Package: rxode2ll (via r-universe)

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Title Log-Likelihood Functions for 'rxode2'

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Suggests covr, testthat (>= 3.0.0)

Imports Rcpp (>= 1.0.8), checkmate

Description Provides the log-likelihoods with gradients from 'stan' (Carpenter et al (2015), <doi:10.48550/arXiv.1509.07164>) needed for generalized log-likelihood estimation in 'nlmixr2' (Fidler et al (2019) <doi:10.1002/psp4.12445>). This is split of to reduce computational burden of recompiling 'rxode2' (Wang, Hallow and James (2016) <doi:10.1002/psp4.12052>) which runs the 'nlmixr2' models during estimation.

BugReports https://github.com/nlmixr2/rxode2ll/issues/

NeedsCompilation yes

License GPL (>= 3)

URL https://nlmixr2.github.io/rxode2ll/, https://github.com/nlmixr2/rxode2ll/

Biarch true

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`.rxode2llPtr` *External pointers to rxode2ll's log-likelihood functions*

Description

Hands a consumer package the addresses of every `rxLlik*` function and its exact derivatives, so it can call them from C/C++ without an ABI dependency on this package.

Usage

```
.rxode2llPtr()
```

Details

`R_GetCCallable()` is not sufficient for that. It drops the link-time dependency, but the consumer still compiles in a typedef'd signature and caches a raw address: updating rxode2ll then requires the consumer to be rebuilt, and reloading rxode2ll leaves the cached pointers dangling. This is the same external-pointer handshake rxode2, nlmixr2est, RcppTrust and n1qn1 already use, where the consumer re-reads the list in its own `.onLoad()` and therefore picks up an updated rxode2ll instead of baking one in.

The returned list is APPEND-ONLY and its order is fixed; see `inst/include/rxode2llPtrs.h`, which is the matching consumer header.

Value

list of external pointers, in the order documented in `rxode2llPtrs.h`

Examples

```
length(.rxode2llPtr())
```

`llikBeta` *Calculate the log likelihood of the binomial function (and its derivatives)*

Description

Calculate the log likelihood of the binomial function (and its derivatives)

Usage

```
llikBeta(x, shape1, shape2, full = FALSE)
```

Arguments

`x`	Observation
`shape1`, `shape2`	non-negative parameters of the Beta distribution.
`full`	Add the data frame showing x, mean, sd as well as the fx and derivatives

Value

data frame with `fx` for the log pdf value of with `dShape1` and `dShape2` that has the derivatives with respect to the parameters at the observation time-point

Author(s)

Matthew L. Fidler

Examples

```
x <- seq(1e-4, 1 - 1e-4, length.out = 21)

llikBeta(x, 0.5, 0.5)

llikBeta(x, 1, 3, TRUE)
```

`llikBetaProportion` *log likelihood of the BetaProportion distribution and its derivatives (from stan)*

Description

log likelihood of the BetaProportion distribution and its derivatives (from stan)

Usage

```
llikBetaProportion(x, mu, kappa, full = FALSE)
```

Arguments

`x`	Observation
`mu`	distribution parameter
`kappa`	distribution parameter
`full`	return the input parameters alongside the result

Value

data frame with `fx` and the derivative of each parameter

`llikBinom` *Calculate the log likelihood of the binomial function (and its derivatives)*

Description

Calculate the log likelihood of the binomial function (and its derivatives)

Usage

```
llikBinom(x, size, prob, full = FALSE)
```

Arguments

`x`	Number of successes
`size`	Size of trial
`prob`	probability of success
`full`	Add the data frame showing x, mean, sd as well as the fx and derivatives

Value

data frame with `fx` for the pdf value of with `dProb` that has the derivatives with respect to the parameters at the observation time-point

Author(s)

Matthew L. Fidler

Examples

```
llikBinom(46:54, 100, 0.5)

llikBinom(46:54, 100, 0.5, TRUE)
```

`llikCauchy` *log likelihood of Cauchy distribution and it's derivatives (from stan)*

Description

log likelihood of Cauchy distribution and it's derivatives (from stan)

Usage

```
llikCauchy(x, location = 0, scale = 1, full = FALSE)
```

Arguments

x	Observation
location, scale	location and scale parameters.
full	Add the data frame showing x, mean, sd as well as the fx and derivatives

Value

data frame with fx for the log pdf value of with dLocation and dScale that has the derivatives with respect to the parameters at the observation time-point

Author(s)

Matthew L. Fidler

Examples

```
x <- seq(-3, 3, length.out = 21)

llikCauchy(x, 0, 1)

llikCauchy(x, 3, 1, full=TRUE)
```

---

llikChisq *log likelihood and derivatives for chi-squared distribution*

Description

log likelihood and derivatives for chi-squared distribution

Usage

```
llikChisq(x, df, full = FALSE)
```

Arguments

x	variable that is distributed by chi-squared distribution
df	degrees of freedom (non-negative, but can be non-integer).
full	Add the data frame showing x, mean, sd as well as the fx and derivatives

Value

data frame with fx for the log pdf value of with dDf that has the derivatives with respect to the df parameter the observation time-point

Author(s)

Matthew L. Fidler

Examples

```
llikChisq(1, df = 1:3, full=TRUE)

llikChisq(1, df = 6:9)
```

`llikDblExp` *log likelihood of the DblExp distribution and its derivatives (from stan)*

Description

log likelihood of the DblExp distribution and its derivatives (from stan)

Usage

```
llikDblExp(x, mu, sigma, full = FALSE)
```

Arguments

`x`	Observation
`mu`	distribution parameter
`sigma`	distribution parameter
`full`	return the input parameters alongside the result

Value

data frame with `fx` and the derivative of each parameter

`llikExp` *log likelihood and derivatives for exponential distribution*

Description

log likelihood and derivatives for exponential distribution

Usage

```
llikExp(x, rate, full = FALSE)
```

Arguments

`x`	variable that is distributed by exponential distribution
`rate`	vector of rates.
`full`	Add the data frame showing x, mean, sd as well as the fx and derivatives

Value

data frame with `fx` for the log pdf value of with `dRate` that has the derivatives with respect to the `rate` parameter the observation time-point

Author(s)

Matthew L. Fidler

Examples

```
llikExp(1, 1:3)

llikExp(1, 1:3, full=TRUE)
```

---

llikF *log likelihood and derivatives for F distribution*

Description

log likelihood and derivatives for F distribution

Usage

```
llikF(x, df1, df2, full = FALSE)
```

Arguments

`x`	variable that is distributed by f distribution
`df1`, `df2`	degrees of freedom. `Inf` is allowed.
`full`	Add the data frame showing x, mean, sd as well as the fx and derivatives

Value

data frame with `fx` for the log pdf value of with `dDf1` and `dDf2` that has the derivatives with respect to the `df1`/`df2` parameters at the observation time-point

Author(s)

Matthew L. Fidler

Examples

```
x <- seq(0.001, 5, length.out = 100)

llikF(x^2, 1, 5)
```

llikFrechet *log likelihood of the Frechet distribution and its derivatives (from stan)*

Description

log likelihood of the Frechet distribution and its derivatives (from stan)

Usage

```
llikFrechet(x, alpha, sigma, full = FALSE)
```

Arguments

x	Observation
alpha	distribution parameter
sigma	distribution parameter
full	return the input parameters alongside the result

Value

data frame with fx and the derivative of each parameter

llikGamma *log likelihood and derivatives for Gamma distribution*

Description

log likelihood and derivatives for Gamma distribution

Usage

```
llikGamma(x, shape, rate, full = FALSE)
```

Arguments

x	variable that is distributed by gamma distribution
shape	this is the distribution's shape parameter. Must be positive.
rate	this is the distribution's rate parameters. Must be positive.
full	Add the data frame showing x, mean, sd as well as the fx and derivatives

Value

data frame with fx for the log pdf value of with dProb that has the derivatives with respect to the prob parameters at the observation time-point

Author(s)

Matthew L. Fidler

Examples

```
llikGamma(1, 1, 10)
```

`llikGeom` *log likelihood and derivatives for Geom distribution*

Description

log likelihood and derivatives for Geom distribution

Usage

```
llikGeom(x, prob, full = FALSE)
```

Arguments

`x`	variable distributed by a geom distribution
`prob`	probability of success in each trial. `0 < prob <= 1`.
`full`	Add the data frame showing x, mean, sd as well as the fx and derivatives

Value

data frame with `fx` for the log pdf value of with `dProb` that has the derivatives with respect to the `prob` parameters at the observation time-point

Author(s)

Matthew L. Fidler

Examples

```
llikGeom(1:10, 0.2)
```

llikGumbel — *log likelihood of the Gumbel distribution and its derivatives (from stan)*

Description

log likelihood of the Gumbel distribution and its derivatives (from stan)

Usage

```
llikGumbel(x, mu, beta, full = FALSE)
```

Arguments

x	Observation
mu	distribution parameter
beta	distribution parameter
full	return the input parameters alongside the result

Value

data frame with fx and the derivative of each parameter

llikInvChisq — *log likelihood of the InvChisq distribution and its derivatives (from stan)*

Description

log likelihood of the InvChisq distribution and its derivatives (from stan)

Usage

```
llikInvChisq(x, nu, full = FALSE)
```

Arguments

x	Observation
nu	distribution parameter
full	return the input parameters alongside the result

Value

data frame with fx and the derivative of each parameter

llikInvGamma *log likelihood of the InvGamma distribution and its derivatives (from stan)*

Description

log likelihood of the InvGamma distribution and its derivatives (from stan)

Usage

```
llikInvGamma(x, alpha, beta, full = FALSE)
```

Arguments

x	Observation
alpha	distribution parameter
beta	distribution parameter
full	return the input parameters alongside the result

Value

data frame with fx and the derivative of each parameter

llikLnorm *log likelihood of the Lnorm distribution and its derivatives (from stan)*

Description

log likelihood of the Lnorm distribution and its derivatives (from stan)

Usage

```
llikLnorm(x, meanlog, sdlog, full = FALSE)
```

Arguments

x	Observation
meanlog	distribution parameter
sdlog	distribution parameter
full	return the input parameters alongside the result

Value

data frame with fx and the derivative of each parameter

llikLogis *log likelihood of the Logis distribution and its derivatives (from stan)*

Description

log likelihood of the Logis distribution and its derivatives (from stan)

Usage

```
llikLogis(x, location, scale, full = FALSE)
```

Arguments

x	Observation
location	distribution parameter
scale	distribution parameter
full	return the input parameters alongside the result

Value

data frame with fx and the derivative of each parameter

llikNbinom *Calculate the log likelihood of the negative binomial function (and its derivatives)*

Description

Calculate the log likelihood of the negative binomial function (and its derivatives)

Usage

```
llikNbinom(x, size, prob, full = FALSE)
```

Arguments

x	Number of successes
size	Dispersion parameter; may be non-integer
prob	probability of success
full	Add the data frame showing x, mean, sd as well as the fx and derivatives

Value

data frame with fx for the pdf value of with dProb that has the derivatives with respect to the parameters at the observation time-point

Author(s)

Matthew L. Fidler

Examples

```
llikNbinom(46:54, 100, 0.5)

llikNbinom(46:54, 100, 0.5, TRUE)
```

`llikNbinomMu` *Calculate the log likelihood of the negative binomial function (and its derivatives)*

Description

Calculate the log likelihood of the negative binomial function (and its derivatives)

Usage

```
llikNbinomMu(x, size, mu, full = FALSE)
```

Arguments

`x`	Number of successes
`size`	Dispersion parameter; may be non-integer
`mu`	mu parameter for negative binomial
`full`	Add the data frame showing x, mean, sd as well as the fx and derivatives

Value

data frame with `fx` for the pdf value of with `dProb` that has the derivatives with respect to the parameters at the observation time-point

Author(s)

Matthew L. Fidler

Examples

```
llikNbinomMu(46:54, 100, 40)

llikNbinomMu(46:54, 100, 40, TRUE)
```

llikNorm *Log likelihood for normal distribution*

Description

Log likelihood for normal distribution

Usage

```
llikNorm(x, mean = 0, sd = 1, full = FALSE)
```

Arguments

x	Observation
mean	Mean for the likelihood
sd	Standard deviation for the likelihood
full	Add the data frame showing x, mean, sd as well as the fx and derivatives

Value

data frame with fx for the pdf value of with dMean and dSd that has the derivatives with respect to the parameters at the observation time-point

Author(s)

Matthew L. Fidler

Examples

```
llikNorm(0)

llikNorm(seq(-2,2,length.out=10), full=TRUE)
```

llikPareto *log likelihood of the Pareto distribution and its derivatives (from stan)*

Description

log likelihood of the Pareto distribution and its derivatives (from stan)

Usage

```
llikPareto(x, yMin, alpha, full = FALSE)
```

Arguments

x	Observation
yMin	distribution parameter
alpha	distribution parameter
full	return the input parameters alongside the result

Value

data frame with fx and the derivative of each parameter

---

llikParetoType2 *log likelihood of the ParetoType2 distribution and its derivatives (from stan)*

Description

log likelihood of the ParetoType2 distribution and its derivatives (from stan)

Usage

```
llikParetoType2(x, mu, lambda, alpha, full = FALSE)
```

Arguments

x	Observation
mu	distribution parameter
lambda	distribution parameter
alpha	distribution parameter
full	return the input parameters alongside the result

Value

data frame with fx and the derivative of each parameter

llikPois *log-likelihood for the Poisson distribution*

Description

log-likelihood for the Poisson distribution

Usage

```
llikPois(x, lambda, full = FALSE)
```

Arguments

x	non negative integers
lambda	non-negative means
full	Add the data frame showing x, mean, sd as well as the fx and derivatives

Value

data frame with fx for the pdf value of with dLambda that has the derivatives with respect to the parameters at the observation time-point

Author(s)

Matthew L. Fidler

llikRayleigh *log likelihood of the Rayleigh distribution and its derivatives (from stan)*

Description

log likelihood of the Rayleigh distribution and its derivatives (from stan)

Usage

```
llikRayleigh(x, sigma, full = FALSE)
```

Arguments

x	Observation
sigma	distribution parameter
full	return the input parameters alongside the result

Value

data frame with fx and the derivative of each parameter

llikScaledInvChisq *log likelihood of the ScaledInvChisq distribution and its derivatives (from stan)*

Description

log likelihood of the ScaledInvChisq distribution and its derivatives (from stan)

Usage

```
llikScaledInvChisq(x, nu, sigma, full = FALSE)
```

Arguments

x	Observation
nu	distribution parameter
sigma	distribution parameter
full	return the input parameters alongside the result

Value

data frame with fx and the derivative of each parameter

llikT *Log likelihood of T and it's derivatives (from stan)*

Description

Log likelihood of T and it's derivatives (from stan)

Usage

```
llikT(x, df, mean = 0, sd = 1, full = FALSE)
```

Arguments

x	Observation
df	degrees of freedom (> 0, maybe non-integer). df = Inf is allowed.
mean	Mean for the likelihood
sd	Standard deviation for the likelihood
full	Add the data frame showing x, mean, sd as well as the fx and derivatives

Value

data frame with `fx` for the log pdf value of with `dDf` `dMean` and `dSd` that has the derivatives with respect to the parameters at the observation time-point

Author(s)

Matthew L. Fidler

Examples

```
x <- seq(-3, 3, length.out = 21)

llikT(x, 7, 0, 1)

llikT(x, 15, 0, 1, full=TRUE)
```

`llikUnif` *log likelihood and derivatives for Unif distribution*

Description

log likelihood and derivatives for Unif distribution

Usage

```
llikUnif(x, alpha, beta, full = FALSE)
```

Arguments

`x`	variable distributed by a uniform distribution
`alpha`	is the lower limit of the uniform distribution
`beta`	is the upper limit of the distribution
`full`	Add the data frame showing x, mean, sd as well as the fx and derivatives

Value

data frame with `fx` for the log pdf value of with `dProb` that has the derivatives with respect to the `prob` parameters at the observation time-point

Author(s)

Matthew L. Fidler

Examples

```
llikUnif(1, -2, 2)
```

`llikWeibull` *log likelihood and derivatives for Weibull distribution*

Description

log likelihood and derivatives for Weibull distribution

Usage

```
llikWeibull(x, shape, scale, full = FALSE)
```

Arguments

`x`	variable distributed by a Weibull distribution
`shape`, `scale`	shape and scale parameters, the latter defaulting to 1.
`full`	Add the data frame showing x, mean, sd as well as the fx and derivatives

Value

data frame with `fx` for the log pdf value of with `dProb` that has the derivatives with respect to the `prob` parameters at the observation time-point

Author(s)

Matthew L. Fidler

Examples

```
llikWeibull(1, 1, 10)
```

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