

# Package ‘rxode2ll’

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**Version** 2.0.13

**Title** Log-Likelihood Functions for 'rxode2'

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**Depends** R (>= 4.0.0)

**Suggests** covr, testthat (>= 3.0.0)

**Imports** Rcpp (>= 1.0.8), checkmate, RcppParallel

**Description** Provides the log-likelihoods with gradients from 'stan' (Carpenter et al (2015), <[doi:10.48550/arXiv.1509.07164](https://doi.org/10.48550/arXiv.1509.07164)>) needed for generalized log-likelihood estimation in 'nlmixr2' (Fidler et al (2019) <[doi:10.1002/psp4.12445](https://doi.org/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](https://doi.org/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/>

**RoxygenNote** 7.2.3

**Biarch** true

**LinkingTo** Rcpp (>= 1.0.8), RcppEigen (>= 0.3.3.9.2), StanHeaders (>= 2.21.0.7), BH (>= 1.78.0.0), RcppParallel

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**Repository** CRAN

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llikBeta	<i>Calculate the log likelihood of the binomial function (and its derivatives)</i>
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### 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)
```

---

llikBinom	<i>Calculate the log likelihood of the binomial function (and its derivatives)</i>
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---

**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	<i>log likelihood of Cauchy distribution and it's derivatives (from stan)</i>
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---

**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	<i>log likelihood and derivatives for chi-squared distribution</i>
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---

**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)
```

---

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**

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

---

llikGamma	<i>log likelihood and derivatives for Gamma distribution</i>
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**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	<i>log likelihood and derivatives for Geom distribution</i>
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---

**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. $0 < \text{prob} \leq 1$ .
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)
```

---

llikNbinom	<i>Calculate the log likelihood of the negative binomial function (and its derivatives)</i>
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---

**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	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**

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

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

---

llikNbinomMu	<i>Calculate the log likelihood of the negative binomial function (and its derivatives)</i>
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**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	Size of trial
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	<i>Log likelihood for normal distribution</i>
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**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)
```

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llikPois	<i>log-likelihood for the Poisson distribution</i>
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**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

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llikT	<i>Log likelihood of T and it's derivatives (from stan)</i>
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**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*

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**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)
```

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llikWeibull	<i>log likelihood and derivatives for Weibull distribution</i>
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**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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