Course description

This course introduces students to the understanding and management of financial risk. Its objective is to familiarize students with the risks faced by financial and nonfinancial firms, particularly the former, and with the tools practitioners use to measure and control risks. We will study the benefits and pitfalls of contemporary risk measurement models. Much of the course will be devoted to detailed examples of how particular tools and techniques are applied to particular problems.

Prerequisites

The course assumes basic familiarity with probability and statistics, the instruments of the financial markets, and asset pricing models.

Textbooks and resources

There is no required textbook, but two suggested ones. Hull (2006) is a good guide to the algebra and analytics. Crouhy, Mark & Galai (2000b) contains a lot of valuable institutional information and has an emphasis on credit risk. The bookstore will stock both. You probably should buy one. Pick the one that appeals to you. If you happen already to own another one, that’s fine, too.

Bernstein (1996) provides good background and is fun to read.

For each topic, the Readings section below tells you where it is covered in the lecture notes, which are posted on CourseWorks.

Students (and everyone else involved in risk management) should be aware of some rich resources on the Internet. Here are a few:

GloriaMundi makes available for download a colossal amount of risk management research, news, documents issued by regulatory authorities and industry groups, and other information, at http://www.gloriamundi.

Bank for International Settlements is a services provider to the world’s central banks. It invests reserves on behalf of some central banks. It also has a research department of its own and hosts regulator groups and research conferences. A large number of key regulatory documents are posted on its website http://www.bis.org/.
Central banks such as the Bank of England and the European Central Bank have large research departments that publish research and surveys related to risk management. Almost all of it can be downloaded from the Internet. A good starting point is the BIS’ links collection http://www.bis.org/cbanks.htm.

The Federal Reserve System is worth singling out; http://www.frbsf.org/publications/fedinprint/ is a handy search tool.

RiskMetrics Group is a risk measurement analytics firm that conducts original research and posts technical papers at http://www.riskmetrics.com/research.html/.

A selection of technical documents from these sources and survey material on financial markets and risk published by major banks and broker-dealers are posted on CourseWorks.
**Session 1** May 27, 2007

The scope of financial risk

- The subprime crisis
- Typology of financial risks
- Financial market participants
- Why is risk a separate discipline today?

Readings
Lecture notes 1; other readings TBD.

**Market risk**

- Standard model of asset prices
- Portfolio risk

Readings
Lecture notes 2; other readings TBD.

**Credit risk**

- Defining credit risk
- Credit risk models

Readings
Lecture notes 3; Crouhy, Mark & Galai (2000a); Moody’s Investors Service (2007); Standard & Poor’s (2006); Finger (1999); Credit Suisse First Boston (2004), ch. 1, 2, Appendix; O’Kane & Schloegl (2001).

**Session 2** June 3, 2008
Value at Risk

- Value-at-Risk
- Volatility estimation: RiskMetrics and GARCH
- Modes of computation: parametric, historical and Monte Carlo simulation
- Expected shortfall

Readings
Lecture notes 4; Duffie & Pan (1997); Morgan Guaranty Trust Company (1996) ch. 1, 5; Mina & Xiao (2001) ch. 2.2-2.3.

Mapping and treatment of bonds and options

- Duration and interest-rate volatility
- Nonlinearity and convexity risk
- The delta-gamma approach
- Vega risk

Readings
Lecture notes 5-6; Mina & Xiao (2001) ch. 3, 5; Morgan Guaranty Trust Company (1996) ch. 6-7; Crouhy et al. (2000b) app. to ch. 5; Malz (2000/2001).

Session 3  June 10, 2008

Portfolio VaR

- Delta-normal VaR
- Portfolio VaR via Monte Carlo simulation

Readings
Lecture notes 7; Mina & Xiao (2001) ch. 3, 5.
Risk capital and portfolio construction

- Concept of economic capital and risk contribution
- Measuring diversification with VaR; marginal and incremental VaR
- Implied views

Readings
Lecture notes 7; Mina & Xiao (2001) ch. 2.

The quality of VaR estimates

- Backtesting
- Variability of VaR estimates
- Coherence of VaR estimates

Readings
Lecture notes 8; Kupiec (1995b); Lopez (1999); Danielsson (2002); Beder (1995).

Session 4 June 17, 2008

Portfolio credit risk measurement

- Default correlation and default distributions
- VaR with the single-factor credit risk model
- Credit VaR
- Copula models

Readings
Lecture notes 9; Lucas (1995); Credit Suisse First Boston (2004), ch. 2; O’Kane & Schloegl (2001), pp. 36–38; Finger (1999); Lehman Brothers (2003), pp. 38–42.

Session 5 TBD
Alternatives to the standard market risk model

- Real-world asset price behavior
- The evidence in option prices
- Modeling approaches for non-normality; jump-diffusion and stochastic volatility models

Readings
Lecture notes 10; Jackwerth (1999); Merton (1976); de Vries (1994).

Liquidity risk

- Transaction cost liquidity, funding liquidity and systemic liquidity
- Liquidity-adjusted VaR

Readings
Lecture notes 11; Malz (2003); Bank for International Settlements (1999); Bangia, Diebold, Schuermann & Stroughair (1999).

Stress testing

- Historical stress tests
- Scenario analysis and scenario design principles

Readings
Lecture notes 12; Mina & Xiao (2001) ch. 4; Kupiec (1995a); Boyer, Gibson & Loretan (1997); Loretan & English (2000).

Session 6    July 1

Financial crises

- Financial crises, bubbles, and extreme volatility
- Financial market behavior during extreme events

Readings
Lecture notes 13; Kindleberger (1978); Garber (1989); Garber (1990).
**Regulation**

- Scope and rationale of regulation
- Regulatory authorities
- Methods of regulation; capital standards

**Readings**


**Final exam**
Reading list


Credit Suisse First Boston (2004), Credit portfolio modeling handbook.


Lehman Brothers (2003), *The Lehman Brothers guide to exotic credit derivatives*.


