Fall 2014

C15.0022: RISK MANAGEMENT

Professor Thomas Philippon

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Meeting time: Mo/We 11am-12:15pm.

Office hour: Monday 5 pm

DESCRIPTION OF THE CLASS

This course focuses on the management of financial risks: market risk, credit risk, and liquidity risk. We first present quantitative methods used by financial institutions to measure and manage these risks: value at risk, market volatility, models of default and recovery, trading costs, stress testing.

We then use these idea to study specific topics: liquidity and capital requirements in banking, the regulation of insurance companies, sovereign risk and debt sustainability, debt restructuring, systemic risk and the resolution of financial crises. We provide a critical analysis of new regulations and of policy-makers' responses to financial crises.

Note that the class is quantitative and uses spreadsheets quite heavily.

PREREQUISITES

This course has two parts: one micro-finance, and one macro-finance. The material covered in **Foundations of Finance** is a prerequisite for this class. In particular, you should be familiar with:

- Statistics concepts such as expected value, standard deviation, and percentiles. You need to know how to compute them in a spreadsheet.

- Pricing and marking to market of forward contracts, futures, swaps, and options.

- Fixed income concepts, such as duration, convexity, and immunization.

- The Black-Scholes-Merton model and the definition of implied volatility.

- Objective and risk-neutral probabilities and how to use them to price derivatives.

All these topics are covered in Foundations. If you do not remember them, take a look at your notes and textbook to refresh your memory.

RECOMMENDED BOOKS

Over the years, I have found that no single book covers all the relevant topics. Therefore there is no required textbook for this class, but there are **required readings** (see below). I can also recommend some books. To refresh your memory before each class, read the relevant chapters in the textbook used in Foundations of Finance, such as Investments by Bodie, Kane, and Marcus, for instance.

Regarding specific issues in Risk Management, here are some good references:

- Financial Institutions Management: a Risk Management Approach by Anthony Saunders and Marcia Cornett, Irwin-McGraw Hill, 5e, 2005. *Good overview of risk management.*

- Options, Futures and Other Derivatives by John C. Hull, Pearson Prentice Hall, 6e, 2006. *Good reference for derivatives but too light on credit risk.*

- Value at Risk by Philippe Jorion, McGraw Hill, 3e, 2007. *Very focused on VaR, and too light on credit risk.*

- Fixed Income Securities by Bruce Tuckman, Wiley, 2e, 2002. *Best reference for fixed income. But nothing on credit risk.*

- Credit Risk Modeling by David Lando, Princeton University Press, 2004. *Good overview of theory and data, but advanced mathematics required.*

If you are interested in how government and central banks react to financial crisis, the best notes are on David Romer's website: "Short-Run Fluctuations" available on his website at Berkeley (http://elsa.berkeley.edu/~dromer, version January 2013).

GRADING

We seek to teach challenging courses that allow students to demonstrate differential mastery of the subject matter. Assigning grades that reward excellence and reflect differences in performance is important to ensuring the integrity of our curriculum. In general, students in this course can expect a grading distribution similar to that used in our core courses:

➢ 25-35% of students can expect to receive A's for excellent work
➢ 50-70% of students can expect to receive B's for good or very good work
➢ 5-15% of students can expect to receive C's or less for adequate or below work

Your final grade will be based on:

- Homework and participation: 30% (homework assignments are submitted directly online)
- Midterm exam: 30%
- Final exam: 40% (exams are open-book, open notes)

RE-GRADING

In line with Grading Guidelines for the NYU Stern Undergraduate College, the process of assigning of grades is intended be one of unbiased evaluation. This means that students are encouraged to respect the integrity and authority of the professor's grading system and discouraged from pursuing arbitrary challenges to it. If a student feels that an inadvertent error has been made in the grading of an individual assignment or in assessing an overall course grade, a request to have that the grade be re-evaluated may be submitted. Students should submit such requests in writing to the professor within 7 days of receiving the grade, including a brief written statement of why he or she believes that an error in grading has been made. See http://w4.stern.nyu.edu/citl/teaching.cfm?doc_id=3369 for more information.

ACADEMIC INTEGRITY

Integrity is critical to the learning process and to all that we do here at NYU Stern. All students are expected to abide by the **NYU Stern Student Code of Conduct**. Please see www.stern.nyu.edu/uc/codeofconduct for more information. A student's responsibilities include, but are not limited to:

- A duty to acknowledge the work and efforts of others when submitting work as one's own. Ideas, data, direct quotations, paraphrasing, creative expression, or any other incorporation of the work of others must be clearly referenced.
- A duty to exercise the utmost integrity when preparing for and completing examinations, including an obligation to report any observed violations.

STUDENTS WITH DISABILITIES

Students whose class performance may be affected due to a disability should notify the professor early in the semester so that arrangements can be made, in consultation with the Henry and Lucy Moses Center for Students with Disabilities, to accommodate their needs.

Please see http://www.nyu.edu/csd for more information.

COURSE POLICIES

Attendance

Class attendance is mandatory and part of a student's grade. Absences may be excused only in the case of documented serious illness, family emergency, religious observance, or civic obligation. If you will miss class for religious observance or civic obligation, you must inform you instructor no later than the first week of class. Recruiting activities are not acceptable reasons for class absence.

Students are expected to arrive to class on time and stay to the end of the class period. Chronically arriving late or leaving class early will have an impact on a student's grade. Students may enter class late only if given permission by the instructor and can do so without disrupting the class.

Participation

Participation is an essential part of learning in this course. Students are expected to participate in all facets of classroom learning.

Homework and other assignments should be completed on time. Late Assignments will not be accepted unless due to documented serious illness or family emergency. Since all homework assignments are online, you are expected to complete them on time even if you cannot attend the class when the homework is due.

All electronic devices must be turned off prior to the start of each class meeting. Laptops, cell phones, smartphones and other electronic devices are a disturbance to both students and professors. Food is not allowed in the classroom.

You need a **calculator** for this class. A scientific calculator is good enough; you do not need to buy a financial one. As a rule, you will use spreadsheets for homework assignments, and the calculator for the exams. It is a very bad idea to wait for the last week before buying a calculator. You need to become familiar with exponential, natural logs, and various other functions, and you need to practice before the exam.

I recommend that you regularly review the readings and class notes in a **study group**. Don't wait until exam week to set up such a study group. You can work on the problem sets with your study group, but you must hand in your own answers.

COURSE CONTENT

We cover 13 topics. For each topic there is a reading, a set of slides, some practice problems, and (usually) a homework assignment.

Each topic takes approximately two lectures, so we will cover one topic per week.

1. Measures of Risk: Volatility, Value at risk and Expected Shortfall
- Definitions, Historical simulation and normal model
- Reading: *JPM Annual Report, Market Risk Management*

2. Mapping, Hedging, and VaR systems
- VaR system and mapping. Review of duration and delta hedging, marking to market (forward, futures, options, swaps)
- Reading: *JPM Annual Report, Value at Risk*

3. Models of Volatility
- Why market risk is not constant, Exponential model to adjust VaR and ES. Case study of S&P volatility
- <u>Reading</u>: *CBOE Volatility Index VIX*

4. Marginal VaR and Diversification
- Portfolio VaR and ES, Diversification, Decomposing VaR
- <u>Reading</u>: *JPM Annual Report, Value at Risk*

5. Credit ratings and migration
- Default, exposures, expected & unexpected losses, ratings, Credit VaR, RAROC
- <u>Reading</u>: *Introduction to CreditMetrics*

6. Credit derivatives
- Systematic credit risk, Actual and risk neutral probabilities, CDS and CDX
- <u>Reading</u>: TBA

7. Liquidity Risk, LVaR
- Market liquidity and funding liquidity, adverse selection
- <u>Reading</u>: TBA

8. Regulation of Banks
- Basel 3, capital, resolution, living wills, debt overhang, risk shifting
- <u>Reading</u>: *Admati, "*[*What Jamie Dimon Won't Tell You*](#)*," Baseline Scenario, December 2010.*

9. Back testing, Stress testing
- Type 1 and 2 errors, Basel regulations, Federal Reserve Stress Tests
- Reading: TBA

10. Systemic risk, macro-prudential regulation
- Measures of systemic risk, Too-big-to-fail
- <u>Reading</u>: Hanson, Kashyap and Stein, "[A Macroprudential Approach to Financial Regulation](#)," 2011.
- <u>Reading</u>: Calomiris, Klingebiel, and Laeven, "Seven ways to deal with a financial crisis: Cross-country Experience and Policy Implications", 2012.

11. Regulation Non-Bank Entities
- Insurance companies, mutual funds
- Reading: *Are insurance companies systemic?*

12. Sovereign risk, debt sustainability, debt restructuring
- Currency mismatch, sudden stops, banking crises
- <u>Reading</u>:
  - Reinhart and Rogoff, "[From Financial Crash to Debt Crisis](#)," March 2010
  - "[The Good, The Bad, and the Ugly: 100 Years of Dealing with Public Debt Overhangs](#)," Chapter 3 of IMF *World Economic Outlook*, Oct. 2012.

13. Advanced Topic (to be chosen)

a. Market Risk and Credit Risk: Merton model
- Black-Sholes formula, equity as a call option, Distance to default
- <u>Reading</u>: *KMV model*

b. Portfolio Credit Risk
- Asset correlation, Factor model and portfolio credit risk
- *RAROC*

c. Securitized Banking and Structured Finance
- Traditional banking vs. securitized banking, Repos, MBS, ABS & ABCP, CDOs