BUS 35131
Winter 2017

Pietro Veronesi
Office: HPC409
(773) 702-6348
pietro.veronesi@

CASES IN FINANCIAL RISK MANAGEMENT

Course Overview

This elective course covers the foundations of modern corporate financial risk management. The traditional view of financial risk management allocates risks in categories and looks at the methodologies to measure and manage such risks. The modern view of corporate financial risk management integrates financial risk management solutions with long term corporate goals. How does financial risk management create value for the corporation? What are the costs? When is it optimal to engage in financial risk management and when is it best to actually not do it? Indeed, under perfect capital markets, financial risk management does not create value. Yet, evidence shows 95% of Fortune 500 firms and over 60% of all non-financial firms actively use derivatives to manage financial risk. What are the market frictions that make financial risk management a strategic tool to achieve long-term corporate goals?

This course uses a mix of lectures and case studies to provide students with a thorough understanding of the benefits and costs of corporate financial risk management. We cover both financial institutions and non-financial institutions and discuss a wide range of topics, including (i) the analysis of market risk (i.e. FX risk, interest rate risk, commodity risk etc), credit risk, and liquidity risk; (ii) measures of financial risk, such as Value at Risk, Cash-flow at Risk, Credit at Risk, Liquidity VaR, Expected Shortfall, Backtesting, as well as their pros and cons; (iii) optimal hedging and insurance through financial derivatives, such options, futures, and credit derivatives; (iv) the benefits and costs of financial risk management, through derivatives and diversification; (v) the logic behind enterprise-wide financial risk management systems and their relations to long-term corporate strategy; (vi) strategic financial risk management and financial innovation. The use of numerous case studies will help cement the topics covered, as well as provide elements of class discussion.

At the end of the course, students will be comfortable with the costs and benefits of corporate financial risk management, will understand the potential pitfalls in numerous measures of risk, and will see the benefits and costs of using financial derivatives as instruments to hedge financial risk. Students will also learn the steps required to set up an effective enterprise-wide risk management system for both financial and non-financial institutions. For these reasons, this course will especially benefit students with career goals in investment banking, sales and trading, financial risk management, corporate treasury, as well as consulting.

In terms of requirements, students should familiar with topics covered in investments (35000) and corporation finance (35200). A good knowledge and understanding of

derivatives and derivative pricing will be useful, but not strictly required. Case analysis and homework assignments will also require the use of Microsoft Excel spreadsheets. I will make available several spreadsheets implementing Monte Carlo simulations for risk measurement and asset valuation. The course is analytical in nature and therefore requires familiarity with calculus, statistics and probability.

Required Material

a) A packet of cases and readings (in chalk)

b) Rene' M. Stulz, *Risk Management and Derivatives,* South Western, 2003, ISBN 0 538 – 86101 – 0;
or
c) Philippe Jorion, *Value at Risk*, 3rd Ed., McGraw Hill, ISBN 978-0-07-146495-6

Optional Material

The following books are all excellent, and cover the material from different perspectives. The two books on financial risk management (Jorion and Smithson) are two classic books written by leading experts. I found both of them very useful.

(A) Financial Risk Management

a) John Hull, *Risk Management and Financial Institutions,* 2012, 3rd Ed. Wiley, ISBN 978-1-118-26903-9

b) Smithson C.W., *Managing Financial Risk*, McGraw Hill, 1998, ISBN 0-07-059354-X;

(B) Derivatives

c) John C. Hull, *Options, Futures and Other Derivatives,* 8th Edition, Prentice Hall, 2011, ISBN 978-0132777421;

d) Robert L. McDonald, *Derivative Markets (3rd Edition)*, Prentice Hall, 2009, ISBN 978-0321543080;

(C) Fixed Income

e) Pietro Veronesi. *Fixed Income Securities: Valuation, Risk, and Risk Management,* Wiley, ISBN 978-0-470-10910-6

f) Sundaresan S. *Fixed Income Markets and Their Derivatives*, Academic Press, 3rd Ed., 2009, ISBN 978-0123704719

g) Tuckman B and A. Serrat. *Fixed Income Securities*, John Wiley and Sons, 3rd Ed, 2011, ISBN 978-0470891698.

Administrative Notes

Office hours: Open door policy with the following caveats:

1) Try to ask your questions by e-mail first. In many cases the answer can easily be given by e-mail, and you can expect it within a reasonable time. I will also post the question and the answer on the electronic board. (Of course, I won't disclose who asked the question.)

2) If you expect you need a long meeting, please try to arrange a mutually convenient meeting-time with me first.

Teaching Assistant: TBA. The TA will lead the review sessions (see below) and will be available for questions as well.

Administrative Assistant: Susan Compton; email: susan.compton@chicagobooth.edu

Course Outline

The course begins with a discussion of **the "building blocks" of financial risk management**. To motivate the discussion, we will discuss the case study *Southwest Airlines*, an airline company who has made large use of financial risk management techniques over the years. We follow with a deeper discussion of basic derivative instruments and standard hedging techniques by looking at the FX hedging problem of European Aeronautic Defense and Space Company (EADS), the leading global aerospace and defense company (especially known for its Airbus aircrafts) which was grappling with the large overvaluation of the euro versus dollar in early 2008. As a further application of basic derivative instruments and as an occasion to discuss what are the **economic motivations for financial risk management**, we will then examine the hedging strategies of *American Barrick Gold Corporation*, in the gold mining industry.

The course proceeds to explore the techniques to **identify, measure, and hedge the exposure to financial price risk**. We will start by studying the concept of Value at Risk (VaR) and Expected Shortfall (ES) – widely used measures of financial risk exposure – and discussing various issues related to implementation and interpretation. We will study its applicability within the wider context of financial risk management for financial institutions within the case study JP Morgan Private Bank: Risk Management during the Financial Crisis 2008 – 2009. We will then evaluate the use of VaR methodologies to decide the risk management strategy in a large non-financial corporation, namely, the

Fortune 500 Brazilian company Vale Mining, in "*VALE: Global Risk Management in Mining."*

We will then also talk about the **modeling interest rate exposure**. Since this is not a course on fixed income securities, the course will concentrate more on the methodology than on the development of term structure models (the latter are extensively discussed in Bus35130 for the interested student). In this course we will only review a simple model and explore how it can be used to manage interest rate risk. We will apply these techniques to study the interest rate hedging program implemented by the mortgage giant *Freddie Mac*, a case study that also opens the door to the discussion of the 2007 – 2009 crisis. We will in fact follow with a discussion of credit risk and credit derivatives, the use of VaR for credit risk – and problems with such measure for strongly skewed portfolios. We will cover such topics as we discuss the details of the large losses and bailout of the insurance giant *AIG*, and the role of CDOs and other securitized products during the crisis.

We will then discuss the issues surrounding the measurement of **systemic risk**, an important concept in recent times. What makes a company "systemically risky?" We will also cover **liquidity risk** by studying the case of *Long Term Capital Management*, a hedge fund that collapsed in 1998.

In the last two weeks we will discuss **strategic risk management**, which involves the application of financial risk management to support and promote the primary business activity of a company. We will discuss several cases: we will analyze how financial engineering can be used (1) to successfully promote the privatization of a big state owned firm, such as *Rhone Poulenc*; (2) to monetize positions in illiquid securities, such as internet stocks, and obtain a tax benefit from it (*Times Mirror's PEPS*); (3) to support M&A activity ("*MW Petroleum Corporation*"); and (4) to meet financing needs contingent on some events (*Chephalon*).

Requirements

Prerequisite for this course is Investments (Bus35000) and Corporation Finance (Bus35200). Knowledge of the material in Financial Instruments (Bus35100) or Futures, Options, Options and Swaps (Bus35101) is helpful. Working knowledge of spreadsheet programs, such as Excel, is also required. I will make available Excel files for the discussion of selected cases.

Course Procedures

You can expect this course to be quite time-consuming: over the course of the quarter we will discuss about 12 cases. Class time will also be devoted to cover concepts important to prepare subsequent cases, such as Value-at-Risk and Expected Shortfall, Monte-Carlo simulation methods, yield curve risk assessment, the pricing of interest rate derivatives, credit risk management etc.

Note that there is a first-class assignment detailed in the reading packet.

For each case, I will assign study questions to guide your own preparation for the class discussion. Before the class begins, you will have to hand in a two-page **memorandum** covering the main points of the case. Each memorandum has to be typed and double spaced. Write each memorandum as if you were giving a recommendation to the major decision-maker of the case (unless differently stated in the actual assignment). The limit of 2 pages is for the typed part only. You can attach as many pages of calculations as you like. Depending on the quality of the write up, memoranda get the simple grades of check, check plus, or check minus.

I will also assign weekly "technical" **homework assignments**: these contain exercises that are closely related to the cases to be discussed in class. The main purpose of these homeworks is to give students the opportunity to revise/learn techniques of risk management abstracting from the details of the case. As the memoranda, homeworks must be handed in at the beginning of class. These assignments will be graded and returned to you. Their solutions will be discussed in class and in the review sessions.

You are encouraged, but not required, to meet in groups to work on the cases and hand in group memoranda and homework assignments. However, a **maximum of 4 people can be in the same group**. When you work in a group, make sure the memorandum and the homework contains all the names of the people in the group. **Memoranda and homeworks won't be accepted after the class has met**.

Because of the nature of this course (and its grading criteria), it is extremely important that you attend every class, arrive on time and be prepared to participate. **Please, bring your name cards to each class.**

I will not hand out "solutions" to the case analysis after the class has discussed the case. This is because there are usually no absolute right answers. The best cases are deliberately written to be ambiguous. While there are no right answers, there are good arguments and bad arguments. This course is designed to help you learn to distinguish between sensible and senseless arguments. Handing out "solutions" would reduce the ambiguity in the cases and partially defeat the purpose of doing cases. Handouts also tend to circulate which is a problem when I teach the case in another quarter. Similarly, I won't hand out solutions for homework assignments that are discussed in class.

Review Sessions

Weekly review sessions are held throughout the course. In the review sessions, the course teaching assistant will give reviews of background material, go through the homework exercises and provide additional clarifications for the material covered in class. Time and location of the review sessions is to be announced. Even though I strongly encourage you to attend them, these review sessions are for your own benefit only and are not mandatory.

Grading

Grading will be based on class participation, the short memoranda, technical homeworks and a final examination.

Class participation: Class participation will count for 30% of the final grade. I will judge your performance based both on the quality and the quantity of your comments. Specifically, for each class I will assign 0 if you do not talk, 1 if you say something OK, 2 or 3 if the comment is good or excellent (3s are rare). I will also give –1 for silly comments (5 seconds of thinking are required before talking). Because so much of the learning in this course occurs in the classroom, it is very important that you attend every class. Low class participation combined with several absences can lead to a failing grade. The first 4 meetings will also have a slightly lower weight in the final computation of the class participation grade to allow everyone to get up to speed.

Homework: Weekly graded technical homework will count towards 20% of the final grade (with equal weight). Many of the homework are discussed in class together with the case, and therefore need to be handed in before class. No late homework is accepted.

Memoranda: The memoranda will count for 10% of the final grade (with equal weight). Memos get grades of check plus, check, check minus only, depending on the quality of the write up.

Final: The final examination will count for 40% of the final grade. The final examination will be an **individual** take home case analysis. You will have approximately five days to work on the case.

Honor Code

Students in my class are required to adhere to the standards of conduct in the GSB Honor Code and the Chicago Booth Standards of Scholarship. The Chicago Booth Honor Code also require students to sign the following Chicago Booth Honor Code pledge. "I pledge my honor that I have not violated the Honor Code during this examination," on every examination, as well as on the term project.

Class Schedule

Please, note the following class schedule is preliminary and could be subject to slight modifications.

A. The Building Blocks of Risk Management Systems

Class 1(A) Derivatives, Financial Innovation, and Financial Risk Management

Readings: (1) Teaching Notes #1.

(2) Either McDonald, Ch.: 2 (skim), 5 (esp 5.3. and 5.4) , 6 (esp. 6.7), 9, 12 (esp. 12.1) *or* Hull Ch.: 2 (skim), 3 (esp. 3.5), 9.1, 9.4, 11, 14 (esp. 14.8), 16.4. *or* Stulz: Ch. 5 (skim), Ch.: 11 (esp. up to 11.2.1 included) and Ch .12 (Black Scholes model).

Class 1(B) Financial Risk Management in a Non-Financial Corporation

Case Study: SouthWest Airlines and Fuel Hedging

Homework #0 (pre-assigned) due.

Homework # 1 assigned. Due at the beginning of class 2.

Class 2 (A) Hedging FX Risk with Forwards and Options

Case Study: FX Risk Hedging at EADS (Harvard Case Study 9 – 213 – 080)

Class 2 (B) Optimal Hedging, Minimum Variance Hedge Ratios, Multiple Hedges

Readings: (1) Teaching Notes #2

Homework #1 due. Homework #2 assigned. Due at the beginning of class 3.

Class 3(A) The Rationale for Financial Risk Management

Case Study: American Barrick Resource Corporation: Managing Gold Price Risk (HBS Case # 9-293-128)

Readings:
(1) Tufano, "Why Manage Risk?" (HBS Note # 9-294-107)
(2) Stulz: Ch. 3.
(3) Bodnar, Graham, Harvey and Martson, "Managing Risk Management". (skim)
(4) Carter, Rogers, and Simskin "Hedging and Value in the U.S. Airline Industry", 2006, Journal of Applied Corporate Finance. (optional)
(5) Rampini, Sufi, Viswanathan. "Dynamic Risk Management", 2014, JFE (skim. Read introduction and literature survey)

B. Identifying, Measuring and Hedging the Exposure to Financial Price Risk

Class 3 (B) Introduction to Value-at-Risk, Expected Shortfall, and Backtesting

Readings: (1) Teaching Notes #3
(2) Jorion: Ch. 5.1, 7.2, 8, 9, 12.1. or Stulz: Ch. 4 (esp. up 4.1.2), Ch. 13 (esp. up to 13.2.2)
(3) Additional (optional) material is in Hull Ch. 21

Homework #2 due.

Homework #3 assigned. Due at the beginning of class 4.

Class 4 (A) The Complexity of Risk Management in a Financial Institution

Case Study: JP Morgan Private Bank: Risk Management during the Financial Crisis 2008 - 2009 (HBS Case)

Reading: (1) JPMorgan Research: Factor Risk Management: A Generalized Methodology for Multi Asset Class Portfolios.
(2) Rene Stulz "Six Ways Companies Miss-manage Risk", Harvard Business Review, March 2009
(2) Taleb, Goldstein, Spitznagel "The Six Mistakes Executives Make in Risk Management" Harvard Business Review, October 2009.

Class 4(B) CaR, EaR and Enterprise-wide Risk Management

Readings (1) Teaching Notes #3
(2) Jorion: Chapter 15, 20; *or* Stulz, Chapter 4.

Homework #3 due.

Homework #4 assigned. Due at the beginning of class 5.

Class 5(A) Global Risk Management and Financial Risk Management System

Case Study: VALE: Global Risk Management in Mining.

Readings: Lewent and Kearney "Identifying, Measuring and Hedging Currency Risk at Merck"
Jorion: Chapter 15, 20; *or* Stulz: Ch. 4.1.3, 4.1.4, 4.2.1, 4.2.2.

C. Modeling Interest Rate Exposure

Class 5(B) Interest Rate Risk Management

Readings:
(1) Teaching Notes #4
(2) Jorion: Ch. 11.4 or Stulz: Ch. 9 (esp. 9.3 and 9.4.1, 9.4.2)
(3) Additional (optional) material is in Hull: Ch. 30 (esp. 30.3) and Sundaresan: Ch. 6, Ch 9.

Homework #4 due.

Homework #5 assigned. Due at the beginning of class 6.

Class 6(A) Interest-Rate Risk Management and Mortgage Backed Securities

Case Study: Risk at Freddie Mac (Case # F-270, Stanford)

Readings: Veronesi: Basics of Mortgage Backed Securities (Ch. 8, in chalk)

D. Credit-Risk Measurement and Control

Class 6(B) Credit Risk Measurement and Management

Readings:
(1) Teaching Notes #5
(2) Smithson Ch. 17 (in chalk)
(3) Additional (optional) material is in Jorion: Ch. 13 and Hull: Ch 23.
(4) Synthetic CDOs: An Introduction (in chalk)

Homework #5 due.

Homework #6 assigned. Due at the beginning of class 7.

Class 7(A) Collateralized Debt Obligations and the 2007 – 2008 Financial Crisis

Case Study: AIG – Blame for the Bailout (Stanford Case # A -203)

Readings: Gary Gorton: The Panic of 2007

Basle Capital Accord: International Convergence of Capital Measurement and Capital Standards (in chalk)
Stulz: Ch. 18
Hull: Ch. 24
Overview of the New Basel Capital Accord (in chalk)

Class 7(B) Measuring Systemic Risk and Systemic Financial Institutions

Readings: (1) Teaching Notes #6
(2) Bisias, Flood, Lo, and Valavanis "A Survey of Systemic Risk Analytics", Working Paper, Office of Financial Research, US Department of Treasury.

Homework #7 due.

Homework #8 assigned. Due at the beginning of class 8.

Class 8(A) Liquidity Risk Management

Case Study: Long Term Capital Management, L.P. (A) (HBS Case # 9-200-007)

Reading: (1) Risk Management Lessons from Long-Term Capital Management (Philippe Jorion, in chalk)
(2) Jorion: Ch. 14 (in chalk)
(3) Brunnermeier and Pedersen: Market Liquidity and Funding Liquidity, Review of Financial Studies 2008 . (skim)

Class 8(B) Structured Finance

Readings: (1) Teaching Notes #7

D. Strategic Risk Management: The Creative Use of Financial Engineering

Class 9(A) Creating Incentives with FE

Case Study: The Privatization of Rhone-Poulenc,1993 (HBS Case # 9-295-049)

Class 9(B) Tax Risk, Illiquid Securities and FE

Case Study: Times Mirror Company PEPS Proposal Review (HSB Case # 9-296-089)

Reading: Financial Engineering and Tax Risk: The case of Times Mirror PEPS

Class 10(A) FE to support M&A

Case Study: MW Petroleum Corporation (B) (HBS Case # 9-295-045)

Class 10(B) FE to meet Financing Needs: Taking FRM Seriously

Case Study: Cephalon, Inc. (HBS Case # 9-298-116)