

Package ‘DtD’

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Type Package

Title Distance to Default

Version 0.1.0

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Description Provides fast methods to work with Merton's distance to default model introduced in Merton (1974) <doi:10.1111/j.1540-6261.1974.tb03058.x>. The methods includes simulation and estimation of the parameters.

License GPL-2

Encoding UTF-8

BugReports <https://github.com/boennecd/DtD/issues>

LazyData true

LinkingTo Rcpp, RcppArmadillo

Imports Rcpp, checkmate

Suggests knitr, rmarkdown, testthat, microbenchmark

VignetteBuilder knitr

RoxygenNote 6.0.1

SystemRequirements C++11

NeedsCompilation yes

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Repository CRAN

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`BS_call`*European Call Option Price and the Inverse*

Description

Computes the European call option and the inverse. All vectors with length greater than one needs to have the same length.

Usage

```
BS_call(V, D, T., r, vol)
```

```
get_underlying(S, D, T., r, vol, tol = 1e-12)
```

Arguments

| | |
|-----|---|
| V | numeric vector or scalar with price of the underlying asset. |
| D | numeric vector or scalar with debt due in T.. |
| T. | numeric vector or scalar with time to maturity. |
| r | numeric vector or scalar with risk free rates. |
| vol | numeric vector or scalar with volatilities, σ s. |
| S | numeric vector with observed stock prices. |
| tol | numeric scalar with tolerance in get_underlying . |

Value

Numeric vector or scalar with price of the underlying asset or equity price.

See Also

[BS_fit](#)

Examples

```
library(DtD)
set.seed(58661382)
sims <- BS_sim(
  vol = .2, mu = .03, dt = .1, V_0 = 100, T. = 1, D = rep(80, 20), r = .01)

stopifnot(with(
  sims, isTRUE(all.equal(V, get_underlying(S, D, T, r, vol))))))
stopifnot(with(
  sims, isTRUE(all.equal(S, BS_call(V, D, T, r, vol))))))
```

Description

Function to estimate the volatility, σ , and drift, μ . See `vignette("Distance-to-default", package = "DtD")` for details. All vectors with length greater than one needs to have the same length. The Nelder-Mead method from `optim` is used when `method = "mle"`. Either `time` or `dt` should be passed.

Usage

```
BS_fit(S, D, T., r, time, dt, vol_start, method = c("iterative", "mle"),
       tol = 1e-12, eps = 1e-08)
```

Arguments

| | |
|-----------|--|
| S | numeric vector with observed stock prices. |
| D | numeric vector or scalar with debt due in T.. |
| T. | numeric vector or scalar with time to maturity. |
| r | numeric vector or scalar with risk free rates. |
| time | numeric vector with the observation times. |
| dt | numeric scalar with time increments between observations. |
| vol_start | numeric scalar with starting value for σ . |
| method | string to specify which estimation method to use. |
| tol | numeric scalar with tolerance in <code>get_underlying</code> . |
| eps | convergence threshold. |

Value

A list with the following components

| | |
|---------|---|
| ests | estimates of σ , and drift, μ . |
| n_iter | number of iterations when <code>method = "iterative"</code> and number of log likelihood evaluations when <code>method = "mle"</code> . |
| success | logical for whether the estimation method converged. |

Examples

```
library(DtD)
set.seed(83486778)
sims <- BS_sim(
  vol = .1, mu = .05, dt = .1, V_0 = 100, T. = 1, D = rep(80, 20), r = .01)

with(sims,
     BS_fit(S = S, D = D, T. = T, r = r, time = time, method = "mle"))
```

`BS_sim`*Simulate Stock Price and Price of Underlying Asset*

Description

At least one of D , r , or T . needs to have the desired length of the simulated series. All vectors with length greater than one needs to have the same length.

Usage

```
BS_sim(vol, mu, dt, V_0, D, r, T.)
```

Arguments

| | |
|------------------|---|
| <code>vol</code> | numeric scalar with σ value. |
| <code>mu</code> | numeric scalar with μ value. |
| <code>dt</code> | numeric scalar with time increments between observations. |
| <code>V_0</code> | numeric scalar with starting value of the underlying asset, S_0 . |
| <code>D</code> | numeric vector or scalar with debt due in T . |
| <code>r</code> | numeric vector or scalar with risk free rates. |
| <code>T.</code> | numeric vector or scalar with time to maturity. |

See Also

[BS_fit](#)

Examples

```
library(DtD)
set.seed(79156879)
sims <- BS_sim(
  vol = .1, mu = .05, dt = .2, V_0 = 100, T. = 1, D = rep(80, 20), r = .01)

# plot underlying
plot(sims$V)

# plot stock
plot(sims$S)
```

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