

课程详述

COURSE SPECIFICATION

以下课程信息可能根据实际授课需要或在课程检讨之后产生变动。如对课程有任何疑问，请联系授课教师。

The course information as follows may be subject to change, either during the session because of unforeseen circumstances, or following review of the course at the end of the session. Queries about the course should be directed to the course instructor.

1.	课程名称 Course Title	计算金融 Computational Finance
2.	授课院系 Originating Department	金融系 Department of Finance
3.	课程编号 Course Code	FIN401
4.	课程学分 Credit Value	3
5.	课程类别 Course Type	专业选修课 Major Elective Courses
6.	授课学期 Semester	秋季 Fall
7.	授课语言 Teaching Language	中英双语 English & Chinese
8.	授课教师、所属学系、联系方式（如属团队授课，请列明其他授课教师） Instructor(s), Affiliation & Contact (For team teaching, please list all instructors)	伍继松, 金融系, 13760303662 Jisong WU, Department of Finance, 13760303662
9.	实验员/助教、所属学系、联系方式 Tutor/TA(s), Contact	待公布 To be announced
10.	选课人数限额(可不填) Maximum Enrolment (Optional)	

11. 授课方式 Delivery Method	讲授 Lectures	习题/辅导/讨论 Tutorials	实验/实习 Lab/Practical	其它(请具体注明) Other (Please specify)	总学时 Total
学时数 Credit Hours	48				48

12. 先修课程、其它学习要求 Pre-requisites or Other Academic Requirements	MA104 线性代数 Linear Algebra
13. 后续课程、其它学习规划 Courses for which this course is a pre-requisite	
14. 其它要求修读本课程的学系 Cross-listing Dept.	

教学大纲及教学日历 SYLLABUS

15. 教学目标 Course Objectives

介绍计算金融的基本概念，重要的金融分析理论，实践方法及数值实现；主要介绍二叉树期权定价模型和 Black-Scholes 期权定价模型，蒙特卡罗模拟方法，新型期权，和利率模型等。

To introduce the basic concept and terminology of computational finance, the important theories of financial analysis, and the practical methods and numerical implementation. To mainly focus on Binomial Tree Option Pricing Model and Black-Scholes Option Pricing Model, Monte Carlo Simulation Method, Exotic Option and Interest Rate Model.

16. 预达学习成果 Learning Outcomes

通过本课程的教学使学生能了解现代计算金融中常用的基本概念及其数值实现，系统掌握计算金融的基本概念和分析问题、解决问题的基本方法，为运用金融分析的理论知识并为掌握更复杂的现代计算方法打好基础。

Students should understand the basic knowledge and terminology of computational finance and its numerical implementation. They should also master basic concept in computational finance and its fundamental methods in analyzing and solving the problems. It builds the foundation for financial modelling and analysis as well as for more complex modern numerical methods.

17. 课程内容及教学日历（如授课语言以英文为主，则课程内容介绍可以用英文；如团队教学或模块教学，教学日历须注明主讲人）

Course Contents (in Parts/Chapters/Sections/Weeks. Please notify name of instructor for course section(s), if this is a team teaching or module course.)

第一章：市场无套利的等价条件(4 学时)

在本章节中，侧重在概念，定义和法则，状态价格与风险中性概率测度，复制定价技术；市场完备性

第二章：二叉树模型定价原理 (4 学时)

在本章节中，侧重二叉树的构，Black-Scholes 定价公式；Black-Scholes 公式分析；数值计算问题。

第三章：利率期限结构 (4 学时)

在本章节中，介绍时变波动率情形的二叉树模型，标的资产支付红利情况；美式期权；数值计算问题

第四章：股票价格的演化模型 (4 学时)

在本章节中，介绍 Black-Scholes 期权定价模型，Black-Scholes 期权定价公式分析；Black-Scholes 期权定价模型的推广；数值计算问题

第五章：蒙特卡罗模拟定价基本原理 (6 学时)

在本章节中，介绍高效的蒙特卡洛定价方法，有限差分方法

期中考试(1-5 章) (2 学时)

第六章：复合期权 (4 学时)

在本章节中，介绍多维 Black-Scholes 定价公式；双币种期权；一篮子期权, 彩虹期权；数值计算方法

第七章：障碍期权 (4 学时)

在本章节中，介绍两值障碍期权；亚式期权，回望期权；数值计算方法

第八章：连续利率期限结构(4 学时)

在本章节中，介绍利率衍生品定价的原理；远期价格与期货价格，利率衍生产品定价的 Black-Scholes 模型；数值计算方法

第八章：单因素利率模型 (6 学时)

在本章节中，介绍多因素模型，Health-Jarrow-Morton 模型，数值计算方法

总复习(2 学时)

小组作业汇报(2 学时)

期末考试(1-9 章) (2 学时)

Chapter 1: Equivalent Condition for Non-Arbitrage Pricing Principle (4 Hours)

In this chapter, focus on concepts, definition and rules, State Prices and Risk Neutral Probability Measure, Replication Pricing Technique; Market Completeness

Chapter 2: Binomial Tree Option Pricing Principle (4 Hours)

In this chapter, focus on The Structure of Binomial Tree; The Term Structure of Interest Rates; Binomial Tree Model with Time-Varying Volatility;

Chapter 3: The Term Structure of Interest Rates, (4 Hours)

In this chapter, Introduction to Binomial Tree Model with Time-Varying Volatility; The Dividend Payment of Underlying Asset; American Option; Numerical Problems.

Chapter 4: The Evolution of Stock Pricing Models (4 Hours)

In this chapter, introduction to Black-Scholes Option Pricing Model, The Analysis on Black-Scholes Option Pricing Model; The Extended Black-Scholes Option Pricing Models; Numerical Problems

Chapter 5: The Basic Principle of Monte Carlo Simulation (4 Hours)

In this chapter, Introduction to The Efficient Monte Carlo Pricing Methods; Finite Difference Methods

Mid-term evaluation course (2 Hours)

Chapter 6: Compound Option (4 Hours)

In this chapter, Introduction to Multi-dimensional Black-Scholes Pricing Formula; Quanto Option; Basket Option, Rainbow Option; Numerical Methods.
 .Chapter 7: Barrier Option (4 Hours)
 In this chapter, Introduction to Double Barrier Option; Asian Option, Look-Back Option; Numerical Methods.
 Chapter 8: Term Structure of Continuous Interest Rates (4 Hours)
 In this chapter, Introduction to The Interest Rate Derivative Pricing Principle; Prices of Forward Contract and Futures, Pricing Interest Rate Derivative in Black Schole Model; Numerical Methods.
 Chapter 9: One-factor Interest Rate Model (6 Hours)
 In this chapter, Definition of Multi- factor Interest Rate Mode, Health-Jarrow-Morton Model, Numerical Methods

Final Review (2 Hours)
 Group Project Presentation (2 Hours)
 Final evaluation course (2 Hours)

18. 教材及其它参考资料 Textbook and Supplementary Readings

教材 Textbook:

Computational Finance: Numerical Methods for Pricing Financial Instruments, George Levy, Butterworth-Heinemann, 2004.

Computational Finance: An Introductory Course with R, Arratia, Argimiro, Springer, 2014

参考资料 Supplementary Readings:

邓留保, 李柏年, 杨桂元, 《Matlab 与金融模型分析》, 合肥工业大学出版社, 2007 年。

朱世武, 《金融计算与建模-理论.算法与 SAS 程序》, 清华大学出版社, 2007 年。

张树德, 《金融计算教程——MATLAB 金融工具箱的应用》, 清华出版社, 2007 年



课程评估 ASSESSMENT

19. 评估形式 Type of Assessment	评估时间 Time	占考试总成绩百分比 % of final score	违纪处罚 Penalty	备注 Notes
出勤 Attendance		10		
课堂表现 Class Performance				
小测验 Quiz				
课程项目 Projects		15		
平时作业 Assignments		15		
期中考试 Mid-Term Test		25		
期末考试		35		

Final Exam
期末报告
Final Presentation
 其它（可根据需要
 改写以上评估方
 式）
**Others (The
 above may be
 modified as
 necessary)**

20. 记分方式 **GRADING SYSTEM**

A. 十三级等级制 **Letter Grading**
 B. 二级记分制（通过/不通过） **Pass/Fail Grading**

课程审批 REVIEW AND APPROVAL

21. 本课程设置已经过以下责任人/委员会审议通过
This Course has been approved by the following person or committee of authority

