Mathematics of Financial Markets
ACTSC 446/846, Winter 2019

Sections

There are two sections of ACTSC 446/846. The two sections share the same contents, lecture notes, assignments, tests, and grading schemes. However, please make sure that you are in the right section and do not switch, because the actual teaching in the two sections may not always be synchronized.

Instructor:	Ruodu Wang, `wang@uwaterloo.ca`	ext.31569
Section 001:	10:00-11:20 Tuesdays and Thursdays	AL 208
Section 002:	2:30-3:50 Tuesdays and Thursdays	MC 2054
Office hours:	4:00-5:00 Tuesdays and 5:00-6:00 Thursdays	M3 3122
Tutorials:	5:30-6:20 Tuesdays, only used for midterms	MC 2066

References

1. Main reference book:

   [1] Tomas Björk. *Arbitrage Theory in Continuous Time*. 3rd edition, Oxford, 2009.

   We do not exactly follow this book. The primary reference will be the lecture notes given in class. Test materials are based on lecture notes.

2. Recommended reading on the understanding of financial markets:

   [2] Robert L. McDonald. *Derivatives Markets*, 3rd edition, Pearson, 2013.

   [3] John C. Hull. *Options, Futures, and Other Derivatives*. 9th edition, Prentice Hall, 2014.

3. Recommended reading on advanced mathematical materials:

   [4] Steven E. Shreve. *Stochastic Calculus for Finance I: The Binomial Asset Pricing Model*. Springer-Verlag, New York, 2004.

   [5] Steven E. Shreve. *Stochastic Calculus for Finance II: Continuous-Time Model*. Springer-Verlag, New York, 2004.

Teaching Assistants

- To be announced

Assignments

Three individual assignments are planned. The assignments will be equally weighted. All assignments will contribute to your coursework grade. Assignments should be handed in to the instructor by the end of the class on the due day. Late assignments are not acceptable.

Midterm

Two midterms are planned. Tentative schedule:

(1) Tutorial time (5:30-6:20) on Tuesday, February 26th (after 13 lectures)

(2) Tutorial time on Tuesday, March 19th (after 19 lectures)

Course Evaluation Breakdown

(1) Assignments 10%

(2) Midterms 30% (15% each)

(3) Final Examination 60%

Course Content and Tentative Schedule

	Lectures	Topics	Björk reference
Part I	1-5	**Introduction to derivatives markets** options, futures and other derivatives arbitrage and trading strategies model independent properties of options	Chapter 1
Part II	6-13	**Discrete-time models** one-period models binomial tree models American and exotic options fundamental theorems of asset pricing	Chapters 2-3
Midterm #1			
Part III	14-16	**Basic stochastic calculus** Brownian motions and martingales Itô integrals and the Itô lemma	Chapter 4
Part IV	17-21	**The Black-Scholes framework** basics of continuous-time financial markets Black-Scholes equation Black-Scholes formula	Chapters 6-9
Midterm #2			
		hedging and Greeks risk-neutral valuation	
Part V	22-23	**General continuous-time models** risk-neutral valuation in general models basics of fixed income products short-rate models	Chapters 10, 22-23
Lecture 24: Final review			

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Policy 71 - Student Discipline

Policy 73 - Intellectual Property Rights