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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() rchi2() rdiscrete() rexponential() rgamma() rhypergeometric() rigaussian() rlogistic() rnbinoimial() rpoisson() rt() runiformint() rweibull() rweibullph()	beta random variates binomial random variates chi-squared random variates discrete random variates exponential random variates gamma random variates hypergeometric random variates inverse Gaussian 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()	cvpermutesetup() 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() ----- lnmvnormalden()	cumulative binormal logarithm of the multivariate normal density
	----- betaden() ibeta() ibetatail() invibeta() invibetatail()	beta density cumulative beta; a.k.a. incomplete beta function 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
	----- chi2() chi2den() chi2tail() invchi2() invchi2tail()	cumulative chi-squared chi-squared density reverse cumulative chi-squared inverse cumulative chi-squared inverse reverse cumulative chi-squared
	----- 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>logisticden()</code>	logistic density
	<code>logistic()</code>	cumulative logistic
	<code>logistictail()</code>	reverse cumulative logistic
	<code>invlogistic()</code>	inverse cumulative logistic
	<code>invlogistictail()</code>	inverse reverse cumulative logistic
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	<code>nbetaden()</code>	noncentral beta density
	<code>nibeta()</code>	cumulative noncentral beta
	<code>invnibeta()</code>	inverse cumulative noncentral beta
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normal() , <i>continued</i>	<code>nbinomialp()</code>	negative binomial probability
	<code>nbinomial()</code>	cumulative negative binomial
	<code>nbinomialtail()</code>	reverse cumulative negative binomial
	<code>invnbinomial()</code>	inverse cumulative negative binomial
	<code>invnbinomialtail()</code>	inverse reverse cumulative negative binomial

	<code>nchi2()</code>	cumulative noncentral chi-squared
	<code>nchi2den()</code>	noncentral chi-squared density
	<code>nchi2tail()</code>	reverse cumulative noncentral chi-squared
	<code>invnchi2()</code>	inverse cumulative noncentral chi-squared
	<code>invnchi2tail()</code>	inverse reverse cumulative noncentral chi-squared
	<code>npnchi2()</code>	noncentrality parameter of <code>nchi2()</code>

	<code>nF()</code>	cumulative noncentral F
	<code>nFden()</code>	noncentral F density
	<code>nFtail()</code>	reverse cumulative noncentral F
	<code>invnF()</code>	inverse cumulative noncentral F
	<code>invnFtail()</code>	inverse reverse cumulative noncentral F
	<code>nFnF()</code>	noncentrality parameter of <code>nF()</code>

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

	<code>poissonp()</code>	Poisson probability
	<code>poisson()</code>	cumulative Poisson
	<code>poissontail()</code>	reverse cumulative Poisson
	<code>invpoisson()</code>	inverse cumulative Poisson
	<code>invpoissontail()</code>	inverse reverse cumulative Poisson

	<code>t()</code>	cumulative Student's t
	<code>tden()</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

	<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

normal() , <i>continued</i>	<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	

Maximization & minimization

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

Logits, odds, & related

logit()	<code>logit()</code>	log of the odds ratio
	<code>invlogit()</code>	inverse log of the odds ratio
	<code>cloglog()</code>	complementary log-log
	<code>invcloglog()</code>	inverse complementary log-log

Multivariate normal

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