

Package ‘invgamma’

May 8, 2026

Type Package

Title The Inverse Gamma Distribution

Version 1.2

URL <https://github.com/dkahle/invgamma>, <https://www.kahle.io/invgamma/>

BugReports <https://github.com/dkahle/invgamma/issues>

Description Light weight implementation of the standard distribution functions for the inverse gamma distribution, wrapping those for the gamma distribution in the stats package.

License MIT + file LICENSE

RoxygenNote 7.3.2

Encoding UTF-8

Suggests testthat (>= 3.0.0)

Config/testthat/edition 3

NeedsCompilation no

Author David Kahle [aut, cre, cph],
James Stamey [aut, cph]

Maintainer David Kahle <david.kahle@gmail.com>

Repository CRAN

Date/Publication 2025-07-02 04:50:02 UTC

Contents

invchisq	2
invexp	3
invgamma	4

Index	7
--------------	----------

 invchisq

The Inverse (non-central) Chi-Squared Distribution

Description

Density, distribution function, quantile function and random generation for the inverse chi-squared distribution.

Usage

```
dinvchisq(x, df, ncp = 0, log = FALSE)
pinvchisq(q, df, ncp = 0, lower.tail = TRUE, log.p = FALSE)
qinvchisq(p, df, ncp = 0, lower.tail = TRUE, log.p = FALSE)
rinvchisq(n, df, ncp = 0)
```

Arguments

x, q	vector of quantiles.
df	degrees of freedom (non-negative, but can be non-integer).
ncp	non-centrality parameter (non-negative).
log, log.p	logical; if TRUE, probabilities p are given as log(p).
lower.tail	logical; if TRUE (default), probabilities are $P[X \leq x]$; if FALSE $P[X > x]$.
p	vector of probabilities.
n	number of observations. If $\text{length}(n) > 1$, the length is taken to be the number required.

Details

The functions (d/p/q/r)invchisq() simply wrap those of the standard (d/p/q/r)chisq() R implementation, so look at, say, [stats::dchisq\(\)](#) for details.

See Also

[stats::dchisq\(\)](#); these functions just wrap the (d/p/q/r)chisq() functions.

Examples

```
s <- seq(0, 3, .01)
plot(s, dinvchisq(s, 3), type = 'l')

f <- function(x) dinvchisq(x, 3)
q <- 2
integrate(f, 0, q)
```

```
(p <- pinvchisq(q, 3))
qinvchisq(p, 3) # = q
mean(rinvchisq(1e5, 3) <= q)

f <- function(x) dinvchisq(x, 3, ncp = 2)
q <- 1.5
integrate(f, 0, q)
(p <- pinvchisq(q, 3, ncp = 2))
qinvchisq(p, 3, ncp = 2) # = q
mean(rinvchisq(1e7, 3, ncp = 2) <= q)
```

 invexp

The Inverse Exponential Distribution

Description

Density, distribution function, quantile function and random generation for the inverse exponential distribution.

Usage

```
dinvexp(x, rate = 1, log = FALSE)

pinvexp(q, rate = 1, lower.tail = TRUE, log.p = FALSE)

qinvexp(p, rate = 1, lower.tail = TRUE, log.p = FALSE)

rinvexp(n, rate = 1)
```

Arguments

x, q	vector of quantiles.
rate	degrees of freedom (non-negative, but can be non-integer).
log, log.p	logical; if TRUE, probabilities p are given as log(p).
lower.tail	logical; if TRUE (default), probabilities are $P[X \leq x]$; if FALSE $P[X > x]$.
p	vector of probabilities.
n	number of observations. If length(n) > 1, the length is taken to be the number required.

Details

The functions (d/p/q/r)invexp() simply wrap those of the standard (d/p/q/r)exp() R implementation, so look at, say, [stats::dexp\(\)](#) for details.

See Also

[stats::dexp\(\)](#); these functions just wrap the (d/p/q/r)exp() functions.

Examples

```
s <- seq(0, 10, .01)
plot(s, dinvexp(s, 2), type = 'l')

f <- function(x) dinvexp(x, 2)
q <- 3
integrate(f, 0, q)
(p <- pinvexp(q, 2))
qinvexp(p, 2) # = q
mean(rinvexp(1e5, 2) <= q)

pinvgamma(q, 1, 2)
```

 invgamma

The Inverse Gamma Distribution

Description

Density, distribution function, quantile function and random generation for the inverse gamma distribution.

Usage

```
dinvgamma(x, shape, rate = 1, scale = 1/rate, log = FALSE)

pinvgamma(q, shape, rate = 1, scale = 1/rate, lower.tail = TRUE, log.p = FALSE)

qinvgamma(p, shape, rate = 1, scale = 1/rate, lower.tail = TRUE, log.p = FALSE)

rinvgamma(n, shape, rate = 1, scale = 1/rate)
```

Arguments

x, q vector of quantiles.

shape, rate, scale	shape, rate, and scale parameters of corresponding gamma distribution. In particular, rate and scale are not the rate and scale of the inverse gamma distribution, but of the <i>gamma</i> distribution.
log, log.p	logical; if TRUE, probabilities p are given as log(p).
lower.tail	logical; if TRUE (default), probabilities are $P[X \leq x]$; if FALSE $P[X > x]$.
p	vector of probabilities.
n	number of observations. If length(n) > 1, the length is taken to be the number required.

Details

The inverse gamma distribution with parameters shape and rate has density

$$f(x) = \frac{\text{rate}^{\text{shape}}}{\Gamma(\text{shape})} x^{-1-\text{shape}} e^{-\text{rate}/x}$$

it is the inverse of the standard gamma parameterization in R. If $X \sim \text{InvGamma}(\text{shape}, \text{rate})$,

$$E[X] = \frac{\text{rate}}{\text{shape} - 1}$$

when $\text{shape} > 1$ and

$$\text{Var}(X) = \frac{\text{rate}^2}{(\text{shape} - 1)^2(\text{shape} - 2)}$$

for $\text{shape} > 2$.

The functions (d/p/q/r)invgamma() simply wrap those of the standard (d/p/q/r)gamma() R implementation, so look at, say, [stats::dgamma\(\)](#) for details.

See Also

[stats::dgamma\(\)](#); these functions just wrap the (d/p/q/r)gamma() functions.

Examples

```
s <- seq(0, 5, .01)
plot(s, dinvgamma(s, 7, 10), type = 'l')

f <- function(x) dinvgamma(x, 7, 10)
q <- 2
integrate(f, 0, q)
(p <- pinvgamma(q, 7, 10))
qinvgamma(p, 7, 10) # = q
mean(rinvgamma(1e5, 7, 10) <= q)

shape <- 3; rate <- 7
x <- rinvgamma(1e6, shape, rate)
mean(x) # = rate / (shape - 1)
var(x) # = rate^2 / ( (shape - 1)^2 * (shape - 2) )
```

```
shape <- 7; rate <- 2.01
x <- rinvgamma(1e6, shape, rate)
mean(x) # = rate / (shape - 1)
var(x)  # = rate^2 / ( (shape - 1)^2 * (shape - 2) )

qnorm(log(.25), log.p = TRUE)
qnorm(.25)

qinvgamma(log(.25), shape = shape, rate = rate, log.p = TRUE)
qinvgamma(.25, shape = shape, rate = rate)

## Not run: `rinvgamma()` warns when shape <= .01

rinvgamma(10, .01, rate) # warns

## End(Not run)
```

Index

dinvchisq (invchisq), 2
dinvexp (invexp), 3
dinvgamma (invgamma), 4

invchisq, 2
invexp, 3
invgamma, 4

pinvchisq (invchisq), 2
pinvexp (invexp), 3
pinvgamma (invgamma), 4

qinvchisq (invchisq), 2
qinvexp (invexp), 3
qinvgamma (invgamma), 4

rinvchisq (invchisq), 2
rinvexp (invexp), 3
rinvgamma (invgamma), 4

stats::dchisq(), 2
stats::dexp(), 4
stats::dgamma(), 5