



T-814-FINA FINANCIAL ENGINEERING OF THE FIRM 8 ECTS

Year of study: 4th year (1st year MSc).
Semester: Fall.
Level of course: 5. Second cycle, intermediate.
Type of course: Core in MSc Financial Engineering, elective in other programs.
Prerequisites: Undergraduate degree in engineering plus selected finance courses such as Securities, Derivatives, Corporate Finance and Risk Management. **Other recommended prerequisites:** Good programming knowledge in Excel, Matlab or Python.
Schedule: Runs for 12 weeks – a total of 72 teaching hours.
Supervisor: Sverrir Ólafsson.
Lecturer: Sverrir Ólafsson.

Learning outcome: This course will analyse the financial performance of firms, both from theoretical and practical perspective. An emphasis will be put on the analyses of value creation and the factors that drive it. The theory of investment choice will be developed under conditions of certainty and uncertainty. Real options will be introduced as an extension to NPV approach with applications to several practical situations. Considerable effort will be focused on capital structure and its relation to market value of equity and debt as well as credit spread on debt and the probability of corporations defaulting on their debt payments. Also, various structured financial instruments will be designed and priced and their use in risk management will be compared with the use of more conventional techniques such as forward contracts and vanilla options.

Knowledge: On completion of this course the students will have an extensive knowledge of the complexities of corporate financial matters and the range of models and techniques that have been developed to manage the performance of firms and the variety of financial risks they are exposed to. These include the application of the theory of investment choice under certainty and under uncertainty; understand the importance and the limitations of NPV and IRR methods; apply real options to real investment scenarios and the valuation of projects/firms; appreciate the implications of capital structure and the value of leverage; appreciate the role of risk capital; understand the role of corporate value drivers.

Skills: On completion of this course students will be able to apply their acquired knowledge of financial engineering techniques to a whole range of important situations, either everyday pop-up problems or medium to long term strategic issues relating to investment decision or the designing of risk management strategies.

Competence: On completion of this course students will have a good understanding of how to analyse complex financial situations and be able to successfully apply the appropriate techniques to each given situation.

All course descriptions may be subject to change. Revised information on the course schedule, reading material, teaching and learning activities, and assessment methods will be introduced in the learning management system Canvas at the beginning of the semester.



Content: We analyse financial variables that critically contribute to corporate value creation. Different valuation models will be introduced and applied to realistic scenarios. They include: enterprise discounted cash flow; discounted economic profit; adjusted present value; capital cash flow and equity cash flow.

We will discuss how capital structure impacts on the firm's return-risk profile and the probability that the firm defaults on its financial commitments. The CAPM will be linked with the theory of options and the resulting structure used to evaluate the credit risk a leveraged firm exposes to its equity and debt providers. In addition to equity and debt financing we will discuss other alternatives such as convertible bonds or instruments with pay-outs that reflect the level of some important market indices.

The course starts by analysing investment decisions under different levels of uncertainty. Decision trees and real options will be compared with NPV and IRR methods and their superiority demonstrated with several practical examples.

The course continues with an extensive discussion of capital structure and its impact on the firm's risk – return profile as well as its likelihood to default on its debt. The relationship between various important corporate value drivers will be analysed and their impact on the enterprise value discussed.

A detailed analysis of the relationship between the CAPM and option theory will be presented and applied to the valuation of corporate assets.

Reading material: Provided by the teacher, will be introduced in the first lectures.

Teaching and learning activities: Interactive lectures, projects, and class exams.

Assessment methods: Continuous assessment; 35 - 40% projects, 60 – 65% class exams. No final exam.

Language of instruction: Icelandic/English.

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