

# Package ‘DISTRIB’

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**Type** Package

**Title** Four Essential Functions for Statistical Distributions Analysis:  
A New Functional Approach

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**Description** A different way for calculating pdf/pmf, cdf, quantile and random data such that the user is able to consider the name of related distribution as an argument and so easily can be changed by a changing argument by user. It must be mentioned that the core and computation base of package 'DISTRIB' is package 'stats'. Although similar functions are introduced previously in package 'stats', but the package 'DISTRIB' has some special applications in some special computational programs.

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 DISTRIB-package

*Four Essential Functions for Statistical Distributions Analysis: A New Functional Approach*


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### Description

Previously, four useful functions `dnorm`, `pnorm`, `qnorm` and `rnorm` are introduced for any univariate distribution in package `stats`. But the name of these functions are different for any distribution, for example compare the names of `dcauchy` and `dchisq` which are for Cauchy and Chi-square distributions, respectively. Now suppose that you have a fixed formula which you want to work with any distribution. To this matter, the author of this package try to define four functions `pdf`, `cdf`, `rd` and `q` in package `DISTRIB`, in which the user is able to consider the name of distribution as a argument of them, and therefore these functions can work with any arbitrary distribution.

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### Examples

```
# An applied example for computing p-value in testing H0: mu>=0, vs, H1: mu<0 with two
# different test statistic distribution:
```

```
# (a) where the statistics test is T~N(0,1) and its observed value is t = -1.5
p_value = cdf(T.dist="norm", T.dist.par=c(0,1), t=-1.5)
print(p_value)
```

```
# (b) where the statistics test T has t-student dist. with 10 degree of freedom
# and its observed value is t = -1.5
p_value = cdf(T.dist="t", T.dist.par=10, t=-1.5)
print(p_value)
```

---

 cdf

*Cumulative density function (cdf)*


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### Description

This function compute the Cumulative Density Function (cdf) value of any univariate distribution in point  $t$ , i.e.  $P(T \leq t)$ . Unlike the common cdf's of other distributions (such as `pnorm`, `ppois` and etc.) the name of the introduced cdf function is `fix` in which the name of distribution is considered as an argument. So the cdf function is applicable for any kind of distribution with a unique form but by considering the name of distribution as a parameter (argument) of cdf function.

### Usage

```
cdf(T.dist, T.dist.par, t)
```

**Arguments**

<code>T.dist</code>	The distribution name of the random variable is determined by characteristic element <code>T.dist</code> . The names of distributions is similar to stats package.
<code>T.dist.par</code>	A vector of distribution parameters with considered ordering in stats package.
<code>t</code>	A real number or a vector of real numbers. <code>cdf</code> function compute the cumulative density function (cdf) of a distribution in point <code>t</code> .

**Value**

This function gives the value of cumulative density function (cdf) at point `t`.

**Examples**

```
# Example:
cdf(T.dist="norm", T.dist.par=c(0,1), 0)
cdf(T.dist="t", T.dist.par=c(7), -2)
cdf(T.dist="pois", T.dist.par=5, 0) # Equal to dpois(0,5)
cdf(T.dist="pois", T.dist.par=5, 5)

## The function is currently defined as
function (T.dist, T.dist.par, t)
{
  pDis = paste("p", T.dist, sep = "", collapse = "")
  if (length(T.dist.par) == 1) {
    cdf.t = do.call(pDis, list(t, T.dist.par[1]))
  }
  else {
    if (length(T.dist.par) == 2) {
      cdf.t = do.call(pDis, list(t, T.dist.par[1], T.dist.par[2]))
    }
    else {
      cdf.t = do.call(pDis, list(t, T.dist.par[1], T.dist.par[2],
        T.dist.par[3]))
    }
  }
  return(cdf.t)
}
```

**Description**

This function compute the value of Probability Density/Mass Function (pdf/pmf) for any univariate distribution at point  $t$ , i.e.  $f(t)$  for continues random variable  $T$ , or  $P(T = t)$  for discrete random variable. Unlike the common pdf's/pmf's of other distributions (such as `dnorm`, `dpois` and etc.) the name of the introduced pdf function is fix for any distribution and the name of distribution

is considered as an argument of this function. So the pdf function is applicable for any kind of distribution with an unique form but by considering the name of  $T$  distribution (and its parameters) as two arguments of pdf function.

### Usage

```
pdf(T.dist, T.dist.par, t)
```

### Arguments

<code>T.dist</code>	The distribution name of the random variable is determined by characteristic element <code>T.dist</code> . The names of distributions is similar to stats package.
<code>T.dist.par</code>	A vector of distribution parameters with considered ordering in stats package.
<code>t</code>	A real number or a vector of real numbers. pdf compute pdf/pmf of a distribution in point <code>t</code> .

### Value

This function gives the value of probability density function (pdf) at point `t` for continues random variable, or gives the value of probability mass function (pmf) at point `t` for discrete random variable.

### Examples

```
pdf(T.dist="norm", T.dist.par=c(0,1), t=0) # Is equal to dnorm(0)
pdf(T.dist="t", T.dist.par=c(7), -2) # Is equal to dt(-2,7)
pdf(T.dist="pois", T.dist.par=5, 5) # Is equal to dpois(5,5)

## The function is currently defined as
function (T.dist, T.dist.par, t)
{
  dDis = paste("d", T.dist, sep = "", collapse = "")
  if (length(T.dist.par) == 1) {
    pdf.t = do.call(dDis, list(t, T.dist.par[1]))
  }
  else {
    if (length(T.dist.par) == 2) {
      pdf.t = do.call(dDis, list(t, T.dist.par[1], T.dist.par[2]))
    }
    else {
      pdf.t = do.call(dDis, list(t, T.dist.par[1], T.dist.par[2],
        T.dist.par[3]))
    }
  }
  return(pdf.t)
}
```

q

*Quantile of a distribution***Description**

This function computes the  $p$ -th quantile for any common univariate distribution, s.t.  $0 \leq p \leq 1$ . Unlike the usual quantile functions of other distributions (such as `qnorm`, `qpois` and etc.) the name of the introduced quantile function is fix for any distribution and the name of corresponded distribution is considered as an argument in this function. Thus `q` function is applicable for any kind of distribution with a unique form but by considering the name of corresponded distribution and its parameters as two arguments of `q` function.

**Usage**

```
q(p, T.dist, T.dist.par)
```

**Arguments**

<code>p</code>	A numeric vector (or single real number) of probabilities in bound $[0,1]$ . Function <code>q</code> compute the $p$ -th quantile for the introduced distribution in its arguments part.
<code>T.dist</code>	The distribution name of the random variable is determined by characteristic element <code>T.dist</code> . The names of distributions is similar to <code>stats</code> package.
<code>T.dist.par</code>	A vector of distribution parameters with considered ordering in <code>stats</code> package.

**Value**

This function gives the  $p$ -th quantile of a given distribution for the real-valued or vector-valued  $p \in [0, 1]$ .

**Examples**

```
q(p=0.25, T.dist="norm", T.dist.par=c(0,1)) # Or the first Quartile of N(0,1), i.e. qnorm(0.25)
q(p=1, T.dist="norm", T.dist.par=c(10,2)) # Is equal to qnorm(1,10,2)
q(0.9, T.dist="cauchy", T.dist.par=c(3,1)) # Is equal to the 9th Decile of Cauchy
# distribution with parameters (3,1); i.e. qcauchy(0.5,3,1)
q(0.237, T.dist="pois", T.dist.par=25) # Is equal to qpois(0.237,25)
```

```
## The function is currently defined as
function (p, T.dist, T.dist.par)
{
  qDis = paste("q", T.dist, sep = "", collapse = "")
  if (length(T.dist.par) == 1) {
    q.t = do.call(qDis, list(p, T.dist.par[1]))
  }
  else {
    if (length(T.dist.par) == 2) {
```

```

        q.t = do.call(qDis, list(p, T.dist.par[1], T.dist.par[2]))
    }
    else {
        q.t = do.call(qDis, list(p, T.dist.par[1], T.dist.par[2],
                                T.dist.par[3]))
    }
}
return(q.t)
}

```

---

rd

*Compute random data from a distribution*


---

### Description

This function creates random data from any usual univariate distribution in R. Unlike the common methods for creating random data from a distribution (such as `rnorm`, `rpois` and etc.), the name of the introduced function is `fix` for any distribution and the name of distribution is considered as an argument in `rd` function. Therefore creating random data by `rd` function is applicable for any kind of distribution with a unique function form but by considering the name of  $T$  distribution (and its parameters) as two arguments of `rd` function.

### Usage

```
rd(n, T.dist, T.dist.par)
```

### Arguments

<code>n</code>	The number of random observations which must be created from the considered distribution in argument part.
<code>T.dist</code>	The distribution name of the random variable is determined by characteristic element <code>T.dist</code> . The names of distributions is similar to <code>stats</code> package.
<code>T.dist.par</code>	A vector of distribution parameters with considered ordering in <code>stats</code> package.

### Value

This function will create `n` random data from the considered distribution.

### Examples

```
rd(n=10, T.dist="norm", T.dist.par=c(0,1)) # Is equal to rnorm(10)
rd(25, T.dist="pois", T.dist.par=3.3) # Is equal to rpois(25,3.3)
```

```
## The function is currently defined as
function (n, T.dist, T.dist.par)
{
  rDis = paste("r", T.dist, sep = "", collapse = "")
  if (length(T.dist.par) == 1) {
```

```
    rd.t = do.call(rDis, list(n, T.dist.par[1]))
  }
  else {
    if (length(T.dist.par) == 2) {
      rd.t = do.call(rDis, list(n, T.dist.par[1], T.dist.par[2]))
    }
    else {
      rd.t = do.call(rDis, list(n, T.dist.par[1], T.dist.par[2],
        T.dist.par[3]))
    }
  }
  return(rd.t)
}
```

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