FRE 6123 Course Outline

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Motivation

➤ **Motivation:** Risk Finance: Past, Present and Future Risk Prospects: An Overview

➤ Financial Risks, Completeness and Incompleteness, Uncertainty and Ambiguity, the measurements of risks and financial risk management are fundamental functions of all aspects of finance and financial engineering.

➤ Assets Pricing, Financial Model building, their analysis and their uses to predict, measure and manage risks are a sample of what we do in financial and risk engineering.

➤ Regulation, Compliance, Globalization, Gating, are part of a long list of increasing risk concerns.

➤ Risk Finance requires an appreciation and an understanding of financial and economic theories, mathematical, computational, statistical, financial econometrics etc. to model, hedge, construct investment portfolios, analyze and solve financial problems.

➤ WHY this CORE course: It provides an introduction to these problems as well as to the courses you will take subsequently.

➤ Further, numerous “real and theoretical” problems and cases will be presented, discussed and solved. Their intent to bridge theory and practice in a highly technological environment.

➤ Homework problems are tailored to motivate and help you study these problems and the importance of financial and risk engineering and its management.

➤ The course is based on theoretical, quantitative models, computational methods and the statistical developments related to financial risk management.

➤ There will be a Mid-Term (30% of the final grade), and a Final (50% of the final grade). The remaining 20% are based on class participation, homework, case problems.

➤ Homework: All students have to submit their homework even though it is acceptable to have group-homework to allow you the experience of studying and working together.

**Topical Elements of the course: Examples**


➤ Risk? And Uncertainty, present vs the future, the future of the present!, the present of the future!

➤ Utility theory and it applications to valuation, risk measurement and risk management, diversification and portfolio risk management. Pricing with utility? CAPM, CCAPM etc.

➤ Fundamental Risk Finance based on the Arrow-Debreu Framework (Complete Markets)
  Trading, investing, managing risks ...how?, Financial Products (stocks, bonds, options, etc.) ...Why are these so important as well as how do we measure, and manage their risks consequences?
  - Fundamental Markets Theory, Arrow-Debreu
  - Pricing and Hedging in Finance: Option and Hedging;
  - The Greeks;
  - the VIX;
  - Credit Risk and Credit Derivatives
  - Compliance and Financial Regulation (and Strategic risks)

- Occasional reference material:
  - PPT to be distributed
  - Selected Papers published for reading
Course Outline at a Glance: Part 1 (all lectures have a PPT and lecture notes associated to them)

- **Motivation:** Risk Finance: Past, Present and Future; Theory and Practice
- **Lecture 2:** An Overview of Risk Finance, Statistical Modeling, Regulation and Compliance; Value at Risk (VaR); Management: ERS Chapters 1 and 2; RS Chapter 2, p. 35; Homework, p. 57, 5/12 (additional note on Regulation)
- **Lecture 3:** Quant and Statistical Risk and Models and Applications: ERS Chapter 3 (a Refresher with Applications), Homework to be assigned (based on data analyses)
- **Lecture 4:** Measuring Risk, Volatility Risks, RS Chapter 3, parts of Chapter 4; ERS Parts of Chapter 6. Extension, Financial Risk Measurement Beyond Volatility. In addition, the VIX and its meaning will be introduced and explained as a financial products that will be expanded on in later lectures.
- **Lecture 5:** Measuring Financial Risks; Statistical Risk Models and Risk Exposure in Finance. Measuring Historical Volatility and ARCH-GARCH Modeling; RS Chapter 4; Additional Notes an advanced lecture notes (for the motivated)
- **Lecture 6:** Valuation and Risk: Utility Theory-Definition and derivation of Essential Terms, RF, Chapter 5
- **Lecture 7:** Utility and Financial Risk Management-Applications, pricing (certain equivalent, premium), portfolio management: RF Chapter 6

Lecture 8: Special Lecture: Mid Term Examination

Course Outline at a Glance: Part 2

- **Lecture 9:** Complete Markets; Principle of Fundamental Assets Pricing: RF Chapter 7: Homework to be assigned; Introduction to Binomial Pricing Models and Basic Stochastic Calculus; Applications to currencies, Portfolios and others.
- **Lecture 10:** Options and Risk (Hedging) and The Greeks: RF Chapter 7: Homework to be assigned; Applications to hedging
- **Lecture 11:** Implied Volatility and Optional Models; RF Chapter 11
- **Lecture 12:** Default Bonds and, RF pp. 339 (Applications to Credit Risks and Pricing)
- **Lecture 13:** The Future of Financial Risk Management: Strategic Risk Finance in a Global and Technology Intensive Financial World
- Lecture 14: Review Problems and Final Examination

References:
- Power Points to be distributed
- Lecture Notes and Readings: To be distributed
- Reference Texts:
  1. Risk Finance and Assets Pricing (Wiley, Charles Tapiero)
  2. Engineering Risks and Finance (Springer, Charles Tapiero)