

European Vanilla Call and Put Options

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Chapter 1

Namespace Index

1.1 Namespace List

Here is a list of all namespaces with brief descriptions:

std_norm	7
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Chapter 2

Class Index

2.1 Class List

Here are the classes, structs, unions and interfaces with brief descriptions:

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Chapter 3

File Index

3.1 File List

Here is a list of all files with brief descriptions:

src/ eur_van_opt.hpp	
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Chapter 4

Namespace Documentation

4.1 std_norm Namespace Reference

Functions

- double [pdf](#) (double x)
Probability density function (PDF) for $\mathcal{N}(0, 1)$:
- double [cdf](#) (double x)
Cumulative distribution function (CDF) for $\mathcal{N}(0, 1)$:

Variables

- const auto [norm_coeff](#) = 1.0 / std::pow(2.0 * M_PI, 0.5)

4.1.1 Function Documentation

4.1.1.1 cdf()

```
double std_norm::cdf (  
    double x )
```

Cumulative distribution function (CDF) for $\mathcal{N}(0, 1)$:

$$\Phi(x) = \frac{1}{\sqrt{2\pi}} \int_{-\infty}^x e^{-t^2/2} dt.$$

The definite integral calculation is adapted from [Michael Halls-Moore. C++ for Quantitative Finance, 2010](#) which in turn is an adaptation from [Mark S. Joshi. C++ Design Patterns and Derivatives Pricing, 2nd Ed. Cambridge University Press, 2008.](#)

Parameters

x	
---	--

Returns

double

References [pdf\(\)](#).Referenced by [EuropeanVanillaOption::callPrice\(\)](#), and [EuropeanVanillaOption::putPrice\(\)](#).**4.1.1.2 pdf()**

```
double std_norm::pdf (
    double x )
```

Probability density function (PDF) for $\mathcal{N}(0, 1)$:

$$f(x) = \frac{1}{\sqrt{2\pi}} e^{-x^2/2}.$$

Parameters

x	
---	--

Returns

double

References [norm_coeff](#).Referenced by [cdf\(\)](#).**4.1.2 Variable Documentation****4.1.2.1 norm_coeff**

```
const auto std_norm::norm_coeff = 1.0 / std::pow(2.0 * M_PI, 0.5)
```

Referenced by [pdf\(\)](#).

Chapter 5

Class Documentation

5.1 EuropeanVanillaOption Class Reference

```
#include <eur_van_opt.hpp>
```

Public Member Functions

- [EuropeanVanillaOption](#) ()
Default constructor a new European Vanilla Option object.
- [EuropeanVanillaOption](#) (const double &K, const double &r, const double &T, const double &S, const double &sigma)
Parametric constructor of a new European Vanilla Option object.
- double [callPrice](#) () const
Calculate Call option price:
- double [putPrice](#) () const
Calculate Put option price:

Private Member Functions

- void [calc_d_](#) ()
Calculate intermediate variables:

Private Attributes

- double [K_](#)
- double [r_](#)
- double [T_](#)
- double [S_](#)
- double [sigma_](#)
- double [d_1_](#)
- double [d_2_](#)

5.1.1 Constructor & Destructor Documentation

5.1.1.1 EuropeanVanillaOption() [1/2]

```
EuropeanVanillaOption::EuropeanVanillaOption ( ) [inline]
```

Default constructor a new European Vanilla Option object.

References [calc_d_\(\)](#).

5.1.1.2 EuropeanVanillaOption() [2/2]

```
EuropeanVanillaOption::EuropeanVanillaOption (
    const double & K,
    const double & r,
    const double & T,
    const double & S,
    const double & sigma ) [inline]
```

Parametric constructor of a new European Vanilla Option object.

Parameters

K	Strike price of the option
r	Risk-free interest rate
T	Time to maturity (in years)
S	Current price of the underlying asset
σ	Volatility of the underlying asset's returns

References [calc_d_\(\)](#).

5.1.2 Member Function Documentation

5.1.2.1 calc_d_()

```
void EuropeanVanillaOption::calc_d_ ( ) [inline], [private]
```

Calculate intermediate variables:

$d_1 = \frac{\ln(S/K) + (r + \sigma^2/2)T}{\sigma\sqrt{T}}$, represents a standardized measure of how far the current price S is from the strike price K after accounting for the time to maturity, risk-free rate, and volatility.

$d_2 = d_1 - \sigma\sqrt{T}$, reflects the uncertainty (volatility) over the time to maturity.

References [d_1_](#), [d_2_](#), [K_](#), [r_](#), [S_](#), [sigma_](#), and [T_](#).

Referenced by [EuropeanVanillaOption\(\)](#), and [EuropeanVanillaOption\(\)](#).

5.1.2.2 callPrice()

```
double EuropeanVanillaOption::callPrice ( ) const [inline]
```

Calculate Call option price:

$$C(S) = SN(d_1) - Ke^{-rT}N(d_2), \text{ where } N = CDF_{\mathcal{N}(0,1)}.$$

Returns

double

References [std_norm::cdf\(\)](#), [d_1_](#), [d_2_](#), [K_](#), [r_](#), [S_](#), and [T_](#).

5.1.2.3 putPrice()

```
double EuropeanVanillaOption::putPrice ( ) const [inline]
```

Calculate Put option price:

$$P(S) = Ke^{-rT}N(-d_2) - SN(-d_1), \text{ where } N = CDF_{\mathcal{N}(0,1)}.$$

Returns

double

References [std_norm::cdf\(\)](#), [d_1_](#), [d_2_](#), [K_](#), [r_](#), [S_](#), and [T_](#).

5.1.3 Member Data Documentation

5.1.3.1 d_1_

```
double EuropeanVanillaOption::d_1_ [private]
```

Referenced by [calc_d_\(\)](#), [callPrice\(\)](#), and [putPrice\(\)](#).

5.1.3.2 d_2_

```
double EuropeanVanillaOption::d_2_ [private]
```

Referenced by [calc_d_\(\)](#), [callPrice\(\)](#), and [putPrice\(\)](#).

5.1.3.3 K_

```
double EuropeanVanillaOption::K_ [private]
```

Referenced by [calc_d_\(\)](#), [callPrice\(\)](#), and [putPrice\(\)](#).

5.1.3.4 `r_`

```
double EuropeanVanillaOption::r_ [private]
```

Referenced by [calc_d_\(\)](#), [callPrice\(\)](#), and [putPrice\(\)](#).

5.1.3.5 `S_`

```
double EuropeanVanillaOption::S_ [private]
```

Referenced by [calc_d_\(\)](#), [callPrice\(\)](#), and [putPrice\(\)](#).

5.1.3.6 `sigma_`

```
double EuropeanVanillaOption::sigma_ [private]
```

Referenced by [calc_d_\(\)](#).

5.1.3.7 `T_`

```
double EuropeanVanillaOption::T_ [private]
```

Referenced by [calc_d_\(\)](#), [callPrice\(\)](#), and [putPrice\(\)](#).

The documentation for this class was generated from the following file:

- [src/eur_van_opt.hpp](#)

Chapter 6

File Documentation

6.1 src/eur_van_opt.hpp File Reference

European Vanilla Call and Put Options implementation.

```
#include "std_norm.hpp"
```

Classes

- class [EuropeanVanillaOption](#)

6.1.1 Detailed Description

European Vanilla Call and Put Options implementation.

Author

Andrei Batyrov

Version

0.1

Date

2024-12-01

Copyright

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6.2 src/std_norm.hpp File Reference

Standard normal distribution basic functions implementation.

```
#include <cmath>
```

Namespaces

- namespace `std_norm`

Functions

- double `std_norm::pdf` (double x)
Probability density function (PDF) for $\mathcal{N}(0, 1)$:
- double `std_norm::cdf` (double x)
Cumulative distribution function (CDF) for $\mathcal{N}(0, 1)$:

Variables

- const auto `std_norm::norm_coeff` = 1.0 / std::pow(2.0 * M_PI, 0.5)

6.2.1 Detailed Description

Standard normal distribution basic functions implementation.

Author

Andrei Batyrov

Version

0.1

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