

# Package ‘mcmapper’

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**Title** Mapping First Moment and C-Statistic to the Parameters of Distributions for Risk

**Version** 0.0.11

**Description** Provides a series of numerical methods for extracting parameters of distributions for risks based on knowing the expected value and c-statistics (e.g., from a published report on the performance of a risk prediction model). This package implements the methodology described in Sadatsafavi et al (2024) <[doi:10.48550/arXiv.2409.09178](https://doi.org/10.48550/arXiv.2409.09178)>. The core of the package is `mcmmap()`, which takes a pair of (mean, c-statistic) and the distribution type requested. This function provides a generic interface to more customized functions (`mcmmap_beta()`, `mcmmap_logitnorm()`, `mcmmap_probitnorm()`) for specific distributions.

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logitnorm	<i>Functions related to logit-normal distribution.</i>
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**Description**

Functions related to logit-normal distribution.

**Usage**

```
rlogitnorm(n, mu, sigma)
```

```
dlogitnorm(x, mu, sigma)
```

```
plogitnorm(x, mu, sigma)
```

```
qlogitnorm(x, mu, sigma)
```

**Arguments**

n	Number of draws requested (for rlogitnorm)
mu	Mean of the logit-transformed variable
sigma	SD of the logit-transformed variable
x	For density, CDF, and quantile functions

**Value**

Depends on the function

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mcmmap	<i>The main mapper function</i>
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**Description**

Maps a pair of mean and c-statistic value to the parameters of a specified distribution for risk

**Usage**

```
mcmmap(target, type = c("beta", "logitnorm", "probitnorm"))
```

**Arguments**

target	A vector of size 2. The first element is mean and the second element is c-statistic.
type	One of "beta", "logitnorm", "probitnorm". Loosy matching is enabled (so "b" will be mapped to "beta").

**Value**

An object of class `mcmapper`. The "value" component returns the parameter. Any warning or error from the integration or gradient ascent will also be returned in the "info" component.

**Examples**

```
mcmmap(c(0.1, 0.75), "beta")
```

---

mcmmap\_beta

*Mapper function for beta distribution*

---

**Description**

Maps a pair of mean and c-statistic value to the parameters of a beta distribution

**Usage**

```
mcmmap_beta(
  target,
  method = "",
  integrate_controls = list(),
  optim_controls = list()
)
```

**Arguments**

`target` A vector of size 2. The first element is mean and the second element is c-statistic.

`method` Not implemented for this function yet; leave as empty string.

`integrate_controls` (optional): parameters to be passed to `integrate()`

`optim_controls` (optional): parameters to be passed to `optim()`

**Value**

A vector of size two that contains the distribution parameters

**Examples**

```
mcmmap_beta(c(0.1, 0.75))
```

---

mcmmap_generic	<i>A generic mapper function</i>
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### Description

Maps a pair of mean and c-statistic value to the parameters of an unspecified distribution that is indexed by two parameters

### Usage

```
mcmmap_generic(
  target,
  CDF,
  integrate_controls = list(),
  optim_controls = list()
)
```

### Arguments

target	A vector of size 2. The first element is mean and the second element is c-statistic.
CDF	Cumulative distribution function of an unspecified distribution. The CDF must be indexed by two parameters.
integrate_controls	(optional): parameters to be passed to integrate()
optim_controls	(optional): parameters to be passed to optim()

### Value

A vector of size two that contains the distribution parameters

### Examples

```
mcmmap_generic(c(0.1, 0.75), pbeta)
```

---

mcmmap_logitnorm	<i>Mapper function for logit-normal distribution</i>
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---

### Description

Maps a pair of mean and c-statistic value to the parameters of a logit-normal distribution

**Usage**

```
mcmmap_logitnorm(
  target = c(m = 0.25, c = 0.75),
  method = "",
  integrate_controls = list(),
  optim_controls = list()
)
```

**Arguments**

**target** A vector of size 2. The first element is mean and the second element is c-statistic.

**method** Either empty string, which invoked the default method; or "meansolve" which uses two 1-dimensional optimization approach.

**integrate\_controls** (optional): parameters to be passed to integrate()

**optim\_controls** (optional): parameters to be passed to optim()

**Value**

A vector of size two that contains the distribution parameters

**Examples**

```
mcmmap_logitnorm(c(0.1, 0.75))
```

---

mcmmap\_probitnorm      *Mapper function for probit-normal distribution*

---

**Description**

Maps a pair of mean and c-statistic value to the parameters of a pobit-normal distribution

**Usage**

```
mcmmap_probitnorm(
  target = c(m = 0.25, c = 0.75),
  method = "",
  integrate_controls = list(),
  optim_controls = list()
)
```

**Arguments**

target	A vector of size 2. The first element is mean and the second element is c-statistic.
method	Fir compatibilty with other functions. Use "" for now (alternative optimization methods might be implemented in the future)
integrate_controls	(optional): parameters to be passed to integrate()
optim_controls	(optional): parameters to be passed to optim()

**Value**

A vector of size two that contains the distribution parameters

**Examples**

```
mcmmap_probitnorm(c(0.1, 0.75))
```

---

 probitnorm

*Functions related to probit-normal distribution.*


---

**Description**

Functions related to probit-normal distribution.

**Usage**

```
dprobitnorm(x, mu, sigma)
```

```
pprobitnorm(x, mu, sigma)
```

```
rprobitnorm(n, mu, sigma)
```

```
qprobitnorm(x, mu, sigma)
```

**Arguments**

x	For density, CDF, and quantile functions
mu	Mean of the probit-transformed variable
sigma	SD of the probit-transformed variable
n	Number of draws requested (for rprobitnorm)

**Value**

Depends on the function

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