
B40.3312

RISK MANAGEMENT IN FINANCIAL INSTITUTIONS

FALL 2008 SYLLABUS

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Office hours: 4-5 pm on days of lectures, or by appointment

GOAL OF THE CLASS

The course focuses on modern, quantitative methods to measure and manage the risks faced by financial institutions. We will cover market risk (value at risk, expected shortfall, market volatility, stress testing, scenario analysis, back testing), credit risk (single name, portfolio, ratings & market based models, credit derivatives), liquidity risks, operational risks, risk budgeting, and capital requirements.

Risk management is a very broad topic. The bad side is that we need to cover a lot of material. The good side is that this class contains some of the most interesting elements of fixed income, credit risk, and market risk.

CLASS MEETING DATES AND TIMES

The class meets on Wednesday from 6 p.m. to 9 p.m. There is a 10 minutes break in the middle of the class. The first class is on September 17. The last class, which is the final exam, is on December 17. There is no class on October 8 or on November 26.

The venue is KMEC, Room 5-90.

PREREQUISITES

The material covered in **B01.2311 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, conditional expected value, standard deviation (volatility), variance. You should know their definitions, their properties, and how to compute them in a spreadsheet.
- Black-Scholes model and implied volatility. Delta hedging.
- 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

I do not think there is one textbook that really covers all the relevant themes, so I selected several. In my slides and lecture notes, I use all of them. These textbooks are not required, just recommended, and you can also use earlier editions.

Before buying a new book, you should make sure that you have fully exploited the ones you already own. To refresh your memory, I recommend

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

Then, there are several books I find useful for risk management. Each has its strengths and weaknesses, none is perfect. You should buy the one that corresponds to the area where you want to learn more. If you manage a fixed income portfolio, you do not need to learn more about fixed income, but you might want to learn about credit risk.

- 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 perhaps too focused on VaR, and too light on credit risk.*
- 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. *Only for case studies.*

- 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.*
- 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.*

GRADING

Your grade is based on a series of home works and one final exam. The breakdown is approximately:

- Home works: 45%
- Participation in class: 5%
- Final: 50%

All home works are submitted directly on Blackboard. The exam is open-book. Following departmental guidelines, the course is graded on a curve with 10% A, 10-15% A-, 10% B+, 50-60% B, 10-15% C+/C/C-, and 0-10% D/F.

ORGANIZATION OF THE CLASS

Each class begins exactly at 6 p.m. and is expected to last until 9 p.m., with a 10 minutes break in the middle.

Laptops

I will make use of spreadsheets to illustrate many difficult concepts. If you have a laptop, you should bring it to class so that you can work on the spreadsheets in real time.

Note that you may not use your laptop freely in class, but only when you are instructed to do so. Checking email and surfing the web are not allowed.

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 the home works, and the calculator for the simple examples in class, and, most importantly, for the final exam. 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.

Readings

There are two types of reading. Before the class, you should review the material that you have learned in the core classes. For instance, read your notes on Black-Scholes before the class on KMV.

I teach you the hard stuff in class. After class, you can read the extra material posted on Blackboard. If you try reading it before class, it will probably be too hard.

General School Policies and Honor Code

Cell Phones, Smart phones, & Other Electronic Devices may not be used in class. Attendance is required and part of the grade. Faculty will excuse absences only in the case of documented serious illness, family emergency, religious observance, or civic obligation. Recruiting activities are not acceptable reasons for absence from class. Students are expected to arrive to class on time and stay to the end of the class period. Arriving late or leaving class early will have impact on the course grade. Late assignments will either not be accepted or will incur a grade penalty unless due to documented serious illness or family emergency.

You are responsible for maintaining Stern's Honor Code which mandates zero tolerance for cheating and plagiarism. Violations of the honor code will be prosecuted with a minimum penalty of failure for the course, as required by code of conduct rules. If you become aware of any violations of the honor code you must take whatever steps are necessary to stop the violators.

Study Groups

It is highly recommended that you regularly review the readings and class notes in a study group. Don't wait until exam time 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 AND CLASS SCHEDULE

Class 1. VaR and capital requirements. Sept 17.

- First half: Overview of regulation, capital requirements, Basel I and II
- Second half: Introduction to Value at Risk & Expected Shortfall
- Reading before class: Statistics, mean, volatility, expected value
- Reading after class: pages from JPMorgan Annual Report (2007) on BB
- Home work due for next class: VaR and ES with one asset

Class 2. VaR system and market volatility. Sept 24.

- First half: VaR mapping
- Second half: Market Volatility
- Reading before class: Forward, futures, swaps, options, delta hedging, duration, immunization.
- Reading after class: pages from Risk Metrics on BB
- Home work due for next class: Volatility

Class 3. Decomposing VaR. Oct 1.

- First half: MVaR, IVaR, CVaR
- Second half: MES, IES, CES
- Reading before class: correlations, conditional expectations
- Reading after class: none, just try to digest the slides!
- Home work due for next class: VaR with 3 stocks

Class 4. Testing VaR. Oct 15.

- First half: Stress testing, scenarios
- Second half: Back testing & regulations, errors of types I and II
- Reading before class: Wikipedia on 1987 crash, LTCM Russia, etc.
- Reading after class: TBA
- Home work due for next class: Testing

Class 5. Credit risk: introduction and migration. Oct 22.

- First half: migration risk with one asset
- Second half: migration risk in a portfolio
- Reading before class: ratings, default probabilities, transition matrices
- Reading after class: Credit Metrics

- Home work due for next class: Migration

Class 6. Credit risk: extensions. Oct 29.

- First half: KMV
- Second half: Copulas
- Reading before class: Black Scholes, implied volatility.
- Reading after class: KMV
- Home work due for next class: Enron

Class 7. Credit derivatives. Nov 5.

- First half: CDS
- Second half: CDOs
- Reading before class: risk neutral probabilities. Bear Stearns CDS.
- Reading after class: CDO risk paper, GM & Ford
- Home work due for next class: CDO

Class 8. Liquidity risk. Nov 12.

- First half: liquidity risk
- Second half: case study
- Reading before class: TBA
- Reading after class: TBA
- Home work due for next class: liquidity

Class 9. Operational risk and model risk. Nov 19.

- First half: operational risk, model risk
- Second half: case study
- Reading before class: TBA

- Reading after class: TBA
- Home work due for next class: Operational risk

Class 10. Risk budgeting, guest lecture. Dec 3.

- First half: Risk budgeting & integrated risk management
- Second half: Guest lecture TBA
- Reading before class: TBA
- Reading after class: TBA
- Home work due for next class: Practice exam

Class 11. Review, discussion of crisis, guest lecture. Dec 10.

- First half: Review
- Second half: Guest lecture TBA
- Reading before class: TBA
- Reading after class: prepare for the exam.
- Home work due for next class: None

Class 12. Final exam. Dec 17.

- 3 hours
- Cumulative
- Open notes
- Bring a calculator with new batteries