Mathematics of Financial Markets
ACTSC 446/846, Winter 2018

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.

Section 001

Instructor:	Ruodu Wang, `wang@uwaterloo.ca`	ext.31569
Lectures:	10:00-11:20 Tuesdays and Thursdays	RCH 307
Tutorials:	1:30-2:20 Fridays, only used for midterms	DC 1351
Office hours:	2:30-3:30 Tuesdays and Thursdays, or by appointment	M3 3122

Section 002

Instructor:	Mario Ghossoub, `mario.ghossoub@uwaterloo.ca`	ext.35547
Lectures:	11:30-12:50 Mondays and Wednesdays	RCH 307
Tutorials:	1:30-2:20 Fridays, only used for midterms	DC 1351
Office hours:	9:30-10:30 Mondays and Wednesday, or by appointment	M3 3143

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 for the understanding of financial markets:

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

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

3. Recommended reading for 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

Two 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

Three midterms are planned. Tentative schedule:

(1) Tutorial time (1:30-2:20) on Friday, January 19th (after 5 lectures)

(2) Tutorial time on Friday, February 16th (after 13 lectures)

(3) Tutorial time on Friday, March 23th (after 21 lectures)

Course Evaluation Breakdown

(1) Assignments 10% (5% each)

(2) Midterms 40% (13.3% each)

(3) Final Examination 50%

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
		Midterm #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 #2	
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 hedging and Greeks risk-neutral valuation	Chapters 6-9
		Midterm #3	
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	