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[M-5] Manual entry	Function	Purpose
	Pseudorandom variates	
runiform()	runiform() rnormal() rseed() rngstate()	uniform random variates normal (Gaussian) random variates obtain or set the random-variate seed obtain or set the random-number generator state
	rbeta() rbinomial() rcauchy() rchi2() rdiscrete() rexponential() rgamma() rhypergeometric() rigaussian() rlaplace() rlogistic() rnbinoimial() rpoisson() rt() runiformint() rweibull() rweibullph()	beta random variates binomial random variates Cauchy random variates χ^2 random variates discrete random variates exponential random variates gamma random variates hypergeometric random variates inverse Gaussian random variates Laplace random variates logistic random variates negative binomial random variates Poisson random variates Student's <i>t</i> random variates uniform random integer variates Weibull random variates Weibull (proportional hazards) random variates

Means, variances, & correlations

mean()	mean() variance() quadvariance() meanvariance() quadmeanvariance() correlation() quadcorrelation()	mean variance quad-precision variance mean and variance quad-precision mean and variance correlation quad-precision correlation
cross()	cross()	$X'X$, $X'Z$, $X'\text{diag}(w)Z$, etc.
corr()	corr()	make correlation from variance matrix
crossdev()	crossdev()	$(X: -x)'(X: -x)$, $(X: -x)'(Z: -z)$, etc.
quadcross()	quadcross() quadcrossdev()	quad-precision cross() quad-precision crossdev()

Factorial & combinations

factorial()	factorial() lnfactorial() gamma() lngamma() digamma() trigamma()	factorial natural logarithm of factorial gamma function natural logarithm of gamma function derivative of lngamma() second derivative of lngamma()
comb()	comb()	combinatorial function n choose k
cvpermute()	cvpermutsetup() cvpermute()	permutation setup return permutations, one at a time

Densities & distributions

normal()	normalden() normal() invnormal() lnnormalden() lnnormal()	normal density cumulative normal inverse cumulative normal logarithm of the normal density logarithm of the cumulative normal
	----- binormal()	cumulative binormal
	----- lnmvnormalden()	logarithm of the multivariate normal density
	----- betaden() ibeta()	beta density cumulative beta; a.k.a. incomplete beta function
	ibetatail() invibeta() invibetatail()	reverse cumulative beta inverse cumulative beta inverse reverse cumulative beta
	----- binomialp() binomial() binomialtail() invbinomial() invbinomialtail()	binomial probability cumulative binomial reverse cumulative binomial inverse cumulative binomial inverse reverse cumulative binomial
	----- cauchyden() cauchy() cauchytail() invcauchy() invcauchytail() lncauchyden()	Cauchy density cumulative Cauchy reverse cumulative Cauchy inverse cumulative Cauchy inverse reverse cumulative Cauchy logarithm of the Cauchy density
	----- chi2() chi2den() chi2tail() invchi2() invchi2tail()	cumulative χ^2 χ^2 density reverse cumulative χ^2 inverse cumulative χ^2 inverse reverse cumulative χ^2
	----- dunnettprob() invdunnettprob()	cumulative multiple range; used in Dunnett's multiple comparison inverse cumulative multiple range; used in Dunnett's multiple comparison

normal() , <i>continued</i>	<code>exponentialden()</code>	exponential density
	<code>exponential()</code>	cumulative exponential
	<code>exponentialtail()</code>	reverse cumulative exponential
	<code>invexponential()</code>	inverse cumulative exponential
	<code>invexponentialtail()</code>	inverse reverse cumulative exponential
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	<code>Fden()</code>	F density
	<code>F()</code>	cumulative F
	<code>Ftail()</code>	reverse cumulative F
	<code>invF()</code>	inverse cumulative F
	<code>invFtail()</code>	inverse reverse cumulative F
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	<code>gammaden()</code>	gamma density
	<code>gammap()</code>	cumulative gamma; a.k.a. incomplete gamma function
	<code>gammaptail()</code>	reverse cumulative gamma;
	<code>invgammap()</code>	inverse cumulative gamma
	<code>invgammaptail()</code>	inverse reverse cumulative gamma
	<code>dgammapda()</code>	$\partial P(a, x)/\partial a$, where $P(a, x) = \text{gammap}(a, x)$
	<code>dgammapdx()</code>	$\partial P(a, x)/\partial x$, where $P(a, x) = \text{gammap}(a, x)$
	<code>dgammapdada()</code>	$\partial^2 P(a, x)/\partial a^2$, where $P(a, x) = \text{gammap}(a, x)$
	<code>dgammapdadx()</code>	$\partial^2 P(a, x)/\partial a \partial x$, where $P(a, x) = \text{gammap}(a, x)$
	<code>dgammapdxdx()</code>	$\partial^2 P(a, x)/\partial x^2$, where $P(a, x) = \text{gammap}(a, x)$
	<code>lnigammaden()</code>	logarithm of the inverse gamma density
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	<code>hypergeometricp()</code>	hypergeometric probability
	<code>hypergeometric()</code>	cumulative hypergeometric
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	<code>igaussianden()</code>	inverse Gaussian density
	<code>igaussian()</code>	cumulative inverse Gaussian
	<code>igaussiantail()</code>	reverse cumulative inverse Gaussian
	<code>invigaussian()</code>	inverse cumulative of inverse Gaussian
	<code>invigaussiantail()</code>	inverse reverse cumulative of inverse Gaussian
	<code>lnigaussianden()</code>	logarithm of the inverse Gaussian density
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	<code>laplaceden()</code>	Laplace density
	<code>laplace()</code>	cumulative Laplace
	<code>laplacetail()</code>	reverse cumulative Laplace
	<code>invlaplace()</code>	inverse cumulative Laplace
	<code>invlaplacetail()</code>	inverse reverse cumulative Laplace
	<code>lnlaplaceden()</code>	logarithm of the Laplace density
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normal() , <i>continued</i>	logisticden()	logistic density
	logistic()	cumulative logistic
	logistictail()	reverse cumulative logistic
	invlogistic()	inverse cumulative logistic
	invlogistictail()	inverse reverse cumulative logistic

	nbetaden()	noncentral beta density
	nibeta()	cumulative noncentral beta
	invnibeta()	inverse cumulative noncentral beta

	nbinomialp()	negative binomial probability
	nbinomial()	cumulative negative binomial
	nbinomialtail()	reverse cumulative negative binomial
	invnbinomial()	inverse cumulative negative binomial
	invnbinomialtail()	inverse reverse cumulative negative binomial

	nchi2()	cumulative noncentral χ^2
	nchi2den()	noncentral χ^2 density
	nchi2tail()	reverse cumulative noncentral χ^2
	invnchi2()	inverse cumulative noncentral χ^2
	invnchi2tail()	inverse reverse cumulative noncentral χ^2
	npnchi2()	noncentrality parameter of nchi2()

	nF()	cumulative noncentral F
	nFden()	noncentral F density
	nFtail()	reverse cumulative noncentral F
	invnF()	inverse cumulative noncentral F
	invnFtail()	inverse reverse cumulative noncentral F
	npnF()	noncentrality parameter of nF()

	nt()	cumulative noncentral Student's t
	ntden()	noncentral Student's t density
	nttail()	reverse cumulative noncentral t
	invnt()	inverse cumulative noncentral t
	invnttail()	inverse reverse cumulative noncentral t
	npnt()	noncentrality parameter of nt()

	poissonp()	Poisson probability
	poisson()	cumulative Poisson
	poissontail()	reverse cumulative Poisson
	invpoisson()	inverse cumulative Poisson
	invpoissontail()	inverse reverse cumulative Poisson

normal() , <i>continued</i>	<code>t()</code>	cumulative Student's t
	<code>tdden()</code>	Student's t density
	<code>ttail()</code>	reverse cumulative Student's t
	<code>invt()</code>	inverse cumulative Student's t
	<code>invttail()</code>	inverse reverse cumulative Student's t
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	<code>tukeyprob()</code>	cumulative multiple range; used in Tukey's multiple comparison
	<code>invtukeyprob()</code>	inverse cumulative multiple range; used in Tukey's multiple comparison
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	<code>weibullden()</code>	Weibull density
	<code>weibull()</code>	cumulative Weibull
	<code>weibulltail()</code>	reverse cumulative Weibull
	<code>invweibull()</code>	inverse cumulative Weibull
	<code>invweibulltail()</code>	inverse reverse cumulative Weibull
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	<code>weibullphden()</code>	Weibull (proportional hazards) density
	<code>weibullph()</code>	cumulative Weibull (proportional hazards)
	<code>weibullphtail()</code>	reverse cumulative Weibull (proportional hazards)
	<code>invweibullph()</code>	inverse cumulative Weibull (proportional hazards)
	<code>invweibullphtail()</code>	inverse reverse cumulative Weibull (proportional hazards)
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	<code>lnwishartden()</code>	logarithm of the Wishart density
	<code>lniwishartden()</code>	logarithm of the inverse Wishart density
mvnormal()	<code>mvnormal()</code>	multivariate normal probabilities (correlation specified)
	<code>mvnormalcv()</code>	multivariate normal probabilities (covariance specified)
	<code>mvnormalqp()</code>	<code>mvnormal()</code> with specified quadrature points
	<code>mvnormalcvqp()</code>	<code>mvnormalcv()</code> with specified quadrature points
	<code>mvnormalderiv()</code>	derivatives of <code>mvnormal()</code>
	<code>mvnormalcvderiv()</code>	derivatives of <code>mvnormalcv()</code>
	<code>mvnormaldervqp()</code>	<code>mvnormalderiv()</code> with specified quadrature points
	<code>mvnormalcvderivqp()</code>	<code>mvnormalcvderiv()</code> with specified quadrature points

Maximization & minimization

optimize()	optimize() optimize_evaluate() optimize_init() optimize_init_*(optimize_result_*(optimize_query()	function maximization and minimization evaluate function at initial values begin optimization set details access results report settings
moptimize()	moptimize() moptimize_evaluate() moptimize_init() moptimize_init_*(moptimize_result_*(moptimize_ado_cleanup() moptimize_query() moptimize_util_*(moptimize_util_*(moptimize_util_*(function optimization evaluate function at initial values begin setup of optimization problem set details access moptimize() results perform cleanup after ado report settings utility functions for writing evaluators and processing results
LinearProgram()	LinearProgram()	linear programming

Logits, odds, & related

logit()	logit() invlogit() cloglog() invcloglog()	log of the odds ratio inverse log of the odds ratio complementary log–log inverse complementary log–log
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Multivariate normal

ghk()	ghk() ghk_init() ghk_init_*(ghk() ghk_query_npts()	GHK multivariate normal (MVN) simulator GHK MVN initialization set details perform simulation return number of simulation points
ghkfast()	ghkfast() ghkfast_init() ghkfast_init_*(ghkfast() ghkfast_i() ghk_query_*(ghk_query_*(GHK MVN simulator GHK MVN initialization set details perform simulation results for the <i>i</i> th observation display settings

Description

The above functions are statistical, probabilistic, or designed to work with data matrices.

Remarks and examples

[stata.com](https://www.stata.com)

Concerning data matrices, see

[M-4] **Stata** Stata interface functions

and especially

[M-5] **st_data()** Load copy of current Stata dataset

[M-5] **st_view()** Make matrix that is a view onto current Stata dataset

For other mathematical functions, see

[M-4] **Matrix** Matrix mathematical functions

[M-4] **Scalar** Scalar mathematical functions

[M-4] **Mathematical** Important mathematical functions

Also see

[M-4] **Intro** — Categorical guide to Mata functions