NAG C Library

Mark 7 News

1 Introduction

At Mark 7 of the C Library new functionality has been introduced in addition to improvements in existing areas. The Library now contains 860 documented routines, of which 397 are new at this Mark.

This is a significant enhancement over Mark 6. New chapters have been introduced to cover LAPACK (Chapters f07 and f08), Partial Differential Equations (Chapter d03), Mesh Generation (Chapter d06) and Input/Output Utilities (Chapter x04). Significant new material capability has been added to Random Number Generators (Chapter g05). New functionality has also been added to Interpolation (Chapter e01), Curve and Surface Fitting (Chapter e02), Simple Calculations on Statistical Data (Chapter g01), Correlation and Regression Analysis (Chapter g02), Univariate Estimation (Chapter g07), Nonparametric Statistics (Chapter g08), Contingency Table Analysis (Chapter g11), Survival Analysis (Chapter g12) and Time Series Analysis (Chapter g13). The special function chapter (Chapter s) sees the addition of a number of special functions with particular appeal to theoretical physicists.

A major innovation at this mark is the introduction of the order parameter, which allows data to be specified either in row or column major order. This allows the C Library functions to be easily callable from other environments such as Visual Basic. For further details please refer to the Essential Introduction.

Finally, in environments where vendor supplied BLAS functions are available, these can now be called by the C Library to further enhance performance. This is achieved by the use of NAG's interface to BLAS, a proportion of which are documented in the new NAG C BLAS chapter (Chapter f16).

2 New Routines

The 397 new user-callable routines included in the C Library at Mark 7 are as follows.

c06pfc	nag_fft_multid_single
	One-dimensional complex discrete Fourier transform of multi-dimensional data (using complex
	data type)
c06pjc	nag_fft_multid_full
	Multi-dimensional complex discrete Fourier transform of multi-dimensional data (using complex
	data type)
c06pxc	nag_fft_3d
	Three-dimensional complex discrete Fourier transform, complex data format
d03ncc	nag_pde_bs_1d
	Finite difference solution of the Black-Scholes equations
d03ndc	nag_pde_bs_1d_analytic
	Analytic solution of the Black–Scholes equations
d03nec	nag_pde_bs_1d_means
	Compute average values for nag_pde_bs_1d_analytic (d03ndc)
d03pcc	nag_pde_parab_1d_fd
	General system of parabolic PDEs, method of lines, finite differences, one space variable
d03pdc	nag_pde_parab_1d_coll
	General system of parabolic PDEs, method of lines, Chebyshev C^0 collocation, one space
	variable
d03pec	nag_pde_parab_1d_keller
	General system of first-order PDEs, method of lines, Keller box discretisation, one space
	variable
d03pfc	nag_pde_parab_1d_cd
	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

d03phc	nag_pde_parab_1d_fd_ode General system of parabolic PDEs, coupled DAEs, method of lines, finite differences, one space
d03nia	variauto
uospje	General system of parabolic PDEs, coupled DAEs, method of lines, Chebyshev C^0 collocation,
102-1	one space variable
аозрке	General system of first-order PDEs, coupled DAEs, method of lines, Keller box discretisation, one space variable
d03plc	nag pde parab 1d cd ode
1	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
d03ppc	nag_pde_parab_1d_fd_ode_remesh General system of parabolic PDEs, coupled DAEs, method of lines, finite differences,
10.2	remesning, one space variable
dospre	General system of first-order PDEs, coupled DAEs, method of lines, Keller box discretisation, remeshing, one space variable
d03psc	nag_pde_parab_ld_cd_ode_remesh 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_mase_variable
d02mua	neg nde nareh 1d euler ree
dospue	Roe's approximate Riemann solver for Euler equations in conservative form, for use with nag_pde_parab_1d_cd (d03pfc), nag_pde_parab_1d_cd_ode (d03plc) and
	nag_pde_parab_1d_cd_ode_remesh (d03psc)
d03pvc	nag_pde_parab_1d_euler_osher
	Osher's approximate Riemann solver for Euler equations in conservative form, for use with nag_pde_parab_1d_cd (d03pfc), nag_pde_parab_1d_cd_ode (d03plc) and nag_pde_parab_1d_cd_ode remesh (d03psc)
d03pwc	nag pde_parab_1d_euler hll
uoopiie	Modified HLL Riemann solver for Euler equations in conservative form, for use with nag_pde_parab_1d_cd (d03pfc), nag_pde_parab_1d_cd_ode (d03plc) and
102 marca	nag_pde_parab_1d_cd_ode_remesn (d05psc)
dospxc	Exact Riemann Solver for Euler equations in conservative form, for use with nag_pde_parab_1d_cd (d03pfc), nag_pde_parab_1d_cd_ode (d03plc) and nag_pde_parab_1d_cd_ode remesh (d03psc)
d03nvc	nag_pde_parao_rd_cd_ode_remesn (dospse)
dospyc	PDEs, spatial interpolation with nag_pde_parab_1d_coll (d03pdc) or nag pde parab 1d coll ode (d03pjc)
d03pzc	nag_pde_interp_1d_fd PDEs, spatial interpolation with nag_pde_parab_1d_fd (d03pcc), nag_pde_parab_1d_keller
	(d03pec), nag_pde_parab_1d_cd (d03pfc), nag_pde_parab_1d_fd_ode (d03phc), nag_pde_parab_1d_keller_ode (d03pkc), nag_pde_parab_1d_cd_ode (d03plc), nag_pde_parab_1d_fd_ode_remesh (d03ppc), nag_pde_parab_1d_keller_ode_remesh (d03prc) or nag_pde_parab_1d_cd_ode_remesh (d03psc)
d06aac	nag_mesh2d_inc Generates a two-dimensional mesh using a simple incremental method
d06abc	nag_mesh2d_delaunay
10.5	Generates a two-dimensional mesh using a Delaunay-Voronoi process
d06acc	nag_mesh2d_front Generates a two-dimensional mesh using an Advancing-front method
d06bac	nag_mesh2d_bound
d06cac	Generates a boundary mesn nag mesh2d smooth
	Uses a barycentering technique to smooth a given mesh

d06cbc	nag_mesh2d_sparse
	Generates a sparsity pattern of a Finite Element matrix associated with a given mesh
d06ccc	nag mesh2d renum
	Renumbers a given mesh using Gibbs method
d06dac	nag mesh2d trans
doodde	Generates a mesh resulting from an affine transformation of a given mesh
d06dbc	nag mesh?d join
doodbe	laing tagathar two given adjacent (neggibly everlenning) mesher
-01	nog 1d shok intern
euraec	nag_10_cneo_interp
0.1	interpolating functions, polynomial interpolant, data may include derivative values, one variable
eutrac	nag_1d_ratnl_interp
	Interpolating functions, rational interpolant, one variable
e01rbc	nag_ld_ratnl_eval
	Interpolated values, evaluate rational interpolant computed by nag_ld_ratnl_interp (e01rac), one
	variable
e01tgc	nag_3d_shep_interp
	Interpolating functions, modified Shepard's method, three variables
e01thc	nag_3d_shep_eval
	Interpolated values, evaluate interpolant computed by nag_3d_shep_interp (e01tgc), function
	and first derivatives, three variables
e02agc	nag 1d cheb fit constr
•	Least-squares polynomial fit, values and derivatives may be constrained, arbitrary data points
e02ahc	nag 1d cheb deriv
	Derivative of fitted polynomial in Chebyshev series form
e02ajc	nag 1d cheb intg
5	Integral of fitted polynomial in Chebyshev series form
e02akc	nag 1d cheb eval2
	Evaluation of fitted polynomial in one variable from Chebyshev series form
e02cac	nag 2d cheb fit lines
	Least-squares surface fit by polynomials, data on lines
e02cbc	nag 2d cheb eval
	Evaluation of fitted polynomial in two variables
e02gac	nag lone fit
	L ₁ -approximation by general linear function
e02gcc	nag linf fit
	L_{∞} -approximation by general linear function
e02rac	nag 1d nade
002140	Padé-annroximants
e02rbc	nag 1d nade eval
002100	Evaluation of fitted rational function as computed by nag 1d nade (e02rac)
f07adc	nag dgetrf
107000	III factorization of real m by n matrix
f07aec	nag dgetrs
107400	Solution of real system of linear equations multiple right-hand sides matrix already factorized
	by pag dgetrf (f07adc)
f07agc	nag_dgeon
107age	Estimate condition number of real matrix, matrix already featorized by neg destrf (f07ada)
f07aba	neg doorfo
10/anc	lidg_ugens
£07	Remed solution with error bounds of real system of inteal equations, multiple right-hand sides
10/ajc	liag_ugelli Inverse of real matrix, matrix almostly factorized by real destrif (f)7ada)
m7	inverse of real matrix, matrix already factorized by nag_dgetri (10/adc)
10/arc	nag_zgetri
~-	LU factorization of complex m by n matrix
i0/asc	nag_zgetts
	Solution of complex system of linear equations, multiple right-hand sides, matrix already
m7	ractorized by nag_zgetrf (10/arc)
10/auc	nag_zgecon
	Estimate condition number of complex matrix, matrix already factorized by nag_zgetrf (f0/arc)

f07avc	nag_zgerfs Refined solution with error bounds of complex system of linear equations, multiple right-hand sides
f07awc	nag_zgetri Inverse of complex matrix, matrix already factorized by nag zgetrf (f07arc)
f07bdc	nag_dgbtrf LU factorization of real m by n band matrix
f07bec	nag_dgbtrs Solution of real band system of linear equations, multiple right-hand sides, matrix already factorized by nag_dgbtrf (f07bdc)
f07bgc	nag_dgbcon Estimate condition number of real band matrix, matrix already factorized by nag_dgbtrf (f07bdc)
f07bhc	nag_dgbrfs Refined solution with error bounds of real band system of linear equations, multiple right-hand sides
f07brc	nag_zgbtrf LU factorization of complex m by n band matrix
f07bsc	nag_zgbtrs Solution of complex band system of linear equations, multiple right-hand sides, matrix already factorized by nag_zgbtrf (f07brc)
f07buc	nag_zgbcon Estimate condition number of complex band matrix, matrix already factorized by nag_zgbtrf (f07brc)
f07bvc	nag_zgbrfs Refined solution with error bounds of complex band system of linear equations, multiple right- hand sides
f07fdc	nag_dpotrf Cholesky factorization of real symmetric positive-definite matrix
f07fec	nag_dpotrs Solution of real symmetric positive-definite system of linear equations, multiple right-hand sides, matrix already factorized by nag dpotrf (f07fdc)
f07fgc	nag_dpocon Estimate condition number of real symmetric positive-definite matrix, matrix already factorized by nag_dpotrf (f07fdc)
f07fhc	nag_dporfs Refined solution with error bounds of real symmetric positive-definite system of linear equations, multiple right-hand sides
f07fjc	nag_dpotri Inverse of real symmetric positive-definite matrix, matrix already factorized by nag_dpotrf (f07fdc)
f07frc	nag_zpotrf Cholesky factorization of complex Hermitian positive-definite matrix
f07fsc	nag_zpotrs Solution of complex Hermitian positive-definite system of linear equations, multiple right-hand sides, matrix already factorized by nag_zpotrf (f07frc)
f07fuc	nag_zpocon Estimate condition number of complex Hermitian positive-definite matrix, matrix already factorized by nag zpotrf (f07frc)
f07fvc	nag_zporfs Refined solution with error bounds of complex Hermitian positive-definite system of linear equations, multiple right-hand sides
f07fwc	nag_zpotri Inverse of complex Hermitian positive-definite matrix, matrix already factorized by nag_zpotrf (f07frc)
f07gdc	nag_dpptrf Cholesky factorization of real symmetric positive-definite matrix, packed storage

f07gec	nag_dpptrs
•	Solution of real symmetric positive-definite system of linear equations, multiple right-hand sides,
	matrix already factorized by nag dpptrf (f07gdc), packed storage
f07ggc	nag dnncon
	Estimate condition number of real symmetric positive-definite matrix matrix already factorized
	by nag dnntrf (f07gdc) nacked storage
f07aha	nag_dppur (10/gue), packed storage
10/gile	lidg_uppils
	Renned solution with error bounds of real symmetric positive-dennite system of linear
~- ·	equations, multiple right-hand sides, packed storage
f0/gjc	nag_dpptri
	Inverse of real symmetric positive-definite matrix, matrix already factorized by nag_dpptrf
	(f07gdc), packed storage
f07grc	nag_zpptrf
	Cholesky factorization of complex Hermitian positive-definite matrix, packed storage
f07gsc	nag_zpptrs
	Solution of complex Hermitian positive-definite system of linear equations, multiple right-hand
	sides, matrix already factorized by nag zpptrf (f07grc), packed storage
f07guc	nag zppcon
C	Estimate condition number of complex Hermitian positive-definite matrix, matrix already
	factorized by nag zpptrf (f07grc), packed storage
f07gyc	nag znnrfs
10/5/0	Refined solution with error bounds of complex Hermitian positive-definite system of linear
	equations multiple right-hand sides nacked storage
f07gwc	nag znatri
10/gwc	Ing_zppui
	(f)/gra) nookad starnag
f07hda	(10/gic), packed stolage
10/1140	liag_uppul
1071	cholesky factorization of real symmetric positive-definite band matrix
i0/hec	nag_dpbtrs
	Solution of real symmetric positive-definite band system of linear equations, multiple right-hand
2071	sides, matrix already factorized by nag_dpbtrf (f0/hdc)
f0/hgc	nag_dpbcon
	Estimate condition number of real symmetric positive-definite band matrix, matrix already
	factorized by nag_dpbtrf (f07hdc)
f07hhc	nag_dpbrfs
	Refined solution with error bounds of real symmetric positive-definite band system of linear
	equations, multiple right-hand sides
f07hrc	nag_zpbtrf
	Cholesky factorization of complex Hermitian positive-definite band matrix
f07hsc	nag_zpbtrs
	Solution of complex Hermitian positive-definite band system of linear equations, multiple right-
	hand sides, matrix already factorized by nag_zpbtrf (f07hrc)
f07huc	nag zpbcon
	Estimate condition number of complex Hermitian positive-definite band matrix, matrix already
	factorized by nag zpbtrf (f07hrc)
f07hvc	nag zpbrfs
	Refined solution with error bounds of complex Hermitian positive-definite band system of linear
	equations multiple right-hand sides
f07mdc	nag dsytrf
10 / 11140	Bunch–Kaufman factorization of real symmetric indefinite matrix
f07mec	nag devers
10/11100	Solution of real symmetric indefinite system of linear equations, multiple right hand sides
	matrix already factorized by neg doutrf (f07mda)
£0.7.00 ~ 0	main aneary factorized by hag_usyth (10/hide)
10/mgc	liag_usycull
	Estimate condition number of real symmetric indefinite matrix, matrix already factorized by $\frac{1}{2}$
m7 1	nag_asytri (IU/mac)
iu/mhc	nag_dsyris
	Kenned solution with error bounds of real symmetric indefinite system of linear equations,
	multiple right-hand sides

f07mjc	nag_dsytri
~-	Inverse of real symmetric indefinite matrix, matrix already factorized by nag_dsytrf (f07mdc)
f0/mrc	nag_zhetri
f07msc	Bunch-Kaulman lactorization of complex Hermitian indefinite matrix
10711150	Solution of complex Hermitian indefinite system of linear equations multiple right-hand sides
	matrix already factorized by nag zhetrf (f07mrc)
f07muc	nag zhecon
	Estimate condition number of complex Hermitian indefinite matrix, matrix already factorized by
	nag_zhetrf (f07mrc)
f07mvc	nag_zherfs
	Refined solution with error bounds of complex Hermitian indefinite system of linear equations,
£0.7	multiple right-hand sides
10/mwc	nag_znern Inverse of complex Hermitian indefinite matrix, matrix already factorized by pag zhetrf
	(f07mrc)
f07nrc	nag zsvtrf
	Bunch–Kaufman factorization of complex symmetric matrix
f07nsc	nag_zsytrs
	Solution of complex symmetric system of linear equations, multiple right-hand sides, matrix
	already factorized by nag_zsytrf (f07nrc)
f07nuc	nag_zsycon
	Estimate condition number of complex symmetric matrix, matrix already factorized by
f07pyc	nag_zsytri (10/mc)
1071170	Refined solution with error bounds of complex symmetric system of linear equations multiple
	right-hand sides
f07nwc	nag zsytri
	Inverse of complex symmetric matrix, matrix already factorized by nag_zsytrf (f07nrc)
f07pdc	nag_dsptrf
	Bunch-Kaufman factorization of real symmetric indefinite matrix, packed storage
f07pec	nag_dsptrs
	Solution of real symmetric indefinite system of linear equations, multiple right-hand sides,
f07pgc	naurix arready racionized by hag_dspiri (10/pdc), packed storage
io/pgc	Estimate condition number of real symmetric indefinite matrix, matrix already factorized by
	nag dsptrf (f07pdc), packed storage
f07phc	nag_dsprfs
	Refined solution with error bounds of real symmetric indefinite system of linear equations,
	multiple right-hand sides, packed storage
f07pjc	nag_dsptri
	Inverse of real symmetric indefinite matrix, matrix already factorized by nag_dsptrf (f0/pdc),
f07prc	packed storage
io/pic	Bunch–Kaufman factorization of complex Hermitian indefinite matrix packed storage
f07psc	nag zhptrs
1	Solution of complex Hermitian indefinite system of linear equations, multiple right-hand sides,
	matrix already factorized by nag_zhptrf (f07prc), packed storage
f07puc	nag_zhpcon
	Estimate condition number of complex Hermitian indefinite matrix, matrix already factorized by
m7	nag_zhptrf (f0/prc), packed storage
10/pvc	nag_znpris Refined solution with error bounds of complex Hermitian indefinite system of linear equations
	multiple right-hand sides packed storage
f07pwc	nag zhptri
- P •	Inverse of complex Hermitian indefinite matrix, matrix already factorized by nag zhptrf
	(f07prc), packed storage
f07qrc	nag_zsptrf
	Bunch-Kaufman factorization of complex symmetric matrix, packed storage

f07qsc	nag_zsptrs
	Solution of complex symmetric system of linear equations, multiple right-hand sides, matrix already factorized by nag_zsptrf (f07qrc), packed storage
f07quc	nag_zspcon
	Estimate condition number of complex symmetric matrix, matrix already factorized by nag_zsptrf (f07qrc), packed storage
f07qvc	nag_zsprfs
	Refined solution with error bounds of complex symmetric system of linear equations, multiple
	right-hand sides, packed storage
f07qwc	nag_zsptri
	Inverse of complex symmetric matrix, matrix already factorized by nag_zsptrf (f07qrc), packed storage
f07tec	nag_dtrtrs
	Solution of real triangular system of linear equations, multiple right-hand sides
f07tgc	nag_dtrcon
aa - 1	Estimate condition number of real triangular matrix
f07thc	nag_dtrrfs
	Error bounds for solution of real triangular system of linear equations, multiple right-hand sides
f07tjc	nag_dtrtri
m =	Inverse of real triangular matrix
f07tsc	nag_ztrtrs
m =	Solution of complex triangular system of linear equations, multiple right-hand sides
f0/tuc	nag_ztrcon
~ ~	Estimate condition number of complex triangular matrix
f0/tvc	nag_ztrrfs
	Error bounds for solution of complex triangular system of linear equations, multiple right-hand
007	sides
f0/twc	
m7	inverse of complex triangular matrix
10/uec	nag_aupurs
f07	solution of real triangular system of finear equations, multiple fight-hand sides, packed storage
10/ugc	liag_uipcon Estimate condition number of real triangular matrix, necked storage
f07ubc	nog dtarfe
10/unc	Error bounds for solution of real triangular system of linear equations, multiple right-hand sides
	packed storage
f07uic	nag dtatri
107uje	Ing_utput Inverse of real triangular matrix nacked storage
f07usc	nag ztntrs
107 450	Solution of complex triangular system of linear equations, multiple right-hand sides, packed
	storage
f07uuc	nag ztncon
107 440	Estimate condition number of complex triangular matrix, packed storage
f07uvc	nag ztprfs
	Error bounds for solution of complex triangular system of linear equations, multiple right-hand
	sides, packed storage
f07uwc	nag ztptri
	Inverse of complex triangular matrix, packed storage
f07vec	nag dtbtrs
	Solution of real band triangular system of linear equations, multiple right-hand sides
f07vgc	nag_dtbcon
	Estimate condition number of real band triangular matrix
f07vhc	nag_dtbrfs
	Error bounds for solution of real band triangular system of linear equations, multiple right-hand
	sides
f07vsc	nag_ztbtrs
	Solution of complex band triangular system of linear equations, multiple right-hand sides
f07vuc	nag_ztbcon
	Estimate condition number of complex band triangular matrix

f07vvc	nag_ztbrfs
	Error bounds for solution of complex band triangular system of linear equations, multiple right-
	hand sides
f08aec	nag dgeqrf
	QR factorization of real general rectangular matrix
f08afc	nag dorggr
	Form all or part of orthogonal Q from QR factorization determined by nag dgeqrf (f08aec) or
	nag dgeqpf (f08bec)
f08agc	nag dormar
8-	Apply orthogonal transformation determined by nag deegrf (f08aec) or nag deegrf (f08bec)
f08ahc	nag dgelaf
looune	LO factorization of real general rectangular matrix
f08aic	nag dorala
iooaje	Form all or part of orthogonal Ω from $I\Omega$ factorization determined by pag digelat (f08abc)
f08akc	nag dormla
IUOAKC	Apply orthogonal transformation determined by pag. dgelaf (f08abc)
f08asc	Apply of hogonal transformation determined by hag_ugerqr (108anc)
100450	OP factorization of complex general rectangular matrix
f08ata	gri factorization of complex general rectangular matrix
IUoale	$\text{Inag}_{\text{zuilgyl}}$
	rollin all of part of ulinary of from one factorization determined by hag_zgeqri (108ase) of
f08aua	nag_zgeqp1 (1080sc)
IUoauc	Analy unitary transformation determined by neg geograf (f08ese) or neg geograf (f08bse)
f08ave	Apply unitary transformation determined by hag_zgeqf1 (106ase) of hag_zgeqp1 (106bse)
IUoave	Indg_Zgeriqi
fnearra	ng ranging
IUoawe	Iag_zungiq Form all or part of unitary O from IO factorization determined by pag. zgalaf (f08aya)
f08ava	neg zupmla
IUoaxe	hag_zunning Apply unitary transformation determined by pag. zgalaf (f08aya)
fOllos	Apply unitary transformation determined by hag_zgetqt (108ave)
1000000	ΩP factorization of real general rectangular matrix with column nivoting
fOther	and according to real general rectangular matrix with column produing
100050	ΩR factorization of complex general rectangular matrix with column nivoting
f08fcc	nag devend
100100	All aigenvalues and ontionally all aigenvectors of real symmetric matrix using divide and
	An eigenvalues and optionally an eigenvectors of real symmetric matrix, using divide and
f08fec	nag devtrd
100100	Distriguistical reduction of real symmetric matrix to symmetric tridiagonal form
f08ffc	nag doratr
100110	Generate orthogonal transformation matrix from reduction to tridiagonal form determined by
	nag devird (f08fee)
f08fac	nag_dsylid (1001cc)
looige	Apply orthogonal transformation determined by pag destrict (f08fee)
f08fac	nag_dsylud (100100)
loolqe	All aigenvalues and antionally all aigenvectors of complex Hermitian matrix using divide and
	An eigenvalues and optionally an eigenvectors of complex freminitian matrix, using divide and
f08fsc	nag zhetrd
100150	Unitary reduction of complex Hermitian matrix to real symmetric tridiagonal form
f08ftc	nag zungtr
100110	Generate unitary transformation matrix from reduction to tridiagonal form determined by
	nag zhetrd (f08fsc)
f08fuc	nag_zinente (100150)
loolue	Apply unitary transformation matrix determined by nag zhetrd (f08fsc)
f08gec	nag dsnevd
loget	All eigenvalues and ontionally all eigenvectors of real symmetric matrix nacked storage using
	divide and conquer
f08gec	nag dsntrd
100500	Orthogonal reduction of real symmetric matrix to symmetric tridiagonal form nacked storage
	states states of the symmetric matrix to symmetric transform form, pucked storage

f08gfc	nag_dopgtr
	Generate orthogonal transformation matrix from reduction to tridiagonal form determined by
	nag dsptrd (f08gec)
f08ggc	nag dopmtr
	Apply orthogonal transformation determined by nag dsptrd (f08gec)
f08gac	nag zhnevd
loogqe	All aigenvalues and antionally all aigenvectors of complex Hermitian matrix nacked storage
	All eigenvalues and oppionally an eigenvectors of complex freminian matrix, packed storage,
000	using divide and conquer
iusgsc	nag_znptrd
	Unitary reduction of complex Hermitian matrix to real symmetric tridiagonal form, packed
	storage
f08gtc	nag_zupgtr
	Generate unitary transformation matrix from reduction to tridiagonal form determined by
	nag_zhptrd (f08gsc)
f08guc	nag zupmtr
U	Apply unitary transformation matrix determined by nag zhptrd (f08gsc)
f08hcc	nag dsbevd
1001100	All eigenvalues and ontionally all eigenvectors of real symmetric hand matrix using divide and
	conquer
fOther	nog debtrd
1001100	Orthogonal reduction of real symmetric hand matrix to symmetric tridiagonal form
£0.01 ~ ~	of though a reduction of real symmetric band matrix to symmetric tridiagonal form
iusnqc	nag_znbevd
	All eigenvalues and optionally all eigenvectors of complex Hermitian band matrix, using divide
	and conquer
f08hsc	nag_zhbtrd
	Unitary reduction of complex Hermitian band matrix to real symmetric tridiagonal form
f08jcc	nag_dstevd
	All eigenvalues and optionally all eigenvectors of real symmetric tridiagonal matrix, using
	divide and conquer
f08jec	nag dsteqr
5	All eigenvalues and eigenvectors of real symmetric tridiagonal matrix, reduced from real
	symmetric matrix using implicit QL or QR
f08ifc	nag dsterf
100510	All eigenvalues of real symmetric tridiagonal matrix root-free variant of QL or QB
f08igc	nag ditear
100550	All eigenvalues and eigenvectors of real symmetric positive-definite tridiagonal matrix reduced
	from real symmetric nositive definite metric
mo::	nom teat symmetric positive-demite matrix
IUðjje	liag_usicoz
000'1	Selected eigenvalues of real symmetric tridiagonal matrix by disection
f08jkc	nag_dstein
	Selected eigenvectors of real symmetric tridiagonal matrix by inverse iteration, storing
	eigenvectors in real array
f08jsc	nag_zsteqr
	All eigenvalues and eigenvectors of real symmetric tridiagonal matrix, reduced from complex
	Hermitian matrix, using implicit QL or QR
f08juc	nag_zpteqr
	All eigenvalues and eigenvectors of real symmetric positive-definite tridiagonal matrix, reduced
	from complex Hermitian positive-definite matrix
f08jxc	nag zstein
5	Selected eigenvectors of real symmetric tridiagonal matrix by inverse iteration, storing
	eigenvectors in complex array
f08kec	nag dgehrd
lookee	Orthogonal reduction of real general rectangular matrix to bidiagonal form
f081/fc	nag dorabr
TOOKIC	Generate orthogonal transformation matrices from reduction to hidiogonal form determined by
	non dashrd (f)(less)
£0.01r~~	nag_ugeotu (tookee)
lookge	liag_uvillivi
	Apply of a good and transformations from reduction to bidiagonal form determined by nag_dgebrd
	(IU8Kec)

f08ksc	nag_zgebrd
f08ktc	Unitary reduction of complex general rectangular matrix to bidiagonal form
lookte	Generate unitary transformation matrices from reduction to bidiagonal form determined by nag zgehrd (f08ksc)
f08kuc	nag zunmbr
	Apply unitary transformations from reduction to bidiagonal form determined by nag_zgebrd (f08ksc)
f081ec	nag_dgbbrd Reduction of real rectangular band matrix to upper bidiagonal form
f081sc	nag_zgbbrd Reduction of complex rectangular band matrix to upper bidiagonal form
f08mec	nag_dbdsqr SVD of real bidiagonal matrix reduced from real general matrix
f08msc	nag_zbdsqr SVD of real bidiagonal matrix reduced from complex general matrix
f08nec	nag_dgehrd Orthogonal reduction of real general matrix to upper Hessenberg form
f08nfc	nag_dorghr
	Generate orthogonal transformation matrix from reduction to Hessenberg form determined by nag_dgehrd (f08nec)
f08ngc	nag_dormhr Apply orthogonal transformation matrix from reduction to Hessenberg form determined by nag_dgehrd (f08nec)
f08nhc	nag_dgebal Balance real general matrix
f08njc	nag_dgebak Transform eigenvectors of real balanced matrix to those of original matrix supplied to
f08nsc	nag_zgehrd Unitery reduction of complex general matrix to upper Hessenberg form
f08ntc	nag zunghr
	Generate unitary transformation matrix from reduction to Hessenberg form determined by nag_zgehrd (f08nsc)
f08nuc	nag_zunmhr
	Apply unitary transformation matrix from reduction to Hessenberg form determined by nag_zgehrd (f08nsc)
f08nvc	nag_zgebal Balance complex general matrix
f08nwc	nag_zgebak Transform eigenvectors of complex balanced matrix to those of original matrix supplied to nag_zgebal (f08nvc)
f08pec	nag_dhseqr Eigenvalues and Schur factorization of real upper Hessenberg matrix reduced from real general
f08pkc	matrix nag dhsein
f00maa	Selected right and/or left eigenvectors of real upper Hessenberg matrix by inverse iteration
lospsc	Eigenvalues and Schur factorization of complex upper Hessenberg matrix reduced from complex general matrix
f08pxc	nag_zhsein Selected right and/or left eigenvectors of complex upper Hessenberg matrix by inverse iteration
f08qfc	nag_dtrexc Reorder Schur factorization of real matrix using orthogonal similarity transformation
f08qgc	nag dtrsen
10 -	Reorder Schur factorization of real matrix, form orthonormal basis of right invariant subspace for selected eigenvalues, with estimates of sensitivities

f08qhc	nag dtrsyl
-	Solve real Sylvester matrix equation $AX + XB = C$, A and B are upper quasi-triangular or
	transposes
f08akc	nag dtrevc
	Left and right eigenvectors of real upper quasi-triangular matrix
f08alc	nag dtrsna
100410	Estimates of sensitivities of selected eigenvalues and eigenvectors of real upper quasi-triangular
	matrix
f08ate	nga ztravo
looqu	Dearder Schur factorization of complex metrix using unitary cimilarity transformation
£0.0 and a	Reorder Schur factorization of complex matrix using unitary similarity transformation
iosque	nag_zursen
	Reorder Schur factorization of complex matrix, form orthonormal basis of right invariant
000	subspace for selected eigenvalues, with estimates of sensitivities
f08qvc	nag_ztrsyl
	Solve complex Sylvester matrix equation $AX + XB = C$, A and B are upper triangular or
	conjugate-transposes
f08qxc	nag_ztrevc
	Left and right eigenvectors of complex upper triangular matrix
f08qyc	nag_ztrsna
	Estimates of sensitivities of selected eigenvalues and eigenvectors of complex upper triangular
	matrix
f08sec	nag_dsygst
	Reduction to standard form of real symmetric-definite generalized eigenproblem $Ax = \lambda Bx$,
	$ABx = \lambda x$ or $BAx = \lambda x$, B factorized by nag_dpotrf (f07fdc)
f08ssc	nag_zhegst
	Reduction to standard form of complex Hermitian-definite generalized eigenproblem
	$Ax = \lambda Bx$, $ABx = \lambda x$ or $BAx = \lambda x$, B factorized by nag zpotrf (f07frc)
f08tec	nag 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 nag dpptrf (f07gdc)
f08tsc	nag 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 nag zpptrf (f07grc)
f08uec	nag dshgst
1000000	Reduction of real symmetric-definite handed generalized eigenproblem $Ax = \lambda Bx$ to standard
	form $Cu = \lambda u$ such that C has the same bandwidth as A
f08ufc	nag dnhstf
1000010	Computes a split Cholesky factorization of real symmetric positive-definite hand matrix A
f08usc	nag zhhost
1000050	Reduction of complex Hermitian-definite banded generalized eigenproblem $Ar = \lambda Br$ to
	standard form $Cu = \lambda u$ such that C has the same handwidth as A
f08utc	nag znhstf
100000	Computes a split Cholesky factorization of complex Hermitian positive-definite hand matrix A
f08wec	nag daghrd
100 wee	Orthogonal reduction of a pair of real general matrices to generalized upper Hessenberg form
f08whc	nog dagbal
100 wite	Dalance a pair of real general matrices
f08wie	nag dagbak
loowje	Transform aigenvectors of a pair of real balanced matrices to these of original matrix pair
	sumplied to not detail (f) Suite)
£0.0	supplied to hag_uggoal (loswinc)
IU8WSC	nag_zggnrd
£0.0	Unitary reduction of a pair of complex general matrices to generalized upper Hessenberg form
IUSWVC	nag_zggoai
<u>mo</u> .	Balance a pair of complex general matrices
IU8WWC	nag_zggoak
	iransform eigenvectors of a pair of complex balanced matrices to those of original matrix pair
	supplied to nag_zggbal (108wvc)

f08xec	nag_dhgeqz
	Eigenvalues and generalized Schur factorization of real generalized upper Hessenberg form reduced from a pair of real general matrices
f08xsc	nag zhgegz
1001100	Eigenvalues and generalized Schur factorization of complex generalized upper Hessenberg form
	reduced from a pair of complex general matrices
f08ykc	nag dtgevc
	Left and right eigenvectors of a pair of real upper quasi-triangular matrices
f08yxc	nag_ztgevc
	Left and right eigenvectors of a pair of complex upper triangular matrices
f16dbc	nag_iload
	Broadcast scalar into integer vector
f16ecc	nag_daxpby
24.5.7	Multiply real vector by scalar, preserving input vector
f16fbc	nag_dload
C1 (1 1	Broadcast scalar into real vector
TIGNOC	nag_zioad
flania	broadcast scalar into complex vector
rropje	System of equations real triangular matrix
f16aec	nag dtr conv
noque	Matrix copy, real triangular matrix
f16qfc	nag dge copy
1	Matrix copy, real rectangular matrix
f16qgc	nag_dtr_load
	Matrix initialisation, real triangular matrix
f16qhc	nag_dge_load
	Matrix initialisation, real rectangular matrix
f16rac	nag_dge_norm
£1 (.1	1-norm, ∞ -norm, Frobenius norm, largest absolute element, real general matrix
TIGrbc	nag_dgb_norm
flbrog	1-norm, ∞ -norm, Frobenius norm, largest absolute element, real band matrix
TIOICC	1_{nag} usy_norm Frobenius norm largest absolute element real symmetric matrix
f16rdc	nag dsn norm
110140	1-norm, ∞ -norm. Frobenius norm, largest absolute element, real symmetric matrix, packed
	storage
f16rec	nag dsb norm
	1-norm, ∞ -norm, Frobenius norm, largest absolute element, real symmetric band matrix
f16sjc	nag_ztrsv
	System of equations, complex triangular matrix
f16tec	nag_ztr_copy
C1 (4)	Matrix copy, complex triangular matrix
TIOTIC	nag_zge_copy
fl6taa	matrix copy, complex rectangular matrix
Tronge	II2g_Zu_loau Matrix initialisation complex triangular matrix
f16thc	nag zge load
110tile	Matrix initialisation, complex rectangular matrix
f16uac	nag zge norm
	1-norm, ∞ -norm, Frobenius norm, largest absolute element, complex general matrix
f16ubc	nag_zgb_norm
	1-norm, ∞ -norm, Frobenius norm, largest absolute element, complex band matrix
f16ucc	nag_zhe_norm
01 (1	1-norm, ∞ -norm, Frobenius norm, largest absolute element, complex Hermitian matrix
116udc	nag_zhp_norm
	1-norm, ∞ -norm, rrobenius norm, largest absolute element, complex Hermitian matrix, packed
	Storage

f16uec	nag_zhb_norm
	1-norm, ∞ -norm, Frobenius norm, largest absolute element, complex Hermitian band matrix
f16ufc	nag zsy norm
	1-norm, ∞ -norm, Frobenius norm, largest absolute element, complex symmetric matrix
f16ugc	nag zsp norm
U	1-norm, ∞ -norm, Frobenius norm, largest absolute element, complex symmetric matrix, packed
	storage
f16vjc	nag dtrsm
55	Solves a system of equations with multiple right-hand sides, real triangular coefficient matrix
f16zic	nag ztrsm
- J-	Solves system of equations with multiple right-hand sides, complex triangular coefficient matrix
g01adc	nag summary stats freq
8	Mean, variance, skewness, kurtosis, etc., one variable, from frequency table
g01dac	nag normal scores exact
0	Normal scores, accurate values
g01dcc	nag normal scores var
8	Normal scores, approximate variance-covariance matrix
g01emc	nag prob studentized range
8	Computes probability for the Studentized range statistic
g01epc	nag prob durbin watson
8 · · · ·	Computes bounds for the significance of a Durbin–Watson statistic
g01erc	nag prob von mises
0	Computes probability for von Mises distribution
g01etc	nag prob landau
0	Landau distribution function $\Phi(\lambda)$
g01euc	nag prob vavilov
8	Vavilov distribution function $\Phi_{tr}(\lambda;\kappa;\beta^2)$
o01evc	nag prob 1 sample ks
501090	Computes probabilities for the one-sample Kolmogorov–Smirnov distribution
o01ezc	nag nroh 2 sample ks
501020	Computes probabilities for the two-sample Kolmogorov–Smirnov distribution
o01 fmc	nag deviates studentized range
5011110	Computes deviates for the Studentized range statistic
o01ftc	nag deviates landau
501110	Landau inverse function $\Psi(x)$
o01icc	nag prob lin non central chi sa
501900	Computes probability for a positive linear combination of v^2 variables
allida	computes probability for a positive initial combination of χ variables
goijue	$\frac{1}{2} \frac{1}{1} \frac{1}$
- 0.1 1	Computes lower tail probability for a linear combination of (central) χ variables
guimbe	nag_initis_ratio
~01	computes reciprocal of Mills Ratio
gornic	$Iag_plob_density_landau$
~01mua	Landau density function $\phi(\lambda)$
gorniuc	$\operatorname{Hag}_{\mathrm{prod}_{\mathrm{density}}} \operatorname{vavinov}^{2}$
01	Variov density function $\phi_V(\lambda;\kappa,\beta^2)$
g01nac	nag_moments_quad_form
01 1	Cumulants and moments of quadratic forms in Normal variables
guinbe	nag_moments_ratio_quad_forms
01 /	Moments of ratios of quadratic forms in Normal variables, and related statistics
guipte	nag_moment_l_landau
01 /	Landau first moment function $\Psi_1(x)$
guiqte	nag_moment_2_landau
~01-++-	Landau second moment function $\Psi_2(x)$
guirte	nag_prop_der_landau
0.1	Landau derivative function $\phi(\lambda)$
guizuc	
	initialisation function for nag_prob_density_vavilov (g01muc) and nag_prob_vavilov (g01euc)

g02btc	nag_sum_sqs_update Update a weighted sum of squares matrix with a new observation
g02buc	nag_sum_sqs Computes a weighted sum of squares matrix
g02bwc	nag_cov_to_corr Computes a correlation matrix from a sum of squares matrix
g02eac	nag_all_regsn Computes residual sums of squares for all possible linear regressions for a set of independent variables
g02ecc	nag_cp_stat Calculates R^2 and C_P values from residual sums of squares
g02eec	nag_step_regsn Fits a linear regression model by forward selection
g02fcc	nag_durbin_watson_stat Computes_Durbin_Watson_test_statistic
g02hbc	nag_robust_m_regsn_wts Robust_regression_compute weights for use with nag_robust_m_regsn_user_fn (g02hdc)
g02hdc	nag_robust_m_regsn_user_fn Debust_megsn_user_fn
g02hfc	nag_robust_m_regsn_param_var
g02hlc	Robust regression, variance-covariance matrix following nag_robust_m_regsn_user_fn (g02hdc) nag_robust_m_corr_user_fn
	Calculates a robust estimation of a correlation matrix, user-supplied weight function plus derivatives
g02hmc	nag_robust_m_corr_user_fn_no_derr Calculates a robust estimation of a correlation matrix, user-supplied weight function
g05kac	nag_rngs_basic Pseudo-random real numbers, uniform distribution over (0,1), seeds and generator number
a05kbc	passed explicitly
gookoe	Initialise seeds of a given generator for random number generating functions (that pass seeds explicitly) to give a repeatable sequence
g05kcc	nag_rngs_init_nonrepeatable Initialise seeds of a given generator for random number generating functions (that pass seeds
g05kec	expicitly) to give non-repeatable sequence nag_rngs_logical
g05lac	Pseudo-random logical (boolean) value, seeds and generator number passed explicitly nag rngs normal
8.00100	Generates a vector of random numbers from a Normal distribution, seeds and generator number passed explicitly
g05lbc	nag_rngs_students_t Generates a vector of random numbers from a Student's <i>t</i> -distribution, seeds and generator number passed explicitly
g051cc	nag_rngs_chi_sq Generates a vector of random numbers from a χ^2 distribution, seeds and generator number
g051dc	passed explicitly nag_rngs_f Generates a vector of random numbers from an <i>E</i> -distribution seeds and generator number
g05lec	passed explicitly nag rngs beta
-	Generates a vector of random numbers from a β distribution, seeds and generator number passed explicitly
g051fc	nag_rngs_gamma Generates a vector of random numbers from a γ distribution, seeds and generator number passed explicitly
g051gc	nag_rngs_uniform Generates a vector of random numbers from a uniform distribution, seeds and generator number passed explicitly

g05lhc	nag_rngs_triangular Generates a vector of random numbers from a triangular distribution, seeds and generator
	number passed explicitly
g05ljc	nag_rngs_exp Generates a vector of random numbers from an exponential distribution, seeds and generator number passed explicitly
g051kc	nag_rngs_lognormal Generates a vector of random numbers from a lognormal distribution, seeds and generator number passed explicitly
g0511c	nag_rngs_cauchy Generates a vector of random numbers from a Cauchy distribution, seeds and generator number
g051mc	nag_rngs_weibull Generates a vector of random numbers from a Weibull distribution, seeds and generator number
g05lnc	passed explicitly nag_rngs_logistic Generates a vector of random numbers from a logistic distribution, seeds and generator number passed explicitly
g051pc	nag_rngs_von_mises Generates a vector of random numbers from a von Mises distribution, seeds and generator number passed explicitly
g05lqc	nag_rngs_exp_mix Generates a vector of random numbers from an exponential mixture distribution, seeds and generator number passed explicitly
g051zc	nag_rngs_multi_normal Generates a vector of random numbers from a multivariate Normal distribution, seeds and generator number passed explicitly
g05mac	nag_rngs_discrete_uniform Generates a vector of random integers from a uniform distribution, seeds and generator number
g05mbc	nag_rngs_geom Generates a vector of random integers from a geometric distribution, seeds and generator number passed explicitly
g05mcc	nag_rngs_neg_bin Generates a vector of random integers from a negative binomial distribution, seeds and generator number passed explicitly
g05mdc	nag_rngs_logarithmic Generates a vector of random integers from a logarithmic distribution, seeds and generator number passed explicitly
g05mec	nag_rngs_compd_poisson Generates a vector of random integers from a Poisson distribution with varying mean, seeds and generator number passed explicitly
g05mjc	nag_rngs_binomial Generates a vector of random integers from a binomial distribution, seeds and generator number passed explicitly
g05mkc	nag_rngs_poisson Generates a vector of random integers from a Poisson distribution, seeds and generator number nassed explicitly
g05mlc	nag_rngs_hypergeometric Generates a vector of random integers from a hypergeometric distribution, seeds and generator number passed explicitly
g05mrc	nag_rngs_gen_multinomial Generates a vector of random integers from a multinomial distribution, seeds and generator number passed explicitly
g05mzc	nag_rngs_gen_discrete Generates a vector of random integers from a general discrete distribution, seeds and generator number passed explicitly
g05nac	nag_rngs_permute Pseudo-random permutation of an integer vector

g05nbc	nag_rngs_sample
g05pac	nag_rngs_arma_time_series
g05pcc	Generates a realisation of a time series from an ARMA model nag rngs varma time series
0 1	Generates a realisation of a multivariate time series from a VARMA model
g05qac	nag_rngs_orthog_matrix Computes a random orthogonal matrix
g05qbc	nag rngs corr matrix
~ ~ 1	Computes a random correlation matrix
g05qdc	nag_rngs_2_way_table Generates a random table matrix
g05yac	nag_quasi_random_uniform Multi-dimensional quasi-random number generator with a uniform probability distribution
g05ybc	nag_quasi_random_normal
	Multi-dimensional quasi-random number generator with a Gaussian or log-normal probability
a07aac	distribution
guraac	Computes confidence interval for the parameter of a binomial distribution
g07abc	nag poisson ci
C	Computes confidence interval for the parameter of a Poisson distribution
g07bbc	nag_censored_normal
	Computes maximum likelihood estimates for parameters of the Normal distribution from
~07haa	grouped and/or censored data
gu/bec	Computes maximum likelihood estimates for parameters of the Weibull distribution
g07dcc	nag robust m estim 1var usr
8	Robust estimation, <i>M</i> -estimates for location and scale parameters, user-defined weight functions
g07eac	nag_rank_ci_1var
07.1	Robust confidence intervals, one-sample
g0/ebc	nag_rank_c1_2var Robust confidence intervals_two-sample
908rac	nag rank regsn
8	Regression using ranks, uncensored data
g08rbc	nag_rank_regsn_censored
	Regression using ranks, right-censored data
gllbcc	nag_tabulate_margin
	nag tabulate percentile (g11bbc)
g11cac	nag_condl_logistic
	Returns parameter estimates for the conditional analysis of stratified data
gllsac	nag_binary_factor
allshe	nag binary factor service
giisoc	Frequency count for nag binary factor (g11sac)
g12zac	nag surviv risk sets
0	Creates the risk sets associated with the Cox proportional hazards model for fixed covariates
g13aac	nag_tsa_diff
. 12	Univariate time series, seasonal and non-seasonal differencing
g13auc	nag_tsa_mean_range Computes quantities needed for range-mean or standard deviation-mean plot
g13bac	nag tsa arma filter
8	Multivariate time series, filtering (pre-whitening) by an ARIMA model
g13bbc	nag_tsa_transf_filter
1.01	Multivariate time series, filtering by a transfer function model
g13bcc	nag_tsa_cross_corr Multivariate time series, cross correlations
g13bdc	nag tsa transf prelim fit
010040	Multivariate time series, preliminary estimation of transfer function model

g13cac	nag_tsa_spectrum_univar_cov
	Univariate time series, smoothed sample spectrum using rectangular, Bartlett, Tukey or Parzen
	lag window
g13ccc	nag_tsa_spectrum_bivar_cov
	Multivariate time series, smoothed sample cross spectrum using rectangular, Bartlett, Tukey or
	Parzen lag window
g13dbc	nag_tsa_multi_auto_corr_part
	Multivariate time series, multiple squared partial autocorrelations
g13dlc	nag_tsa_multi_diff
	Multivariate time series, differences and/or transforms
g13dmc	nag_tsa_multi_cross_corr
	Multivariate time series, sample cross-correlation or cross-covariance matrices
g13dnc	nag_tsa_multi_part_lag_corr
	Multivariate time series, sample partial lag correlation matrices, χ^2 statistics and significance
	levels
g13dpc	nag tsa multi part regsn
0 1	Multivariate time series, partial autoregression matrices
g13dxc	nag tsa arma roots
	Calculates the zeros of a vector autoregressive (or moving average) operator
s01bac	nag_shifted_log
	$\ln(1+x)$
s14acc	nag_polygamma_fun
	$\psi(x) - \ln x$
s14adc	nag_polygamma_deriv
	Scaled derivatives of $\psi(x)$
s14agc	nag_complex_log_gamma
	Logarithm of the Gamma function $\ln \Gamma(z)$
s15afc	nag_dawson
	Dawson's integral
s15ddc	nag_complex_erfc
	Scaled complex complement of error function, $exp(-z^2)erfc(-iz)$
s17dcc	nag_complex_bessel_y
	Bessel functions $Y_{\nu+a}(z)$, real $a \ge 0$, complex $z, \nu = 0, 1, 2,$
s17dec	nag_complex_bessel_j
	Bessel functions $J_{\nu+a}(z)$, real $a \ge 0$, complex $z, \nu = 0, 1, 2,$
s17dgc	nag_complex_airy_ai
	Airy functions $Ai(z)$ and $Ai'(z)$, complex z
s17dhc	nag_complex_airy_bi
	Airy functions $Bi(z)$ and $Bi'(z)$, complex z
s17dlc	nag_complex_hankel
	Hankel functions $H_{\nu+a}^{(j)}(z)$, $j = 1, 2$, real $a \ge 0$, complex $z, \nu = 0, 1, 2, \ldots$
s18dcc	nag_complex_bessel_k
	Modified Bessel functions $K_{\nu+a}(z)$, real $a \ge 0$, complex $z, \nu = 0, 1, 2,$
s18dec	nag_complex_bessel_i
	Modified Bessel functions $I_{\nu+a}(z)$, real $a \ge 0$, complex $z, \nu = 0, 1, 2,$
s18gkc	nag_complex_bessel_j_seq
	Bessel function of the 1st kind $J_{\alpha \pm n}(z)$
s21cac	nag_real_jacobian_elliptic
	Jacobian elliptic functions sn, cn and dn of real argument
x04cac	nag_gen_real_mat_print
	Print real general matrix (easy-to-use)
x04cbc	nag_gen_real_mat_print_comp
	Print real general matrix (comprehensive)
x04ccc	nag_pack_real_mat_print
04 1	Print real packed triangular matrix (easy-to-use)
x04cdc	nag_pack_real_mat_print_comp
	Print real packed triangular matrix (comprehensive)

x04cec	nag_band_real_mat_print
	Print real packed banded matrix (easy-to-use)
x04cfc	nag band real mat print comp
	Print real packed banded matrix (comprehensive)
x04dac	nag gen complx mat print
	Print complex general matrix (easy-to-use)
x04dbc	nag gen complx mat print comp
	Print complex general matrix (comprehensive)
x04dcc	nag_pack_complx_mat_print
	Print complex packed triangular matrix (easy-to-use)
x04ddc	nag_pack_complx_mat_print_comp
	Print complex packed triangular matrix (comprehensive)
x04dec	nag_band_complx_mat_print
	Print complex packed banded matrix (easy-to-use)
x04dfc	nag_band_complx_mat_print_comp
	Print complex packed banded matrix (comprehensive)