

Risk Management I

Instructor: Dr. Vincent Fardeau

Abstract

This elective course deals with the ways in which risks are quantified and managed by financial institutions. It consists of two parts, one on market risk and one on credit risk.

The first part of the course studies market risk. A parametric structure on the distribution of returns may be imposed, or the realised distribution of returns can be used to generate a non-parametric distribution of returns. With the parametric or non-parametric distribution of returns in hand, the risk of particular portfolios can be studied and optimised with reference to the likelihood of losses (Value-at-Risk or Expected Short-fall). Finally applications and short-comings of market risk management tools in banking and financial stability regulation will be studied, and in particular the evolution of the Basel regulation.

The second part of the course gives an introduction to commonly used models of credit risk. Credit risk is the risk of loss due to a debtor's non-payment of a bond or a loan. Models of default risk of a single counterparty are studied, and then extended to the case of portfolios of bond or loans. The major complication with portfolios is the correlation of defaults. A widely used tool to deal with it, Copula distributions, is introduced. Regulation of credit risk in the Basel II Accord and its transition to Basel III is presented briefly. Finally, financial instruments used to mitigate credit risk, in particular credit derivatives, are discussed.

Learning Objectives and Outcomes

The students will learn how

- to model the risk of portfolios emanating from fluctuations in market prices;
- to strike a balance between a practical approach to the most popular credit risk models and their theoretical underpinnings.

The student should be able to apply professional knowledge and skills acquired while studying the course in practical areas, including academic research, work in financial institutions, industry, state governance.

Prerequisites: Financial Economics I (Asset Pricing)

Methods of Instruction

- Lectures
- Problem sets (one for each part, serving as exam preparation)

Grading System and Knowledge Assessment

The final grade is determined as follows:

- Mid-term test (25%)
- Final exam (75%)

The final exam covers the material of the entire semester.

Sample materials for knowledge assessment are available in ICEF Information system at <https://icef-info.hse.ru>.

Required reading

Lecture slides will be provided to students at icef-info.hse.ru. They contain a complete description of the course unless stated in the lectures. In addition, the following books are required:

- Christoffersen, P.F. (2003), Elements of Financial Risk Management, Academic Press, London
- Hull, John C. (2015), Risk Management and Financial Institutions (4th edition), Pearson

Optional reading

- Saunders, Anthony and Linda Allen (2nd edition 2002): Credit Risk Measurement, Wiley , or 1st edition, 1999.
- Jorion, Philippe (2011): Financial Risk Manager Handbook, Wiley.
- Lando, David (2004): Credit Risk Modeling, Princeton UP.
- McNeil, Alexander, Rüdiger Frey, and Paul Embrechts (2005): Quantitative Risk Management – Concepts, Techniques and Tools, Princeton UP.

987-1019.

Special Equipment and Software Support

Laptop, projector, Internet connection

MS Word, MS Excel

Course plan

1. The case for Risk Management

- Why hedge?
- Typology of risks
- Some well-known risk-management failures
- Stylized facts about asset returns
- Hedging assets vs hedging portfolios

2. Risk measures

- Value-at-Risk (VaR) and Expected Shortfall (ES)
- Coherent risk measures
- Some analytical expressions for VaR
- The choice of parameters
- Historical simulation for VaR and ES

3. Volatility modeling

- Moving average and weighted moving average
- GARCH type models
- Implied and realized volatility

4. The model-building approach

- The linear model
- Cash-flow mapping
- Second-order extensions

5. Backtesting and stress testing

- Violation ratios, Bernoulli tests
- Testing independence of violations and window length
- Stress-tests

6. Value-at-Risk and regulation

- The Basel framework: Basel I, II, III, Liquidity Coverage Ratio, Net Stable Funding Ratio, Fundamental Review of the Trading Book

- The economics of VaR:
 - Endogenous risk: VaR and procyclical leverage
 - Equilibrium effects of VaR constraints

7. Introduction to Credit Risk

- Default, exposure, and loss given default (or recovery)
- Expected, unexpected loss
- Settlement and pre-settlement risks
- Exposures
- Wrong-way, right-way risks

8. Credit Risk on a Single Counterparty I: Simple methods

- Scoring models
- Default rates implied from bond prices

9. Credit Risk on a Single Counterparty II: Ratings-based models

- Ratings
- Transition matrices
- Rating-based models (CreditMetrics)

10. Credit Risk on a Single Counterparty III: Structural models

- Default rates implied from equity prices: Asset-based (structural) models (Merton model)
- KMV implementation

11. Credit Risk on a Single Counterparty IV: Reduced-form models

- Intensity-based (reduced form) models
- Constant intensity special case
- Jarrow-Turnbull and Duffie-Singleton models

12. Credit Risk on Portfolios

- Actuarial Approach: Mortality tables, CreditRisk+
- Introduction to copulas
- Vasicek model of correlated defaults

13. Economic capital and regulatory capital

- Economic capital
- Short history and current provisions of the Basel Accord
- Calculation of capital charges and main regulations of Basel II and Basel III

14. Credit risk management

- Exposure mitigation: Netting, collateral, limits, guarantees
- Credit derivatives
 - Credit default swap (CDS): standard, binary, basket CDS, mechanics and pricing of the contracts
 - Total return swaps
 - Collateralized debt obligations
 - Definition
 - Measurement issues