ICEOMFE 2015

Workshop on Equilibrium and Optimization Methodology in Finance and Economics

ABSTRACTS

November 9-11, 2015
King Saud University, Riyadh, Saudi Arabia

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Risk, Utility and Regret in Financial Optimization

R.T. Rockafellar

University of Washington (Seattle), USA.

Abstract: Measures of risk, especially with properties such as the coherency introduced in 1999 for applications in the banking industry, have attracted wide attention. A key example of a coherent measure is conditional value-at-risk (CVaR), in contrast to the much-used value at risk (VaR), which lacks coherency, but many other possibilities have come to light since CVaR was discovered. These examples share the important feature that the risk in a random variable representing loss can be computed through a one-dimensional minimization formula involving a different quantity, called regret. The risk-reget formula is important in portfolio optimization problems involving risk in constraints as well as objectives. Regret in this sense is a sort of mirror image of utility, tuned to minimization instead of maximization, but utility relative to a benchmark. Risk-based modeling in finance can thereby be unified with utility-based modeling. Furthermore, surprising connections emerge between different approaches to risk and different statistical treatments of data. From the economic point of view there insights are gained also into issues of stochastic ambiguity in handling utility.

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Regular Economies with Ambiguity Aversion

Noé Biheng and **Jean-Marc Bonnisseau**

University Paris 1 Panthéon-Sorbonne, France.

Abstract: We consider a family of exchange economies with complete markets where consumers have multiprior preferences representing their ambiguity aversion. Under a linear independence assumption, we prove that regular economies are generic. Regular economies exhibit enjoyable properties: odd finite number of equilibrium prices, local constancy of this number, local differentiable selections of the equilibrium prices. Thus, even if ambiguity aversion is represented by non-differentiable multiprior preferences, economies retain generically the properties of the differentiable approach.

Capital Taxation, Reduction of Inequality and Economic Growth

Cuong Le Van

Paris School of Economics, IPAG Business School,

VCREME, France.

Abstract: In this paper we present an economy with two classes. Class A owns the capital, works, consumes and invests. Class B works and consumes all its labour income and does not invest. Class A is richer than Class B. We consider two cases (i) the capital tax is used for the consumption of Class B, (ii) the tax is used for the Human Capital of Class B. In our infinite horizon model, in both cases inequality between the two classes diminishfi es, but there is no growth in case (i) while growth exists in case (ii).

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Algorithmic Efficiency

Kosrow Dehnad

Columbia University & Samba Financial Group, USA.

Abstract: This concept of market efficiency for US equity markets that was first proposed by Eugene Fama from Chicago has created a great deal of controversy. It has spawned an industry that tries to convince investors that markets are efficient and all attempts to find mispriced equities are in vane and the best strategy is to invest in the market index and forget about the ups and downs of the market. On the other hand, the behavioral finance camp tries to dredge up instances to show that investors do not always behave rationally and markets are not always efficient. And in the meantime game theorists, statisticians, technical analysts, psychologist has joined this foray. One reason that this controversy endures is that the concept of "market efficiency" has been stated in an imprecise way thus making it difficult if not impossible to prove or disprove it. This articles attempts to narrow the definition of "efficiency" thus making it possible to verify it using historical data. It introduced the concept of "algorithmic efficiency" that has a precise and operational definition thus making it possible to test this hypothesis for any given stock for which historical prices are available.

Characterizations of the Free Disposal Condition for Nonconvex Economies on Infinite-Dimensional Commodity Spaces

Alejandro Jofre and **Abderrahim Jourani**

University of Burgundy, France.

Abstract: Our aim in this talk is to prove geometric characterizations of the free disposal condition for nonconvex economies on infinite-dimensional commodity spaces even if the cone and the production set involved in the condition have empty interior such as in L^1 with the positive cone . We then use this characterization to prove existence of Pareto and weak Pareto optimal points. We also explore a notion of extremal systems a la Kruger-Mordukhovich. We show that the free disposal hypothesis alone assures extremality of the production set with respect to some set.

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Growth of Small World Networks Versus Endogenous R&D Spillover Model

Mohamed Alghamdi

King Saud University, Saudi Arabia.

Abstract: Alghamdi et al. (2015) introduces a new model of R\&D networks. The new model extended Goyal and Moraga-Gonzalez (2001) model by involving statistical factors of the social network on R&D spillovers. The first aim of this paper is to investigate theoretically the relationship between the rate of R&D spillover and the process of network formation. The second aim is to examine the new model to find out the impact of a small world network on economic equilibria. A common result of the two aims lies in the emphasis on incentives of firms to form a small world network to gain high rates of R&D spillover and high profits. However, when the density of the small world network starts growing, there are positive and negative impacts on equilibrium outcomes. In a weak competitive market, the growth of the small world network enhances the outcomes; whereas in a competitive market, the opposite occurs for firms who have weak positions in the network and for the social welfare

Useless Portfolios in Financial Economies with Restricted Participations

Zaier Aouani and Bernard Cornet

Nazabayev University, Kazakhstan.

Abstract: We adapt the notion of useless commodity bundles [Werner, J., 1987. Arbitrage and the existence of equilibria. Econometrica 55 (6), 1403–1418.] to the setting of financial structures. We define the class of Werner-useless portfolios and a larger class of useless portfolios. We characterize the first class in terms of individual demand and the second class in terms of individual and aggregate demand. We show that the appropriate substitute for the no-redundant assets assumption in the context of financial structures with constraints is the no-useless portfolios assumption. We characterize useless-free financial structures (i.e., without useless portfolios) in terms of boundedness of several sets of admissible portfolio allocations and in terms of full dimensionality of the set of unbounded-arbitrage-free asset prices.

We show that, under fairly general conditions, every financial structure has the same consumption equilibria (a consumption equilibrium is the "real" part of an equilibrium in a financial exchange economy, i.e., the pair consisting of the equilibrium commodity price and the equilibrium consumption allocation.) as a useless-free financial structure, and finally we prove existence of financial equilibria for useless-free financial structures.

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Variational Principles for Equilibrium Problems and Applications to Inequality Problems and Fixed Point Theory

V.D. Rădulescu

University of Craiova, Romania.

Abstract: We report on recent results in collaboration with B. Alleche concerning the qualitative analysis of equilibrium problems. We establish several abstract variational principles in a general setting, in particular a version of the Ekeland variational principle for countable systems of nonconvex equilibrium problems. Applications include existence results for quasi-hemivariational inequality problems and fixed point properties of multi-valued operators.

Enlargements and Autoconjugate Representations of Maximally Monotone Operators

Michel Théra

University of Limoges, France.

Abstract: The aim of this talk consists in presenting new results on enlargements as well as on autoconjugate representations of maximally monotone operators. More precisely, let X be a real Banach space with continuous dual X*. We consider a generalized equation governed by a maximally monotone operator T from X into the subsets of X*, that is the problem of finding $x \in X$ such that $0 \in T(x)$. This model has been extensively used as a mathematical formulation of fundamental problems in optimization and fixed point theory. Solving the previous inclusion is tantamount to finding a point of the form $(x,0)$ in the graph of T. When T is set-valued, the problem could be ill-behaved, making the required computations hard. Enlargements of T are point-to-set mappings (the terms set-valued mapping and multifunction are also used) which have a graph larger than the graph of T. These mappings, however, have better continuity properties than T itself. Moreover, they stay "close" to T, so they allow to define perturbations of the initial problem, without losing information on T. In this way, we can define well-behaved

approximations of the initial problem, which (i) are numerically more robust, and (ii) whose solutions approximate accurately the solutions of $0 \in T(x)$: The use of enlargements in the study of such a problem has been a fruitful approach, from both practical and theoretical reasons. One key ingredient for this study is the (variational) representation of operators as introduced independently by Fitzpatrick et Martinez-Legaz & Thera. It is nowadays well established that:

- each representable operator is monotone;
- each monotone operator is not necessarily representable;
- each maximally monotone operator is representable;
- a representable operator is not necessarily maximally monotone.

In other words, the family of representable operators forms a class strictly included in between monotone operators and maximally monotone operators. A typical example of representable operator is given by the subdifferential of a lower semicontinuous proper function f. It can be observed that it is represented by the Fenchel-Young mapping: $g(x; x^*) = f(x) + f^*(x^*)$ associated to f, where f* stands for the Fenchel conjugate of f. It should be noticed that this representation is auto-conjugate in a sense which will be de_ned during the lecture. We will also give some recent developments on auto-conjugate representations of maximally monotone operators. This presentation summarizes a joint work with R. Burachik, J.-.E. Martinez- Legaz and M. Rezai, appeared in Set-Valued and Variational Analysis.

Approximation of Spaces and Maps, Fixed Points and Equilibria: the Non-Convex Case

Hichem Ben-El Mechaiekh

Brock University, Canada.

Abstract: The talk will describe a general framework for the solvability of fixed point and equilibrium inclusions $x_0 \in \Psi(x_0)$ and $0 \in \Phi(x_0)$ for non-convex and non-smooth domains based on approximation methods for domains (generalized admissibility in the sense of Klee) and maps (continuous graph approximations). Applications to systems of constrained inequalities without convexity will conclude the talk.

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A Convex-Valued Selection Theorem with a non Separable Banach Space

Pascal Gourdel and Nadia Maagli

University Paris 1 Panthéon-Sorbonne, France.

Abstract: Within the spirit of Michael's convex-valued selection theorem and using the closed-convex valued selection theorem, we weakened some hypothesis and strengthened others in order to establish conditions under which there exists continuous selections. We provide a geometric and constructive proof of our main result.

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On the Class of -Type Contractive Mappings and Related Fixed Point Theorem

Bessem Samet

King Saud University, Saudi Arabia.

Abstract: We present a new class of operators for which we study the existence and uniqueness of fixed points. We show that such class unifies large classes of contractive type operators, whose fixed points can be obtained by means of the Picard iteration. The obtained results generalize several existing theorems including fixed---point theorems due to Banach, Kannan, Chatterjea, Zamfirescu, Berinde, Suzuki, Ciric, Ran-Reurings, Nieto-Lopez, and many others. Some applications to integral equations and matrix equations are presented.

An Iterative Approach to Common Fixed Point Problem

Abdul Rahim Khan

King Fahd University of Petroleum and Mineral, Saudi Arabia.

The Banach contraction principle asserts that a contraction on a complete metric space has a unique fixed point and its proof hinges on ``Picard iterations". The principle itself is applicable to integral equations, partial differential equations, image process engineering and many other subjects. The existence problems in economics such as existence of competitive equilibrium in general equilibrium theory and existence of Nash equilibrium in game theory can be formulated as a fixed point problem. The study of nonexpansive maps (a class of nonlinear maps containing contractions as a subclass) remains a popular area of research in various fields. The iterative construction of fixed points of nonexpansive type maps is a fascinating field of research. In this talk, an iterative approach for the solution of common fixed point problem of asymptotically quasi-nonexpansive maps through their explicit and implicit iterative schemes on more general nonlinear domains, namely, CAT (0) spaces, hyperbolic spaces and convex metric spaces will be presented. As application of our results, a solution of certain nonlinear functional equations in Banach space and uniformly convex metric space setting will be given.

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Convergence Theorems for Family of Multi-Valued Mappings in CAT(0) Space and an Application

Javid Ali and Izhar Uddin

Aligarh Muslim University, India

Abstract: The aim of present paper is to introduce a new iterative process involving a finite family of multivalued nonexpansive mappings in CAT(0) spaces. We prove some Δ-convergence and strong convergence theorems for the proposed scheme with and without end point conditions. The newly defined iteration scheme is also utilized to an application in image recovery problem. In process, our results generalize and extend the corresponding results of Uddin et al., Abbas et al., Eslamian and Abkar, Bunyawat and Suantai, Khan, Khan and Fukhar-ud-din and Fukhar-ud-din and Khan and references cited therein.

Existence and Uniqueness for Solutions of a Parabolic Quasi-Variational Inequalities with Impulse Control Problem

Salah Boulaaras

Al-Qassim University, Saudi Arabia.

Abstract: In this talk, we present a new proof for the existence and uniqueness for solution of parabolic quasi-variational inequalities with impulse control problem. For that some properties of the presented algorithm using a semi-implicit scheme with respect to the *t*-variable combined with a finite element spatial approximation are proved.

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Proximal Methods for Nonconvex Optimization Problems

Hong-Kun Xu

Hangzhou Dianzi University, China.

Abstract: It is quite well known that the proximal method can solve a variety of convex optimization problems such as the lasso (also known as the basis pursuit denoising) which is the minimization problem min . Many practical problems are however modeled as a nonconvex optimization. For instance, the compressed sensing requires to minimize the nonconvex objective function, where and is the quasi-norm of. A recent stream in the optimization theory is to develop proximal methods for solving nonconvex optimization problems. The purpose of this talk is to report some recent developments in nonconvex optimization theory, including the proximal point algorithm for nonconvex functions, and the Kurdyka-Lojasiewicz property and its role in nonconvex proximal analysis.

Iterative Schemes for V-prox-Regular Quasi-Equilibrium Problems in Smooth Banach Spaces

Messaoud Bounkhel

King Saud University, Saudi Arabia.

Abstract: In this talk, we suggest and study the convergence of some new iterative schemes for solving nonconvex quasi-equilibrium problems in smooth Banach spaces with V - prox-regular data. Many existing results have been obtained as particular cases.

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Ergodric Convergence of the Double Backward Method for Monotone Operators

Najla Altwaijry, Souhail Chebbi and Hong-Kun Xu

King Saud University, Saudi Arabia.

Abstract: The double backward method for finding zeros of the sum of two maximal monotone operators is investigated. This method was initially introduced by Passty in 1979 who used an equal index to the resolvents of both operators. In this paper, we use distinct indices in order to see different roles played by the two operators in the double backward method. Under certain conditions on the indices, we prove the ergodic convergence of our method.

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Optimal Investment and Consumption Problem in an Infinite Horizon with Frictions

Senda Ounaies, Jean-Marc Bonnisseau, **Souhail Chebbi** and H.M. Soner

King Saud University, Saudi Arabia.

Abstract: We investigate the problem of optimal investment and consumption of Merton in the case of discrete markets in an infinite horizon. We suppose that there is frictions in the markets due to loss in trading. These frictions are modeled through nonlinear penalty functions and the classical transaction cost and liquidity models are included in this formulation. In this context, the solvency region is defined taking into account this penalty function and every investigator have to maximize his utility that is derived from consumption, in this region. We give the dynamic programming of the model and we prove the existence and uniqueness of the value function.

Applications of Chaos and Fractals in Financial Markets

Mohammad Sajid

Qassim University, Saudi Arabia

Abstract: The aim of this talk is to demonstrate the applications of chaos and fractals in financial markets. Chaos exists everywhere in this world. Market prices are chaotic, traffic situation is chaotic, weather is chaotic, behavior of human is very chaotic, structure of brain is chaotic, chemical reactions are chaotic, explosion of volcano seems chaotic, and so on. In addition, explanations of some aspects of chaos and fractals have been presented effectively by using computer graphics. Recently, the mathematicians and researchers have utilized chaos and fractals in Financial Calculations. It is believed that chaos and fractals will be very useful and attractive subject for developing new tools to study financial markets.

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