
Draft syllabus

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14 weeks, 3 credits

Course description

This course introduces risk management principles, with an emphasis on their practical implementation and application. It presents standard market, liquidity and credit risk measurement techniques, as well as their drawbacks and limitations. The course will convey much of the quantitative and technical material by working through calculation examples using market data and simple models. The example also introduce many sources of financial and statistical data, enabling students to better grasp the realities behind abstract financial concepts.

Students will understand risk management techniques from the viewpoint of practitioners, such as banks and other intermediaries. Many of these techniques have been adopted into financial regulatory standards. Especially since the crisis, regulatory standards have exerted great influence over firms’ risk management practices. The course will help understand this interaction, and the role of risk management in regulatory compliance.

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. Students should also be comfortable with programming numerical examples using software of their choice.
Assignments and grades

There will be two assignments, giving students the opportunity to practice the quantitative techniques and concepts presented, and midterm and final exams. Grades will be based primarily on the assignments and exams, but some weight may also be placed on class discussion.

Schedule and location

Mondays and Wednesdays 2:40–03:55 p.m., Jan. 18–May 1, 2017
Location: Fayerweather 310.
Exams will be given during the class sessions on Mar. 6 and May 1.
The syllabus is not yet completely final.

Week 1 Jan. 18: Overview of financial risks

- Market risk
- Credit, counterparty and liquidity risk
- Operational, model, reputational and compliance risk

Week 2 Jan. 23: Risk, return distributions and portfolios

- Defining returns: arithmetic and logarithmic
- Total, nominal and real returns
- Univariate and multivariate return distributions
- Return characteristics
- Portfolios and diversification

Week 3 Jan. 25: Market equilibrium

- Risk, expectations and asset prices
- Investor choice
- Capital asset pricing model
Week 4  Jan. 30: Asset prices over time

- Forecasting asset returns
- Random walks
- The standard model of asset price dynamics: and geometric Brownian motion
- The information in asset prices
- Capital market efficiency

Week 5  Feb. 1: Volatility behavior and forecasting

- Time variation in return behavior across assets
- Return volatility measurement and forecasting
- Estimating volatility via GARCH
- Estimating volatility via EWMA

Week 6  Feb. 6: Value-at-Risk

- Definition and motivation of Value-at-Risk
- Computing Value-at-Risk: parametric, Monte Carlo, and historical simulation approaches
- Value-at-Risk for short positions

Week 7  Feb. 8: Market risk measurement in practice

- Value-at-Risk for nonlinear positions: delta-gamma and full revaluation
- Delta-normal Value-at-Risk
- Value-at-Risk for portfolios
- Value-at-Risk for options and fixed income

Week 8  Feb. 13: Extreme events in asset markets

- Limitations of the standard model of asset price dynamics
- Behavior of asset prices in normal and in stress periods
- Alternative models of asset price behavior
- Extreme Value Theory
Week 9  Feb. 15: Assessing the accuracy of Value-at-Risk

- Limitations of Value-at-Risk
- Coherent risk measures
- Backtesting Value-at-Risk estimates
- Variability Value-at-Risk estimates

Week 10  Feb. 20: Credit and counterparty risk

Need to find a good distribution of material through the 4 pre-securitization credit lectures

- Financial distress: default, ratings migration, insolvency and bankruptcy
- Treatment of insolvency for financial firms
- Counterparty risk
- Forms of debt, capital structure and collateral

Week 11  Feb. 22: Default analytics

- Hazard rates and default analytics
- Credit spreads and credit spread risk

Week 12  Feb. 27: Liquidity risk

- Sources of liquidity risk: credit, maturity and liquidity transformation
- Funding liquidity risk and risk management by financial firms
- Financial distress: solvency and liquidity
- Market liquidity risk and risk management

Week 13  Mar. 1: Leverage risk

- Defining and measuring leverage for the financial industry
- Leverage risk and the attractions of leverage
- Forms of leverage: carry trades and embedded leverage
Week 14  Mar. 6: Midterm exam

Week 15  Mar. 8: Extreme events and market risk measurement

- Alternatives to Value-at-Risk: expected shortfall
- Alternatives to Value-at-Risk: stress testing

Week 16  Mar. 20: Credit risk modeling

- Expected and unexpected credit loss and credit Value-at-Risk
- Single-obligor credit risk models

Week 17  Mar. 22: Portfolio credit risk models

- Behavior of credit portfolios: credit diversification and default correlation
- Portfolio credit risk models and Value-at-Risk

Week 18  Mar. 27: Securitization

- Basics of structured credit and tranching
- Impact of default rates and default correlation on structured credit risk
- Tranche credit VaR

Week 19  Mar. 29: Structured credit risk

- Collateralized securities markets
- Copula models and other approaches to structured credit risk measurement
- Base correlation
- Tranche deltas and hedging
- The 2005 auto maker and London Whale episodes

Week 20  Apr. 3: Financial crises

- Banking, currency, and sovereign and external debt crises
- Typical features of financial crises
- Illiquidity and insolvency during crises
- Bubbles, market crashes and financial crises
Week 21  Apr. 5: How asset prices express the risk of extreme events

- Option-implied return distributions
- Implied correlation
- Base correlation, default correlation and widespread financial distress

Week 22  Apr. 10: Overview of regulatory policy

- Organization of regulation: governments, central banks, and international coordination
- Regulation and supervision of individual financial firms
- Pitfalls of regulation

Week 23  Apr. 12: Economic capital

- Concept of economic capital
- Risk contributions
- Computing risk contributions using marginal VaR
- Reverse optimization and implied views

Week 24  Apr. 17: Regulatory capital

- Evolution of capital standards: Value-at-Risk, internal models and pre-crisis risk management practice
- Imposition of higher capital standards: Basel 2.5, III and beyond

Week 25  Apr. 19: Regulatory stress testing and Too-Big-to-Fail

- Regulatory stress testing and its impact on firm practice
- Addressing counterparty risk: capital standards and derivatives clearing mandates

Week 26  Apr. 24: Liquidity regulation

- Addressing liquidity and run risk
- Basel III liquidity standards
- Money market mutual fund reform
Week 27  Apr. 26: Macroprudential supervision

- Rationale of macroprudential policy
- Stability policy institutions after the crisis
- Reaching for yield and other targeted behaviors
- Tools of macroprudential policy
- Anticipating financial stress and financial warning indicators

Week 28  May 1: Final exam

January 10, 2017