Package ‘CustomDerivative’

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Type Package

Title Pricing Various Types of Custom Derivatives

Version 0.1.1

Description

A versatile R package for creating and pricing custom derivatives to suit your financial needs.

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Encoding UTF-8

Imports R6

RoxygenNote 7.2.3

NeedsCompilation no

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`CustomDerivative` *Custom Derivative R6 Class*

Description

This class provides methods to create and price custom derivatives.

Details

An R6 class to create and price custom derivatives.

The class uses the Monte Carlo method for pricing. The price method simulates the underlying asset price paths and applies the payoff function to determine the option price.

Value

For `price`, `delta`, `gamma`, `theta`, `vega`, and `rho`: a numeric value.

Methods

initialize(underlying_price, strike_price, time_to_maturity, volatility, risk_free_rate, payoff_function): Constructor method. Initializes the parameters for the custom derivative.

price(): Calculate the option price using the Monte Carlo method.

delta(): Calculate the Delta of the option.

gamma(): Calculate the Gamma of the option.

theta(): Calculate the Theta of the option.

vega(): Calculate the Vega of the option.

rho(): Calculate the Rho of the option.

Public fields

`underlying_price` The underlying asset price.

`strike_price` The strike price of the option.

`time_to_maturity` Time to maturity of the option.

`volatility` The volatility of the underlying asset.

`risk_free_rate` The risk-free rate.

`payoff_function` The function that determines the payoff of the option.

Methods

Public methods:

- `CustomDerivative$new()`
- `CustomDerivative$price()`
- `CustomDerivative$delta()`
- `CustomDerivative$gamma()`
- `CustomDerivative$theta()`
- `CustomDerivative$vega()`
- `CustomDerivative$rho()`
- `CustomDerivative$clone()`

Method `new()`:

Usage:

```
CustomDerivative$new(
  underlying_price,
  strike_price,
  time_to_maturity,
  volatility,
  risk_free_rate,
  payoff_function
)
```

Arguments:

`underlying_price` Initial price of the underlying asset.

`strike_price` Strike price of the option.

`time_to_maturity` Time to maturity in years.

`volatility` Volatility of the underlying asset.

`risk_free_rate` Risk-free rate (annual).

`payoff_function` A function that calculates the option payoff. Calculate the option price using the Monte Carlo method.

Method `price()`**:**

Usage:

```
CustomDerivative$price()
```

Returns: Numeric value representing the option price. Calculate the Delta of the option.

Method `delta()`**:**

Usage:

```
CustomDerivative$delta()
```

Returns: Numeric value representing the Delta. Calculate the gamma of the option.

Method `gamma()`**:**

Usage:

```
CustomDerivative$gamma()
```

Returns: Numeric value representing the gamma Calculate the theta of the option.

Method `theta()`**:**

Usage:

```
CustomDerivative$theta()
```

Returns: Numeric value representing the theta Calculate the vega of the option.

Method `vega()`**:**

Usage:

```
CustomDerivative$vega()
```

Returns: Numeric value representing the vega Calculate the rho of the option.

Method `rho()`**:**

Usage:

```
CustomDerivative$rho()
```

Returns: Numeric value representing the rho

Method `clone()`**:** The objects of this class are cloneable with this method.

Usage:

```
CustomDerivative$clone(deep = FALSE)
```

Arguments:

`deep` Whether to make a deep clone.

Examples

```
# Define the payoff function for a European call option
call_payoff <- function(price) {
  return(max(price - 100, 0))
}

# Create an instance of the CustomDerivative class
option <- CustomDerivative$new(100, 100, 1, 0.2, 0.05, call_payoff)

# Print Option Price and Greeks
cat("Option Price:", option$price(), "\n")
cat("Delta:", option$delta(), "\n")
cat("Gamma:", option$gamma(), "\n")
cat("Theta:", option$theta(), "\n")
cat("Vega:", option$vega(), "\n")
cat("Rho:", option$rho(), "\n")
```

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