NYU TANDON SCHOOL OF ENGINEERING
Finance & Risk Engineering

# FRE 8061 (Section I)
# Model Risk Management – A Case Study Based Approach

## Instructor Information


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## Course Information

- **Syllabus date –** April 5, 2021
- **Course number –** FRE 7801-I
- **Credits –** 1.5 credits
- **Course name –** Model Risk Management – A case study based approach.
- **Course description –**
  Model risk management (MRM) is often cited as one of the key concerns by regulators and global banks in recent surveys and interviews conducted in the US and Europe (as per recent McKinsey and other industry studies). The total number of models at a given bank range anywhere from 100 to 5000+, and the number of full-time equivalents (FTEs) professionals dedicated to MRM and validation is also highly variable, with US banks dedicating an ~20 FTEs per $100 billion of assets, while for European banks this average is ~10. Model risk groups have grown considerably in recent years, and that growth is expected to continue. With respect to governance, most of the MRM groups report directly to the chief risk officer (CRO), and the boards at these banks typically discuss MRM in at least 6 meetings per year.
- **Prerequisites** – None
- **Classroom number and building** – In-person (Fall 2021)
- **Virtual (online) meeting days and times** – By appointment on Mondays

## Course Overview and Goals

The current class provides the basic components of model risk, assessments, and model validation process. The class is intended to be applied in nature with focus on real life case studies to provide actual flavor of bank's MRM challenges to the students. Upon completion of this course, students will be able to:

- Understand the core elements of modern model risk management,

- Be able to apply model validation techniques to pricing models, and market risk models,
- Comprehend the basics behind model testing procedures including back-testing, and
- Develop keen appreciation for regulatory expectations and prevailing industry practices.

# Course Requirements

The grading for this class will based on homework (assigned readings), open-book quizzes, open book final, class participation, and individual project.

## Grading of Assignments

The grade for this course will be determined according to the following formula:

| Assignments/Activities | % of Final Grade |
|---|---|
| 5 Homework assignments | 30% |
| 5 quizzes | 30% |
| Class project/<br>Class participation | 30% |
| Final test | 10% |

# Letter Grades

Letter grades for the entire course will be assigned as follows:

| Letter Grade | Points | Percent |
|---|---|---|
| **A** | 4.00 | 92.5% and higher |
| **A-** | 3.67 | 90.0 – 92.49% |
| **B+** | 3.33 | 87.5% - 89.99% |
| **B** | 3.00 | 82.5% - 87.49% |
| **B-** | 2.67 | 80% - 82.49% |
| **C+** | 2.33 | 77.5% - 79.99% |
| **C** | 2.00 | 70.0% - 77.49% |
| **F** | .00 | 69.99% and lower |

## View Grades

The grades will be available in Albert with 3 after the final class.

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# Course Schedule

## Topics and Assignments

| Week/Date | Topic | Reading |
|---|---|---|
| Week 1 | • **Introduction to model risk management (MRM)**<br>• Historical examples of model failures & consequences | Class presentation deck, and contemporary industry insights/papers |
| Week 2 | • **Model definition & classification**<br>a) MRM governance process<br>b) Model development<br>c) Model validation<br>• Model Assumptions and limitations | Class presentation deck, and contemporary industry insights/papers |
| Week 3 | **Model validation process** and issue identification<br>• Key attributes<br>• Model testing (back-testing, bench-marking) | Class presentation deck, and contemporary industry insights/papers |
| Week 4 | **Case study 1.** Two factor commodity pricing models | Class presentation deck, and contemporary industry insights/papers |
| Week 5 | **Case Study 2.** Standard Initial Margin Models (SIMM) for derivatives | Class presentation deck, and contemporary industry insights/papers |
| Week 6 | **Case study 3.** Machine learning and Algo models | Class presentation deck, and contemporary industry insights/papers |
| Week 7 | **Current and future trends** in model risk management | Class presentation deck, and contemporary industry insights/papers |

# Course Materials

## Required Textbooks & Materials

- Understanding and Managing Model Risk: A Practical Guide for Quants, Traders and Validators by **Massimo Morini**
- Multiple contemporary industry and academic papers on model risk management topics as applied to *risk models, valuation models, algorithmic/ML/AI models, and estimation approaches*.

## Resources

- **Access your course materials**: NYU Classes (nyu.edu/its/classes)
- **Databases, journal articles, and more**: Bern Dibner Library (library.nyu.edu)
  NYU Virtual Business Library (guides.nyu.edu/vbl)
- **Obtain 24/7 technology assistance:**
  Tandon IT Help Desk (soehelpdesk@nyu.edu, 646.997.3123)
  NYU IT Service Desk (AskIT@nyu.edu, 212-998-3333)

# Policies

## 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 of Engineering 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 have 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. I 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 my 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 me.