



FRE GY-6123, Section A Financial Risk Management Fall 2022

Course Prerequisite: Graduate standing at NYU.

Course Description and Objectives

This M.S. course in Finance and Risk Engineering will cover five of the major classes of risk that are measured and monitored by most financial firms. These categories are: market, credit, liquidity, operational, and model risks. (Asset and liability (A/L) risk, which references elements of market and credit risks, will not be addressed). These risk classes are not fully independent of each other, and some are quite complex.

The weekly lectures will include reading assignments, student presentations, and case studies drawn from the financial industry.

Meeting time: Tuesdays, 2:00 – 4:30 pm

Classroom: Rogers Hall, Room 216, Brooklyn Campus

First session: Tuesday, September 6, 2022

Instructors

Leon Tatevossian (lt56@nyu.edu / 917-699-6400)

Jon Hill (jh7050@nyu.edu / 732-995-2279)

Teaching assistant

T J Prabhu (trp8615@nyu.edu)

Textbook

GARP Financial Risk and Regulation Series (4 books). Recommended, but not mandatory. The texts may be ordered directly from GARP at an estimated cost of \$75 for e-books and \$125 for print. Additional readings as well as added links to useful articles or resources will be provided during the lectures and/or posted on Brightspace.

Note on Model Risk

The GARP books on Financial Risk and Regulation do not specifically address model risk, as this is a relatively new risk class. Model risk has been receiving increased scrutiny at leading banks since the 2008 Global Financial Crisis. Model risk may be considered to be a form of operational risk, but it is not specifically included in any of the standard operational risk categories.

Class Participation

Your instructors encourage class participation in the form of oral presentations by students as a crucial part of the learning process. To this end, 10% of the final grade will be awarded to brief (10 – 15 minute) class presentations on recent events in finance and 40% on in-depth research presentations (15-30 minutes) on select topics such as the 2008 global markets meltdown. A list of 20+ suggestions for research topics will be provided by the instructors, but students are free to pursue other relevant topics of their own choosing.

Group presentations will be made at the beginning of each class beginning on Oct. 4

Guest Speakers

Your instructors believe that students will benefit by hearing from more than one lecturer on a given topic. To that end several outside speakers will be scheduled during each semester to share their knowledge with the class.

To date, David Palmer, head of model risk analytics at the Federal Reserve Bank, and Agus Sudjianto, head of model risk management at Wells Fargo Bank, have agreed to be guest speakers during the fall, 2022 semester. More guests may be scheduled during the semester as they become available.

Grading

Students can earn a total of 100 points for the course as follows:

- a) Homework 10%
- b) Class Presentation 10%
- c) Midterm 20%
- d) Group Research Project 40%
- e) Final Exam 20%

Total course points are ranked and graded on a curve with a 3.5 average.

Student Groups: Thirty students are registered for this the fall FRE6123A course. During the first two weeks of the semester students are expected to form working groups of two to three students apiece for the class presentations and research projects that will count 10% and 40% of the final grade respectively.

Class Presentations (10%): Each group of two or three students will be tasked to lead one brief 10 to 15-minute verbal discussion at the beginning of each class beginning September 20, providing a market update which includes one or more significant, relevant financial market events over the previous several months. Students will participate in groups of two or three for each class presentation; a written submission is not necessary but a PowerPoint slide deck to guide the in-class presentation is strongly encouraged.

Homework, midterm and final examination due dates:

Midterm Exam, due October 25: This will be a take home exam distributed on Oct. 18 and due back to the course TA by 11:59PM on October 25.

Dec. 13: Final Exam - This will be a take home exam distributed on Nov. 29 and due back to the course TA by 11:59 PM on Dec. 6

Homework

Homework assignments will be posted on Brightspace and should be submitted electronically (two homework assignments over the term). You can work in groups of two or three students, but each student will hand in an individual paper.

Assigned work over the semester will include two take-home open-book homework assignments (10% each). Homework assignments will be distributed two weeks before each of the two exams (midterm and final) and will be due one week before the exam dates (October 23 and Dec. 13) Due dates for homework will be monitored, and students will be penalized a point per day for late submissions.

Group Research Project (40%)

The project will consist of a written and in-class PowerPoint presentation on a subject relevant to FRE 6123A course topics. Instructors may suggest various topics to be investigated, but students are free to choose their own.

Details of the project will be shared separately in class and on NYU Brightspace. Students must form groups of 2-4 and submit a written proposal with the subject and details of their group project no later than February 23rd. Group projects will count for 20% of each student's final grade as follow:

5% - Initial proposal submission – Due Sept. 20
5% - Revised proposal submission – Due Sept. 27
15% - Final written presentation – Due Oct. 4
15% - In-class oral presentations – Starting Oct. 4

Students unable to form a group and/or find a subject on their own may be assigned to a group and/or topic. Each group member is expected to contribute equally to the project, and no work for this project may be all or part of an assignment prepared for another course. Peer evaluations may be used in order to provide constructive feedback but will not count towards the final grade.

Part I: Market Risk Management Professor Tatevossian

Lecture 1, Sept. 6:

Introduction to Financial Risk Management (Professors Hill & Tatevossian) – A course overview.

Introduction to Market Risk – Prof. Tatevossian

What is market risk? Motivation via examples across different constituencies (individual consumer, corporation, asset manager, hedge fund) and different asset classes. Identify the uncertainties we need to quantify: value, future cash flows, probabilities of loss. Introduce background on some of the case studies we will reference during the course.

Lecture 2, Sept. 13: Introduction to basic products in the equity, fixed-income, currency, and commodity markets. Look across product types to isolate the notion of “risk factors” and risk-factor sensitivities. Discuss how holistic risk management must capture risk factors consistently among the different product types.

Lecture 3, Sept. 20: Introduce three basic types of market-risk statistics: sensitivities, value-at-risk (VaR) and its variants, and stress-scenario price responses. Show how they are complementary and interdependent. Emphasize that the information content and forward-looking reliability of these statistics depend on portfolio composition (and can also depend on the market backdrop).

Lecture 4, Sept. 27: Specialize the Lecture 3 discussion to some prototypical portfolios in the fixed-income, equity, and (possibly) other asset sectors. Develop intuition on how the risk statistics shift with adjustments in portfolio composition. Using real-world examples to motivate the impact of correlation of risk factors. Introduce concepts of risk reduction and hedging via derivatives.

Part II: Credit Risk Management

Professor Tatevossian

Lecture 5, Oct. 4: Introduction to credit risk. How is lending priced? How are prices quoted? Examples from the syndicated loan market and the corporate bond market. What are the other domains in which credit risk is present? Introduce the concept of “trading” credit risk.

Lecture 6, Oct. 11: Measuring credit risk. What concepts can be adapted from our discussion of market risk? Credit ratings. EL and UL. Credit risk in a portfolio context. Breakdown of credit risk into components (default risk, ratings migration risk, etc.) Third-party credit models.

Lecture 7, Oct. 18: Mitigation of credit risk. Introduction to credit derivatives (CDSs). Basics of CDS pricing. Extraction of market-implied probabilities of default. How could CDSs be deployed in hedging counter-party risk in swaps? Springboard for an introduction to CVA and its related concepts.

Review of the take home homework assignment. Review for the midterm exam. Distribution of the take home midterm exam to students.

Part III: Operational Risk

Professor Hill

Lecture 8, Oct. 25:

Discussion of the midterm exam questions.

Introduction to Operational Risk. Operational risk measurement, mitigation, and control. **Definition of operational risk.** What is operational risk and what are the consequences. **Seven standard categories of operational risk loss attribution.** Hypothetical and real-world examples. **Seven categories of operational risk loss attribution.** Model risk viewed as a dimension of operational risk. **Basel II requirements for estimation of Operational Risk.** The Basel II Accord approaches to calculating Operational Risk Capital requirements. **Basic indicator approach (BIA), the standardized approach (TSA), and advanced measurement approach (AMA).** Inputs for estimating OpVaR: Internal loss data (ILD) history, external loss data (ELD), scenario analysis (SA), Business environment and internal control factors (BCEIF). **Standardized formula, the Advanced Measurement Approach, the Modified Standard formula.**

Lecture 9, Nov. 1:

Operational Risk Inputs for estimating OpVaR: Internal loss data (ILD) history, external loss data (ELD), scenario analysis (SA), Business environment and internal control factors (BCEIF). **Standardized formula, the Advanced Measurement Approach, the Modified Standard formula.** **Key Risk Indicators (KRIs), Key Performance Indicators (KPIs) and Key Control Indicators (KCIs) for Operational Risk.** The trouble with the AMA method: unstable outputs. **Basel III guidance for operational risk (OpRisk) estimation, mitigation, and control.**

Part IV Model Risk Management

Professor Hill

Lecture 10, Nov. 8:

Discussion of the midterm exam questions.

Introduction to Model Risk, Governance and Validation: How is model risk different from other forms of risk? Why model risk is increasingly important. Introductory presentation on the long and curious history of model risk. **Essential Elements of Model Risk Management.** What is a model and what is model risk? The fourteen foremost challenges faced by today's model risk managers.

Lecture 11, Nov. 15: **Introduction to SR11-7, Federal Reserve Bank guidance on model risk management for all conforming banks.** What is a financial model and why should financial firms care about model risk? What are the sources and consequences of unmitigated model risk? **The traditional three Lines of Defense (LOD) against model risk.**

Lecture 12, Nov. 22: Model Risk Part III: What is model validation and what are the best practices that have been developed by leading financial institutions? Can model risk ever be completely eliminated? Going beyond SR11-7. Case Studies: The 2012 London Whale Episode at JPM, 2021 Greensill and Archegos episodes at Credit Suisse (model risk, operational risk, or both?)

Lecture 13, Nov. 29: Model Risk Part IV: Advanced topics in model risk management. The model “ecosystem”; inter-dependencies between data and models within the ecosystem; the challenges of large model inventories; Quantifying model risk; Aggregation of model risk to firmwide levels. Building a smarter model risk management discipline by building smarter models.

Part V: Liquidity Risk

Professor Hill

Lecture 14, Dec. 6: Introduction to Liquidity Risk: What is meant by “liquidity”? Market and funding liquidity concepts. Measurements of liquidity, bid-ask spread, market depth, immediacy, resilience. liquidity “squeezes” during market crises. Liquidity horizons. Methods to mitigate liquidity risk. Case studies in liquidity mismanagement: Amaranth Advisors (2006), Northern Rock (2007), Long Term Capital Management (LTCM, 1998).

Review of the take home homework assignment. Review for the final exam. Distribution of the take home final exam to students.

Lecture 15, Dec. 13: Discussion of the final exam questions and course review

Family, Health or Other Issues Arising During the Semester

If you encounter any unforeseen family, health or other issues during the semester which create circumstances that prevent you from meeting course requirements, please raise them directly with Deanna Rayment in the Office of Student Affairs at 646-997-3046 (deanna.rayment@nyu.edu) before requesting any accommodation from the instructors.

Moses Center Statement of Disability

If you are a student with a disability who is requesting accommodations, please contact New York University's Moses Center for Students with Disabilities (CSD) at 212-998-4980 (mosescsd@nyu.edu). You must be registered with CSD to receive accommodations. Information about the Moses Center can be found at www.nyu.edu/csd. The Moses Center is located at 726 Broadway on the 2nd floor.

NYU School of Engineering Policies and Procedures on Academic Misconduct

A. Introduction: The School of Engineering encourages academic excellence in an environment that promotes honesty, integrity, and fairness, and students at the School are expected to exhibit those qualities in their academic work. It is through the process

of submitting their own work and receiving honest feedback on that work that students may progress academically. Any act of academic dishonesty is seen as an attack upon the School and will not be tolerated. Furthermore, those who breach the School's rules on academic integrity will be sanctioned under this Policy. Students are responsible for familiarizing themselves with the School's Policy on Academic Misconduct.

B. Definition: Academic dishonesty may include misrepresentation, deception, dishonesty, or any act of falsification committed by a student to influence a grade or other academic evaluation. Academic dishonesty also includes intentionally damaging the academic work of others or assisting other students in acts of dishonesty. Common examples of academically dishonest behavior include, but are not limited to, the following:

1. Cheating: intentionally using or attempting to use unauthorized notes, books, electronic media, or electronic communications in an exam; talking with fellow students or looking at another person's work during an exam; submitting work prepared in advance for an in-class examination; having someone take an exam for you or taking an exam for someone else; violating other rules governing the administration of examinations.
2. Fabrication: including but not limited to, falsifying experimental data and/or citations.
3. Plagiarism: intentionally or knowingly representing the words or ideas of another as one's own in any academic exercise; failure to attribute direct quotations, paraphrases, or borrowed facts or information.
4. Unauthorized collaboration: working together on work that was meant to be done individually.
5. Duplicating work: presenting for grading the same work for more than one project or in more than one class, unless express and prior permission has been received from the course instructor(s) or research adviser involved.
6. Forgery: altering any academic document, including, but not limited to, academic records, admissions materials, or medical excuses.

Disability Disclosure Statement

Academic accommodations are available for students with disabilities. Please contact the Moses Center for Students with Disabilities (212-998-4980 or mosescsd@nyu.edu) for further information. Students who are requesting academic accommodations are advised to reach out to the Moses Center as early as possible in the semester for assistance.

Inclusion Statement

The NYU Tandon School values an inclusive and equitable environment for all our students. The instructors hope to foster a sense of community in this class and consider it a place

where individuals of all backgrounds, beliefs, ethnicities, national origins, gender identities, sexual orientations, religious and political affiliations, and abilities will be treated with respect. It is our intent that all students' learning needs be addressed both in and out of class, and that the diversity that students bring to this class be viewed as a resource, strength, and benefit. If this standard is not being upheld, please feel free to speak with either of the instructors.