CASE WESTERN RESERVE UNIVERSITY
Weatherhead School of Management

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BAFI 432
Risk Management and Financial Engineering
Spring 2001
Thu, 6-8 pm

Course Syllabus

Introduction

This course is aimed at participants who wish to

- have a deeper understanding of the risks faced by corporate firms, both financial and non-financial,
- learn techniques to identify and measure these risks, and
- understand how financial engineering, especially derivatives and risk management techniques, can be used to manage these risks and advance the strategic goals of the firm.

This course would be of use to executives of corporations, who issue securities and use a wide array of derivative contracts; bankers, who design, price, produce, sell and buy securities both on their own behalf and for their clients; and investment managers (i.e. issuers, intermediaries, and investors).

The course starts with an understanding of how risk management contributes to the value of the firm, the various kinds of risks that can be faced by firms, and the array of risk management products available. The second module in the course deals specifically with market risk measurement and control, using Value-at-Risk (VaR) techniques. The purpose of this module is to provide grounding in VaR, which is now being widely used as a benchmark for controlling market risk. The topics covered include basic VaR estimation, including the RiskMetrics system, along with some newer and advanced approaches. The course then focuses on using derivatives to manage a firm's financial risks. The course shows how forwards and futures, equity, interest rate, commodity and exchange rate options, vanilla and exotic swaps, and exotic options can be used to manage financial risks and how the risks of these derivatives can be evaluated. The fourth module in the course introduces credit risk. An overview of credit-risk pricing models is provided, along with Credit VaR techniques and CreditMetrics. The last class in this module focuses on using credit derivatives to manage credit risk (including credit risk of derivatives). The penultimate session in the course is devoted to firmwide operational risk management, and the issue of managerial control. The course concludes with the discussion of financial innovation in risk management, and some of the limitations that any risk management technique or process might run into.

The emphasis of this course is on risk management rather than on the technical details of pricing derivatives. The course takes the approach of identifying risks, quantifying them, and

developing financial contracts (often derivatives) that provide solutions. In this way, the process of financial innovation and financial engineering is integrated into risk management. Several cases and exercises are used to put participants in the position of a firm with a risk management problem.

Prerequisites

This is an advanced course targeted at the second year MBA/MS level. The course is about using derivatives in a risk management setting, therefore it assumes that the students are very comfortable with concepts regarding **pricing and hedging derivative securities** like options and futures. Students not comfortable with options and futures should not register for this course. Even students comfortable with these topics should brush up their knowledge by reading any options textbook, like the one by Hull. It is also required that students be familiar with a **spreadsheet package** like excel, and have some familiarity with **Matrix Algebra**. Knowledge of a **programming language** (like C++) would be very useful, though not absolutely necessary, in doing the assignments in the course.

Pre/Co-requisite - **BAFI 430**: Options and Futures

Ideally, the students registering for this class should have already done BAFI 430. However, students very interested in this area can also take my class if they also take BAFI 430 along with it as a co-requisite. ***Students taking BAFI 430 as a co-requisite should make sure that they do extra reading on their own and bring themselves up to speed with the basic concepts in options and futures within the first few weeks of this class***. I will not be repeating any material that is already covered in BAFI 430, hence the onus of learning that material and being prepared for my class well in advance is on the students themselves. **If you feel you cannot handle this course with BAFI 430 as a co-requisite, you should not register for this class**.

This course also presumes that the students are reasonably well informed, i.e., that they are familiar with the financial markets and regularly read a financial newspaper, like the *Wall Street Journal* or the *Financial Times*.

Course Materials

Since this is a new and still evolving area, the right textbook has still not been written. There is no comprehensive textbook that can be used for all components of this course. Each class session would be supplemented by class notes and handouts that I'll prepare for the topic being discussed. The class notes would be put up on my website at least one week before class. **Its your responsibility to print them out ahead of class, read them, and bring them with you to class so that you do not have to write them down by hand. Please note that I would not be distributing these handouts in class at all.** For each section of the course, the recommended readings list would also be distributed. Following is the list of some good books in risk management - please note that you are not *required* to buy any book for this course, but if you plan to work in this area, these are good books to be familiar with (in no particular order):

- *Managing Financial Risk*, 3rd. ed. 1998, by Charles W. Smithson.
- *Value-at-Risk: The benchmark for controlling market risk*, 2000 (2nd Edition), Philippe Jorion

- *Managing Credit Risk*, John B. Caouette, Edward Altman and Paul Narayanan
- *Derivatives Handbook*, 1997, Robert Schwartz and Clifford W. Smith
- *Credit Risk Measurement: New Approaches to Value at Risk and Other Paradigms*, 1999, Anthony Saunders
- *Options, Futures, and other Derivatives*, 1999, John C. Hull
- Selected readings and articles distributed in class.

I strongly recommend that students read *RISK*, a journal that is available in the library. *RISK* is the best source of information about current issues in risk management, financial engineering, and derivative markets.

Course pedagogy:

There would be four exercises, two cases and one final examination in the course, with the following weights:

Exercises	40%
Cases	20%
Class participation	10%
Final	30%

The exercises are very computational in nature, while the cases require you to analyze specific corporate settings and recommend risk management solutions. Cases and exercises are much more rewarding if worked on in groups, hence it is *required* that you do all of them in groups of *two* (and two only - **no individual assignments**). Pick your own group member (if you have trouble getting picked, I will help). The group composition cannot be changed during the semester, so I would advise you to choose your group member carefully. It would help you if you chose your group member so as to have good combined skills in math, computer work, writing and communication skills. All group work will be self-policed. Group members will share the same case grade, no matter how the work was distributed amongst the group members.

Late submissions will not be accepted.

Class discussions are an extremely important part of the learning process in this course. I would therefore encourage every student to actively participate in class discussions. By asking questions and sharing your views, you not only enhance your own understanding of the issues, but also benefit your colleagues in the classroom. There will be a 10% weight assigned to class participation based on your contribution to the discussion in class (this will be based on the *quality* of your contribution to classroom discussions, not the *quantity*), and your overall participation in the course. Each student would start the semester with a score of 5/10 in the class participation category, and from there on, it is upto the student to gain or lose points.

Also, the onus of understanding all the materials in this course is on you. If you do not understand anything in class, you should feel totally free to stop me right there and ask me to explain it again. If I make a point that you disagree with, do not hesitate to challenge me. The area of Risk Management is a new area and is still evolving, so there is plenty of room for

debate. **Remember, if you do not ask me any questions, I will assume that you have understood the materials perfectly**.

There will be one in-class final examination in the course, covering the entire course materials. The final exam would be completely objective type (multiple choice), and it would be open book, open notes - i.e., you would be allowed to get *whatever* you want in the exam (as long as it is not alive!). The exam would ask mostly applied questions. There is no midterm exam in this course. The date and time of the final examination is listed in the course outline.

Office Hours and Communication

I encourage you to communicate with me by e-mail so I can respond to you with a written note. I check my e-mail constantly through the day during weekdays, and frequently on weekends, and usually reply very promptly. You will benefit more from e-mail communications since my written response will provide you with a record of the solution to your problem. You can always call me at 368-2938 if you need to discuss something. I also encourage you to stop by my office whenever you want to and I will usually see you right away. Since I am in my office till 7-8 p.m. on most days, you should have little difficulty in meeting with me. Alternatively, you can set up an appointment to see me at your convenience if you wish.

I will use e-mail as my primary mode of communication with you. From time to time, I'll send you mails regarding any changes in the schedule, any extra readings that you need to do before class, or any other announcements. For this purpose, I will use the class e-mail list provided by Weatherhead. I would urge you to check your Weatherhead e-mail account at least once every day. If you cannot access your Weatherhead account for any reason, you can have your mails forwarded to an e-mail address of your choice – so please get your mails forwarded in case you do not plan to access your Weatherhead account periodically. I believe it is a very simple procedure that you can do over the net. You can contact the ITG help desk if you have any questions regarding forwarding your e-mails. **Its your responsibility to either check your Weatherhead e-mail or get them forwarded – I will assume that you are getting the e-mails I am sending to you**.

Course Outline

A detailed outline of each class, with the specific topics to be covered, is given below. The week before every class, I will give you a list of readings that you should go through before coming for the class.

Date	Topic
Jan 18	**No Class**
Introduction to Risk Management	
Jan 25	Introduction; The need for risk management; Risk Management and the link to firm value; Derivative debacles.
Feb 1	Creating shareholder value with risk management; Managing risk for financial and nonfinancial firms; The evolution and firmwide use of risk management products; Identification of risk elements.
Market Risk Management	
Feb 8	Introduction to Value-at-Risk (VaR); Measuring VaR for individual contracts; Portfolio VaR; Incremental VaR; VaR for linear derivatives. *Hedge Fund VaR Exercise handed out.*
Feb 15	Option VaR; The Barings example; Using RiskMetrics for VaR computation; Implementing Delta-normal VaR; Implementing Historical Simulation VaR; Structured Monte-Carlo VaR. *Equity Options Portfolio VaR Exercise handed out.*
Feb 22	Implementing VaR systems; VaR for nonfinancial corporations; Lessons about VaR; VaR assumptions; Stress Testing. ***Hedge Fund VaR Exercise due.***
Managing Financial Risk	
Feb 24 (Sat.)	Hedging exposures with futures and forward contracts - the Metallgesellschaft case study. ***Equity Options Portfolio VaR Exercise due.*** *Foreign Exchange risk management case handed out.*
March 1	Interest rate risk management; Using vanilla interest rate derivatives like ED futures, FRAs, swaps, bond options, caps/floors/collars, swaptions for managing financial risk; Creating synthetic instruments - financial engineering.
March 8	Risk management using exotic structures (Fx, Interest rate, Equity, Commodities, etc.), Engineering new products; Hybrid securities. ***Foreign Exchange risk management case report due.*** *Interest Rate risk management case handed out.*
Credit Risk Management	
March 22	Why credit risk management? BIS risk-based capital requirements; Traditional credit risk management approaches; Neural Networks; Implementing the KMV (Credit Monitor) model; CreditMetrics and VaR models. ***Interest Rate risk management case report due.***
March 29	Loan portfolio theory; KMV's portfolio manager; CreditMetrics - implementing credit VaR for loan portfolios; Simulation approaches. *Loan Portfolio credit VaR exercise handed out*

April 5	McKinsey (CreditPortfolioView) model; The macro-simulation approach; The risk-neutral valuation approach; KPMG's Loan Analysis System; Mortality models; CSFP's Credit Risk Plus model; Back testing credit risk models; RAROC models and capital at risk.
April 12	Credit risk of derivatives; BIS and CreditMetrics swap VaR; Credit derivatives (credit risk options, swaps, forwards); Credit securitization; Pricing and hedging issues; Credit risk of Credit derivatives. ***Loan Portfolio credit VaR exercise due.*** *Interest-rate Cap credit VaR exercise handed out.*
Operational & Integrated Risk Management	
April 19	Operational risk management; Model risk; Liquidity risk; Legal risk; Systemic risk; Contagion.
Conclusion	
April 21 (Sat.)	The case of Long Term Capital Management - risk management lessons, hedge fund analytics and risk management, regulatory attention on systemic risk. ***Interest-rate Cap credit VaR exercise due.***
April 26	**No Class**
May 3	**In-class Final Exam**

Good luck!