
C++ for MSc and Phd Students

Preparation for a Life in Quantitative Finance

A C++ course is being proposed for MSc/Phd students. A provisional syllabus of the material to be covered is detailed below. The course will be taught by Dr. Daniel Duffy who has taught and written a number of books on C++ and Finance (Financial Instrument Pricing Using C++). Please email if you have any further questions or are interested in attending the course.

Goals of the Course

The goals of this intensive three-day hands-on C++ course is to introduce the essential syntax of the C++ language and apply it to a number of relevant examples and applications in Quantitative Finance (QF) .

This course is unique for a number of reasons: first, it delivers C++ knowledge with all examples taken from QF and numerical mathematics. This approach will help you later during your professional career. Second, the course fee has been priced so that it is affordable for students with a tight budget. After having attended this course you will have a good understanding of C++ and how to apply it to a number of problems in QF:

- Lattice methods (binomial and trinomial trees)
- Monte Carlo simulation Modelling the Black Scholes model in C++
- Finite Difference Methods

On the last day it is possible to do an exam to test what you have learned.

What do you get?

Course documentation, full source code and other relevant material.

Since this is a special low priced course for MSc/Phd students, you should bring your own laptop and arrange your own lunch.

This course will be given in English.

Course contents

The course consists of three major blocks (one block per day)

Part I: C++ Fundamentals

Classes and objects

- Member data and member functions
- Improving your classes
- Operator overloading

Memory management

- The operators 'new' and 'delete'
- Pointers and arrays
- Tips, pitfalls and guidelines

Basic Inheritance

- What is inheritance?
- Inheritance and memory management
- Examples in QF

Part II: Advanced C++ Features

Advanced Inheritance

- Abstract and concrete classes
- Dynamic casting
- Polymorphic functions
- Polymorphic containers

Introduction to C++ Templates

- Template classes and template functions
- Creating template classes
- Extending using inheritance and composition
- Nesting template classes

Standard Template Library (STL)

- Overview of functionality
- Containers (vector, list, map)
- Iterators
- Algorithms

Advanced Templates

- Creating reusable data structures
- Vectors and matrices
- Lattice data structures
- The Property pattern

Introduction to Component Object Model (COM)

- What is COM?
- Interfaces and component objects
- Implementing interfaces
- Using COM in QF applications

Part III: Applications in Quantitative Finance

C++ and Numerical Mathematics

- Using C++ in numerical analysis
- Matrix computation
- Interpolation and curve fitting
- Numerical integration

Black Scholes Model

- C++ classes Implementing option sensitivities
- Creating a simple option engine
- Visualisation in Excel

Lattice Models

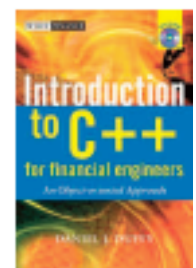
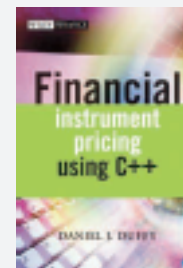
- Creating generic lattice structures
- Forward and backward induction
- Option pricing problems

Finite Difference Methods

- Quick overview partial differential equations
- Mapping finite difference methods to C++
- Implicit and explicit methods
- Relationships with the trinomial methods



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Prerequisites

You must be a full-time student at an institution of higher learning. Some knowledge of at least high-level programming language, for example Pascal, Matlab, Java or C. No previous knowledge of C is assumed

Who should attend?

This course is a special course organised for MSc/Phd students. You must be a full-time student at an institution of higher learning to attend this course.

Duration

3 days.