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# RISK MANAGEMENT IN FINANCIAL INSTITUTIONS

FINC-GB.3312.10, FALL 2011

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Wednesday 6-9pm, KMEC 4-110

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Office hour: Wednesday 4:30-5:30 pm, or by appointment

## GOAL OF THE CLASS

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

In light of the ongoing crisis, we also will discuss systemic risk, sovereign risk and financial regulations.

## PREREQUISITES

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All homework assignments use real data and require the use of spreadsheets.

The material covered in **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 need to know 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 them, take a look at your notes and textbook to refresh your memory.

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## RECOMMENDED BOOKS

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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:

- Financial Institutions Management: a Risk Management Approach by Anthony Saunders and Marcia Cornett, Irwin-McGraw Hill, 5e, 2005. *Good overview of risk management. Not very technical.*
- Options, Futures and Other Derivatives by John C. Hull, Pearson Prentice Hall, 6e, 2006. *Best reference for derivatives. But not a complete risk management book, and too light on credit risk.*
- Value at Risk by Philippe Jorion, McGraw Hill, 3e, 2007. *Everything you always wanted to know about VaR, and more. But too 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.*
- Measuring and Managing Credit Risk by Arnaud de Servigny and Olivier Renault, McGraw Hill, 2007. *The S&P guide to credit risk.*

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.*

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)

- Credit Risk Modeling by David Lando, Princeton University Press, 2004. *Good overview of theory and data.*
- Credit Risk by Darrell Duffie and Kenneth J. Singleton, Princeton University Press, 2003. *Good theoretical overview. Technically difficult.*

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

- Financial Risk Management by Steven Allen, Wiley, 2003. *Risk management from the sell side perspective. Not a textbook, more like a guidebook. Nicely written.*
- Risk Takers by John Marthinsen, Pearson Prentice Hall, 2008. *For case studies.*

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## 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%

Homework assignments are submitted directly on Blackboard. Exams are open notes.

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## 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**.

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## 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.

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## 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 in

advance. Recruiting activities are not acceptable reasons for class absence. If you will miss a class because of a business trip, you must inform me as soon as possible.

### **Participation**

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

### **Reading/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.

Before the class, you should review the material that you have learned in the core classes. For instance, review your notes on option pricing before the class on the Merton models of credit risk.

### **Classroom Norms**

**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**

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- *Prerequisites* are the concepts (listed above) you need to know to understand the classes. 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.

## **Fundamentals of Risk Management**

### Introduction

#### **Overview of Risk Management**

- *JPM Annual Report*

#### **Review of Portfolio Theory**

### Market Risk

#### **Value at risk and expected shortfall**

- Definitions
- Historical simulation and normal model
- *JPM: Market Risk Management*

#### **Market volatility**

- Why market risk is not constant
- Exponential model to adjust VaR and ES
- Case study of S&P volatility
- *Risk Metrics* and *VIX*

#### **Mapping and VaR system**

- Overview of VaR system and mapping
- Review of duration and delta hedging
- Review of marking to market (forward, futures, options, swaps)

#### **Decomposing VaR**

- Portfolio VaR and ES
- Diversification
- Marginal VaR and Component VaR

#### **Back testing**

- Exceptions and binomial distribution
- Type 1 and 2 errors
- Basel regulations for back testing
- *VaR and Capital*

## Credit Risk

### **Introduction to credit risk**

- Default, exposures, LGD
- Expected & unexpected loss
- Credit risk capital
- *JPM Annual Report*

### **Credit ratings and migration**

- Ratings
- Migration model with one bond
- Credit VaR and RAROC
- Migration with two bonds
- *Credit Metrics*

### **Credit scoring**

- Scoring models
- Estimation of logit model
- ROC curve

### **Merton models**

- Equity as a call option
- Distance to default
- Probability of default
- *KMV*

### **Portfolio Credit Risk**

- Asset correlation
- Factor model and portfolio credit risk
- Commercial models
- *RAROC*

### **Credit derivatives**

- Systematic credit risk
- Actual and risk neutral probabilities
- CDS and CDX
- *Markit document on credit indexes*

## Liquidity Risk

### **LVaR**

- Bid-Ask Spread
- Funding Liquidity
- Liquidity Crises
- *JPM Annual Report*

### **Stress Testing**

- Stress tests
- Scenarios

### **Securitized Banking and Structured Finance**

- Traditional banking vs. securitized banking
- Repos
- MBS
- ABS & ABCP
- CDOs

## Extra Topics

### **Basel III**

### **Sovereign Risk**