Special Values in Extreme-Value Distributions

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Contents

Note

This vignette has been compiled using **nieve** 0.1.4 and R version 4.3.0 (2023-04-21). The version of the packages used is mentioned with the results. This is a preliminary version and a *References* section duly citing the packages used will be added soon.

Probability functions of Extreme-Value (EV) distributions

Many R packages define the probability functions (density, distribution and quantile) of the Generalized Pareto (GP) and the Generalized Extreme Value distribution (GEV). While these packages could have kept the probability functions as for internal use, they often instead export the functions. As a result, the R user interested by using such a probability function has to choose between the different implementations. The present vignette inquires about quite subtle details in the way the functions work. In most cases, these details can not be anticipated by reading the package documentation.

In this vignette we focus on the two-parameter GP and the three parameter GEV distributions. These will be denoted as `GPD2` and `GEV` as in **nieve**, although the name of these vary across packages. In all packages the three functions of interest for each of the distribution have their name obtained by pasting a prefix to the distribution name. These are

- The density function with prefix `"d"` and its first argument named `x`.
- The distribution function with prefix `"p"` and with its first argument named `q`.

- The quantile function with prefix `"q"` and with its first argument named `p`.

The other arguments are the parameters corresponding to the location (GEV) and the scale and the shape. These arguments are often named `loc`, `scale` and `shape`, but not always. Also, default values for the parameter are most often provided as `loc = 0.0`, `scale = 1.0`, and `shape = 0.0`, but there are some exceptions. We may refer to these values as the "standard" default values.

Note that **evd** was first released on CRAN in 2002, and has been a source of inspiration for later packages, in which the probability functions can be nearly copies of those of **evd**. The package **ismev** is also one of the first released on CRAN. While some of the older packages have been re-factored (**extRemes**) only limited changes were made in the code of the package **evd**.

Vectorization

While in most (if not all) of the packages the first argument of the probability function is vectorized, this is generally not the case for the other arguments representing the parameters (location, scale, shape). This contrasts with the classical probability functions implemented in the **stats** package, in which the parameter arguments are vectorized.

```
dnorm(1:4, mean = 1:4)
```

```
## [1] 0.3989423 0.3989423 0.3989423 0.3989423
```

```
dnorm(1:4, sd = 1:4)
```

```
## [1] 0.24197072 0.12098536 0.08065691 0.06049268
```

```
try(evd::dgev(x = c(1.4, 1.5), shape = c(0.1, -0.1)))
```

```
## Error in evd::dgev(x = c(1.4, 1.5), shape = c(0.1, -0.1)) : invalid shape
```

```
try(SpatialExtremes::dgev(x = c(1.4, 1.5), shape = c(0.1, -0.1)))
```

```
## Error in SpatialExtremes::dgev(x = c(1.4, 1.5), shape = c(0.1, -0.1)) :
##   'shape' should be a scalar
```

```
try(mev::dgev(x = c(1.2, 1.3), shape = c(0.2, -0.1)))
```

```
## Error in mev::dgev(x = c(1.2, 1.3), shape = c(0.2, -0.1)) :
##   length(shape) == 1L is not TRUE
```

A vectorization w.r.t. the parameter arguments is a plus at least in the Bayesian framework when the probability functions have to be evaluated using vectors of MCMC iterates for the parameters. Using loops coded in R language may then lead to slowly executing code. In the **revdbayes** package the two distributions GPD2 and GEV are suitably vectorized w.r.t. the parameters.

Non-finite values

By non-finite values we mean the four special values for a `double` `-Inf`, `Inf`, `NA` and `NaN`. Note that `NA` is used to show a missing value whatever be its type, but there are different classes of missing values. By default `NA` refers to the logical missing value while we will here be concerned by numeric missing values.

```
x <- NA_real_
class(x)
```

```
## [1] "numeric"
```

```
y <- NA
class(y)
```

```
## [1] "logical"
```

```
class(Inf)
```

```
## [1] "numeric"
```

```
class(-Inf)
```

```
## [1] "numeric"
```

```
class(NaN)
```

```
## [1] "numeric"
```

Non-finite values in the first argument

Most probability functions from EV packages accept non-finite values in their first arguments, with a few exceptions or problems

```
try(evd::dgpd(c(0.0, Inf)))
```

```
## [1]   0 Inf
```

```
try(evd::dgpd(c(0.0, 1.0, Inf)))
```

```
## Error in d[index] <- log(1/scale[index]) - d[index] :
##   NAs are not allowed in subscripted assignments
```

Non-finite values in the parameter arguments

As for non-finite values of the parameter arguments, only a few packages allow this possibility in a consistent way. Beside **nieve**, the **texmex** package seems to be the sole package conforming to the classical behaviour as described below both for the density and the distribution functions.

Accepting non-finite values of the parameter arguments can be important because the density and the distribution functions are often used to define a log-likelihood function that has to be maximised numerically. By experience we know that the optimisation may have to evaluate the objective at a vector of parameters embedding non-finite values, without compromising an eventual convergence. Moreover, it is a desirable feature of an optimisation routine to allow the evaluation of the objective or constraint at such vector. The `stats::optim` routine allows this when used with `method = "BFGS"`, and this is a very popular choice. Optimisation routines from the **nloptr** package allow the parameter to take non-finite values both in the objective and in the constraint function, if any. Of course the log-likelihood function written by the user could catch non-finite values before calling the probability function(s), but this is an extra pain and may slow down the estimation.

"Classical" behaviour for non-finite values

Remind of how the probability functions of the classical continuous distributions in the **stats** package work.

1. The first argument of the density, distribution of quantile function is a vector in which some elements can be non-finite without casting any error or warning. In the corresponding returned vector, an input value `NA` (resp. `NaN`) will produce an output value `NA` (resp. `NaN`). An infinite value `-Inf` (resp. `Inf`) correspond to: an output value `0.0` (resp. `0.0`) for the density function, an output value `0.0` (resp. `1.0`) for the distribution function and `NaN` (resp. `NaN`) for the quantile function.
2. When the first argument `p` of the quantile function contains a value `< 0.0` or `> 1.0`, a warning is cast and the corresponding output value is `NaN`. When `p` is `0.0` (resp. `1.0`), the corresponding output value is the lower (resp. upper) end-point of the distribution, be it finite or not.
3. The *parameter arguments* can be vectors and some elements in these can be non-finite without resulting in an error. An input value `NA` (resp. `NaN`) will produce an output value `NA` (resp. `NaN`). When an input value is `-Inf` or `Inf` the corresponding value will usually be `NaN`. Yet it can be a finite value in some

cases, as in `dnorm(x = 1.3, mean = Inf)` which returns 0. It does not seem wise to formulate a rule about the value corresponding to an infinite value of a parameter.

4. When incorrect values are given in a parameter argument such as a negative value for a scale argument, the corresponding output value is `NaN`, not `NA`. This makes sense as long as `NA` is understood as standing for a missing value while `NaN` results from an impossible of ambiguous math operation.

It is worth noting that incorrect or unanticipated values given for the first argument or parameter arguments never lead to an error as long as the are numeric. Yet `dnorm("a")` will produce an error.

When computing the log-likelihood of some EV model it is wise to assume that some observations can be `NA`. The log-likelihood function of such a model is usually the sum of terms involving the EV density and possibly the corresponding distribution function - in case of censoring. One must be sure that a `NA` value in the vector or list of observations will correspond to a contribution zero in the log-likelihood. Rule 1. above helps at preventing issues because if `NA` observations are not omitted as they should, the log-likelihood will be `NA`.

Rule 2. above matters for EV distributions because it allows the use of the quantile function to find the end-points which depends on the parameters. By evaluating the distribution function at these end-points, one finds the anticipated results.

Experimentation with Extreme-Value packages

For a number of CRAN Extreme-Value packages, we evaluate the results given by the probability functions for their two-parameter GP and for their three-parameter GEV distributions (if any) using non-finite values in the first argument and possibly for a chosen parameter. The results are displayed below in tables. Each table corresponds to *an EV package*, *a distribution* (GPD2 or GEV), *a probability function* (`d`, `p` or `q`) and *a parameter* (`scale`, `shape`). For each table, the rows correspond to a value for the chosen parameter and the columns for the values of the first argument. Mind that the parameter value for a row can contain a correct value, an incorrect one (e.g., a negative shape) and a non-finite value. Only one parameter is changed in each row, the other parameters being kept at their default value. If no such default value is defined (which turns out to be the case only for **texmex**) the other parameters are silently given their "standard" default value as described above.

Note that each row in a table corresponds to a call that is *vectorized w.r.t. the first argument* (`x` for a density, `q` for a distribution and `p` for a quantile). So an error must be considered as holding for a full row.

Findings

Our findings are as follows.

- For all packages tested the quantile function `q` casts an error when the vector given as probability argument `p` contains non-finite values. This behaviour differs from the classical behaviour of the quantile function.
- In the packages **evd**, `POT` and **SpatialExtremes**, the GPD density casts an error `x` is a vector containing non-finite values and the shape is `0.0` (the scale being the default `1.0`), but not when the shape is changed. This is a rather strange behaviour.
- Most packages do not cope with non-finite values for the parameters as the classical distribution functions do. For some packages, the behaviour is not consistent across the two distributions or across the density and the distribution functions for a same distribution.
- For several packages a (meaningless) finite value can be returned by the probability functions corresponding to a first argument `NA` or `NaN`. This can lead to difficult-to-understand errors when evaluating log-likelihood functions.

Results for package evd

Package version used: 2.3.6.1

o Equivalent of 'dGPD2': 'evd::dgpd'

	x = 1.4	x = -Inf	x = Inf	x = NA	x = NaN
scale = 1	ERROR	*****	*****	*****	*****
scale = -1	ERROR	*****	*****	*****	*****
scale = 0	ERROR	*****	*****	*****	*****
scale = -Inf	ERROR	*****	*****	*****	*****
scale = Inf	0	NaN	NaN	NA	NaN
scale = NA	ERROR	*****	*****	*****	*****
scale = NaN	ERROR	*****	*****	*****	*****

	x = 1.4	x = -Inf	x = Inf	x = NA	x = NaN
shape = -0.4	0.291863	0.000000	0.000000	NA	NaN
shape = 0.0	ERROR	*****	*****	*****	*****
shape = 0.5	0.2035416	0.0000000	0.0000000	NA	NaN
shape = -Inf	0	0	0	NA	NaN
shape = Inf	0	0	0	NA	NaN
shape = NA	ERROR	*****	*****	*****	*****
shape = NaN	ERROR	*****	*****	*****	*****

o Equivalent of 'pGPD2': 'evd::pgpd'

	q = 1.5	q = -Inf	q = Inf	q = NA	q = NaN
scale = 1	0.7768698	0.0000000	1.0000000	NA	NaN
scale = -1	ERROR	*****	*****	*****	*****
scale = 0	ERROR	*****	*****	*****	*****
scale = -Inf	ERROR	*****	*****	*****	*****
scale = Inf	0	0	NaN	NA	NaN
scale = NA	ERROR	*****	*****	*****	*****
scale = NaN	ERROR	*****	*****	*****	*****

	q = 1.5	q = -Inf	q = Inf	q = NA	q = NaN
shape = -0.4	0.8988071	0.0000000	1.0000000	NA	NaN
shape = 0.0	0.7768698	0.0000000	1.0000000	NA	NaN
shape = 0.5	0.6734694	0.0000000	1.0000000	NA	NaN
shape = -Inf	0	0	0	0	0
shape = Inf	0	0	0	0	0
shape = NA	ERROR	*****	*****	*****	*****
shape = NaN	ERROR	*****	*****	*****	*****

o Equivalent of 'qGPD2': 'evd::qgpd'

	p = -0.1	p = 0.0	p = 0.5	p = 1.0	p = 1.1	p = -Inf	p = Inf	p = NA	p = NaN
scale = 1	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
scale = -1	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
scale = 0	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
scale = -Inf	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
scale = Inf	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
scale = NA	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
scale = NaN	ERROR	*****	*****	*****	*****	*****	*****	*****	*****

	p = -0.1	p = 0.0	p = 0.5	p = 1.0	p = 1.1	p = -Inf	p = Inf	p = NA	p = NaN
shape = -0.4	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
shape = 0.0	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
shape = 0.5	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
shape = -Inf	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
shape = Inf	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
shape = NA	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
shape = NaN	ERROR	*****	*****	*****	*****	*****	*****	*****	*****

o Equivalent of 'dGEV': 'evd::dgev'

	x = 1.4	x = -Inf	x = Inf	x = NA	x = NaN
scale = 1	ERROR	*****	*****	*****	*****
scale = -1	ERROR	*****	*****	*****	*****
scale = 0	ERROR	*****	*****	*****	*****
scale = -Inf	ERROR	*****	*****	*****	*****
scale = Inf	0	NaN	NaN	NA	NaN
scale = NA	ERROR	*****	*****	*****	*****
scale = NaN	ERROR	*****	*****	*****	*****

	x = 1.4	x = -Inf	x = Inf	x = NA	x = NaN
shape = -0.4	0.291863	0.000000	0.000000	NA	NaN
shape = 0.0	ERROR	*****	*****	*****	*****
shape = 0.5	0.2035416	0.0000000	0.0000000	NA	NaN
shape = -Inf	0	0	0	NA	NaN
shape = Inf	0	0	0	NA	NaN
shape = NA	ERROR	*****	*****	*****	*****
shape = NaN	ERROR	*****	*****	*****	*****

o Equivalent of 'pGEV': 'evd::pgev'

	q = 1.5	q = -Inf	q = Inf	q = NA	q = NaN
scale = 1	0.7768698	0.0000000	1.0000000	NA	NaN
scale = -1	ERROR	*****	*****	*****	*****
scale = 0	ERROR	*****	*****	*****	*****
scale = -Inf	ERROR	*****	*****	*****	*****
scale = Inf	0	0	NaN	NA	NaN

	q = 1.5	q = -Inf	q = Inf	q = NA	q = NaN
scale = NA	ERROR	*****	*****	*****	*****
scale = NaN	ERROR	*****	*****	*****	*****

	q = 1.5	q = -Inf	q = Inf	q = NA	q = NaN
shape = -0.4	0.8988071	0.0000000	1.0000000	NA	NaN
shape = 0.0	0.7768698	0.0000000	1.0000000	NA	NaN
shape = 0.5	0.6734694	0.0000000	1.0000000	NA	NaN
shape = -Inf	0	0	0	0	0
shape = Inf	0	0	0	0	0
shape = NA	ERROR	*****	*****	*****	*****
shape = NaN	ERROR	*****	*****	*****	*****

o Equivalent of 'qGEV': 'evd::qgev'

	p = -0.1	p = 0.0	p = 0.5	p = 1.0	p = 1.1	p = -Inf	p = Inf	p = NA	p = NaN
scale = 1	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
scale = -1	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
scale = 0	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
scale = -Inf	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
scale = Inf	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
scale = NA	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
scale = NaN	ERROR	*****	*****	*****	*****	*****	*****	*****	*****

	p = -0.1	p = 0.0	p = 0.5	p = 1.0	p = 1.1	p = -Inf	p = Inf	p = NA	p = NaN
shape = -0.4	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
shape = 0.0	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
shape = 0.5	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
shape = -Inf	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
shape = Inf	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
shape = NA	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
shape = NaN	ERROR	*****	*****	*****	*****	*****	*****	*****	*****

Results for package extRemes

Package version used: 2.1.3

o Equivalent of 'dGPD2': 'extRemes::devd'

	x = 1.4	x = -Inf	x = Inf	x = NA	x = NaN
scale = 1	ERROR	*****	*****	*****	*****
scale = -1	ERROR	*****	*****	*****	*****
scale = 0	ERROR	*****	*****	*****	*****
scale = -Inf	ERROR	*****	*****	*****	*****
scale = Inf	0	NaN	NaN	NA	NaN
scale = NA	ERROR	*****	*****	*****	*****
scale = NaN	ERROR	*****	*****	*****	*****

	x = 1.4	x = -Inf	x = Inf	x = NA	x = NaN
shape = -0.4	0.291863	0.000000	0.000000	NA	NaN
shape = 0.0	ERROR	*****	*****	*****	*****
shape = 0.5	0.2035416	0.0000000	0.0000000	NA	NaN
shape = -Inf	0	0	0	NA	NaN
shape = Inf	0	0	0	NA	NaN
shape = NA	ERROR	*****	*****	*****	*****
shape = NaN	ERROR	*****	*****	*****	*****

o Equivalent of 'pGPD2': 'extRemes::pevd'

	q = 1.5	q = -Inf	q = Inf	q = NA	q = NaN
scale = 1	0.7768698	0.0000000	1.0000000	NA	NaN
scale = -1	ERROR	*****	*****	*****	*****
scale = 0	ERROR	*****	*****	*****	*****
scale = -Inf	ERROR	*****	*****	*****	*****
scale = Inf	0	0	NaN	NA	NaN
scale = NA	ERROR	*****	*****	*****	*****
scale = NaN	ERROR	*****	*****	*****	*****

	q = 1.5	q = -Inf	q = Inf	q = NA	q = NaN
shape = -0.4	0.8988071	0.0000000	1.0000000	NA	NaN
shape = 0.0	0.7768698	0.0000000	1.0000000	NA	NaN
shape = 0.5	0.6734694	0.0000000	1.0000000	NA	NaN
shape = -Inf	0	0	0	0	0
shape = Inf	0	0	0	0	0
shape = NA	ERROR	*****	*****	*****	*****
shape = NaN	ERROR	*****	*****	*****	*****

o Equivalent of 'qGPD2': 'extRemes::qevd'

	p = -0.1	p = 0.0	p = 0.5	p = 1.0	p = 1.1	p = -Inf	p = Inf	p = NA	p = NaN
scale = 1	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
scale = -1	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
scale = 0	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
scale = -Inf	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
scale = Inf	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
scale = NA	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
scale = NaN	ERROR	*****	*****	*****	*****	*****	*****	*****	*****

	p = -0.1	p = 0.0	p = 0.5	p = 1.0	p = 1.1	p = -Inf	p = Inf	p = NA	p = NaN
shape = -0.4	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
shape = 0.0	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
shape = 0.5	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
shape = -Inf	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
shape = Inf	ERROR	*****	*****	*****	*****	*****	*****	*****	*****

	p = -0.1	p = 0.0	p = 0.5	p = 1.0	p = 1.1	p = -Inf	p = Inf	p = NA	p = NaN
shape = NA	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
shape = NaN	ERROR	*****	*****	*****	*****	*****	*****	*****	*****

o Equivalent of 'dGEV': 'extRemes::devd'

	x = 1.4	x = -Inf	x = Inf	x = NA	x = NaN
scale = 1	ERROR	*****	*****	*****	*****
scale = -1	ERROR	*****	*****	*****	*****
scale = 0	ERROR	*****	*****	*****	*****
scale = -Inf	ERROR	*****	*****	*****	*****
scale = Inf	0	NaN	NaN	NA	NaN
scale = NA	ERROR	*****	*****	*****	*****
scale = NaN	ERROR	*****	*****	*****	*****

	x = 1.4	x = -Inf	x = Inf	x = NA	x = NaN
shape = -0.4	0.291863	0.000000	0.000000	NA	NaN
shape = 0.0	ERROR	*****	*****	*****	*****
shape = 0.5	0.2035416	0.0000000	0.0000000	NA	NaN
shape = -Inf	0	0	0	NA	NaN
shape = Inf	0	0	0	NA	NaN
shape = NA	ERROR	*****	*****	*****	*****
shape = NaN	ERROR	*****	*****	*****	*****

o Equivalent of 'pGEV': 'extRemes::pevd'

	q = 1.5	q = -Inf	q = Inf	q = NA	q = NaN
scale = 1	0.7768698	0.0000000	1.0000000	NA	NaN
scale = -1	ERROR	*****	*****	*****	*****
scale = 0	ERROR	*****	*****	*****	*****
scale = -Inf	ERROR	*****	*****	*****	*****
scale = Inf	0	0	NaN	NA	NaN
scale = NA	ERROR	*****	*****	*****	*****
scale = NaN	ERROR	*****	*****	*****	*****

	q = 1.5	q = -Inf	q = Inf	q = NA	q = NaN
shape = -0.4	0.8988071	0.0000000	1.0000000	NA	NaN
shape = 0.0	0.7768698	0.0000000	1.0000000	NA	NaN
shape = 0.5	0.6734694	0.0000000	1.0000000	NA	NaN
shape = -Inf	0	0	0	0	0
shape = Inf	0	0	0	0	0
shape = NA	ERROR	*****	*****	*****	*****
shape = NaN	ERROR	*****	*****	*****	*****

o Equivalent of 'qGEV': 'extRemes::qevd'

	p = -0.1	p = 0.0	p = 0.5	p = 1.0	p = 1.1	p = -Inf	p = Inf	p = NA	p = NaN
scale = 1	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
scale = -1	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
scale = 0	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
scale = -Inf	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
scale = Inf	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
scale = NA	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
scale = NaN	ERROR	*****	*****	*****	*****	*****	*****	*****	*****

	p = -0.1	p = 0.0	p = 0.5	p = 1.0	p = 1.1	p = -Inf	p = Inf	p = NA	p = NaN
shape = -0.4	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
shape = 0.0	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
shape = 0.5	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
shape = -Inf	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
shape = Inf	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
shape = NA	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
shape = NaN	ERROR	*****	*****	*****	*****	*****	*****	*****	*****

Results for package mev

Package version used: 1.15

o Equivalent of 'dGPD2': 'mev::dgp'

	x = 1.4	x = -Inf	x = Inf	x = NA	x = NaN
scale = 1	0.246597	0.000000	0.000000	NA	NaN
scale = -1	ERROR	*****	*****	*****	*****
scale = 0	ERROR	*****	*****	*****	*****
scale = -Inf	ERROR	*****	*****	*****	*****
scale = Inf	ERROR	*****	*****	*****	*****
scale = NA	ERROR	*****	*****	*****	*****
scale = NaN	ERROR	*****	*****	*****	*****

	x = 1.4	x = -Inf	x = Inf	x = NA	x = NaN
shape = -0.4	0.291863	0.000000	0.000000	NA	NaN
shape = 0.0	0.246597	0.000000	0.000000	NA	NaN
shape = 0.5	0.2035416	0.0000000	0.0000000	NA	NaN
shape = -Inf	ERROR	*****	*****	*****	*****
shape = Inf	ERROR	*****	*****	*****	*****
shape = NA	ERROR	*****	*****	*****	*****
shape = NaN	ERROR	*****	*****	*****	*****

o Equivalent of 'pGPD2': 'mev::pgp'

	q = 1.5	q = -Inf	q = Inf	q = NA	q = NaN
scale = 1	0.7768698	0.0000000	1.0000000	NA	NaN
scale = -1	ERROR	*****	*****	*****	*****

	q = 1.5	q = -Inf	q = Inf	q = NA	q = NaN
scale = 0	ERROR	*****	*****	*****	*****
scale = -Inf	ERROR	*****	*****	*****	*****
scale = Inf	ERROR	*****	*****	*****	*****
scale = NA	ERROR	*****	*****	*****	*****
scale = NaN	ERROR	*****	*****	*****	*****

	q = 1.5	q = -Inf	q = Inf	q = NA	q = NaN
shape = -0.4	0.8988071	0.0000000	1.0000000	NA	NaN
shape = 0.0	0.7768698	0.0000000	1.0000000	NA	NaN
shape = 0.5	0.6734694	0.0000000	1.0000000	NA	NaN
shape = -Inf	ERROR	*****	*****	*****	*****
shape = Inf	ERROR	*****	*****	*****	*****
shape = NA	ERROR	*****	*****	*****	*****
shape = NaN	ERROR	*****	*****	*****	*****

o Equivalent of ‘qGPD2’: ‘mev::qgp’

	p = -0.1	p = 0.0	p = 0.5	p = 1.0	p = 1.1	p = -Inf	p = Inf	p = NA	p = NaN
scale = 1	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
scale = -1	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
scale = 0	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
scale = -Inf	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
scale = Inf	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
scale = NA	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
scale = NaN	ERROR	*****	*****	*****	*****	*****	*****	*****	*****

	p = -0.1	p = 0.0	p = 0.5	p = 1.0	p = 1.1	p = -Inf	p = Inf	p = NA	p = NaN
shape = -0.4	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
shape = 0.0	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
shape = 0.5	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
shape = -Inf	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
shape = Inf	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
shape = NA	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
shape = NaN	ERROR	*****	*****	*****	*****	*****	*****	*****	*****

o Equivalent of ‘dGEV’: ‘mev::dgev’

	x = 1.4	x = -Inf	x = Inf	x = NA	x = NaN
scale = 1	0.246597	0.000000	0.000000	NA	NaN
scale = -1	ERROR	*****	*****	*****	*****
scale = 0	ERROR	*****	*****	*****	*****
scale = -Inf	ERROR	*****	*****	*****	*****
scale = Inf	ERROR	*****	*****	*****	*****
scale = NA	ERROR	*****	*****	*****	*****
scale = NaN	ERROR	*****	*****	*****	*****

	x = 1.4	x = -Inf	x = Inf	x = NA	x = NaN
shape = -0.4	0.291863	0.000000	0.000000	NA	NaN
shape = 0.0	0.246597	0.000000	0.000000	NA	NaN
shape = 0.5	0.2035416	0.0000000	0.0000000	NA	NaN
shape = -Inf	ERROR	*****	*****	*****	*****
shape = Inf	ERROR	*****	*****	*****	*****
shape = NA	ERROR	*****	*****	*****	*****
shape = NaN	ERROR	*****	*****	*****	*****

o Equivalent of 'pGEV': 'mev::pgev'

	q = 1.5	q = -Inf	q = Inf	q = NA	q = NaN
scale = 1	0.7768698	0.0000000	1.0000000	NA	NaN
scale = -1	ERROR	*****	*****	*****	*****
scale = 0	ERROR	*****	*****	*****	*****
scale = -Inf	ERROR	*****	*****	*****	*****
scale = Inf	ERROR	*****	*****	*****	*****
scale = NA	ERROR	*****	*****	*****	*****
scale = NaN	ERROR	*****	*****	*****	*****

	q = 1.5	q = -Inf	q = Inf	q = NA	q = NaN
shape = -0.4	0.8988071	0.0000000	1.0000000	NA	NaN
shape = 0.0	0.7768698	0.0000000	1.0000000	NA	NaN
shape = 0.5	0.6734694	0.0000000	1.0000000	NA	NaN
shape = -Inf	ERROR	*****	*****	*****	*****
shape = Inf	ERROR	*****	*****	*****	*****
shape = NA	ERROR	*****	*****	*****	*****
shape = NaN	ERROR	*****	*****	*****	*****

o Equivalent of 'qGEV': 'mev::qgev'

	p = -0.1	p = 0.0	p = 0.5	p = 1.0	p = 1.1	p = -Inf	p = Inf	p = NA	p = NaN
scale = 1	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
scale = -1	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
scale = 0	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
scale = -Inf	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
scale = Inf	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
scale = NA	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
scale = NaN	ERROR	*****	*****	*****	*****	*****	*****	*****	*****

	p = -0.1	p = 0.0	p = 0.5	p = 1.0	p = 1.1	p = -Inf	p = Inf	p = NA	p = NaN
shape = -0.4	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
shape = 0.0	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
shape = 0.5	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
shape = -Inf	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
shape = Inf	ERROR	*****	*****	*****	*****	*****	*****	*****	*****

	p = -0.1	p = 0.0	p = 0.5	p = 1.0	p = 1.1	p = -Inf	p = Inf	p = NA	p = NaN
shape = NA	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
shape = NaN	ERROR	*****	*****	*****	*****	*****	*****	*****	*****

Results for package nieve

Package version used: 0.1.4

o Equivalent of 'dGPD2': 'nieve::dGPD2'

	x = 1.4	x = -Inf	x = Inf	x = NA	x = NaN
scale = 1	0.246597	0.000000	0.000000	NA	NaN
scale = -1	NaN	0	0	NA	NaN
scale = 0	NaN	0	0	NA	NaN
scale = -Inf	NaN	0	0	NA	NaN
scale = Inf	NaN	0	0	NA	NaN
scale = NA	NaN	0	0	NA	NaN
scale = NaN	NaN	0	0	NA	NaN

	x = 1.4	x = -Inf	x = Inf	x = NA	x = NaN
shape = -0.4	0.291863	0.000000	0.000000	NA	NaN
shape = 0.0	0.246597	0.000000	0.000000	NA	NaN
shape = 0.5	0.2035416	0.0000000	0.0000000	NA	NaN
shape = -Inf	NaN	0	0	NA	NaN
shape = Inf	NaN	0	0	NA	NaN
shape = NA	NaN	0	0	NA	NaN
shape = NaN	NaN	0	0	NA	NaN

o Equivalent of 'pGPD2': 'nieve::pGPD2'

	q = 1.5	q = -Inf	q = Inf	q = NA	q = NaN
scale = 1	0.7768698	0.0000000	1.0000000	NA	NaN
scale = -1	NaN	0	1	NA	NaN
scale = 0	NaN	0	1	NA	NaN
scale = -Inf	NaN	0	1	NA	NaN
scale = Inf	NaN	0	1	NA	NaN
scale = NA	NaN	0	1	NA	NaN
scale = NaN	NaN	0	1	NA	NaN

	q = 1.5	q = -Inf	q = Inf	q = NA	q = NaN
shape = -0.4	0.8988071	0.0000000	1.0000000	NA	NaN
shape = 0.0	0.7768698	0.0000000	1.0000000	NA	NaN
shape = 0.5	0.6734694	0.0000000	1.0000000	NA	NaN
shape = -Inf	NaN	0	1	NA	NaN
shape = Inf	NaN	0	1	NA	NaN
shape = NA	NaN	0	1	NA	NaN
shape = NaN	NaN	0	1	NA	NaN

o Equivalent of ‘qGPD2’: ‘nieve::qGPD2’

	p = -0.1	p = 0.0	p = 0.5	p = 1.0	p = 1.1	p = -Inf	p = Inf	p = NA	p = NaN
scale = 1	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
scale = -1	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
scale = 0	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
scale = -Inf	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
scale = Inf	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
scale = NA	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
scale = NaN	ERROR	*****	*****	*****	*****	*****	*****	*****	*****

	p = -0.1	p = 0.0	p = 0.5	p = 1.0	p = 1.1	p = -Inf	p = Inf	p = NA	p = NaN
shape = -0.4	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
shape = 0.0	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
shape = 0.5	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
shape = -Inf	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
shape = Inf	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
shape = NA	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
shape = NaN	ERROR	*****	*****	*****	*****	*****	*****	*****	*****

o Equivalent of ‘dGEV’: ‘nieve::dGEV’

	x = 1.4	x = -Inf	x = Inf	x = NA	x = NaN
scale = 1	0.246597	0.000000	0.000000	NA	NaN
scale = -1	NaN	0	0	NA	NaN
scale = 0	NaN	0	0	NA	NaN
scale = -Inf	NaN	0	0	NA	NaN
scale = Inf	NaN	0	0	NA	NaN
scale = NA	NaN	0	0	NA	NaN
scale = NaN	NaN	0	0	NA	NaN

	x = 1.4	x = -Inf	x = Inf	x = NA	x = NaN
shape = -0.4	0.291863	0.000000	0.000000	NA	NaN
shape = 0.0	0.246597	0.000000	0.000000	NA	NaN
shape = 0.5	0.2035416	0.0000000	0.0000000	NA	NaN
shape = -Inf	NaN	0	0	NA	NaN
shape = Inf	NaN	0	0	NA	NaN
shape = NA	NaN	0	0	NA	NaN
shape = NaN	NaN	0	0	NA	NaN

o Equivalent of ‘pGEV’: ‘nieve::pGEV’

	q = 1.5	q = -Inf	q = Inf	q = NA	q = NaN
scale = 1	0.7768698	0.0000000	1.0000000	NA	NaN
scale = -1	NaN	0	1	NA	NaN
scale = 0	NaN	0	1	NA	NaN

	q = 1.5	q = -Inf	q = Inf	q = NA	q = NaN
scale = -Inf	NaN	0	1	NA	NaN
scale = Inf	NaN	0	1	NA	NaN
scale = NA	NaN	0	1	NA	NaN
scale = NaN	NaN	0	1	NA	NaN

	q = 1.5	q = -Inf	q = Inf	q = NA	q = NaN
shape = -0.4	0.8988071	0.0000000	1.0000000	NA	NaN
shape = 0.0	0.7768698	0.0000000	1.0000000	NA	NaN
shape = 0.5	0.6734694	0.0000000	1.0000000	NA	NaN
shape = -Inf	NaN	0	1	NA	NaN
shape = Inf	NaN	0	1	NA	NaN
shape = NA	NaN	0	1	NA	NaN
shape = NaN	NaN	0	1	NA	NaN

o Equivalent of 'qGEV': 'nieve::qGEV'

	p = -0.1	p = 0.0	p = 0.5	p = 1.0	p = 1.1	p = -Inf	p = Inf	p = NA	p = NaN
scale = 1	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
scale = -1	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
scale = 0	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
scale = -Inf	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
scale = Inf	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
scale = NA	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
scale = NaN	ERROR	*****	*****	*****	*****	*****	*****	*****	*****

	p = -0.1	p = 0.0	p = 0.5	p = 1.0	p = 1.1	p = -Inf	p = Inf	p = NA	p = NaN
shape = -0.4	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
shape = 0.0	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
shape = 0.5	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
shape = -Inf	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
shape = Inf	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
shape = NA	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
shape = NaN	ERROR	*****	*****	*****	*****	*****	*****	*****	*****

Results for package POT

Package version used: 1.1.10

o Equivalent of 'dGPD2': 'POT::dgpd'

	x = 1.4	x = -Inf	x = Inf	x = NA	x = NaN
scale = 1	ERROR	*****	*****	*****	*****
scale = -1	ERROR	*****	*****	*****	*****
scale = 0	ERROR	*****	*****	*****	*****
scale = -Inf	ERROR	*****	*****	*****	*****
scale = Inf	0	NaN	NaN	NA	NaN

	x = 1.4	x = -Inf	x = Inf	x = NA	x = NaN
scale = NA	ERROR	*****	*****	*****	*****
scale = NaN	ERROR	*****	*****	*****	*****

	x = 1.4	x = -Inf	x = Inf	x = NA	x = NaN
shape = -0.4	0.291863	0.000000	0.000000	NA	NaN
shape = 0.0	ERROR	*****	*****	*****	*****
shape = 0.5	0.2035416	0.0000000	0.0000000	NA	NaN
shape = -Inf	0	0	0	NA	NaN
shape = Inf	0	0	0	NA	NaN
shape = NA	ERROR	*****	*****	*****	*****
shape = NaN	ERROR	*****	*****	*****	*****

o Equivalent of 'pGPD2': 'POT::pgpd'

	q = 1.5	q = -Inf	q = Inf	q = NA	q = NaN
scale = 1	0.7768698	0.0000000	1.0000000	NA	NaN
scale = -1	ERROR	*****	*****	*****	*****
scale = 0	ERROR	*****	*****	*****	*****
scale = -Inf	ERROR	*****	*****	*****	*****
scale = Inf	0	0	NaN	NA	NaN
scale = NA	ERROR	*****	*****	*****	*****
scale = NaN	ERROR	*****	*****	*****	*****

	q = 1.5	q = -Inf	q = Inf	q = NA	q = NaN
shape = -0.4	0.8988071	0.0000000	1.0000000	NA	NaN
shape = 0.0	0.7768698	0.0000000	1.0000000	NA	NaN
shape = 0.5	0.6734694	0.0000000	1.0000000	NA	NaN
shape = -Inf	0	0	0	0	0
shape = Inf	0	0	0	0	0
shape = NA	ERROR	*****	*****	*****	*****
shape = NaN	ERROR	*****	*****	*****	*****

o Equivalent of 'qGPD2': 'POT::qgpd'

	p = -0.1	p = 0.0	p = 0.5	p = 1.0	p = 1.1	p = -Inf	p = Inf	p = NA	p = NaN
scale = 1	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
scale = -1	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
scale = 0	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
scale = -Inf	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
scale = Inf	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
scale = NA	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
scale = NaN	ERROR	*****	*****	*****	*****	*****	*****	*****	*****

	p = -0.1	p = 0.0	p = 0.5	p = 1.0	p = 1.1	p = -Inf	p = Inf	p = NA	p = NaN
shape = -0.4	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
shape = 0.0	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
shape = 0.5	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
shape = -Inf	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
shape = Inf	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
shape = NA	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
shape = NaN	ERROR	*****	*****	*****	*****	*****	*****	*****	*****

Results for package revdbayes

Package version used: 1.5.1

o Equivalent of 'dGPD2': 'revdbayes::dgp'

	x = 1.4	x = -Inf	x = Inf	x = NA	x = NaN
scale = 1	0.246597	0.000000	0.000000	NA	NA
scale = -1	ERROR	*****	*****	*****	*****
scale = 0	NaN	NaN	NaN	NA	NA
scale = -Inf	ERROR	*****	*****	*****	*****
scale = Inf	0	NA	NA	NA	NA
scale = NA	ERROR	*****	*****	*****	*****
scale = NaN	ERROR	*****	*****	*****	*****

	x = 1.4	x = -Inf	x = Inf	x = NA	x = NaN
shape = -0.4	0.291863	0.000000	0.000000	NA	NA
shape = 0.0	0.246597	0.000000	0.000000	NA	NA
shape = 0.5	0.2035416	0.0000000	0.0000000	NA	NA
shape = -Inf	0	0	0	NA	NA
shape = Inf	0	0	0	NA	NA
shape = NA	NA	0	0	NA	NA
shape = NaN	NA	0	0	NA	NA

o Equivalent of 'pGPD2': 'revdbayes::pgp'

	q = 1.5	q = -Inf	q = Inf	q = NA	q = NaN
scale = 1	0.7768698	0.0000000	1.0000000	NA	NaN
scale = -1	ERROR	*****	*****	*****	*****
scale = 0	1	NaN	1	NA	NaN
scale = -Inf	ERROR	*****	*****	*****	*****
scale = Inf	0	0	NaN	NA	NaN
scale = NA	ERROR	*****	*****	*****	*****
scale = NaN	ERROR	*****	*****	*****	*****

	q = 1.5	q = -Inf	q = Inf	q = NA	q = NaN
shape = -0.4	0.8988071	0.0000000	1.0000000	NA	NaN
shape = 0.0	0.7768698	0.0000000	1.0000000	NA	NaN

	q = 1.5	q = -Inf	q = Inf	q = NA	q = NaN
shape = 0.5	0.6734694	0.0000000	1.0000000	NA	NaN
shape = -Inf	0	0	0	0	0
shape = Inf	0	0	0	0	0
shape = NA	NA	NA	NA	NA	NA
shape = NaN	NA	NA	NA	NA	NA

o Equivalent of 'qGPD2': 'revdbayes::qgp'

	p = -0.1	p = 0.0	p = 0.5	p = 1.0	p = 1.1	p = -Inf	p = Inf	p = NA	p = NaN
scale = 1	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
scale = -1	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
scale = 0	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
scale = -Inf	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
scale = Inf	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
scale = NA	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
scale = NaN	ERROR	*****	*****	*****	*****	*****	*****	*****	*****

	p = -0.1	p = 0.0	p = 0.5	p = 1.0	p = 1.1	p = -Inf	p = Inf	p = NA	p = NaN
shape = -0.4	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
shape = 0.0	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
shape = 0.5	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
shape = -Inf	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
shape = Inf	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
shape = NA	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
shape = NaN	ERROR	*****	*****	*****	*****	*****	*****	*****	*****

o Equivalent of 'dGEV': 'revdbayes::dgev'

	x = 1.4	x = -Inf	x = Inf	x = NA	x = NaN
scale = 1	0.246597	0.000000	0.000000	NA	NA
scale = -1	ERROR	*****	*****	*****	*****
scale = 0	NaN	NaN	NaN	NA	NA
scale = -Inf	ERROR	*****	*****	*****	*****
scale = Inf	0	NA	NA	NA	NA
scale = NA	ERROR	*****	*****	*****	*****
scale = NaN	ERROR	*****	*****	*****	*****

	x = 1.4	x = -Inf	x = Inf	x = NA	x = NaN
shape = -0.4	0.291863	0.000000	0.000000	NA	NA
shape = 0.0	0.246597	0.000000	0.000000	NA	NA
shape = 0.5	0.2035416	0.0000000	0.0000000	NA	NA
shape = -Inf	0	0	0	NA	NA
shape = Inf	0	0	0	NA	NA
shape = NA	NA	0	0	NA	NA
shape = NaN	NA	0	0	NA	NA

o Equivalent of ‘pGEV’: ‘revdbayes::pgev’

	q = 1.5	q = -Inf	q = Inf	q = NA	q = NaN
scale = 1	0.7768698	0.0000000	1.0000000	NA	NaN
scale = -1	ERROR	*****	*****	*****	*****
scale = 0	1	NaN	1	NA	NaN
scale = -Inf	ERROR	*****	*****	*****	*****
scale = Inf	0	0	NaN	NA	NaN
scale = NA	ERROR	*****	*****	*****	*****
scale = NaN	ERROR	*****	*****	*****	*****

	q = 1.5	q = -Inf	q = Inf	q = NA	q = NaN
shape = -0.4	0.8988071	0.0000000	1.0000000	NA	NaN
shape = 0.0	0.7768698	0.0000000	1.0000000	NA	NaN
shape = 0.5	0.6734694	0.0000000	1.0000000	NA	NaN
shape = -Inf	0	0	0	0	0
shape = Inf	0	0	0	0	0
shape = NA	NA	NA	NA	NA	NA
shape = NaN	NA	NA	NA	NA	NA

o Equivalent of ‘qGEV’: ‘revdbayes::qgev’

	p = -0.1	p = 0.0	p = 0.5	p = 1.0	p = 1.1	p = -Inf	p = Inf	p = NA	p = NaN
scale = 1	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
scale = -1	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
scale = 0	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
scale = -Inf	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
scale = Inf	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
scale = NA	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
scale = NaN	ERROR	*****	*****	*****	*****	*****	*****	*****	*****

	p = -0.1	p = 0.0	p = 0.5	p = 1.0	p = 1.1	p = -Inf	p = Inf	p = NA	p = NaN
shape = -0.4	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
shape = 0.0	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
shape = 0.5	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
shape = -Inf	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
shape = Inf	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
shape = NA	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
shape = NaN	ERROR	*****	*****	*****	*****	*****	*****	*****	*****

Results for package SpatialExtremes

Package version used: 2.1.0

o Equivalent of ‘dGPD2’: ‘SpatialExtremes::dgpd’

	x = 1.4	x = -Inf	x = Inf	x = NA	x = NaN
scale = 1	ERROR	*****	*****	*****	*****
scale = -1	ERROR	*****	*****	*****	*****
scale = 0	ERROR	*****	*****	*****	*****
scale = -Inf	ERROR	*****	*****	*****	*****
scale = Inf	0	NaN	NaN	NA	NaN
scale = NA	ERROR	*****	*****	*****	*****
scale = NaN	ERROR	*****	*****	*****	*****

	x = 1.4	x = -Inf	x = Inf	x = NA	x = NaN
shape = -0.4	0.291863	0.000000	0.000000	NA	NaN
shape = 0.0	ERROR	*****	*****	*****	*****
shape = 0.5	0.2035416	0.0000000	0.0000000	NA	NaN
shape = -Inf	0	0	0	NA	NaN
shape = Inf	0	0	0	NA	NaN
shape = NA	ERROR	*****	*****	*****	*****
shape = NaN	ERROR	*****	*****	*****	*****

o Equivalent of 'pGPD2': 'SpatialExtremes::pgpd'

	q = 1.5	q = -Inf	q = Inf	q = NA	q = NaN
scale = 1	0.7768698	0.0000000	1.0000000	NA	NaN
scale = -1	ERROR	*****	*****	*****	*****
scale = 0	ERROR	*****	*****	*****	*****
scale = -Inf	ERROR	*****	*****	*****	*****
scale = Inf	0	0	NaN	NA	NaN
scale = NA	ERROR	*****	*****	*****	*****
scale = NaN	ERROR	*****	*****	*****	*****

	q = 1.5	q = -Inf	q = Inf	q = NA	q = NaN
shape = -0.4	0.8988071	0.0000000	1.0000000	NA	NaN
shape = 0.0	0.7768698	0.0000000	1.0000000	NA	NaN
shape = 0.5	0.6734694	0.0000000	1.0000000	NA	NaN
shape = -Inf	0	0	0	0	0
shape = Inf	0	0	0	0	0
shape = NA	ERROR	*****	*****	*****	*****
shape = NaN	ERROR	*****	*****	*****	*****

o Equivalent of 'qGPD2': 'SpatialExtremes::qgpd'

	p = -0.1	p = 0.0	p = 0.5	p = 1.0	p = 1.1	p = -Inf	p = Inf	p = NA	p = NaN
scale = 1	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
scale = -1	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
scale = 0	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
scale = -Inf	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
scale = Inf	ERROR	*****	*****	*****	*****	*****	*****	*****	*****

	p = -0.1	p = 0.0	p = 0.5	p = 1.0	p = 1.1	p = -Inf	p = Inf	p = NA	p = NaN
scale = NA	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
scale = NaN	ERROR	*****	*****	*****	*****	*****	*****	*****	*****

	p = -0.1	p = 0.0	p = 0.5	p = 1.0	p = 1.1	p = -Inf	p = Inf	p = NA	p = NaN
shape = -0.4	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
shape = 0.0	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
shape = 0.5	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
shape = -Inf	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
shape = Inf	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
shape = NA	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
shape = NaN	ERROR	*****	*****	*****	*****	*****	*****	*****	*****

o Equivalent of 'dGEV': 'SpatialExtremes::dgev'

	x = 1.4	x = -Inf	x = Inf	x = NA	x = NaN
scale = 1	ERROR	*****	*****	*****	*****
scale = -1	ERROR	*****	*****	*****	*****
scale = 0	ERROR	*****	*****	*****	*****
scale = -Inf	ERROR	*****	*****	*****	*****
scale = Inf	0	NaN	NaN	NA	NaN
scale = NA	ERROR	*****	*****	*****	*****
scale = NaN	ERROR	*****	*****	*****	*****

	x = 1.4	x = -Inf	x = Inf	x = NA	x = NaN
shape = -0.4	0.291863	0.000000	0.000000	NA	NaN
shape = 0.0	ERROR	*****	*****	*****	*****
shape = 0.5	0.2035416	0.0000000	0.0000000	NA	NaN
shape = -Inf	0	0	0	NA	NaN
shape = Inf	0	0	0	NA	NaN
shape = NA	ERROR	*****	*****	*****	*****
shape = NaN	ERROR	*****	*****	*****	*****

o Equivalent of 'pGEV': 'SpatialExtremes::pgev'

	q = 1.5	q = -Inf	q = Inf	q = NA	q = NaN
scale = 1	0.7768698	0.0000000	1.0000000	NA	NaN
scale = -1	ERROR	*****	*****	*****	*****
scale = 0	ERROR	*****	*****	*****	*****
scale = -Inf	ERROR	*****	*****	*****	*****
scale = Inf	0	0	NaN	NA	NaN
scale = NA	ERROR	*****	*****	*****	*****
scale = NaN	ERROR	*****	*****	*****	*****

	q = 1.5	q = -Inf	q = Inf	q = NA	q = NaN
shape = -0.4	0.8988071	0.0000000	1.0000000	NA	NaN
shape = 0.0	0.7768698	0.0000000	1.0000000	NA	NaN
shape = 0.5	0.6734694	0.0000000	1.0000000	NA	NaN
shape = -Inf	0	0	0	0	0
shape = Inf	0	0	0	0	0
shape = NA	ERROR	*****	*****	*****	*****
shape = NaN	ERROR	*****	*****	*****	*****

o Equivalent of 'qGEV': 'SpatialExtremes::qgev'

	p = -0.1	p = 0.0	p = 0.5	p = 1.0	p = 1.1	p = -Inf	p = Inf	p = NA	p = NaN
scale = 1	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
scale = -1	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
scale = 0	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
scale = -Inf	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
scale = Inf	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
scale = NA	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
scale = NaN	ERROR	*****	*****	*****	*****	*****	*****	*****	*****

	p = -0.1	p = 0.0	p = 0.5	p = 1.0	p = 1.1	p = -Inf	p = Inf	p = NA	p = NaN
shape = -0.4	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
shape = 0.0	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
shape = 0.5	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
shape = -Inf	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
shape = Inf	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
shape = NA	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
shape = NaN	ERROR	*****	*****	*****	*****	*****	*****	*****	*****

Results for package tea

Package version used: 1.1

o Equivalent of 'dGPD2': 'tea::dgpd'

	x = 1.4	x = -Inf	x = Inf	x = NA	x = NaN
scale = 1	0.246597	0.000000	0.000000	NA	0.000000
scale = -1	ERROR	*****	*****	*****	*****
scale = 0	ERROR	*****	*****	*****	*****
scale = -Inf	ERROR	*****	*****	*****	*****
scale = Inf	0	0	0	NA	0
scale = NA	ERROR	*****	*****	*****	*****
scale = NaN	ERROR	*****	*****	*****	*****

	x = 1.4	x = -Inf	x = Inf	x = NA	x = NaN
shape = -0.4	0.291863	0.000000	0.000000	NA	0.000000
shape = 0.0	0.246597	0.000000	0.000000	NA	0.000000

	x = 1.4	x = -Inf	x = Inf	x = NA	x = NaN
shape = 0.5	0.2035416	0.0000000	0.0000000	NA	0.0000000
shape = -Inf	0	0	0	NA	0
shape = Inf	0	0	0	NA	0
shape = NA	NA	0	NA	NA	NA
shape = NaN	NA	0	NA	NA	NA

o Equivalent of 'pGPD2': 'tea::pgpd'

	q = 1.5	q = -Inf	q = Inf	q = NA	q = NaN
scale = 1	0.7768698	0.0000000	1.0000000	NA	NaN
scale = -1	ERROR	*****	*****	*****	*****
scale = 0	ERROR	*****	*****	*****	*****
scale = -Inf	ERROR	*****	*****	*****	*****
scale = Inf	0	0	NaN	NA	NaN
scale = NA	ERROR	*****	*****	*****	*****
scale = NaN	ERROR	*****	*****	*****	*****

	q = 1.5	q = -Inf	q = Inf	q = NA	q = NaN
shape = -0.4	0.8988071	0.0000000	1.0000000	NA	NaN
shape = 0.0	0.7768698	0.0000000	1.0000000	NA	NaN
shape = 0.5	0.6734694	0.0000000	1.0000000	NA	NaN
shape = -Inf	NaN	NaN	NaN	NA	NaN
shape = Inf	NaN	NaN	NaN	NA	NaN
shape = NA	NA	NA	NA	NA	NA
shape = NaN	NA	NA	NA	NA	NA

o Equivalent of 'qGPD2': 'tea::qgpd'

	p = -0.1	p = 0.0	p = 0.5	p = 1.0	p = 1.1	p = -Inf	p = Inf	p = NA	p = NaN
scale = 1	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
scale = -1	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
scale = 0	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
scale = -Inf	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
scale = Inf	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
scale = NA	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
scale = NaN	ERROR	*****	*****	*****	*****	*****	*****	*****	*****

	p = -0.1	p = 0.0	p = 0.5	p = 1.0	p = 1.1	p = -Inf	p = Inf	p = NA	p = NaN
shape = -0.4	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
shape = 0.0	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
shape = 0.5	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
shape = -Inf	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
shape = Inf	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
shape = NA	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
shape = NaN	ERROR	*****	*****	*****	*****	*****	*****	*****	*****

Results for package texmex

Package version used: 2.4.8

```
## Warning in log(sigma): NaNs produced
```

```
## Warning in log(sigma): NaNs produced
```

o Equivalent of 'dGPD2': 'texmex::dgpd'

	x = 1.4	x = -Inf	x = Inf	x = NA	x = NaN
scale = 1	0.246597	0.000000	0.000000	NA	NaN
scale = -1	NaN	0	NaN	NaN	NaN
scale = 0	NaN	0	NaN	NA	NaN
scale = -Inf	NaN	0	NaN	NaN	NaN
scale = Inf	0	0	NaN	NA	NaN
scale = NA	NA	0	NA	NA	NA
scale = NaN	NaN	0	NaN	NaN	NaN

	x = 1.4	x = -Inf	x = Inf	x = NA	x = NaN
shape = -0.4	0.291863	0.000000	0.000000	NA	NaN
shape = 0.0	0.246597	0.000000	0.000000	NA	NaN
shape = 0.5	0.2035416	0.0000000	NaN	NA	NaN
shape = -Inf	0	0	0	NA	NaN
shape = Inf	0	0	NaN	NA	NaN
shape = NA	NA	0	NA	NA	NA
shape = NaN	NaN	0	NaN	NaN	NaN

o Equivalent of 'pGPD2': 'texmex::pgpd'

	q = 1.5	q = -Inf	q = Inf	q = NA	q = NaN
scale = 1	0.7768698	0.0000000	1.0000000	NA	NaN
scale = -1	0	1	0	NA	NaN
scale = 0	1	0	1	NA	NaN
scale = -Inf	0	NaN	NaN	NA	NaN
scale = Inf	0	NaN	NaN	NA	NaN
scale = NA	NA	NA	NA	NA	NaN
scale = NaN	NaN	NaN	NaN	NA	NaN

	q = 1.5	q = -Inf	q = Inf	q = NA	q = NaN
shape = -0.4	0.8988071	0.0000000	1.0000000	NA	NaN
shape = 0.0	0.7768698	0.0000000	1.0000000	NA	NaN
shape = 0.5	0.6734694	0.0000000	NaN	NA	NaN
shape = -Inf	1	NaN	1	NA	NaN
shape = Inf	0	NaN	NaN	NA	NaN
shape = NA	NA	NA	NA	NA	NaN
shape = NaN	NaN	NaN	NaN	NA	NaN

o Equivalent of 'qGPD2': 'texmex::qgpd'

	p = -0.1	p = 0.0	p = 0.5	p = 1.0	p = 1.1	p = -Inf	p = Inf	p = NA	p = NaN
scale = 1	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
scale = -1	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
scale = 0	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
scale = -Inf	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
scale = Inf	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
scale = NA	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
scale = NaN	ERROR	*****	*****	*****	*****	*****	*****	*****	*****

	p = -0.1	p = 0.0	p = 0.5	p = 1.0	p = 1.1	p = -Inf	p = Inf	p = NA	p = NaN
shape = -0.4	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
shape = 0.0	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
shape = 0.5	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
shape = -Inf	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
shape = Inf	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
shape = NA	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
shape = NaN	ERROR	*****	*****	*****	*****	*****	*****	*****	*****

o Equivalent of 'dGEV': 'texmex::dgev'

	x = 1.4	x = -Inf	x = Inf	x = NA	x = NaN
scale = 1	0.246597	0.000000	0.000000	NA	NaN
scale = -1	NaN	0	NaN	NaN	NaN
scale = 0	NaN	0	NaN	NA	NaN
scale = -Inf	NaN	0	NaN	NaN	NaN
scale = Inf	0	0	NaN	NA	NaN
scale = NA	NA	0	NA	NA	NA
scale = NaN	NaN	0	NaN	NaN	NaN

	x = 1.4	x = -Inf	x = Inf	x = NA	x = NaN
shape = -0.4	0.291863	0.000000	0.000000	NA	NaN
shape = 0.0	0.246597	0.000000	0.000000	NA	NaN
shape = 0.5	0.2035416	0.0000000	NaN	NA	NaN
shape = -Inf	0	0	0	NA	NaN
shape = Inf	0	0	NaN	NA	NaN
shape = NA	NA	0	NA	NA	NA
shape = NaN	NaN	0	NaN	NaN	NaN

o Equivalent of 'pGEV': 'texmex::pgev'

	q = 1.5	q = -Inf	q = Inf	q = NA	q = NaN
scale = 1	0.7768698	0.0000000	1.0000000	NA	NaN
scale = -1	0	1	0	NA	NaN
scale = 0	1	0	1	NA	NaN
scale = -Inf	0	NaN	NaN	NA	NaN
scale = Inf	0	NaN	NaN	NA	NaN

	q = 1.5	q = -Inf	q = Inf	q = NA	q = NaN
scale = NA	NA	NA	NA	NA	NaN
scale = NaN	NaN	NaN	NaN	NA	NaN

	q = 1.5	q = -Inf	q = Inf	q = NA	q = NaN
shape = -0.4	0.8988071	0.0000000	1.0000000	NA	NaN
shape = 0.0	0.7768698	0.0000000	1.0000000	NA	NaN
shape = 0.5	0.6734694	0.0000000	NaN	NA	NaN
shape = -Inf	1	NaN	1	NA	NaN
shape = Inf	0	NaN	NaN	NA	NaN
shape = NA	NA	NA	NA	NA	NaN
shape = NaN	NaN	NaN	NaN	NA	NaN

o Equivalent of 'qGEV': 'texmex::qgev'

	p = -0.1	p = 0.0	p = 0.5	p = 1.0	p = 1.1	p = -Inf	p = Inf	p = NA	p = NaN
scale = 1	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
scale = -1	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
scale = 0	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
scale = -Inf	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
scale = Inf	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
scale = NA	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
scale = NaN	ERROR	*****	*****	*****	*****	*****	*****	*****	*****

	p = -0.1	p = 0.0	p = 0.5	p = 1.0	p = 1.1	p = -Inf	p = Inf	p = NA	p = NaN
shape = -0.4	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
shape = 0.0	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
shape = 0.5	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
shape = -Inf	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
shape = Inf	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
shape = NA	ERROR	*****	*****	*****	*****	*****	*****	*****	*****
shape = NaN	ERROR	*****	*****	*****	*****	*****	*****	*****	*****