Package ‘finiteruinprob’

December 30, 2016

Type  Package
Title  Computation of the Probability of Ruin Within a Finite Time Horizon
Version  0.6
Date  2016-12-30
Maintainer  Benjamin Baumgartner <benjamin@baumgrt.com>
Description  In the Cramér–Lundberg risk process perturbed by a Wiener process, this packages provides approximations to the probability of ruin within a finite time horizon. Currently, there are three methods implemented: The first one uses saddlepoint approximation (two variants are provided), the second one uses importance sampling and the third one is based on the simulation of a dual process. This last method is not very accurate and only given here for completeness.
License  AGPL-3
Imports  sdprisk, numDeriv, utils, methods
Encoding  UTF-8
NeedsCompilation  no
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Repository  CRAN
Date/Publication  2016-12-30 19:38:40

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**Description**

In the Cramér–Lundberg risk process perturbed by a Wiener process, this package provides approximations to the probability of ruin within a finite time horizon. Currently, there are three methods implemented: The first one uses saddlepoint approximation (two variants are provided), the second one uses importance sampling and the third one is based on the simulation of a dual process. This last method is not very accurate and only given here for completeness.

**Author(s)**

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**References**


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**rriskproc**

*Simulation of a risk process that is perturbed by a Wiener process*

**Description**

This function simulates paths of a compound Poisson risk process that is perturbed by a Wiener process. Multiple paths can be simulated simultaneously.

**Usage**

```r
rriskproc(m = 1001L, window = c(0L, 1L), num = 1L,
           sigma = 1L, freq = 1L, drift = 0L, jumpdist, ...)
```

**Arguments**

- `m`: Number of sample points for each path
- `window`: Beginning and end of the time window
- `num`: Number of paths to be simulated
- `sigma`: Volatility of the Wiener process
- `freq`: Frequency of the claims
- `drift`: Drift (premium intensity) of the process
- `jumpdist`: A function that returns realizations of the claim distribution
- `...`: Additional arguments for `jumpdist`
**Details**

Possible choices for `jumpdist` include `rexp`, `rgamma` and `rlnorm`.

It is assumed that the function specified for `jumpdist` interprets its first argument as the vector length of its return value, i.e. the number of simultaneously generated random variables.

The path realizations of the Wiener process are generated using the circulant embedding method (see references).

**Value**

A *time-series object/time-series object* containing the simulated sample path(s).

**References**


**See Also**

`rhypoexp`

**Examples**

```r
require(sdprisk)

rriskproc(m = 1001,
          window = c(0, 5),
          num = 1,
          sigma = sqrt(0.4),
          freq = 1,
          drift = 2,
          jumpdist = rhypoexp,
          rate = c(1, 10))

# The same can be achieved using
# jumpdist = function(n) rexp(n, 1) + rexp(n, 10)

rriskproc(window = c(0, 10),
          jumpdist = function(n) {
            rexp(n, 1) + rexp(n, 10)
          })
```
ruinprob.finite.dsim  Computation of the probability of ruin within a finite time horizon using a dual process

Description

This function calculates an approximation to the probability of ruin within a finite time horizon for a compound Poisson risk process that is perturbed by a Wiener process. The approximation is based on a dual process to the risk process.

Usage

ruinprob.finite.dsim(Z)

Arguments

Z  A time-series object, e.g. one generated by riskproc, containing at least two series

Details

This function computes an approximation to the probability of ruin within a finite time horizon using a dual process. See the references for more details.

Value

A function taking one numeric argument, the initial capital. This function returns the approximation for the specified initial reserve and for all values of the time horizon that are sampling points of Z.

References


ruinprob.finite.imps  Approximation of the probability of ruin within a finite time horizon using importance sampling

Description

This function calculates an approximation to the probability of ruin within a finite time horizon for a compound Poisson risk process that is perturbed by a Wiener process. The approximation is based on importance sampling.
ruinprob.finite.sdp

Usage
ruinprob.finite.imps()

Value
This function is not yet fully implemented. At the moment it invisibly returns NULL.

References

ruinprob.finite.sdp  Approximation of the probability of ruin within a finite time horizon using saddlepoint methods

Description
This function calculates an approximation to the probability of ruin within a finite time horizon for a compound Poisson risk process that is perturbed by a Wiener process. The approximation makes use of saddlepoint methods.

Usage
ruinprob.finite.sdp(mgf, mgf.d1, mgf.d2, premium, freq, variance, endpoint, verbose = FALSE)

Arguments
mgf   The moment-generating function of the individual claim amounts
mgf.d1 The first derivative of mgf
mgf.d2 The second derivative of mgf
premium The premium force
freq   Frequency of the claims
variance The variance of the Wiener process by which the risk process is perturbed
endpoint The upper endpoint of mgf, i.e. the position of a pole
verbose Return additional diagnostic information as an attribute of the output

Details
If neither or only the first derivative of mgf is provided, a numerical approximation to the missing derivative(s) will be used instead (see grad and hessian).

The argument endpoint is the (smallest) positive pole of mgf. Omitting this information will issue a warning and the value 1.0e+6 will be used instead, possibly yielding unexpected and unreliable output or leading to further errors.
Value

A function \( \psi(x, t) \) taking as inputs the initial capital \( x \) and the time horizon \( t \). This function returns a list, the first element of which contains a Lugannani–Rice-type approximation, the second one contains a Skovgaard-type approximation.

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