Spring 2011

B40.3312: RISK MANAGEMENT IN FINANCIAL INSTITUTIONS

Professor Thomas Philippon

Office: KMEC 9-90
Phone: 998-0490
Email: tphilipp@stern.nyu.edu
Office hours: TBA.

GOAL OF THE CLASS

The course focuses on modern, quantitative methods to measure and manage the risks faced by financial institutions. It covers market, credit risk, liquidity risk, and operational risk.

In light of the recent crisis, the course will focus on systemic risk, interconnected networks of counter-parties, moral hazard, compensation and incentives.

PREREQUISITES

The material covered Foundations of Finance is a prerequisite for this class. In particular, you should be familiar with:

• Definition, pricing and marking to market of forward contracts, futures, swaps, and options.

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

• Statistics concepts such as expected value, standard deviation, and percentiles. You should know their definitions, their properties, and how to compute them in a spreadsheet.

• 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, take a look at your notes and textbook to refresh your memory.

**RECOMMENDED BOOKS**

Before buying new books, you should make sure that you have fully exploited the ones you already own. To refresh your memory before each class, read the relevant chapters in the textbook used in Foundations of Finance:

- **Investments** by Zvi Bodie, Alex Kane, and Alan J. Marcus, 7e or 8e. *The basics, well explained.*

Regarding Risk Management, no single textbook covers all the relevant material. In designing the class, I have used the books listed below. These textbooks are not required, just recommended, and you can also use earlier editions. Each has its strengths and weaknesses, none is perfect. You should buy the one that corresponds to the area where you need or want to learn more. Here are some excellent references:


I can also recommend two academic books on credit risk if you want to expand your knowledge (but the material is more advanced than what we will do in class):


Finally, you can find some interesting specific information in these two books:


### GRADING

At NYU Stern 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.

No more than 35% of students will receive grades of A or A-. Your grade will be based on a series of home works, one midterm and one final exam. The breakdown is approximately:

- Homework: 40%
- Final: 50%
- Participation in class: 10%

All homework assignments are submitted directly on Blackboard. The exams are open-book, open notes.

### 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 **Graduate Programs Honor Code**. A student’s responsibilities include, but are not limited to:

### COURSE POLICIES

#### Attendance

Class attendance is required and part of a student's grade. Absences are excused 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 me no later than the first week of class. Recruiting activities are not acceptable reasons for class absence. If you will miss a class because of a business trip, you must inform me a week in advance.

#### Homework

Homework and other assignments are expected to 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.

Calculator

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 simple examples in class, and, most importantly, 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.

Study Groups

It is highly recommended 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. By then it’s too late. You are encouraged to work on the problem sets with your study group, but you must hand in your own answers.

COURSE CONTENT

• Prerequisites are the concepts you need to know to understand the class. You should have learned them in your core classes. You should review your class notes to make sure they are fresh in your mind.

• Readings. The required readings are in the handouts. You should read them before the class, skipping the technical parts, and after the class, once I have explained the concepts and the techniques.

The class is divided into three broad sections

INTRODUCTION

Overview of risk management, regulation and capital requirements

• JPM 2008 annual report pages 212-213: Tier 1&2, RWA

• JPM 2008 annual report pages 82-83: Economic Risk Capital
PART ONE: MARKET RISK

Value at risk and Expected Shortfall

Prerequisites: statistics, mean, percentiles

• JPM 2008 annual report pages 112-115

Mapping and VaR system

Prerequisites: Forward, futures, swaps, options, delta hedging, duration, immunization.

Market volatility

Prerequisites: empirical estimates of means and variances

• Risk metrics pages 13-16
• VIX pages 1-4

Decomposing VaR

Prerequisites: covariance, correlation, conditional expectations

• JPM 2008 annual report pages 112-115 (see above)

Back testing

Prerequisites: probabilities, Bernoulli trials

• Christopher Finger “VaR is from Mars...”

Special topic: Systemic risk regulations

Prerequisites: covariance, correlation, conditional expectations

• Regulating systemic risk, NYU working paper

PART TWO: CREDIT RISK

Introduction to credit risk

• JPM pages 92-93

Migration model

Prerequisites: probabilities
• Credit metrics, Chapter 2

Credit scoring

Prerequisites: regression analysis

• Retail Credit Risk Modeling

Merton model

Prerequisites: Black-Scholes formula, implied volatility

• “Modeling default risk”, KMV pages 6-18

Portfolio Models of Credit Risk

• “RAROC”, RMA Journal

CDS and credit spreads

Prerequisites: risk neutral probabilities

Special topic: Network of Counterparties

• “Does a Central Clearing Counterparty Reduce Counterparty Risk?”, Duffie & Zhu

• “Too-interconnected-to-fail” Gross & Philippon

PART THREE: CAPITAL ALLOCATION, LIQUIDITY, SECURITIZATION, AND MACROECONOMIC RISK

Strategic Capital allocation

Securitization

• “The Consequences of Mortgage Credit Expansion” Mian and Sufi

• “House Prices, Home Equity-Based Borrowing, and the U.S. Household Leverage Crisis” Mian and Sufi

Liquidity risk, bank runs, stress tests

• “When everyone runs for the exit”, Lasse Pedersen

• “Securitized banking and the run on repo”, Gary Gorton and Andrew Metrick

• “What happened to the Quants”, Andy Lo

Crisis forensic
• “Shareholder Report on UBS’s Write-Downs”, UBS
• “The Failure Mechanics of Dealer Banks”, Duffie

**Macroeconomic risks**

**Prerequisites:** Principles of corporate finance, Modigliani Miller theorem, asymmetric information, debt overhang

**Monetary policy & government interventions**

• “Why do banks hold so much reserves”
• “Crisis and responses: The Federal Reserve and the financial crisis of 2007-2008”
  Cecchetti

**New regulations**

• JPM shareholder letter 2009
• “The Shadow Banking System: Implications for Financial Regulation”, Adrian and Shin