Package ‘finiteruinprob’

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Type Package

Title Computation of the probability of ruin within a finite time horizon

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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.

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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.

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References


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

rriskproc(m = 1001, window = c(0, 1), num = 1, sigma = 1, freq = 1, drift = 0, 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 \texttt{rexp}, \texttt{rgamma} and \texttt{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 \texttt{time-series object/time-series object} containing the simulated sample path(s).

References


See Also

\texttt{rhypoexp}

Examples

\begin{verbatim}
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)
          })
\end{verbatim}
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.
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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