# Corporate Risk Management I & II

## Fall 2003

FINA515: Sep 6 – Oct 25, Sat 14:30 – 17:00
FINA516: Nov 1 – Dec 20, Sat 14:30 – 17:00

**COURSE OBJECTIVE**

This course discusses financial risk management and financial engineering from the perspective of non-financial corporations (end-users). FINA 515 focuses mostly on the theory of corporate risk management. The course covers how to measure risk and risk exposures, why firms should or should not hedge, hedging strategies, and how financial engineering can increase shareholder value. FINA 516 covers the management of foreign exchange rate risk, interest rate risk and credit risk, and discusses advanced financial engineering issues. We will also discuss special risk management problems in Asia and hear about risk management at Jardine Matheson and MTRC.

**INSTRUCTOR**

Prof. Tim Adam
Office: Room 5482
Tel.: 2358-7675
E-mail: *adam@ust.hk*
Office hours: By appointment
Teaching Assistant: TBA

Course website: http://www.bm.ust.hk/~adam/fina515.html

**COURSE PREREQUISITS**

The course pre-requisites for FINA 515 are: (i) FINA 512: Corporate Finance, and (ii) FINA 551: Options and Futures Markets. I am willing to waive either prerequisite for students who can demonstrate knowledge in the principals of corporate finance and derivative securities.

The prerequisite for FINA 516 is the successful completion of FINA 515. No exceptions.

**Note: The add/drop period and the extended drop period for FINA 516 end on November 1, 2003.**

## READINGS

There is no assigned textbook for this course. The required readings (identified by ●) and some optional articles (identified by ○) are contained in two course packs, one for FINA 515 and a second one for FINA 516, which will be distributed at the beginning of each course. Lecture notes and further optional materials are available from the course web site.

The following is a list of useful reference books.

R. Stulz (2003), *Risk Management and Derivatives*, Thomson – South-Western College Publishing

J.C. Hull (2000), *Options, Futures and other Derivative Securities*, Prentice Hall, 4th edition

S. Titman and M. Grinblatt (2002), *Financial Markets and Corporate Strategy*, McGraw-Hill, 2nd edition

Brealey and Myers (2000), *Principles of Corporate Finance*, McGraw-Hill, 6th edition

## ASSESSMENT

The course grades for FINA 515/516 will be based on class participation, homeworks, and two case reports for each course.

| | FINA 515 | FINA 516 |
|---|---|---|
| Class participation | 30% | 30% |
| Homeworks | 10% | 10% |
| 2 case reports | 60% | 60% |

***Class participation***: Class participation consists of your comments and questions during lectures and case discussions, as well as case presentations. Remember that the quality of your participation counts more than the quantity.

Your participation will be evaluated after each class. <u>To make sure you receive credit for your class participation, you should display your name card at all times during the class.</u>

Late arrivals are very disruptive to the quality of the learning environment in the classroom. I discourage these strongly. Consistent late arrivals will affect your participation grade negatively. Please also disable your mobile phone/pager during class time.

*Note*: Class participation counts for 30%. This will have a major impact on your grade, especially if you do not participate at all.

***Homeworks***: Homeworks will be distributed occasionally during both courses. You should work on these *individually* and submit a hardcopy of your answers before class on the due dates. A penalty of 10% will be applied to late homeworks for each day past the due date, except if the answers to the homework are discussed in class. In this case no late homework assignments can be accepted. To accommodate the sometimes erratic work schedules of part-time students I will drop the worst homework grade when calculating your overall homework grade.

***Case reports***: For each course you need to submit two detailed case reports. You should work in teams of five people, no more – no less, and submit one report per team. You should share the workload equally among all team members. If you experience any free-rider problems in your team you should inform me as soon as possible. I will handle any complaints confidentially. At the end of the semester there will be a peer evaluation, which may affect your overall case grade.

Those students who submit a case report should prepare themselves to lead the discussion of the case during class. Each team should present a case at least once during the semester.

To ensure that you tackle a case from the right angle and don't overlook critical points you should send me a draft of your report one week before the due date. This will give you the opportunity to incorporate my feedback in your case analysis prior to the case discussion in class.

Both a hardcopy of your report and a computer file containing the report are due at the beginning of the class the case is scheduled for discussion. The computer file that contains the report should be sent as an e-mail attachment. Since we discuss the case solutions in class, late reports cannot be accepted.

## CLASS ANNOUNCEMENTS

Announcements and some class materials will be distributed via the course web site and via e-mail. If you do not use your UST account regularly, you should automatically forward incoming e-mail messages to whatever account you are using, so that you will receive all e-mail announcements and class materials without delay.

## COURSE OUTLINE AND READING ASSIGNMENTS

**Sept. 6: Derivatives Review**
Futures forwards and options: Payoff functions, pricing relationships, closing out futures/forwards, calculating profits, delta, interest rate derivatives, probability distributions, binomial option pricing model

- *Learning by the Case Method*, Harvard Business School, HBS 9-376-241

**Sept. 6: The Building Block Approach to Financial Engineering**
The nature and sources of risk
The building block approach to financial engineering
East Tex Oil: Valuation of an oil-indexed dual-currency bond

- C.W. Smithson (Winter 1987), *A LEGO Approach to Financial Engineering: An Introduction to Forwards, Futures, Swaps, and Options*, Midland Corporate Finance Journal 4, pp. 16 - 28.

**Sept. 13: Measuring Risk and Risk Exposures**
Transaction, translation, and economic (competitive) exposures
Risk measures: Volatility, RiskGrade™, VaR, CaR
Measuring the sensitivity of risk exposures

- Smithson, Smith and Wilford (1995), *Chapter 5: Measuring a Firm's Exposure to Financial Price Risk*, in Managing Financial Risk, Irwin, pp. 134 - 144

**Sept. 13: Why Firms Hedge**
How managing risk can enhance shareholder value
Empirical evidence on corporate risk management

- Why Manage Risk? HBS Note 294107
  - Fite and Pfleiderer, *Should Firms Use Derivatives to Manage Risk?*, in Risk Management: Problems and Solutions, McGraw-Hill, pp. 139 - 169
  - Brealey and Myers (2000), *Chapter 17: Does Debt Policy Matter?*, in Principles of Corporate Finance, McGraw-Hill
  - Bodnar and Marston (1998), *1998 Survey of Financial Risk Management by U.S. Non-Financial Firms*, George Weiss Center for International Financial Research, Wharton School

**Sept. 20: Why Firms Hedge** (class meets in 2407)

**Sept. 20: Aspen Technology (Case)**

- Aspen Technology, HBS 6-296-027

**Sept. 27: American Barrick Resources Corp: Managing Gold Price Risk (Case)**

- American Barrick Resources Corp: Managing Gold Price Risk, HBS 9-293-128
  - Proxy statement of American Barrick for fiscal year ending Dec. 1992

**Sept. 27: Hedging Strategies**
Hedging strategies using futures and forwards
The minimum-variance hedge

- Hull (2000), Chapters 2.8 - 2.10, in Options, Futures and other Derivative Securities, Prentice Hall, 4th edition, pp. 35 - 41
- Sercu and Uppal (1995), *Options as Hedging or Speculating Devices*, in International Financial Markets and the Firm, pp. 178 - 186

**Oct. 4: Hedging Strategies**
Hedging strategies using options
A hedging strategy for Aspen Technology Inc.
Strip versus stack hedges: The case of Metallgesellschaft

- Stulz (2001), *Metallgesellschaft*, in Financial Engineering and Risk Management, Chapter 7.6, pp. 40 - 47
  - Culp and Miller (1995), *Metallgesellschaft and the Economics of Synthetic Storage*, Journal of Applied Corporate Finance

**Oct. 11: Practical Risk Management Problems (Financial Engineering)**
Hedging strategies at Barrick
TVX Gold Inc.: Analysis of a gold-linked convertible note

**Oct. 18: Financial Engineering: Warrants & Convertibles**
Warrants and convertible debt

- P. Tufano (1996), *How Financial Engineering Can Advance Corporate Strategy*, Harvard Business Review, January-February, pp. 136 – 141
- Brealey and Myers (2000), *Chapter 22: Warrants and Convertibles*, in Principles of Corporate Finance, McGraw-Hill

**Oct. 18: Financial Engineering: Why Firms Issue Put Options & IBM: Issuer of Put Options (Case)**

- IBM: Issuer of Put Options, Darden UVA-F-1009
- *Stock answers*, Risk Magazine (July 1998), pp. 16 – 17

**Oct. 25: Avon Products (Case)**

- Avon Products, HBS 289049

**Oct. 25: Times Mirror Co. PEPS Proposal Review (Case)**

- Times Mirror Co. PEPS Proposal Review, HBS 296089
- Financial Engineering and Tax Risk: The Case of Times Mirror PEPS, HBS Note 297056

*Note: The add/drop period for FINA 516 ends on November 1, 2002.*

**Nov. 1: Financial Engineering: Why Firms Issue Hybrid Securities**
Freeport-McMoRan's Gold-Denominated Depositary Shares

- Smithson and Chew (1991), *The Uses of Hybrid Debt in Managing Corporate Risk*, Journal of Applied Corporate Finance, pp. 79 - 89
- Chidambaran, Fernando and Spindt (2001), *Credit enhancement through financial engineering: Freeport-McMoRan's Gold-Denominated Depositary Shares*, Journal of Financial Economics 60, 487 - 528

**Nov. 1: Managing Foreign Exchange Risks**
Characteristics of foreign exchange markets
Exchange rate determination
Swaps

- Campbell and Kracaw (1993), *Chapter 11: Managing Foreign Exchange Risk*, in Financial Risk Management, pp. 302 - 319
- A Note on Currency Swaps, HBS 9-292-043
- Economist (April 2001), *Big Mac Currencies*

**Nov. 8: Managing Interest Rate Risk**
Duration
Asset – liability management

- Hull (2000), Chapters 4.13 – 4.15, in Options, Futures and other Derivative Securities, Prentice Hall, 4th edition, pp. 108 - 114
- John Y. Campbell (1995), *Some Lessons From the Yield Curve*, Journal of Economic Perspectives 9, 129 - 152

**Nov. 15: Walt Disney Company's Yen Financing (Case)**

- Walt Disney Company's Yen Financing, HBS 9-287-058

**Nov. 15: Managing Credit Risk**
The market for credit derivatives
Pricing credit derivatives: The Jarrow-Lando-Turnbull Model (1997)

- Neal and Rolph (1999), *Chapter 1: An Introduction to Credit Derivatives*, in The Handbook of Credit Derivatives, Francis, Frost, and Whittaker eds., pp. 3 – 20
- Neal and Rolph (1999), *Chapter 5: Pricing Credit Derivatives*, in The Handbook of Credit Derivatives, Francis, Frost, and Whittaker eds., pp. 101 – 138

**Nov. 22: Union Carbide Corp. – Interest Rate Risk Management (Case)**

- Union Carbide Corp. – Interest Rate Risk Management, HBS 9-294-057
  - E. Sheridan (December 1992), *Smarter Than the Average Player*, Risk Magazine
  - Statement by Thomas Jones, Vice President and Treasurer of UCC in *Bank of America Roundtable on Derivatives and Corporate Risk Management*, Journal of Applied Corporate Finance 8 (Fall 1995), pp. 64 – 67

**Nov. 29: Enron Corporation - Credit Sensitive Notes (Case)**
Risk-neutral pricing

- Enron Corporation - Credit Sensitive Notes, HBS 9-297-099
  - S.R. Das and P. Tufano (199?), *Pricing Credit-Sensitive Debt When Interest Rates, Credit Ratings and Credit Spreads Are Stochastic*, Journal of Financial Engineering 5, 161 - 198

**Dec. 6: Risk Management in Practice**
Company presentation

**Dec. 13: Risk Management in Practice**
Company presentation

**Dec. 20: A Risk Management Success Story: Enron Gas Services (Case)**

- Enron Gas Services, HBS 9-294-076

**Dec. 20: Managing Risk in Developing Countries**
Risk management issues in Asia
Summary of course

  - Asia Risk (June 2001), *Cutting through the hype*
  - Allayannis, Brown and Kappler (2001), *Exchange-Rate Risk Management: Evidence from East Asia*, University of Virginia Working Paper
  - Asia Risk (December 1998), Property knocks

A blue font indicates that the document is available in electronic format from the course web page.

# Case Questions

Case reports consist of answers to the following study questions. Good case reports are concise and brief. They make clear and precise statements. Any claims are supported by references to the information given in a case, graphs, figures. Good case reports do not contain vague statements or guesses. If you think that the information in a case does not provide enough information to make a clear judgment, then it is better to say so than to make a guess.

The purpose of cases is to apply the financial concepts covered in class. You need not explain these concepts in your case report, but can assume that the reader is familiar the finance theory.

Any spreadsheet printouts provided should be *self-contained*, i.e., one should be able to understand the information given in a table without relying on the main text of the analysis. Tables should include all your assumptions as well as the formulas that are not immediately transparent.

You should start working on a case report at least two weeks prior to the due date. This allows you to get some feedback from me about your case analysis before you submit your final version.

## Aspen Technology, Inc. (quantitative)

*Case objectives*: Exposure measurement, should firms hedge

1. What are Aspen Technology's main exchange rate exposures? How does Aspen's business strategy give rise to these exposures as well as to the firm's financing needs?

2. What is the effect of Aspen's currency exposures on its accounting earnings and its cash flows? Quantify Aspen's exposures by currency for 1995. What currencies is it long and short?

3. Evaluate Aspen's currency hedging program. What is the effect of its hedging activities on the volatility of its cash flows?

4. Calculate the 1-year CaR at the 5% level due to Aspen's currency exposures.[1]

5. Should the firm hedge its currency exposures? Why, or why not? How, if at all, may Aspen's recent transition from a private to a publicly traded firm affect its approach to risk management?

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[1] Consider using a simulation package such as Crystal Ball by Decisioneering. http://www.decisioneering.com/crystal_ball/

## American Barrick (qualitative/analytical)

*Case objectives*: Should firms hedge, financial engineering

1. Background questions
   a. Describe the value chain in the mining industry, i.e. what general activities do mining firms perform? At which points in this value chain can a mining company create value for its shareholders?
   b. Briefly describe the market for gold. What is the gold lease rate?
   c. Briefly characterize American Barrick and its position in the gold mining industry.

2. What is the stated objective of Barrick's hedging program? Is this objective consistent with any of the five theories of hedging? Should a gold mining company like Barrick hedge its gold price exposure? Why, or why not?

3. Describe the instruments that Barrick has used to manage its exposure to gold prices. How would you replicate the cash flows from (i) a gold loan (e.g. the bullion loan with Toronto Dominion Bank to fund the acquisition of the Mercur Mine), (ii) the $50 million 2% gold-indexed Eurobond (p.8), and (iii) the Cullaton Gold Trust with simple financial securities?

   Assume the following return schedule for the Cullaton Gold Trust

| *Gold price* | *Return* | *Gold price* | *Return* |
|---|---|---|---|
| < $399 | 3% of production | $700 - $799 | 7% of production |
| $400 - $499 | 4% of production | $800 - $899 | 8% of production |
| $500 - $599 | 5% of production | $900 - $999 | 9% of production |
| $600 - $699 | 6% of production | > $1000 | 10% of production |

4. What is a spot-deferred contract (SDC)? Is it an option, a forward contract, both, or neither? How does deferring delivery on a SDC differ from rolling over a forward position?

5. *Optional*: Estimate the sensitivity of Barrick's stock returns to changes in the gold price. How does a 1% change in the gold price affect Barrick's market valuation? Compare Barrick's sensitivity to the gold price sensitivities of Homestake Mining and Agnico-Eagle, two companies which do not hedge their gold price exposure.

## IBM

1. What risks does IBM face as a result of the Employee Stock Purchase Plan (ESPP)? Does the put-option strategy hedge IBM's ESPP position?

2. What alternatives does IBM have to satisfy its obligations from the ESPP? What are the pros and cons of each alternative?

3. Should IBM pursue the put option strategy?

4. Should the treasury department be allowed to make money like other IBM profit centers? Why, or why not?

5. How would you expect the stock market to react to IBM's move to begin writing put options on its own shares? How do you think current shareholders and employees would perceive such a strategy?

## Avon Products, Inc. (quantitative)

1. Briefly evaluate Avon's financial condition as of the end of 1987. Why was Avon reducing its dividend?

2. Value Avon's PERCS. As an institutional investor holding Avon stock, would you accept the exchange offer or keep the common stock?

3. What was the purpose of the exchange offer?

## Times Mirror PEPS Proposal Review (quantitative)

1. Describe the PEPS in terms of simple financial contracts (building blocks, e.g. stocks, options, bonds, etc.). What are the salient institutional features of the PEPS proposal?

2. Does the pricing proposed by Morgan Stanley appear to be "fair" from the perspective of potential investors? What are the key sensitivities of your pricing analysis? What important assumptions have you made? What aspects of the contract have you ignored, and how might they affect your valuation?

3. Why would Times Mirror issue the PEPS? How large is Times Mirror's net benefit from issuing the PEPS as compared to its other alternatives? Calculate the sources of value (and costs) to Times Mirror of issuing the PEPS transaction instead of selling its Netscape shares privately. What are the largest sources of value and costs? What risks must Times Mirror bear to carry out this strategy?

4. Does everyone "win" in this case? Explain.

## Walt Disney (quantitative)

*Case objectives*: How to hedge, swaps

1. Should Disney hedge its yen royalty cash flow? Why or why not? Do not simply recite the theories of hedging but show whether and how they apply in the case of Disney.

2. Assuming a hedge is desirable, what hedging techniques are available to the treasurer (discuss all) and what are the advantages and disadvantages of each?

3. Evaluate Goldman's proposal for an ECU bond issue accompanied by an ECU/Yen swap.

    a. What is the 'all-in' cost of the yen term loan available to Disney? What is the 'all-in' cost of the proposed ECU bond before executing the currency swap? What are currently (as of 1985) the French utility's borrowing costs in ECU and Yen? (*Note*: 'all-in' cost generally refers to that discount rate which equates the present discounted value of future debt service payments with the financing proceeds less front-end fees [i.e. the internal rate of return], expressed as an annual rate).

    b. Why would the French utility ever consider swapping obligations with Disney?

    c. What is the 'all-in' cost of the ECU Eurobond swapped into yen for Disney? For the French utility? How well does IBJ make out? Express the gains for all parties in terms of basis points.

    d. What is the origin of these gains?

## Union Carbide Corp. (qualitative)

Case objectives: Interest rate risk management at non-financial corporations

1. You are a member of the Finance and Pension Committee of Union Carbide Corporation's Board of Directors. The firm's finance staff has come before you with their proposal for managing interest rate risk. What questions will you ask the team? What is your response to the team's proposal?

2. In analyzing this proposal, you may want to consider the following questions:
    a. Do the objectives of the plan make sense? If not, what objectives would you suggest? *Hints*: The four objectives of the plan are discussed on pages 5-6. What theories of corporate risk management might motivate the fourth objective: protecting the equity value from interest rate movements? Is the plan consistent with the implications of the theory?
    b. Is it sensible to characterize the firm's normalized portfolio in terms of its duration? If not, what alternative would you suggest?

c. UCC tries to analyze the duration of its assets in Exhibit 6. Is the analysis correct? If not, how could it be improved?
d. Critique the proposed implementation program. Does it follow from the analysis that precedes it? *Hints*: Do you agree with the limited active approach for long-dated instruments (p.9), and the active approach for short-dated instruments (p.10)? Do you think the performance measurement plan (p.10-11) is sensible?
e. Will you approve the program? If not, what modifications to it would you recommend?

## Enron Corporation (qualitative & quantitative)

1. Based on Exhibits 2-7, describe the determinants of credit spreads and credit spread volatility. Provide intuition for your results.

2. Analyze Enron's credit sensitive note. Consider the following questions.
   a. How does Enron's note differ from standard bonds?
   b. Is the embedded credit derivative sensitive to default and/or recovery risk?
   c. How does the yield on Enron's credit sensitive note compare to the market conditions for corporate bonds at the time of issue?
   d. What are possible motives for Enron to issue the credit sensitive note? What are the benefits to Enron, <u>and where could these benefits come from?</u>

3. As a buyer of Enron's credit sensitive note, how would you analyze its value? What are the benefits of this issue to a buyer?

## Enron Gas Services (qualitative)

*Case objective*: How to hedge

1. Describe the market for natural gas as of 1993 (prices, participants, regulations).

2. Describe Enron Gas Services' business and its position in the gas industry.

3. Describe Enron's supply and delivery contracts. What is the structure of the "Cactus Fund?"

4. Describe Enron's risk management program (ERMS). What are the major risks that Enron faces as a result of its supply and delivery contracts? How does Enron manage these risks?

5. Where in the complex system of contracts does EGS create value for its shareholders?

6. What challenges does Enron face?