北京大学 汇丰商学院
Peking University HSBC Business School

FIN 514
Applied Stochastic Processes
Module 1 (Fall), 2016-17

Course Information

Instructor: Jaehyuk Choi

Office: PHBS Building, Room 755
Phone: (+86) 755 2603 0568
Email: jaehyuk@phbs.pku.edu.cn
Office Hour: Tuesday & Friday 2 – 3PM

Teaching Assistant: TBA

Phone:
Email:

Classes:

Lectures: Tuesday & Friday 3:30 – 5:20 PM
Venue: PHBS Building, Room 313

Course Website:
http://www.jaehyukchoi.net/teaching/ASP

1. Course Description

1.1 Context

Course overview: *Applied Stochastic Processes* is intended for the students who are seeking advanced knowledge in stochastic calculus and are eventually interested in the jobs in financial engineering. As the name indicates, the course will balance theory and application, with emphasis on numerical calculation and coding for practical applications. On completion of this course, the students will learn how financial observations (e.g. stock prices and FX rate) are modelled with stochastic processes and how they can be computed using analytics or computer simulations.

Prerequisites: Undergraduate-level knowledge in probability, statistics, linear algebra and programming skill (R recommended) are highly recommended. The student without these backgrounds can still take the course but are expected to take extra efforts.

A note for the 1st year quantitative finance student: The course, *Stochastic Finance*, which is offered in module 3 is a more basic course on the same subject and is a new required course. Therefore, the 1st year students are recommended to take this course in the next academic year after taking *Stochastic Finance* first.

1.2 Textbooks and Reading Materials

- *Stochastic Calculus and Financial Applications (Stochastic Modelling and Applied Probability)* by J. Michael Steele (see author's webpage on the book for some exercise problem solutions)
- *Monte Carlo Methods in Finance* by Peter Jaeckel

2. Learning Outcomes

2.1 Intended Learning Outcomes

Learning Goals	Objectives	Assessment
1. Our graduates will be effective communicators.	1.1. Our students will produce quality business and research-oriented documents.	Yes
	1.2. Students are able to professionally present their ideas and also logically explain and defend their argument.	Yes
2. Our graduates will be skilled in team work and leadership.	2.1. Students will be able to lead and participate in group for projects, discussion, and presentation.	Yes
	2.2. Students will be able to apply leadership theories and related skills.	
3. Our graduates will be trained in ethics.	3.1. In a case setting, students will use appropriate techniques to analyze business problems and identify the ethical aspects, provide a solution and defend it.	
	3.2. Our students will practice ethics in the duration of the program.	
4. Our graduates will have a global perspective.	4.1. Students will have an international exposure.	Yes
5. Our graduates will be skilled in problem-solving and critical thinking.	5.1. Our students will have a good understanding of fundamental theories in their fields.	Yes
	5.2. Our students will be prepared to face problems in various business settings and find solutions.	Yes
	5.3. Our students will demonstrate competency in critical thinking.	Yes

2.2 Course specific objectives

See the course overview in 1.1.

2.3 Assessment/Grading Details

Tentative weights are as below;
Attendance 20%, Mid-term Exam 30%, Assignments 20%, Final Project 30%

2.4 Academic Honesty and Plagiarism

It is important for a student's effort and credit to be recognized through class assessment. Credits earned for a student work due to efforts done by others are clearly unfair. Deliberate dishonesty is considered academic misconducts, which include plagiarism; cheating on assignments or examinations; engaging in unauthorized collaboration on academic work; taking, acquiring, or using test materials without faculty permission; submitting false or incomplete records of academic achievement; acting alone or in cooperation with another to falsify records or to obtain dishonestly grades, honors, awards, or professional endorsement; or altering, forging, or misusing a University academic record; or fabricating or falsifying of data, research procedures, or data analysis.

All assessments are subject to academic misconduct check. Misconduct check may include reproducing the assessment, providing a copy to another member of faculty, and/or communicate a copy of this assignment to the PHBS Discipline Committee. A suspected plagiarized document/assignment submitted to a plagiarism checking service may be kept in its database for future reference purpose.

Where violation is suspected, penalties will be implemented. The penalties for academic misconduct may include: deduction of honour points, a mark of zero on the assessment, a fail grade for the whole course, and reference of the matter to the Peking University Registrar.

For more information of plagiarism, please refer to *PHBS Student Handbook*.

3. Topics, Teaching and Assessment Schedule

The course will be roughly divided into two parts, i.e., before and after National day break. The first half will cover the theory, following Steele's book. The second half will cover 2~3 real-world applications in finance. Jaeckel's book will be useful as a reference in the second half.

Tentative course schedule is as below;

Week	Dates	Topics and the corresponding textbook chapters
1	Aug 30 & Sep 2	Random walk, Martingales (Steele 1~3)
2	Sep 6 & 9	Brownian motion (Steele Ch 3~5, Jaeckel 3)
3	Sep 13 & 16	Ito's formula (Steele 6~8, Jaeckel 3)
4	Sep 20 & 23	Stochastic differential equations (Steele 9-11)
5	Sep 27 & 30	Application 1: Normal model: swaption volatility mid-term exam, project assignment, R
	Oct 4 & 7	No class due to National day break
6	Oct 11 & 14	Girsanov theorem, Monte-Carlo simulation (Steele 13-15, Jaeckel 4)
7	Oct 18 & 21	Monte-Carlo simulation continued (Jaeckel 6, 7, 9, 10)
8	Oct 25 & 28	Application 2: Black-Scholes: spread and basket options
9	Nov 1 & 4	Application 3: Stochastic Alpha-Beta-Rho (SABR) model
Final Exam on Nov 8 Tues		3:30 ~ 5:20 PM

Miscellaneous

- The email (jaehyuk@phbs.pku.edu.cn) is the preferred method of communication.