RISK MANAGEMENT

Professor Thomas Philippon, KMEC 9-90, Phone: 998-0490, tphilipp@stern.nyu.edu.

Classes: Tuesday 6 pm.

DESCRIPTION OF THE CLASS

This course focuses on the management of financial risks (market, credit, and liquidity risks) by banks, insurance companies, asset managers, and hedge funds.

We first present quantitative methods used by financial institutions to measure and manage these risks: value at risk, market volatility, corporate credit risk, retail credit risk, sovereign credit risk, trading costs, stress tests, etc.

We then provide a critical analysis of how these models perform in normal times and during financial crisis, and we cover specific issues of financial regulation: liquidity and capital requirements in banking, the regulation of insurance companies, sovereign risk and debt sustainability, debt restructuring, systemic risk and the resolution of financial crises.

The class is quantitative and often uses spreadsheets.

PREREQUISITES

The material covered in **Foundations of Finance** is a prerequisite for this class. In particular, you should be familiar with the following topics:

- Statistics concepts such as expected value, standard deviation, and percentiles. You need to know how to compute them in a spreadsheet.

- Fixed income concepts, such as duration, convexity, and immunization.

- Pricing and marking to market of forward contracts, futures, swaps, and options.

- The Black-Scholes-Merton model and the definition of implied volatility.

- Objective and risk-neutral probabilities and how to use them to price derivatives.

RECOMMENDED BOOKS

There is no required book. I will give you a course packet at the beginning of the class.

Over the years, I have found that no single book covers all the relevant topics. Therefore there is no required textbook for this class, but here is a list of books that I have found useful:

- Risk Management and Financial Institutions, by John C. Hull, Wiley, 3e, 2012

- Financial Institutions Management: a Risk Management Approach by Anthony Saunders and Marcia Cornett, Irwin-McGraw Hill, 5e, 2005. *Good overview of risk management.*

- Options, Futures and Other Derivatives by John C. Hull, Pearson Prentice Hall, 6e, 2006. *Good reference for derivatives but too light on credit risk.*

- Value at Risk by Philippe Jorion, McGraw Hill, 3e, 2007. *Very focused on VaR, and too light on credit risk.*

- Fixed Income Securities by Bruce Tuckman, Wiley, 2e, 2002. *Best reference for fixed income. But nothing on credit risk.*

- Credit Risk Modeling by David Lando, Princeton University Press, 2004. *Good overview of theory and data, but advanced mathematics required.*

GRADING

At NYU Stern, we strive to create courses that challenge students intellectually and that meet the Stern standards of academic excellence. To ensure fairness and clarity of grading, the Stern faculty have agreed that for elective courses the individual instructor or department is responsible for determining reasonable grading guidelines. The Finance Department has elected to use the following grading guidelines for this course and all other elective courses. Instructors should award grades of "A" or "A-" to approximately 35% of students in elective courses with enrollments of more than 25 students. Your final grade will be based on:

- Homework assignments and participation: 25%
- One midterm exam (1h): 25%
- One final exam (3h): 50%

Assignments are submitted directly online via NYU Classes; exams are open notes.

COURSE CONTENT

We cover 13 topics. For each topic there is a reading, a set of slides, some practice problems, and (usually) a homework assignment. Each topic takes approximately two lectures.

1. Measures of Risk: Volatility, Value at risk and Expected Shortfall
- Definitions, historical simulation and normal model
- Reading: JPM 2013, *Annual Report, Market Risk Management, p. 142-145*

2. Mapping, Hedging, and VaR systems
- VaR system and mapping: duration, hedging, mark-to-market (forward, options, swaps)
- Reading: Jorion 2009, *Risk Management Lessons from the Credit Crisis, p. 1-10*

3. Models of Volatility
- Market risk is not constant, exponential model, case study of S&P volatility
- Reading*: RiskMetrics, Chapter 2, p. 15-16*

4. Marginal VaR and Diversification
- Portfolio VaR and ES, Diversification, Decomposing VaR
- Reading: JPM 2013, *Annual Report, p. 144-145*

5. Credit ratings and migration
- Default, exposures, expected & unexpected losses, ratings, Credit VaR, RAROC
- Reading: CreditMetrics, *Chapter 2 (section 2.4.2 in particular)*

6. Credit derivatives
- Systematic credit risk, actual and risk neutral probabilities, CDS and CDX
- Reading: IMF, CDS Market Overview, p. 9-12

7. Liquidity Risk, LVaR
- Market liquidity and funding liquidity, adverse selection
- Reading: TBA

8. Regulation of Banks
- Basel 3, capital, resolution, living wills, debt overhang, risk shifting
- Reading: Hanson, Samuel G., Andrei Shleifer, Jeremy C. Stein, and Robert W. Vishny. "Banks as Patient Fixed-Income Investors." Working Paper, August 2014.

9. Back testing, Stress testing
- Type 1 and 2 errors, Basel regulations, Federal Reserve Stress Tests
- Reading: JPM 2013, *Annual Report, p. 146-148*

10. Systemic risk, macro-prudential regulation
- Measures of systemic risk, Too-big-to-fail
- Reading: Hanson, Kashyap and Stein, "A Macroprudential Approach to Financial Regulation," 2011.
- Reading: Calomiris, Klingebiel, and Laeven, "Seven ways to deal with a financial crisis: Cross-country Experience and Policy Implications", 2012.

11. Regulation Non-Bank Entities
- Insurance companies, mutual funds
- Reading: *Are insurance companies systemic?*

12. Sovereign risk, debt sustainability, debt restructuring
- Currency mismatch, sudden stops, banking crises
- Reading:
  - Reinhart and Rogoff, "From Financial Crash to Debt Crisis," March 2010

- "The Good, The Bad, and the Ugly: 100 Years of Dealing with Public Debt Overhangs," Chapter 3 of IMF *World Economic Outlook*, Oct. 2012.

13. Advanced Topic (to be chosen)
a. Market Risk and Credit Risk: Merton model
- Black-Sholes formula, equity as a call option, Distance to default
- Reading: *KMV model*

b. Portfolio Credit Risk
- Asset correlation, Factor model and portfolio credit risk
- *RAROC*

c. Securitized Banking and Structured Finance
- Traditional banking vs. securitized banking, Repos, MBS, ABS & ABCP, CDOs

d. Counterparty risk, gross vs. net exposures