistic distribution
G05DDF Pseudo-random real numbers, Normal distribution
G05DEF Pseudo-random real numbers, log-normal distribution
G05DFF Pseudo-random real numbers, Cauchy distribution
G05DHF Pseudo-random real numbers, χ^2 distribution
G05DJF Pseudo-random real numbers, Student's t-distribution
G05DKF Pseudo-random real numbers, F-distribution
G05DPF Pseudo-random real numbers, Weibull distribution
G05DRF Pseudo-random integer, Poisson distribution
G05DYF Pseudo-random integer from uniform distribution
G05DZF Pseudo-random logical (boolean) value
G05EAF Set up reference vector for multivariate Normal distribution
G05EBF Set up reference vector for generating pseudo-random integers, uniform distribution
G05ECF Set up reference vector for generating pseudo-random integers, Poisson distribution
G05EDF Set up reference vector for generating pseudo-random integers, binomial distribution
G05EEF Set up reference vector for generating pseudo-random integers, negative binomial distribution
G05EFF Set up reference vector for generating pseudo-random integers, hypergeometric distribution
G05EGF Set up reference vector for univariate ARMA time series model
G05EHF Pseudo-random permutation of an integer vector
G05EJF Pseudo-random sample from an integer vector
G05EWF Generate next term from reference vector for ARMA time series model
G05EXF Set up reference vector from supplied cumulative distribution function or probability distribution function
G05EYF Pseudo-random integer from reference vector
G05EZF Pseudo-random multivariate Normal vector from reference vector
G05FAF Generates a vector of random numbers from a uniform distribution
G05FBF Generates a vector of random numbers from an (negative) exponential distribution
G05FDF Generates a vector of random numbers from a Normal distribution
G05FEF Generates a vector of pseudo-random numbers from a beta distribution
G05FFF Generates a vector of pseudo-random numbers from a gamma distribution
G05FSF Generates a vector of pseudo-random variates from von Mises distribution
G05GAF Computes random orthogonal matrix
G05GBF Computes random correlation matrix
G05HDF Generates a realisation of a multivariate time series from a VARMA model
G05ZAF Selection of basic algorithm random number generator or Wichmann–Hill algorithm generators for subsequent calls to G05 routines

Chapter G07 – Univariate Estimation

G07AAF Computes confidence interval for the parameter of a binomial distribution
G07ABF Computes confidence interval for the parameter of a Poisson distribution
G07BBF Computes maximum likelihood estimates for parameters of the Normal distribution from grouped and/or censored data
G07BEF Computes maximum likelihood estimates for parameters of the Weibull distribution
G07CAF Computes t-test statistic for a difference in means between two Normal populations, confidence interval
G07DAF Robust estimation, median, median absolute deviation, robust standard deviation
G07DBF Robust estimation, M-estimates for location and scale parameters, standard weight functions
G07DCF Robust estimation, M-estimates for location and scale parameters, user-defined weight functions
G07DDF Computes a trimmed and winsorized mean of a single sample with estimates of their variance
G07EAF Robust confidence intervals, one-sample
G07EBF Robust confidence intervals, two-sample

Chapter G08 – Nonparametric Statistics

G08AAF Sign test on two paired samples
G08ACF Median test on two samples of unequal size
G08AEF Friedman two-way analysis of variance on k matched samples
G08AFF Kruskal–Wallis one-way analysis of variance on k samples of unequal size

G08AGF Performs the Wilcoxon one-sample (matched pairs) signed rank test
G08AHF Performs the Mann–Whitney U test on two independent samples
G08AJF Computes the exact probabilities for the Mann–Whitney U statistic, no ties in pooled sample
G08AKF Computes the exact probabilities for the Mann–Whitney U statistic, ties in pooled sample
G08ALF Performs the Cochran Q test on cross-classified binary data
G08BAF Mood's and David's tests on two samples of unequal size
G08CBF Performs the one-sample Kolmogorov–Smirnov test for standard distributions
G08CCF Performs the one-sample Kolmogorov–Smirnov test for a user-supplied distribution
G08CDF Performs the two-sample Kolmogorov–Smirnov test
G08CGF Performs the χ^2 goodness of fit test, for standard continuous distributions
G08DAF Kendall's coefficient of concordance
G08EAF Performs the runs up or runs down test for randomness
G08EBF Performs the pairs (serial) test for randomness
G08ECF Performs the triplets test for randomness
G08EDF Performs the gaps test for randomness
G08RAF Regression using ranks, uncensored data
G08RBF Regression using ranks, right-censored data

Chapter G10 – Smoothing in Statistics

G10ABF Fit cubic smoothing spline, smoothing parameter given
G10ACF Fit cubic smoothing spline, smoothing parameter estimated
G10BAF Kernel density estimate using Gaussian kernel
G10CAF Compute smoothed data sequence using running median smoothers
G10ZAF Reorder data to give ordered distinct observations

Chapter G11 – Contingency Table Analysis

G11AAF χ^2 statistics for two-way contingency table
G11BAF Computes multiway table from set of classification factors using selected statistic
G11BBF Computes multiway table from set of classification factors using given percentile/quantile
G11BCF Computes marginal tables for multiway table computed by G11BAF or G11BBF
G11CAF Returns parameter estimates for the conditional analysis of stratified data
G11SAF Contingency table, latent variable model for binary data
G11SBF Frequency count for G11SAF

Chapter G12 – Survival Analysis

G12AAF Computes Kaplan–Meier (product-limit) estimates of survival probabilities
G12BAF Fits Cox's proportional hazard model
G12ZAF Creates the risk sets associated with the Cox proportional hazards model for fixed covariates

Chapter G13 – Time Series Analysis

G13AAF Univariate time series, seasonal and non-seasonal differencing
G13ABF Univariate time series, sample autocorrelation function
G13ACF Univariate time series, partial autocorrelations from autocorrelations
G13ADF Univariate time series, preliminary estimation, seasonal ARIMA model
G13AEF Univariate time series, estimation, seasonal ARIMA model (comprehensive)
G13AFF Univariate time series, estimation, seasonal ARIMA model (easy-to-use)
G13AGF Univariate time series, update state set for forecasting
G13AHF Univariate time series, forecasting from state set
G13AJF Univariate time series, state set and forecasts, from fully specified seasonal ARIMA model
G13ASF Univariate time series, diagnostic checking of residuals, following G13AEF or G13AFF
G13AUF Computes quantities needed for range-mean or standard deviation-mean plot
G13BAF Multivariate time series, filtering (pre-whitening) by an ARIMA model
G13BBF Multivariate time series, filtering by a transfer function model
G13BCF Multivariate time series, cross-correlations
G13BDF Multivariate time series, preliminary estimation of transfer function model
G13BEF Multivariate time series, estimation of multi-input model

G13BGF Multivariate time series, update state set for forecasting from multi-input model
G13BHF Multivariate time series, forecasting from state set of multi-input model
G13BJF Multivariate time series, state set and forecasts from fully specified multi-input model
G13CAF Univariate time series, smoothed sample spectrum using rectangular, Bartlett, Tukey or Parzen lag window
G13CBF Univariate time series, smoothed sample spectrum using spectral smoothing by the trapezium frequency (Daniell) window
G13CCF Multivariate time series, smoothed sample cross spectrum using rectangular, Bartlett, Tukey or Parzen lag window
G13CDF Multivariate time series, smoothed sample cross spectrum using spectral smoothing by the trapezium frequency (Daniell) window
G13CEF Multivariate time series, cross amplitude spectrum, squared coherency, bounds, univariate and bivariate (cross) spectra
G13CFF Multivariate time series, gain, phase, bounds, univariate and bivariate (cross) spectra
G13CGF Multivariate time series, noise spectrum, bounds, impulse response function and its standard error
G13DBF Multivariate time series, multiple squared partial autocorrelations
G13DCF Multivariate time series, estimation of VARMA model
G13DJF Multivariate time series, forecasts and their standard errors
G13DKF Multivariate time series, updates forecasts and their standard errors
G13DLF Multivariate time series, differences and/or transforms (for use before G13DCF)
G13DMF Multivariate time series, sample cross-correlation or cross-covariance matrices
G13DNF Multivariate time series, sample partial lag correlation matrices, χ^2 statistics and significance levels
G13DPF Multivariate time series, partial autoregression matrices
G13DSF Multivariate time series, diagnostic checking of residuals, following G13DCF
G13DXF Calculates the zeros of a vector autoregressive (or moving average) operator
G13EAF Combined measurement and time update, one iteration of Kalman filter, time-varying, square root covariance filter
G13EBF Combined measurement and time update, one iteration of Kalman filter, time-invariant, square root covariance filter

Chapter H – Operations Research

H02BBF Integer LP problem (dense)
H02BFF Interpret MPSX data file defining IP or LP problem, optimize and print solution
H02BUF Convert MPSX data file defining IP or LP problem to format required by H02BBF or E04MFF
H02BVF Print IP or LP solutions with user specified names for rows and columns
H02BZF Integer programming solution, supplies further information on solution obtained by H02BBF
H02CBF Integer QP problem (dense)
H02CCF Read optional parameter values for H02CBF from external file
H02CDF Supply optional parameter values to H02CBF
H02CEF Integer LP or QP problem (sparse)
H02CFF Read optional parameter values for H02CEF from external file
H02CGF Supply optional parameter values to H02CEF
H03ABF Transportation problem, modified 'stepping stone' method
H03ADF Shortest path problem, Dijkstra's algorithm

Chapter M01 – Sorting

M01CAF Sort a vector, real numbers
M01CBF Sort a vector, integer numbers
M01CCF Sort a vector, character data
M01DAF Rank a vector, real numbers
M01DBF Rank a vector, integer numbers
M01DCF Rank a vector, character data
M01DEF Rank rows of a matrix, real numbers
M01DFF Rank rows of a matrix, integer numbers
M01DJF Rank columns of a matrix, real numbers

M01DKF Rank columns of a matrix, integer numbers
M01DZF Rank arbitrary data
M01EAF Rearrange a vector according to given ranks, real numbers
M01EBF Rearrange a vector according to given ranks, integer numbers
M01ECF Rearrange a vector according to given ranks, character data
M01EDF Rearrange a vector according to given ranks, complex numbers
M01ZAF Invert a permutation
M01ZBF Check validity of a permutation
M01ZCF Decompose a permutation into cycles

Chapter P01 – Error Trapping

P01ABF Return value of error indicator/terminate with error message

Chapter S – Approximations of Special Functions

S01BAF $\ln(1+x)$
S01EAF Complex exponential, e^z
S07AAF $\tan x$
S09AAF $\arcsin x$
S09ABF $\arccos x$
S10AAF $\tanh x$
S10ABF $\sinh x$
S10ACF $\cosh x$
S11AAF arctanh$x$
S11ABF arcsinh$x$
S11ACF arccosh$x$
S13AAF Exponential integral $E_1(x)$
S13ACF Cosine integral $\mathrm{Ci}(x)$
S13ADF Sine integral $\mathrm{Si}(x)$
S14AAF Gamma function
S14ABF Log Gamma function
S14ACF $\psi(x) - \ln x$
S14ADF Scaled derivatives of $\psi(x)$
S14BAF Incomplete Gamma functions $P(a,x)$ and $Q(a,x)$
S15ABF Cumulative normal distribution function $P(x)$
S15ACF Complement of cumulative normal distribution function $Q(x)$
S15ADF Complement of error function $\mathrm{erfc}(x)$
S15AEF Error function $\mathrm{erf}(x)$
S15AFF Dawson's integral
S15DDF Scaled complex complement of error function, $\exp(-z^2)\mathrm{erfc}(-iz)$
S17ACF Bessel function $Y_0(x)$
S17ADF Bessel function $Y_1(x)$
S17AEF Bessel function $J_0(x)$
S17AFF Bessel function $J_1(x)$
S17AGF Airy function $\mathrm{Ai}(x)$
S17AHF Airy function $\mathrm{Bi}(x)$
S17AJF Airy function $\mathrm{Ai}'(x)$
S17AKF Airy function $\mathrm{Bi}'(x)$
S17DCF Bessel functions $Y_{\nu+a}(z)$, real $a \geq 0$, complex z, $\nu = 0, 1, 2, \ldots$
S17DEF Bessel functions $J_{\nu+a}(z)$, real $a \geq 0$, complex z, $\nu = 0, 1, 2, \ldots$
S17DGF Airy functions $\mathrm{Ai}(z)$ and $\mathrm{Ai}'(z)$, complex z
S17DHF Airy functions $\mathrm{Bi}(z)$ and $\mathrm{Bi}'(z)$, complex z
S17DLF Hankel functions $H^{(j)}_{\nu+a}(z)$, $j = 1, 2$, real $a \geq 0$, complex z, $\nu = 0, 1, 2, \ldots$
S18ACF Modified Bessel function $K_0(x)$
S18ADF Modified Bessel function $K_1(x)$
S18AEF Modified Bessel function $I_0(x)$
S18AFF Modified Bessel function $I_1(x)$
S18CCF Modified Bessel function $e^x K_0(x)$

S18CDF Modified Bessel function $e^x K_1(x)$
S18CEF Modified Bessel function $e^{-|x|} I_0(x)$
S18CFF Modified Bessel function $e^{-|x|} I_1(x)$
S18DCF Modified Bessel functions $K_{\nu+a}(z)$, real $a \geq 0$, complex z, $\nu = 0, 1, 2, \ldots$
S18DEF Modified Bessel functions $I_{\nu+a}(z)$, real $a \geq 0$, complex z, $\nu = 0, 1, 2, \ldots$
S19AAF Kelvin function ber x
S19ABF Kelvin function bei x
S19ACF Kelvin function ker x
S19ADF Kelvin function kei x
S20ACF Fresnel integral $S(x)$
S20ADF Fresnel integral $C(x)$
S21BAF Degenerate symmetrised elliptic integral of 1st kind $R_C(x, y)$
S21BBF Symmetrised elliptic integral of 1st kind $R_F(x, y, z)$
S21BCF Symmetrised elliptic integral of 2nd kind $R_D(x, y, z)$
S21BDF Symmetrised elliptic integral of 3rd kind $R_J(x, y, z, r)$
S21CAF Jacobian elliptic functions sn, cn and dn

Chapter X01 – Mathematical Constants

X01AAF Provides the mathematical constant π
X01ABF Provides the mathematical constant γ (Euler's Constant)

Chapter X02 – Machine Constants

X02AHF The largest permissible argument for sin and cos
X02AJF The machine precision
X02AKF The smallest positive model number
X02ALF The largest positive model number
X02AMF The safe range parameter
X02ANF The safe range parameter for complex floating-point arithmetic
X02BBF The largest representable integer
X02BEF The maximum number of decimal digits that can be represented
X02BHF The floating-point model parameter, b
X02BJF The floating-point model parameter, p
X02BKF The floating-point model parameter $e_{\min}$
X02BLF The floating-point model parameter $e_{\max}$
X02DAF Switch for taking precautions to avoid underflow
X02DJF The floating-point model parameter ROUNDS

Chapter X03 – Inner Products

X03AAF Real inner product added to initial value, basic/additional precision
X03ABF Complex inner product added to initial value, basic/additional precision

Chapter X04 – Input/Output Utilities

X04AAF Return or set unit number for error messages
X04ABF Return or set unit number for advisory messages
X04ACF Open unit number for reading, writing or appending, and associate unit with named file
X04ADF Close file associated with given unit number
X04BAF Write formatted record to external file
X04BBF Read formatted record from external file
X04CAF Print real general matrix (easy-to-use)
X04CBF Print real general matrix (comprehensive)
X04CCF Print real packed triangular matrix (easy-to-use)
X04CDF Print real packed triangular matrix (comprehensive)
X04CEF Print real packed banded matrix (easy-to-use)
X04CFF Print real packed banded matrix (comprehensive)
X04DAF Print complex general matrix (easy-to-use)
X04DBF Print complex general matrix (comprehensive)

Chapter X05 – Date and Time Utilities