

ICEF, NRU - Higher School of Economics Moscow
MSc in Financial Economics, 2nd year

Risk Management Course Syllabus

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Course Objective

This 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 course prepares for the credit risk parts of the Financial Risk Manager[®] and Professional Risk Manager[™] Examinations provided by the professional risk manager associations GARP and PRMIA, respectively. Both certificates are valuable assets on your CV if you aim at a career in the banking sector.

The first part of the course studies how to model the risk of portfolios emanating from fluctuations in market prices, or 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, devices to mitigate credit risk, in particular credit derivatives are discussed. This part of the course is designed to strike a balance between a practical approach to the most popular credit risk models and their theoretical underpinnings.

Prerequisites

Financial Economics I (Asset Pricing)

Teaching Methods

- Lectures
- Market risk part: A group practical assignment to be done on excel which will require students to integrate theoretical and practical knowledge of the course.
- Credit risk part: A homework assignment is given and serves mainly for exam preparation.

Grade Determination

Each of the two sections accounts for 50% of the final grade. Within the market risk section, the final exam accounts for 80%, and a group assignment accounts for 20%. The grade for the credit risk section will be fully determined by the final exam.

Required readings

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 (short: **C**)
- Hull, John C. (2015), Risk Management and Financial Institutions (4th edition), Pearson (short: **H**).

Supplementary readings

- Saunders, Anthony and Linda Allen (2nd edition 2002): Credit Risk Measurement, Wiley (short: **SA**), or 1st edition, 1999.
- Duffie, Darrell and Kenneth J. Singleton (2003): Credit Risk, Princeton UP (short: **DS**).
- Jorion, Philippe (2011): Financial Risk Manager Handbook, Wiley.

- Resti, Andrea and Andrea Sironi (2007): Risk Management and Shareholders' Value in Banking, 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.
- Merton, Robert C. (1974): On the Pricing of Corporate Debt: The Risk Structure of Interest Rates, The Journal of Finance, 29(2), 449-470
- Leland, Hayne E., and Klaus Bjerre Toft (1996): Optimal Capital Structure, Endogenous Bankruptcy, and the Term Structure of Credit Spreads, The Journal of Finance, 51(3), 987-1019.

Course Outline

References to the required readings and corresponding chapter numbers are given in [].

1. Value-at-risk [C 1]. It starts by defining value at risk (VaR). It compares VaR to expected shortfall and shows that the latter has better theoretical properties. (To use the technical term, it is more coherent.) It discusses the choice of parameters for VaR, and the impact of autocorrelation on VaR estimates.
2. Historical Simulation, Value-at-Risk and Expected Shortfall [C 2]. The advantage of the historical simulation approach is that it requires no assumptions about probability distributions and correlations. It assumes that percentage changes in all market variables over the next day are a random sample from the last N days. We study how to calculate a standard error when VaR is estimated from historical simulation.
3. Volatility Modeling [C 4, 5]. This topic provides a formal definition of volatility and then moves on to discuss how the volatility of a variable can be monitored by risk managers. One issue is whether volatility should be considered to be a trading-day or calendar-day phenomenon. Whatever the reason, volatility is much greater when markets are open than when they are closed. It therefore makes sense to measure volatility using trading days rather than calendar days. This is what traders and risk managers do.
4. Backtesting and Stress Testing [C 13]. This section covers the model-building approach, which is the main alternative to historical simulation. We study the relationship of VaR to the Markowitz results and also show how covariance matrices can be used. The section first explains how the model building approach can be used for the situation where the value of the portfolio is linearly dependent on the values of the underlying market variables.

5. Value-at-Risk and Banking Regulation [Slides]. This section looks at prudential regulation of banks capital and conduct of business. We stress the reasons for regulating banks, notably in the light of the interrelation between prudential regulation and the safety net, as well as looking at some additional forms of regulation such as reserve requirements, and discussing the various Basel Agreements for international banking regulation.
6. The elements of Credit Risk [H 19.2, 19.3, DS 1, 2.4-2.5]
 - Introduction, outline and literature
 - Definition, market vs. credit Risk
 - The elements of credit risk: Default, exposure, and loss given default (or recovery)
 - Expected, unexpected loss, and VaR
7. Credit exposure [H 20]
 - Pre-settlement and settlement risk
 - Measures of exposure, exposure profiles
 - Wrong-way and right-way risk
8. Models of Single Counterparty Default Risk [H 19.1, 19.6-19.8, 21.1, 21.4, SA 2, 4-9 or SA, 1st ed. 2-8, DS 3-4]
 - Scoring, logit and probit
 - Ratings
 - Rating-based models: CreditMetrics, CreditPortfolioView
 - Default rates implied from bond prices
 - Default rates implied from equity prices: Asset-based (structural) models (Merton and KMV models)
 - Intensity-based (reduced-form) models
 - Actuarial Approach: Mortality tables, CreditRisk+
9. Modelling Default and Recovery: Portfolio Models [H 21.2-21.4, 11.4, 11.5, SA 11 or SA 1st ed. 10, DS 10]
 - Actuarial Approach: Mortality tables, CreditRisk+
 - Asset return models, correlated Defaults and CreditMetrics for portfolios
 - Introduction to Copula distributions
 - Vasicek model of correlated defaults

10. Economic capital and regulatory capital [H 15, 16, 26, SA 3 (2nd ed. only), 13 or SA 1st ed. 12, DS 2.5]

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

11. Credit risk management [H 19.4-19.5, 6.2, SA 15 or SA, 1st ed. 14, DS 8]

- 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