IEOR E4724: Risk management and the financial system

Syllabus

Prof. Allan M. Malz

Fall 2016, first half

1.5 credits

IEOR E4724 is identical to the first half of IEOR E4723, and the final exam of IEOR E4724 is identical to the midterm exam of IEOR E4723.

The second half of IEOR E4723 covers portfolio credit risk, securitization and wholesale funding markets, financial crises, regulatory policy and unconventional monetary policies, and the impact of the crisis and policy on financial markets today.

Course description

The close relationships among quantitative risk management techniques, quantitative approaches to financial regulation, and research on financial risk, have been accentuated by the global financial crisis. This course presents an overview of risk and risk management in the context of the crisis. We study market, liquidity and credit risk management principles and techniques employed by banks and other intermediaries, as well as their drawbacks and limitations. The course will make comprehensible the enormous changes leading up to and during the crisis, provide context and background for studying quantitative finance, and prepare students to participate meaningfully in discussions of current issues in finance.

The course provides background in several areas related to quantitative risk management and to the public sector’s increasingly dominant role in the financial system. We review asset price behavior in normal times and periods of financial distress, by looking at data and using basic models of returns, volatility and extreme events. We examine the institutional
and legal setup of modern credit systems, focusing on the treatment of firms and debt in bankruptcy and how it differs for financial firms. And we study the role of leverage and of market and funding liquidity.

**Prerequisites**

The course assumes basic familiarity with probability and statistics, instruments of the financial markets, and asset pricing models, and is appropriate for graduate students as well as advanced undergraduates who meet these requirements. The course will also convey much of the quantitative and technical material using graphical and numerical examples, introducing many sources of financial and statistical data, and enabling students to grasp the realities behind abstract financial concepts.

**Assignments and grades**

There will be one assignment, giving students the opportunity to rehearse the quantitative techniques and concepts presented, and a final exam. Grades will be based primarily on the assignment and exam, but some weight may also be placed on class discussion.

**Schedule and location**

Weekly, Monday 7:30–10:00 p.m., Sep. 12–Oct. 24, 2016

Location TBD

The final exams will be given during the second half of the 7th weekly class session.
Course outline

Week 1  Development of the financial system up to the crisis

- Financial intermediation
- Overview of financial risks: market, credit, counterparty and liquidity risk
- Overview of financial risks: operational, model, reputational and compliance risk
- Postwar evolution of the financial system: derivatives, financial globalization and market intermediation
- Broader economic developments: large capital pools and rising frequency of crisis
- The Great Inflation and the Great Moderation
- Long-term decline in real interest rates

Week 2  Basic concepts of asset pricing and risk

- Risk, expectations and asset prices
- Investor choice and the capital asset pricing model
- Capital market efficiency
- The standard model of asset price dynamics
- Return volatility measurement and estimation

Week 3  Market risk measurement and Value-at-Risk

- Value-at-Risk for positions and portfolios
- Computing Value-at-Risk: parametric, Monte Carlo, and historical simulation
- Assessing the accuracy of Value-at-Risk estimates
- Limitations of Value-at-Risk
- Alternatives to Value-at-Risk
- Scenario analysis and stress testing

Week 4  Extreme events and market risk

- Limitations of the standard asset price dynamics model
- Behavior of asset prices in normal and in stress periods
- Alternatives models of asset price behavior
- Extreme value theory
- How asset prices express extreme event risk
Week 5  Credit and counterparty risk

- Financial distress: default, ratings migration, insolvency and bankruptcy
- Treatment of insolvency for financial firms
- Counterparty risk
- Forms of debt, capital structure and collateral
- Credit spreads and credit spread risk
- Hazard rates and default analytics
- Single-obligor credit risk models

Week 6  Liquidity risk and leverage

- Credit, maturity and liquidity transformation
- Fragility of commercial banking
- Funding liquidity risk and asset-liability management
- Liquidity risk management by commercial banks and securities dealers
- Financial distress: solvency and liquidity
- Market liquidity risk
- Defining and measuring leverage
- Leverage risk: why is leverage attractive?
- Forms of leverage: carry trades and embedded leverage
- Economic capital

Week 7  Central banks and the financial system

- The framework of monetary policy
- The economics of monetary policy in normal times
- The conduct of monetary policy in normal times

Final exam

September 14, 2016