Doctoral School in Finance and Economics

DSEF PhD Course: Advanced Microeconomics

1. Course details

Semester:	1
Credit rating:	1 ECTS
Teaching units	15
Pre-requisite(s):	No background beyond first year graduate microeconomics is required.
Lecturers:	Vincent Anesi, University of Luxembourg, FDEF
Administrator:	Roswitha GLORIEUX
Tutors:	None
Seminar times and rooms:	please see Point 3
Tutorial times and rooms:	None
Communications	It is important that students should regularly read their University e-mails, as important information will normally be communicated this way.
Mode of assessment:	Attendance/Exam paper
Examination Periods:	TBA
Course WebPage:	Moodle.uni.lu

2. Aims and objectives

Aims

Principal-agent problems are pervasive in economics, including relationships between firms and their employees, international organizations and member states, firms' shareholders and managers, voters and elected representatives, central and local governments, tax authorities and taxpayers, or foreign-aid donor countries and recipient countries, to cite a few examples. There are of course variations across cases, but typical features of principal-agent relationships are: (i) repeated interactions and learning; (ii) uncertainty about the value of the relationship; and (iii) asymmetric information between principals and agents.

The set of formal techniques used in economic theory to analyze such relationships has significantly grown in recent years. The result is that an increasingly large fraction of the literature on dynamic incentives has become inaccessible to most graduate students of Economics when they start a PhD. The material taught in most first-year graduate programs, though essential, has become insufficient for them to understand the modern principal-agent literature and use the appropriate theoretical "tools" to carry out their research work.

The aim of this course is to introduce students to the modern methods of dynamic games and contract theory, which go beyond standard dynamic programming methods (Bellman equations). These include duality theory and Lagrange multipliers techniques, relational contracts, and martingale methods, which are new to the dynamic contracts literature and considerably expand the set of possible applications. Students who will pass the course will be able to: (i) read and understand the theoretical and applied literatures that use these methods; (ii) apply up-to-date methods to their own research work. Particular attention will be given to providing an intuitive understanding of the logic behind the formal results presented, and to how they can be used in economic applications of interest. In particular, applications to public finance, corporate finance, development economics, and international economics will be discussed in detail.

3. Plan of semester

Dates to be announced

4. Course details (by topics)

Part I. Review of the Standard Recursive Approach: We will review the main steps in the standard dynamic-programming approach to dynamic contracts: application of the Revelation Principle; simplification of the problem by focusing on one-shot incentive constraints; and recursive statement of the problem using "promised utilities" as state variables.

Part II. Duality Theory and Lagrange-multiplier Techniques:A critical limitation of the standard approach is that it requires to write the incentive constraints in a simple recursive form. In many applications, however, the problem involves constraints that cannot be writtenrecursively. We will present a method that allows to extend the standard approach to such problems. Specifically, we will provide theoretical results about the properties of Lagrange multipliers in infinite dimensional spaces, as well as several examples of applications of these techniques.

Part III. Dynamic Mechanism Design without Commitment (Relational Contracts): The standard approach typically assumes that principals, who offer contracts to agents, have perfect commitment; i.e., they cannot renege on those contracts as time goes by. This assumption is not innocuous and does not apply to many applications of interest. This part will present recent developments in the relational-contracts literature, which permit to analyze dynamic contracting problems in environments where the principal cannot commit.

Part IV. Martingale Methods: This part shows how to analyze dynamic contracting problems using martingale methods and the stochastic version of the dynamic programming principle. These methods often simplify the characterization of optimal contracts, allowing for analytical comparative statics.

Part V. Applications: We will provide a number of applications of the techniques presented in the previous parts, e.g.: public finance, corporate finance, development economics, and international economics.

References:

Bertsekas, D. P., A. Nedi, and A. E. Ozdaglar(2003): *Convex analysis and optimization,* Athena Scientific.

Bester, H. and R. Strausz(2001): "Contracting with imperfect commitment and the revelation principle: The single agent case," *Econometrica,* 69, 1077-1098.

Biais, B., T. Mariotti, J.-C. Rochet, and S. Villeneuve (2010): "Large risks, limited liability, and dynamic moral hazard," *Econometrica,* 73-118.

Billingsley, P. (1995): *Probability and measure,* Wiley Series in Probability and Statistics, Wiley.

Chari, V. V. and P. J. Kehoe (1990): "Sustainable plans," *Journal of Political Economy,* 98, 783-802.

Cole, H. and F. Kubler (2012): “Recursive contracts, lotteries and weakly concave Pareto sets," *Review of Economic Dynamics,* 15, 479-500.

Cvitanic, J. and J. Zhang (2012): *Contract theory in continuous-time models,* Springer Science & Business Media.

De Marzo, P. and Y. Sannikov(2006): “Optimal security design and dynamic capital structure in a continuous-time agency model," *The Journal of Finance,* 61, 2681-2724.

DeMarzo, P. M. and M. J. Fishman (2007a): “Agency and optimal investment dynamics," *Review of Financial Studies,* 20, 151-188.

Diamond, P. and J. Mirrlees(1978): “A model of social insurance with variable retirement," *Journal of Public Economics,* 10, 295-336.

Farhi, E. and I. Werning(2007): “Inequality and social discounting," *Journal of Political Economy,* 115, 365-402.

Fernandes, A. and C. Phelan (2000): “A recursive formulation for repeated agency with history dependence," *Journal of Economic Theory,* 91, 223-247.

Golosov, M., A. Tsyvinski, and I. Werning(2006): “New dynamic public finance: A user's guide," *NBER Macroeconomics Annual,* 21, 317-363.

Golosov, M., A. Tsyvinski, and I. Werning(2016): "Recursive contracts and endogenously incomplete markets." *Handbook of Macroeconomics*. Vol. 2. Elsevie, 725-841.

Isaiah, A. and D. Barron (2016) "The Allocation of Future Business: Dynamic Relational Contracts with Multiple Agents,"*American Economic Review,* 106, 2742-2759.

Kapicka, M. (2013): Efficient allocations in dynamic private information economies with persistent shocks: A first order approach," *Review of Economic Studies,* 80, 1027-1054.

Karaivanov, A. and R. M. Townsend (2014): “Dynamic financial constraints: Distinguishing mechanism design from exogenously incomplete regimes," *Econometrica,* 82, 887-959.

Levin, J. (2003): “Relational Incentive Contracts,” *American Economic Review,*93, 835-857.

Mailath, G.J., and L. Samuelson (2006): *Repeated games and reputations: long-run relationships*. Oxford University Press.

Messner, M., N. Pavoni, and C. Sleet (2012): “Recursive methods for incentive problems," *Review of Economic Dynamics,* 15, 501-525.

Messner, M., N. Pavoni, and C. Sleet (2014): “The dual approach to recursive optimization: Theory and examples," in *2014 Meeting Papers,* Society for Economic Dynamics, 1267.

Miao, J. and Y. Zhang (2014): “A duality approach to continuous-time contracting problems

with limited commitment," *Journal of Economic Theory,* 159, 929-928.

Milgrom, P. and I. Segal (2002): "Envelope theorems for arbitrary choice sets," *Econometrica,* 70, 583-601.

Pavan, A., I. Segal, and J. Toikka(2014): "Dynamic mechanism design: A Myersonian approach," *Econometrica,* 82, 601-653.

Phelan, C. (1995): "Repeated moral hazard and one-sided commitment," *Journal of Economic Theory,* 66, 488-506.

Sannikov, Y. (2008): "A continuous-time version of the principal-agent problem," *The Review of Economic Studies,* 75, 957{984.

Thomas, J. and T. Worrall (1990): "Income fluctuation and asymmetric information: An example of a repeated principal-agent problem," *Journal of Economic Theory,* 51, 367-390.

Thomas, J. and T. Worrall (1994): "Foreign direct investment and the risk of expropriation,"*Review of Economic Studies,* 81-108.

5. Further information about assessment

Examination(s)

Weighting:	100%
Date:	TBA
Length:	2 hours
Structure:	Written examination (questions about the material). Pass/Fail.