National Research University - Higher School of Economics
International College of Economics and Finance
MSc in Financial Economics, 2nd year

Risk Management
Course Syllabus

Fall semester 2019

Instructor: Dr. Vincent Fardeau

Course Description

Prerequisites
First year courses of the MSc in Financial Economics, in particular Financial Economics I (asset pricing).

Abstract
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 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. 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. 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.

Learning Objectives and Outcomes

The course provides students with the tools of risk management and an introduction to the regulatory framework. The course presents the technical aspects of risk management but also insists on the economics of risk management (traders' incentives, general equilibrium effects of regulation, etc.).

At the end of the course, students should be familiar with, and be able to assess critically, the main techniques and metrics of market risk management, the rationale for and development over time of the regulatory framework, and the main instruments and models used to manage credit risk.

Further, the course should help students develop the following competencies:
- Ability to reflect (evaluate and process) the mastered scientific methods and ways of activity.
- Ability to make management decisions and is ready to take responsibility for them.
- Ability to make economic and financial organizational and managerial decisions in professional activities.
- Ability to develop methodological and regulatory documents, as well as proposals and activities for the implementation of projects and programs.
- Ability to develop options for management decisions and justify their choice on the basis of criteria of socio-economic efficiency.
- Ability to prepare analytical materials for the assessment of economic policy and strategic decision-making at the micro-and macro-level

Teaching Methods

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

Reading list

Lecture slides will be provided to students at icef-info.hse.ru.
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 (optional)

- 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).
- Lando, David (2004): Credit Risk Modeling, Princeton UP.

Grade Determination

The final grade is determined as follows:
- Mid-term test (25%)
- Final exam (75%)

The final exam covers the material of the entire semester. The mid-term test has the status of Control Paper without retake. The final exam has the status of exam in the curriculum, with a possible retake.

All grades are given initially out of 100. The final grades are also transferred to 10- and 5-points grades in accordance with the ICEF Grading Regulations (par.3) available at
https://icef-info.hse.ru/goto_icef_file_29837_download.html

Retakes are organized in accordance with the HSE Interim and Ongoing Assessment Regulations (incl. Annex 8 for ICEF). Grade determination after retakes is done in accordance with ICEF Grading Regulations (par. 5) available at https://icef-info.hse.ru/goto_icef_file_29837_download.html

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

Course Outline

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

1. The case for Risk Management [C 1, H 1, 2, 3]
   Why hedge?
   Typology of risks
   Some well-known risk-management failures
   Stylized facts about asset returns
   Hedging assets vs hedging portfolios

2. Risk measures [C 2, H 8]
   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 [C 4, 5, H 5]
   Moving average and weighted moving average
   GARCH type models
   Implied and realized volatility

4. Backtesting and stress testing [C 13, H 8]
   Violation ratios, Bernoulli tests
   Testing independence of violations and window length
   Stress-tests

5. Value-at-Risk and regulation [H 7]
   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

6. Introduction to Credit Risk [H 19.2, 19.3, DS 1, 2.4-2.5]
   Default, exposure, and loss given default (or recovery)
   Expected, unexpected loss
   Settlement and pre-settlement risks

Exposures
Wrong-way, right-way risks

7. Credit Risk on a Single Counterparty I: Simple methods [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 models
Default rates implied from bond prices

8. Credit Risk on a Single Counterparty II: Ratings-based models [H 19.1, 19.6-19.8, 21.1, 21.4, SA 2, 4-9 or SA, 1st ed. 2-8, DS 4-5]
Ratings
Transition matrices
Rating-based models (CreditMetrics)

9. Credit Risk on a Single Counterparty III: Structural models [H 19.1, 19.6-19.8, 21.1, 21.4, SA 2, 4-9 or SA, 1st ed. 2-8, DS 5
Default rates implied from equity prices: Asset-based (structural) models (Merton model)
KMV implementation

10. Credit Risk on a Single Counterparty IV: Reduced-form models [H 19.1, 19.6-19.8, 21.1, 21.4, SA 2, 4-9 or SA, 1st ed. 2-8, DS 5]
Intensity-based (reduced form) models
Constant intensity special case
Jarrow-Turnbull and Duffie-Singleton models

11. Credit Risk on Portfolios [H 21.2-21.4, 11.4, 11.5, SA 11 or SA 1st ed. 10, DS 10]
Vasicek model of correlated defaults
Economic capital and reserves using Vasicek model
Introduction to copulas

12. Credit Derivatives
Brief overview of single-name CDS, Basket CDS and CDOs
The economics of structured finance

Distribution of hours

Topic	Hours
The case for RM	4
Risk Measures	2
Volatility Modeling	4
Back and Stress testing	4
VaR and Regulation	4
Credit Risk on a Single Counterparty	6
Credit Risk on a Portfolio	4
Economic Capital and Regulatory Capital	4
Credit Risk Management	2
Total	34