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Type Package

Title Utilizes the Black-Scholes Option Pricing Model to Perform Strategic Option Analysis and Plot Option Strategies

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Description Utilizes the Black-Scholes-Merton option pricing model to calculate key option analytics and perform graphical analysis of various option strategies. Provides functions to calculate the option premium and option greeks of European-style options.

License GPL-3

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Contents

`calldelta` *Call Delta*

Description

Calculates the delta of the European- style call option

Usage

```
calldelta(s, x, sigma, t, r, d = 0)
```

Arguments

`s`	Spot price of the underlying asset
`x`	Strike price of the option
`sigma`	Implied volatility of the underlying asset price, defined as the annualized standard deviation of the asset returns
`t`	Time to maturity in years
`r`	Annual continuously-compounded risk-free rate, use the function r.cont
`d`	Annual continuously-compounded dividend yield, use the function r.cont

Details

The delta of an option can be defined as the rate of change of the option value given a $1 change in the underlying asset price.

Value

Returns the call delta

Examples

```
calldelta(100, 100, 0.20, (45/365), 0.02, 0.02)
```

---

calleval *Call Option Evaluation*

Description

Creates a data.frame containing call option greeks; delta, gamma, vega, theta, rho and the call premium

Usage

```
calleval(s, x, sigma, t, r, d = 0)
```

Arguments

s	Spot price of the underlying asset
x	Strike price of the option
sigma	Implied volatility of the underlying asset price, defined as the annualized standard deviation of the asset returns
t	Time to maturity in years
r	Annual continuously-compounded risk-free rate, use the function r.cont
d	Annual continuously-compounded dividend yield, use the function r.cont

Value

Returns a data.frame containing the option premium and greeks:

- Premium
- Delta
- Gamma
- Vega
- Theta
- Rho

Author(s)

John T. Buynak

Examples

```
calleval(100, 100, 0.20, (45/365), 0.02, 0.02)
```

---

callgreek *Call Option Greek*

Description

Computes the selected option greek, including premium

Usage

```
callgreek(greek = c("delta", "gamma", "theta", "vega", "rho", "premium"),
  s, x, sigma, t, r, d = 0)
```

Arguments

greek	String value, desired option greek to return
s	Spot price of the underlying asset
x	Strike price of the option
sigma	Implied volatility of the underlying asset price, defined as the annualized standard deviation of the asset returns
t	Time to maturity in years
r	Annual continuously-compounded risk-free rate, use the function r.cont
d	Annual continuously-compounded dividend yield, use the function r.cont

Value

Returns the desired option greek, including premium

Examples

```
callgreek("delta", 100, 100, 0.20, (45/365), 0.02, 0.02)
callgreek("gamma", 100, 100, 0.20, (45/365), 0.02, 0.02)
```

callpremium *Call Premium*

Description

Calculates the premium of a European-style call option using the Black-Scholes option pricing model

Usage

```
callpremium(s, x, sigma, t, r, d = 0)
```

Arguments

s	Spot price of the underlying asset
x	Strike price of the option
sigma	Implied volatility of the underlying asset price, defined as the annualized standard deviation of the asset returns
t	Time to maturity in years
r	Annual continuously-compounded risk-free rate, use the function r.cont
d	Annual continuously-compounded dividend yield, use the function r.cont

Value

Returns the value of the call option

Examples

```
callpremium(100, 100, 0.20, (45/365), 0.02, 0.02)
```

callrho *Call Rho*

Description

Calculates the rho of the European- style call option

Usage

```
callrho(s, x, sigma, t, r, d = 0)
```

Arguments

s	Spot price of the underlying asset
x	Strike price of the option
sigma	Implied volatility of the underlying asset price, defined as the annualized standard deviation of the asset returns
t	Time to maturity in years
r	Annual continuously-compounded risk-free rate, use the function r.cont
d	Annual continuously-compounded dividend yield, use the function r.cont

Details

Rho measures the change in the option's value given a 1

Value

Returns the call rho

Examples

```
callrho(100, 100, 0.20, (45/365), 0.02, 0.02)
```

---

calltheta *Call Theta*

Description

Calculates the theta of the European- style call option

Usage

```
calltheta(s, x, sigma, t, r, d = 0)
```

Arguments

s	Spot price of the underlying asset
x	Strike price of the option
sigma	Implied volatility of the underlying asset price, defined as the annualized standard deviation of the asset returns
t	Time to maturity in years
r	Annual continuously-compounded risk-free rate, use the function r.cont
d	Annual continuously-compounded dividend yield, use the function r.cont

Details

Theta is the "time-decay" of the option value measured as a daily value

Value

Returns the call theta

Examples

```
calltheta(100, 100, 0.20, (45/365), 0.02, 0.02)
```

---

dv *Double Vertical Spread Analytics*

Description

Calculates the key analytics of a Double Vertical Credit Spread

Usage

```
dv(s, x1, x2, x3, x4, t, r, sigma, sigma2 = sigma, sigma3 = sigma,
  sigma4 = sigma, vol = sigma, d = 0)
```

Arguments

s	Spot price of the underlying asset
x1	Strike price of the lower strike (long) put option
x2	Strike price of the higher strike (short) put option
x3	Strike price of the lower strike (short) call option
x4	Strike price of the higher strike (long) call option
t	Time to expiration in years
r	Annual continuously compounded risk-free rate
sigma	Implied volatility of the lower strike (long) put option (annualized)
sigma2	Implied volatility of the higher strike (short) put option (annualized)
sigma3	Implied volatility of the lower strike (short) call option (annualized)
sigma4	Implied volatility of the higher strike (long) call option (annualized)
vol	Manual over-ride for the volatility of the underlying asset (annualized)
d	Annual continuously compounded dividend yield

Value

Returns a data.frame

Examples

```
dv(s = 100, x1 = 90, x2 = 95, x3 = 105, x4 = 110, t = 0.08, r = 0.02, sigma = 0.2, vol = 0.3)
```

iv.calc *Implied Volatility Calculation*

Description

Computes the implied volatility of an option, either a call or put, given the option premium and key parameters

Usage

```
iv.calc(type, price, s, x, t, r, d = 0)
```

Arguments

type	String argument, either "call" or "put"
price	Current price of the option
s	Spot price of the underlying asset
x	Strike Price of the underlying asset
t	Time to expiration in years
r	Annual continuously compounded risk-free rate
d	Annual continuously compounded dividend yield

Value

Returns a single option's implied volatility

Examples

```
iv.calc(type = "call", price = 2.93, s = 100, x = 100, t = (45/365), r = 0.02, d = 0)
```

lambda *Lambda*

Description

Calculates the Lambda of the call or put option

Usage

```
lambda(type = "call", s, x, sigma, t, r, d = 0)
```

Arguments

type	Character string, either "call" or "put"
s	Spot price of the underlying asset
x	Strike price of the option
sigma	Implied volatility of the underlying asset price, defined as the annualized standard deviation of the asset returns
t	Time to maturity in years
r	Annual continuously-compounded risk-free rate, use the function r.cont
d	Annual continuously-compounded dividend yield, use the function r.cont

Details

Lambda, or elasticity is the percentage change in the option valueper percentage change in the underlying price. It is a measure of leverage.

Value

Calculates the Lambda of the option contract

Examples

```
lambda(type = "put", s = 100, x = 100, sigma = 0.15, t = 45/365, r = 0.02)
```

---

opteval *Dual Option Evaluation*

Description

Creates a data.frame containing both call and put option greeks; delta, gamma, vega, theta, rho and the option premium

Usage

```
opteval(s, x, sigma, t, r, d = 0)
```

Arguments

s	Spot price of the underlying asset
x	Strike price of the option
sigma	Implied volatility of the underlying asset price, defined as the annualized standard deviation of the asset returns
t	Time to maturity in years
r	Annual continuously-compounded risk-free rate, use the function r.cont
d	Annual continuously-compounded dividend yield, use the function r.cont

Value

Returns a data.frame containing the call and put option premium and greeks:

- Premium
- Delta
- Gamma
- Vega
- Theta
- Rho

Examples

```
opteval(100, 100, 0.20, (45/365), 0.02, 0.02)
```

`optiongamma` *Option Gamma*

Description

Calculates the gamma of a European- style call and put option

Usage

```
optiongamma(s, x, sigma, t, r, d = 0)
```

Arguments

`s`	Spot price of the underlying asset
`x`	Strike price of the option
`sigma`	Implied volatility of the underlying asset price, defined as the annualized standard deviation of the asset returns
`t`	Time to maturity in years
`r`	Annual continuously-compounded risk-free rate, use the function r.cont
`d`	Annual continuously-compounded dividend yield, use the function r.cont

Details

Gamma is the rate of change of the option's delta given a $1 change in the underlying asset.

Value

Returns the option gamma

Examples

```
optiongamma(100, 100, 0.20, (45/365), 0.02, 0.02)
```

optionvega *Option Vega*

Description

Calculates the vega of a European- style call and put option

Usage

```
optionvega(s, x, sigma, t, r, d = 0)
```

Arguments

s	Spot price of the underlying asset
x	Strike price of the option
sigma	Implied volatility of the underlying asset price, defined as the annualized standard deviation of the asset returns
t	Time to maturity in years
r	Annual continuously-compounded risk-free rate, use r.cont
d	Annual continuously-compounded dividend yield, use r.cont

Details

Vega measures the change in the option's value given a 1

Value

Returns the option vega

Examples

```
optionvega(100, 100, 0.20, (45/365), 0.02, 0.02)
```

plotbearcall *Plot Bear Call Spread*

Description

Plot a bear call spread (credit spread)

Usage

```
plotbearcall(s, x1, x2, t, r, sigma, sigma2 = sigma, d = 0,
  ll = 0.75, ul = 1.25, xlab = "spot", ylab = "Profit/Loss",
  main = "Bear Call Spread", ...)
```

Arguments

s	Spot price of the underlying asset
x1	Lower-strike option price (short option)
x2	Higher-strike option price (long option)
t	Time to expiration in years
r	Annual continuously compounded risk-free rate
sigma	Annualized implied volatility of the lower-strike option
sigma2	Annualized implied volatility of the higher-strike option
d	Annual continuously compounded risk-free rate
ll	Lower-limit of the plot, set as (desired price/spot)
ul	Upper-limit of the plot, set as (desired price/spot)
xlab	X-Axis Label
ylab	Y-Axis Label
main	Title of the plot
...	Additional plot parameters

Value

Returns a plot of a vertical call spread (credit spread). Black line: The profit(loss) at expiration. Red line: The profit(loss) at (1/2) time "t" ~ half-way to expiration. Blue line: The profit(loss) at inception.

Author(s)

John T. Buynak

Examples

```
plotbearcall(s= 100, x1 = 95, x2 = 105, t = (45/365), r = 0.02,
sigma = 0.20, sigma2 = 0.20, d = 0, ll = 0.75, ul = 1.25)
```

---

plotbearput *Plot Bear Put Spread*

Description

Plot a bear put spread (debit spread)

Usage

```
plotbearput(s, x1, x2, t, r, sigma, sigma2 = sigma, d = 0, ll = 0.75,
  ul = 1.25, xlab = "spot", ylab = "Profit/Loss",
  main = "Bear Put Spread", ...)
```

Arguments

s	Spot price of the underlying asset
x1	Lower-strike option price (short option)
x2	Higher-strike option price (long option)
t	Time to expiration in years
r	Annual continuously compounded risk-free rate
sigma	Annualized implied volatility of the lower-strike option
sigma2	Annualized implied volatility of the higher-strike option
d	Annual continuously compounded risk-free rate
ll	Lower-limit of the plot, set as (desired price/spot)
ul	Upper-limit of the plot, set as (desired price/spot)
xlab	X-Axis Label
ylab	Y-Axis Label
main	Title of the plot
...	Additional plot parameters

Value

Returns a plot of a vertical put spread (debit spread). Black line: The profit(loss) at expiration. Red line: The profit(loss) at (1/2) time "t" ~ half-way to expiration. Blue line: The profit(loss) at inception.

Author(s)

John T. Buynak

Examples

```
plotbearput(s= 100, x1 = 95, x2 = 105, t = (45/365), r = 0.02,
sigma = 0.20, sigma2 = 0.20, d = 0, ll = 0.75, ul = 1.25)
```

---

plotbullcall *Plot Bull Call Spread*

Description

Plot a bull call spread (debit spread)

Usage

```
plotbullcall(s, x1, x2, t, r, sigma, sigma2 = sigma, d = 0,
  ll = 0.75, ul = 1.25, xlab = "spot", ylab = "profit/loss",
  main = "Bull Call Spread", ...)
```

Arguments

s	Spot price of the underlying asset
x1	Lower-strike option price (long option)
x2	Higher-strike option price (short option)
t	Time to expiration in years
r	Annual continuously compounded risk-free rate
sigma	Annualized implied volatility of the lower-strike option
sigma2	Annualized implied volatility of the higher-strike option
d	Annual continuously compounded risk-free rate
ll	Lower-limit of the plot, set as (desired price/spot)
ul	Upper-limit of the plot, set as (desired price/spot)
xlab	X-Axis Label
ylab	Y-Axis Label
main	Title of the plot
...	Additional plot parameters

Value

Returns a plot of a vertical call spread (debit spread). Black line: The profit(loss) at expiration. Red line: The profit(loss) at (1/2) time "t" ~ half-way to expiration. Blue line: The profit(loss) at inception.

Author(s)

John T. Buynak

Examples

```
plotbullcall(s= 100, x1 = 95, x2 = 105, t = (45/365), r = 0.02,
sigma = 0.20, sigma2 = 0.20, d = 0, ll = 0.75, ul = 1.25)
```

---

plotbullput *Plot Bull Put Spread*

Description

Plot a bull put spread (credit spread)

Usage

```
plotbullput(s, x1, x2, t, r, d = 0, sigma, sigma2 = sigma, ll = 0.75,
  ul = 1.25, xlab = "spot", ylab = "Profit/Loss",
  main = "Bull Put Spread", ...)
```

Arguments

s	Spot price of the underlying asset
x1	Lower-strike option price (long option)
x2	Higher-strike option price (short option)
t	Time to expiration in years
r	Annual continuously compounded risk-free rate
d	Annual continuously compounded risk-free rate
sigma	Annualized implied volatility of the lower-strike option
sigma2	Annualized implied volatility of the higher-strike option
ll	Lower-limit of the plot, set as (desired price/spot)
ul	Upper-limit of the plot, set as (desired price/spot)
xlab	X-Axis Label
ylab	Y-Axis Label
main	Title of the plot
...	Additional plot parameters

Value

Returns a plot of a vertical put spread (credit spread). Black line: The profit(loss) at expiration. Red line: The profit(loss) at (1/2) time "t" ~ half-way to expiration. Blue line: The profit(loss) at inception.

Author(s)

John T. Buynak

Examples

```
plotbullput(s= 100, x1 = 95, x2 = 105, t = (45/365), r = 0.02,
sigma = 0.20, sigma2 = 0.20, d = 0, ll = 0.75, ul = 1.25)
```

---

plotdv *Plot Double Vertical Spread*

Description

Plot a double vertical spread (credit spread)

Usage

```
plotdv(s, x1, x2, x3, x4, t, r, sigma, sigma2 = sigma, sigma3 = sigma,
  sigma4 = sigma, d = 0, ll = 0.75, ul = 1.25, xlab = "spot",
  ylab = "Profit/Loss", main = "Double Vertical Spread", ...)
```

Arguments

s	Spot price of the underlying asset
x1	Lower-strike put option price (long option)
x2	Higher-strike put option price (short option)
x3	Lower-strike call option price (short option)
x4	Higher-strike call option price (long option)
t	Time to expiration in years
r	Annual continuously compounded risk-free rate
sigma	Annualized implied volatility of the lower-strike put option
sigma2	Annualized implied volatility of the higher-strike put option
sigma3	Annualized implied volatility of the lower-strike call option
sigma4	Annualized implied volatility of the higher-strike call option
d	Annual continuously compounded risk-free rate
ll	Lower-limit of the plot, set as (desired price/spot)
ul	Upper-limit of the plot, set as (desired price/spot)
xlab	X-Axis Label
ylab	Y-Axis Label
main	Title of the plot
...	Additional plot parameters

Details

The double vertical spread consists of a credit put spread and a credit debit spread.

Value

Returns a plot of a double vertical spread (credit spread). Black line: The profit(loss) at expiration. Red line: The profit(loss) at (1/2) time "t" ~ half-way to expiration. Blue line: The profit(loss) at inception.

Author(s)

John T. Buynak

Examples

```
plotdv(s= 100, x1 = 90, x2 = 95, x3 = 105, x4 = 110, t = (45/365), r = 0.02, sigma = 0.20)
```

`plotvertical` *Plot Custom Vertical Spread*

Description

Plot Custom Vertical Spread

Usage

```
plotvertical(options = c("call", "put"), s, x1, x2, t, r, sigma,
  sigma2 = sigma, d = 0, ll = 0.75, ul = 1.25, xlab = "spot",
  ylab = "profit/loss", main = "Vertical Spread", ...)
```

Arguments

`options`	String argument, either "call" or "put"
`s`	Spot price of the underlying asset
`x1`	Short strike (either higher or lower)
`x2`	Long strike (either higher or lower)
`t`	Time to expiration in years
`r`	Annual continuously compounded risk-free rate
`sigma`	Annualized implied volatility of the short option
`sigma2`	Annualized implied volatility of the long option
`d`	Annual continuously compounded dividend yield
`ll`	Lower-limit of the plot, set as (desired price/spot)
`ul`	Upper-limit of the plot, set as (desired price/spot)
`xlab`	X-Axis Label
`ylab`	Y-Axis Label
`main`	Title of the plot
`...`	Additional plot parameters

Value

Returns a plot of a custom vertical spread. Black line: The profit(loss) at expiration. Red line: The profit(loss) at (1/2) time "t" ~ half-way to expiration. Blue line: The profit(loss) at inception.

Author(s)

John T. Buynak

Examples

```
plotvertical("call", 100, 90, 110, (45/365), 0.02, 0.20)
```

prob.above *Probability Above*

Description

Calculates the probability of the underlying asset value remaining above a price level in a designated time frame, given the daily standard devaiation of the underlying returns.

Usage

```
prob.above(spot, lower, mean = 0, asd = 0, dsd = 0, dte = 0, p,
  quantile = FALSE, tradedays = 262)
```

Arguments

spot	Current price of the underlying asset
lower	Lower price of the range
mean	The average daily price movement, default = 0
asd	Annualized standard deviation of the underlying returns
dsd	Daily standard deviation of the underlying returns (Annual vol/sqrt(256)), used as an alternative to the asd parameter in conjuction with the dte parameter
dte	Days until expiration, designated time frame
p	Designated probability
quantile	Logical. If True, calculates the price the asset will remain above, given the designated probability
tradedays	Number of trade days in a year, default = 262

Details

This function has two separate possible operations: 1. Calculates the probability of the underlying asset value remaining above a price level in a designated time frame, given the daily standard devaiation of the underlying returns. 2. Calculates the price the asset will remain above, given the designated probability

Value

Returns a probability (if quantile = FALSE), Returns a data.frame (if quantile = TRUE)

Examples

```
prob.above(spot = 100, lower = 110, mean = 0, dsd = 0.01, dte = 45)
prob.above(spot = 100, mean = 0, dsd = 0.01, dte = 45, p = 0.75, quantile = TRUE)
```

prob.below *Probability Below*

Description

Calculates the probability of the underlying asset value remaining below a price level in a designated time frame, given the daily standard devaiation of the underlying returns.

Usage

```
prob.below(spot, upper, mean = 0, asd = 0, dsd = 0, dte = 0, p,
  quantile = FALSE, tradedays = 262)
```

Arguments

spot	Current price of the underlying asset
upper	Upper price of the range
mean	The average daily price movement, default = 0
asd	Annualized standard deviation of the underlying returns
dsd	Daily standard deviation of the underlying returns (Annual vol/sqrt(256)), used as an alternative to the asd parameter in conjuction with the dte parameter
dte	Days until expiration, designated time frame
p	Designated probability
quantile	Logical. If True, calculates the price the asset will remain below, given the designated probability
tradedays	Number of trade days in a year, default = 262

Details

This function has two separate possible operations: 1. Calculates the probability of the underlying asset value remaining below a price level in a designated time frame, given the daily standard devaiation of the underlying returns. 2. Calculates the price the asset will remain below, given the designated probability

Value

Returns a probability (if quantile = FALSE), Returns a data.frame (if quantile = TRUE)

Examples

```
prob.below(spot = 100, upper = 110, mean = 0, dsd = 0.01, dte = 45)
prob.below(spot = 100, mean = 0, dsd = 0.01, dte = 45, p = 0.75, quantile = TRUE)
```

prob.btwn *Probability Between*

Description

Calculates the probability of the underlying asset value falling between two prices in a designated time frame, given the daily standard devaiation of the underlying returns.

Usage

```
prob.btwn(spot, lower, upper, asd = 0, dsd = 0, dte = 0, mean = 0,
  p, quantile = FALSE, tradedays = 262)
```

Arguments

spot	Current price of the underlying asset
lower	Lower price of the range
upper	Upper price of the range
asd	Annualized standard deviation of the underlying returns
dsd	Daily standard deviation of the underlying returns (Annual vol/sqrt(256)), used as an alternative to the asd parameter in conjuction with the dte parameter
dte	Days until expiration, designated time frame
mean	The average daily price movement, default = 0
p	Designated probability
quantile	Logical. If True, calculates the probable price range
tradedays	Number of trade days in a year, default = 262

Details

This function has two separate possible operations: 1. Calculates the probability of the underlying asset value falling between two prices in a designated time frame, given the daily standard devaiation of the underlying returns. 2. Calculates the probable price range, given a set probability

Value

Returns a probability (if quantile = FALSE), Returns a data.frame (if quantile = TRUE)

Examples

```
prob.btwn(spot = 100, lower = 90, upper = 110, mean = 0, dsd = 0.01, dte = 45)
prob.btwn(spot = 100, mean = 0, dsd = 0.01, dte = 45, p = 0.75, quantile = TRUE)
```

putdelta *Put Delta*

Description

Calculates the delta of the European- style put option

Usage

```
putdelta(s, x, sigma, t, r, d = 0)
```

Arguments

s	Spot price of the underlying asset
x	Strike price of the option
sigma	Implied volatility of the underlying asset price, defined as the annualized standard deviation of the asset returns
t	Time to maturity in years
r	Annual continuously-compounded risk-free rate, use the function r.cont
d	Annual continuously-compounded dividend yield, use the function r.cont

Details

The delta of an option can be defined as the rate of change of the option value given a $1 change in the underlying asset price.

Value

Returns the put delta

Examples

```
putdelta(100, 0.20, (45/365), 0.02, 0.02)
```

puteval *Put Option Evaluation*

Description

Creates a data.frame containing put option greeks; delta, gamma, vega, theta, rho and the put-premium

Usage

```
puteval(s, x, sigma, t, r, d = 0)
```

Arguments

s	Spot price of the underlying asset
x	Strike price of the option
sigma	Implied volatility of the underlying asset price, defined as the annualized standard deviation of the asset returns
t	Time to maturity in years
r	Annual continuously-compounded risk-free rate, use the function r.cont
d	Annual continuously-compounded dividend yield, use the function r.cont

Value

Returns a data.frame containing the option premium and greeks:

- Premium
- Delta
- Gamma
- Vega
- Theta
- Rho

Author(s)

John T. Buynak

Examples

```
puteval(100, 100, 0.20, (45/365), 0.02, 0.02)
```

---

putgreek *Put Option Greek*

Description

Computes the selected option greek, including premium

Usage

```
putgreek(greek = c("delta", "gamma", "theta", "vega", "rho", "premium"),
  s, x, sigma, t, r, d = 0)
```

Arguments

greek	String value, desired option greek to return
s	Spot price of the underlying asset
x	Strike price of the option
sigma	Implied volatility of the underlying asset price, defined as the annualized standard deviation of the asset returns
t	Time to maturity in years
r	Annual continuously-compounded risk-free rate, use the function r.cont
d	Annual continuously-compounded dividend yield, use the function r.cont

Value

Returns the dired option greek, including premium

Examples

```
putgreek("vega", 100, 100, 0.20, (45/365), 0.02, 0.02)
```

---

putpremium *Put Premium*

Description

Calculates the premium of a European-style put option using the Black-Scholes option pricing model

Usage

```
putpremium(s, x, sigma, t, r, d = 0)
```

Arguments

s	Spot price of the underlying asset
x	Strike price of the option
sigma	Implied volatility of the underlying asset price, defined as the annualized standard deviation of the asset returns
t	Time to maturity in years
r	Annual continuously-compounded risk-free rate, use the function r.cont
d	Annual continuously-compounded dividend yield, use the function r.cont

Value

Returns the value of the put option

Examples

```
putpremium(100, 100, 0.20, (45/365), 0.02, 0.02)
```

putrho *Put Rho*

Description

Calculates the rho of the European- style put option

Usage

```
putrho(s, x, sigma, t, r, d = 0)
```

Arguments

s	Spot price of the underlying asset
x	Strike price of the option
sigma	Implied volatility of the underlying asset price, defined as the annualized standard deviation of the asset returns
t	Time to maturity in years
r	Annual continuously-compounded risk-free rate, use the function r.cont
d	Annual continuously-compounded dividend yield, use the function r.cont

Details

Rho measures the change in the option's value given a 1

Value

Returns the put rho

Examples

```
putrho(100, 100, 0.20, (45/365), 0.02, 0.02)
```

puttheta *Put Theta*

Description

Calculates the theta of the European- style put option

Usage

```
puttheta(s, x, sigma, t, r, d = 0)
```

Arguments

s	Spot price of the underlying asset
x	Strike price of the option
sigma	Implied volatility of the underlying asset price, defined as the annualized standard deviation of the asset returns
t	Time to maturity in years
r	Annual continuously-compounded risk-free rate, use the function r.cont
d	Annual continuously-compounded dividend yield, use the function r.cont

Details

Theta is the "time-decay" of the option value measured as a daily value.

Value

Returns the put theta

Examples

```
puttheta(100, 100, 0.20, (45/365), 0.02, 0.02)
```

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r.cont *Continuously Compounded Rate*

Description

Convert a given nominal rate to a continuously compounded rate

Usage

```
r.cont(r, n)
```

Arguments

r	nominal rate
n	number of times compounded each year

Value

Returns a continuously compounded rate

Examples

```
r.cont(0.12, 2)
```

tdiff *Time Difference*

Description

Computes the difference in time between two dates

Usage

```
tdiff(date1, date2, period = c("days, years"))
```

Arguments

date1	Earlier date
date2	Later date
period	String value, either "days", or "years"

Value

Returns a numeric value

Examples

```
tdiff("2018-01-01", "2018-06-30", "days")
```

vertical *Vertical Spread Analytics*

Description

Calculates the key analytics of a vertical spread

Usage

```
vertical(options = c("call", "put"), s, x1, x2, t, r, sigma,
  sigma2 = sigma, vol = sigma, d = 0)
```

Arguments

options	Character string. Either "call", or "put"
s	Spot price of the underlying asset
x1	Strike price of the short option
x2	Strike price of the long option
t	Time to expiration in years
r	Annual continuously compounded risk-free rate
sigma	Implied volatility of the short option (annualized)
sigma2	Implied volatility of the long option (annualized)
vol	Manual over-ride for the volatility of the underlying asset (annualized)
d	Annual continuously compounded dividend yield

Value

Returns a data.frame

Examples

```
vertical("call", s = 100, x1 = 90, x2 = 110, t = (45/365), r =  0.025, sigma = 0.20, vol = 0.25)
```

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