Introduction to Financial Risk Management FE 535A

Division of Financial Engineering
Spring 2017

Meeting Times:	Mondays 3:00-5:30PM
Classroom Location:	Burchard 118
Instructor:	Dr. Chatterjee
Contact Info:	Babbio 545, Rupak.Chatterjee@stevens.edu, 201-216-3393
Office Hours:	Thursdays 1:00-3:00
Prerequisite(s):	Knowledge of Finance, Statistics, and Probability
Hanlon II Labs:	Fri 2/3 & 2/10: 6:00-7:30. Bloomberg Training.
TAs:	Joey Engling (jengling@stevens.edu) Kuan-Heng Chen (kchen3@stevesn.edu)

COURSE DESCRIPTION

Risk Control and derivative pricing are major concerns for financial institutions. Yet, as recent events have shown us there is a real need for adequate statistical tools to measure and anticipate the amplitude of the potential moves of the financial market. Many of the standard models seen on Wall Street however are based on simplified assumptions and can lead to systematic (and sometimes dramatic) underestimation of real risks. Starting from a detailed analysis of market data, one can take into account more faithfully the real behavior of financial markets (in particular the 'rare events') for asset allocation, derivative pricing and hedging, and risk control. This course will introduce some concepts to better address these issues. There will also be a few sessions in the Hanlon lab learning to use a Bloomberg terminal.

Various financial instruments will be presented in a form familiar to Wall Street traders (i.e. Bloomberg screens). The purpose of **Risk Management** is to provide a valuation of these financial contracts ("*pricing*") and to provide various measures of risk and methods to hedge these risks as best as possible ("*hedging*"). These tasks are not just performed by "Risk Managers" but by "Traders" who price and hedge their respective trading books on a daily basis. Successful trading (over extended periods of time) comes down to successful risk management. Successful risk management comes down to robust valuation which is the main prerogative of **Financial Engineering**. Valuation of financial instruments begins with an analysis of possible future events (i.e. stock price moves, interest rate moves, defaults, etc.). Dealing with the future involves the mathematics of statistics and probability. The first step is to find a probability distribution that is suitable for the financial instrument at hand. The next step is to calibrate this distribution. The third step is to generate future events using this calibrated distribution and based on this, provide the necessary valuation and risk measures for the financial contract at hand. The failure of any of these steps can lead to incorrect valuation and therefore an incorrect assessment of the risks of the financial instrument under consideration.

LEARNING OBJECTIVES

- Market Quotes of Major Asset Classes

- Risk Types of Major Asset Classes
- Statistical Analysis of Financial Data for Risk Management
- Stochastic Processes and Risk Measures (VAR, CVAR)

COURSE MATERIALS

Textbook(s): ***Practical Methods of Financial Engineering and Risk Management,*** Rupak Chatterjee, Apress-Springer, 2014.

Other Readings:

Risk Management and Financial Institutions, John Hull, John Wiley & Sons, 2012.
Monte Carlo Methods in Financial Engineering, Paul Glasserman, Springer-Verlag, 2004.
Fixed Income Securities, *3rd Edition,* Bruce Tuckman & Angel Serrat, Wiley Finance, 2012.

COURSE REQUIREMENTS

All the homework assignments require the use of **Excel** with the following properties:

1) Functions:
   a. **Offset()**
   b. **Rand()**
   c. **Norminv()**
   d. **Skew(), Kurt(), Average(), Stdev(), Frequency()**
   e. **Gammaln()**

2) Data Analysis Function: **Histogram**

Attention Apple Users: Even though you may have Excel, the above functionality does not come with all Apple versions of Excel so you better check to see what your Excel provides.

Attendance	Required
Participation	Required
Homework	Mostly in Excel.
Exams	In-class and closed book

Homework assignments must be uploaded to the Canvas shell of the course.

GRADING PROCEDURES

Grades will be based on:

Homework	(20 %)
Midterm	(30 %)
Final Exam	(50 %)

ACADEMIC INTEGRITY

Graduate Student Code of Academic Integrity

All Stevens graduate students promise to be fully truthful and avoid dishonesty, fraud, misrepresentation, and deceit of any type in relation to their academic work. A student's submission of work for academic credit indicates that the work is the student's own. All outside assistance must be acknowledged. Any student who violates this code or who knowingly assists another student in violating this code shall be subject to discipline.

All graduate students are bound to the Graduate Student Code of Academic Integrity by enrollment in graduate coursework at Stevens. It is the responsibility of each graduate student to understand and adhere to the Graduate Student Code of Academic Integrity. More information including types of violations, the process for handling perceived violations, and types of sanctions can be found at www.stevens.edu/provost/graduate-academics.

Special Provisions for Undergraduate Students in 500-level Courses

The general provisions of the Stevens Honor System do not apply fully to graduate courses, 500 level or otherwise. Any student who wishes to report an undergraduate for a violation in a 500-level course shall submit the report to the Honor Board following the protocol for undergraduate courses, and an investigation will be conducted following the same process for an appeal on false accusation described in Section 8.04 of the Bylaws of the Honor System. Any student who wishes to report a graduate student may submit the report to the Dean of Graduate Academics or to the Honor Board, who will refer the report to the Dean. The Honor Board Chairman will give the Dean of Graduate Academics weekly updates on the progress of any casework relating to 500-level courses. For more information about the scope, penalties, and procedures pertaining to undergraduate students in 500-level courses, see Section 9 of the Bylaws of the Honor System document, located on the Honor Board website.

EXAM ROOM CONDITIONS

The following procedures apply to exams for this course. As the instructor, I reserve the right to modify any conditions set forth below by printing revised Exam Room Conditions on the exam.

1. Students may **not** use the following devices during exams. Any electronic devices that are not mentioned in the list below are also **not** permitted.

Device	**Permitted?**	
	Yes	No
Laptops		X
Cell Phones		X
Tablets		X
Smart Watches		X
Google Glass		X
Other		X

2. Students may **not** use the following materials during exams. Any materials that are not mentioned in the list below are also **not** permitted.

Material	Permitted?	
	Yes	No
Handwritten Notes		X
Typed Notes		X
Textbooks		X
Readings		X
Other		X

3. Students are **not** allowed to work with or talk to other students during exams.

LEARNING ACCOMODATIONS

Stevens Institute of Technology is dedicated to providing appropriate accommodations to students with documented disabilities. Student Counseling and Disability Services works with undergraduate and graduate students with learning disabilities, attention deficit-hyperactivity disorders, physical disabilities, sensory impairments, and psychiatric disorders in order to help students achieve their academic and personal potential. They facilitate equal access to the educational programs and opportunities offered at Stevens and coordinate reasonable accommodations for eligible students. These services are designed to encourage independence and self-advocacy with support from SCDS staff. The SCDS staff will facilitate the provision of accommodations on a case-by-case basis. These academic accommodations are provided at no cost to the student.

Disability Services Confidentiality Policy

Student Disability Files are kept separate from academic files and are stored in a secure location within the office of Student Counseling, Psychological & Disability Services. The Family Educational Rights Privacy Act (FERPA, 20 U.S.C. 1232g; 34CFR, Part 99) regulates disclosure of disability documentation and records maintained by Stevens Disability Services. According to this act, prior written consent by the student is required before our Disability Services office may release disability documentation or records to anyone. An exception is made in unusual circumstances, such as the case of health and safety emergencies.

For more information about Disability Services and the process to receive accommodations, visit https://www.stevens.edu/sit/counseling/disability-services. If you have any questions please contact:

> Lauren Poleyeff, Psy.M., LCSW - Diability Services Coordinator and Staff Clinician in Student Counseling and Disability Services at Stevens Institute of Technology at lpoleyef@stevens.edu or by phone (201) 216-8728.

INCLUSIVITY STATEMENT

Stevens Institute of Technology believes that diversity and inclusiveness are essential to excellence in education and innovation. Our community represents a rich variety of backgrounds, experiences, demographics and perspectives and Stevens is committed to fostering a learning environment where every individual is respected and engaged. To facilitate a dynamic and inclusive educational experience, we ask all members of the community to:

- be open to the perspectives of others
- appreciate the uniqueness their colleagues
- take advantage of the opportunity to learn from each other

- exchange experiences, values and beliefs
- communicate in a respectful manner
- be aware of individuals who are marginalized and involve them
- keep confidential discussions private

TENTATIVE COURSE SCHEDULE

Week Starting		Readings	Assignment
January 23		***Chapter 1: Financial Instruments***	
January 30		***Chapter 1 & 2: Financial Instruments and Building a Yield Curve***	**Problem 2.1:** Building a LIBOR Yield Curve
February 6th		***Chapter 1: Financial Instruments***	
February 13th		***Chapter 1: Financial Instruments***	**Problem 1.1:** Black Formula Calculator and Implied Volatility
February 22th (WEDNESDAY)		***Chapter 3: Statistical Analysis of Financial Data***	**Problems 3.1-3.2**: Inverse Transform Method / Mixed Gaussians (method one and two)
February 27th		***Chapter 3: Statistical Analysis of Financial Data***	**Problems 3.3-3.4**: Calibrate stock returns to a Mixed Gaussian and a Student t-Dist
March 6th		***MIDTERM***	
March 20th		***Chapter 3: Statistical Analysis of Financial Data***	**Problems 3.5**: Create a Skew Normal Dist **Problems 3.6**: VAR/CVAR
March 27th		***Chapter 3: Statistical Analysis of Financial Data***	**Problems 3.7:** Term Structure of Skew, Kurt, Up & Down Volatility
April 3rd		***Chapter 4: Stochastic Processes***	
April 10th		***Chapter 4: Stochastic Processes***	**Problem 4.1:** Brownian Motion MC Simulator
April 17th		***Chapter 4: Stochastic Processes***	**Problem 4.2:** Ito's Lemma
April 24th		***Chapter 4: Statistical Modeling of Trading Strategies***	**Problem 4.3:** GARCH(1,1)
May 1st		***Chapter 4: Statistical Modeling of Trading Strategies***	**Problem 4.5:** Pairs Trading
May 8th		***FINAL EXAM (not yet confirmed)***	