UNIVERSITY OF TORONTO

S. Jaimungal
Department of Statistics and Mathematical Finance Program,
University of Toronto

MMF1928H / STA 2503F –

PRICING THEORY I / APPLIED PROBABILITY FOR MATHEMATICAL FINANCE

IMPORTANT:

This course is restricted and enrollment is limited, please contact me if you are interested in taking the couse.

If you are interested in taking this course, please read through chapters 1-4 of Shreve's book on Stochastic Calculus for finance volume 2. Spend more time on chapters 3 and 4, with a light reading of chapters 1 and 2.

FYI: STA2502 is open.

You might be also interested in a Short Course on Commodity Models

LOCATION :

Tutorials: Mon 4pm - 6pm in SS 1085 (100 St. George Street)

Lectures: Wed 2pm - 5pm in SS 1085 (100 St. George Street)

CLASS NOTES / LECTURES :

Class notes and videos will be updated as the course progresses.

Archived content from 2010 can be found here.

Archived content from 2012 can be found here

Archived content from 2013 can be found here

#	Description	Video	Notes
1			
2	Review Fundamental Theorem of Finance, CRR model limiting distribution, risk-neutral distribution, call option price, using asset as numeraire, American option and default model		STA2503-2.pdf
3			
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OUTLINE:

This course focuses on financial theory and its application to various derivative products. A working knowledge of basic probability theory, stochastic calculus, knowledge of ordinary and partial differential equations and familiarity with the basic financial instruments is assumed. The topics covered in this course include, but are not limited to:

Discrete Time Models

- Arbitrage Strategies and replicating portfolios
- Multi-period model (Cox, Ross, Rubenstein)
- European, Barrier and American options
- Change of Measure and Numeraire assets

Continuous Time Limit

- Random walks and Brownian motion
- Geometric Brownian motion
- Black-Scholes pricing formula
- Martingales and measure change

Equity derivatives

- Puts, Calls, and other European options in Black-Scholes
- American contingent claims

The Greeks and Hedging

- Delta, Gamma, Vega, Theta, and Rho
- Delta and Gamma neutral hedging

- Barriers, Look-Back and Asian options

Interest rate derivatives

- Short rate and forward rate models
- Bond options, caps, floors, swap options

Stochastic Volatility and Jump Modeling

- Heston model
- Compound Poisson and Levy models
- Volatility Options

- Time-based and move-based hedging

Foreign Exchange and Commodity models

- Cross currency options
- Quantos
- Spot and forward price models
- commodity-FX derivatives

Numerical Methods

- Monte Carlo and Least Square Monte Carlo
- Finite Difference Schemes
- Fourier Space Time-Stepping

TEXTBOOK:

The following are recommended (but not required) text books for this course.

- *Options, Futures and Other Derivatives* , John Hull, Princeton Hall
- *Arbitrage Theory in Continuous Time*, Tomas Bjork, Oxford University Press
- *Stochastic Calculus for Finance II : Continuos Time Models*, Steven Shreve, Springer
- *Financial Calculus: An Introduction to Derivative Pricing*, Martin Baxter and Andrew Rennie

GRADING SCHEME:

Item	Frequency	Grade
Exam	End of Term	50%
Quizzes	weekly	25%
Challenges	~ every 2-3 weeks	25%

The **exam** *focuses on theory* and will be closed book, but I will provide a single sheet with pertinent formulae.

Quizzes *test basic knowledge* of the material and are conducted in the tutorials every week.

Challenges are *real world inspired problems* that are based on the theory. You will be required to understand the theory, formulate an approach to the problem, implement the numerics in **matlab or R**, interpret the results and write-up a short report. This will be conducted in teams of 3-4 people. These are normally distributed every two-three weeks, but you will be informed ahead of time when a challenge is to be conducted.

TUTORIALS:

Your TA is Xuancheng (Bill) Huang, Ph.D. candidate, Dept. Statistical Sciences

OFFICE HOURS:

TBA

ACADEMIC CODE OF CONDUCT

http://www.utoronto.ca/academicintegrity/index.html