

04716912 Topics in Quantitative Finance Module 4, 2015-2016

Course Information

Instructor: Kwangwon Ahn

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Teaching Assistant: Adam Lin

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Classes:

Lectures: 3:30pm – 5:20pm on Monday and Thursday Venue: PHBS 335

Course Website: http://www.finstab.net/

1. Course Description

1.1 Context

Course overview:

This course introduces the research topics of modern quantitative finance in the area of econophysics. Course content includes a reading list of both classical book chapters and contemporary research papers. The reading list mainly focuses on theories and mathematical foundations, although empirical findings will be introduced at the end of each lecture as well.

Student will learn how to develop basic modelling skills, critically review major literature, as well as explore some of the frontier issues in quantitative finance research. The course structure will be similar to that of FIN514 and FIN515. The instructor will explain the topics in detail. Each student should expect to read all the papers and relevant book chapters, and those are all examinable.

Prerequisites: Applied Stochastic Processes, Econometrics, Macroeconomics, and Numerical Methods and Analysis

1.2 Textbooks and Reading Materials

Textbooks:

There is no textbook for this course. Instructor will provide a list of references for each topic and will distribute course pack to students.

Suggested readings:

- ➡ Baaquie, B.E., 2007, Quantum Finance: Path Integrals and Hamiltonians for Options and Interest Rates
- ⇒ Gabaix, X., Gopikrishnan, P., Plerou, V., Stanley, E., 2003, A theory of power-law distributions in financial market fluctuations
- ⇒ Gut, A., 2009, An Intermediate Course in Probability Theory
- ⇒ Hull, J., 2012, Risk Management and Financial Institutions
- ⇒ Liboff, R., 1980, Introductory Quantum Mechanics
- ⇒ Sornette, D., 2009, Dragon-Kings, Black Swans and the Prediction of Crises
- ➡ Wosnitza, J., Denz, C., 2013, Liquidity crisis detection: An application of log-periodic power-law structures to default prediction

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.	0
	1.2. Students are able to professionally present their ideas and also logically explain and defend their argument.	0
 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.	
	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 analyse business problems and identify the ethical aspects, provide a solution and defend it.	0
	3.2. Our students will practice ethics in the duration of the program.	0
4. Our graduates will have a global perspective.	 4.1. Students will have an international exposure. 	
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.	0
	5.2. Our students will be prepared to face problems in various business settings and find solutions.	0
	5.3. Our students will demonstrate competency in critical thinking.	0

2.2 Assessment/Grading Details

Assessment task	Weighting
Random Quiz (without notice)	40%
Assignments	10%
Midterm Exam	10%

Individual Project	40%
Total	100%

Assignments:

Students are required to submit 8 assignments (hardcopy) to a TA. This is an individual task, not a group work. These assignments will help students to keep track of key ideas of the courses. Late submission does not count towards the final mark.

Attendance:

The weight (no absence: 1, one absence: 0.99, two absences: 0.98, and more than two absences: 0.7) will be used for the final GPA adjustment.

2.3 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, honours, 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. Miscellaneous

Do not hesitate to come to my office during office hours or by appointment to discuss any aspect of the course.

4. Topics, Teaching and Assessment Schedule

	Schedule		Topics Covered
1			Extreme Value Theory Hull, J. (Ch. 10 & 14)
2	HW 1 (due date)		Dynamics of Complex Systems Gabaix, X. et al. (2003)
3			Phase Transition Sornette, D. (2009)
4	HW 2 (due date)	Part I. Power Law	Log Periodic Power Law Wosnitza, J., Denz, C. (2013)
5			Power Law in Economics and Finance I Gabaix, X. (2009)
6	HW 3 (due date)		Power Law in Economics and Finance II Gabaix, X. (2009)
7			Firm Bankruptcy and Power Law Hong, B. (2007), Fujiwara, Y. (2004)
8	HW 4 (due date)		Agent Based Model and Power Law Gallegati, X., et al. (2003)
9			Emergence of Skewed Distributions in Analyst Forecasts Ahn, K. et al. (2016)
10	HW 5 (due date)		Midterm (10%) & (i) Demo – MATLAB
11			Operators, Eigenfunctions and Eigenvalues Liboff, R. (Chapter 3)
12	HW 6 (due date)		Function Spaces and Hermitian Operators Liboff, R. (Chapter 4)
13		Part II.	Hamiltonians and Stock Options Baaquie, B. (Chapter 4)
14	HW 7 (due date)	Quantum Finance	A Quantum Model for the Stock Market Zhang, C., Huang, L. (2010)
15			A Finite Dimensional QM for the Stock Market Cotfas, L. (2013)
16	HW 8 (due date)		A Wave Function for Stock Market Returns Ataullah, A., Davidson, I., Tippett, M. (2009)
17		Part III.	Student Presentations Subject: Power Law
18		Group Project	Student Presentations Subject: Quantum Finance