Book of Abstracts

22-24 May 2019, Jussieu, Paris

Schedule

Wednesday

Morning

9h15-9h30: Welcome address by:
- Emmanuel Trélat (Directeur de la Fondation Sciences Mathématiques de Paris).
-Lorenzo Zambotti (Directeur du LPSM, Sorbonne Université) .

9h30-10h: Jean-Pierre Fouque (Department of Statistics and Applied Probability, University of California Santa Barbara).
On Fairness of Systemic Risk Measures.

10h-10h30: Bruno Dupire (Bloomberg L.P.)
The Perils of Parameterization.

10h30-11h: *Coffee Break.*

11h-11h30: Michel Benaïm (Institut de mathématiques, Université de Neuchâtel).
Stochastic Persistence.

11h30-12h: Said Hamadène (LMM, Le Mans Université).
McKean-Vlasov backward-forward stochastic differential equations and McKean-Vlasov (or MF) nonzero-sum LQ stochastic differential games.

Afternoon

14h-14h30: Brahim Mezerdi (King Fahd University of Petroleum and Minerals, Department of Mathematics and Statistics).
Existence and optimality conditions in stochastic mean-field optimal control.

14h30-15h: Denis Talay (Inria Sophia Antipolis and Ecole Polytechnique).
On two stochastic modelling issues.

15h-15h30: Emmanuel Gobet (CMAP, Ecole Polytechnique).
Central limit theorem for discretization errors based on general stopping time sampling.

15h30-16h: Noureddine El Karoui (UC Berkeley and Criteo AI Lab).
Can we trust the bootstrap? (for moderately difficult statistical problems).

16h-16h30: *Coffee Break.*

16h30-16h45: Mohamed Mrad (LAGA, Université Paris 13).
Consistent Dynamic Utilities.

16h45-17h: Sarah Kaakaï (LMM, Le Mans Université).
On the "blue death" and Poisson measures.

17h-17h30: Ioannis Karatzas (Department of Mathematics, Department of Statistics Columbia University).
Conservative diffusion as entropic gradient flux.

17h30-18h: Julien Guyon (Bloomberg L.P.).
The Joint S&P 500/VIX Smile Calibration Puzzle Solved: A Dispersion-Constrained Martingale Transport Approach.

Thursday

Morning

9h-9h30: Hans Föllmer (Institut für Mathematik, Humboldt University of Berlin).
Entropy on Wiener Space.

9h30-10h: Sylvie Roelly (Institut für Mathematik, Universität Potsdam).
Bridges (ou comment distinguer les vrais des faux...).

10h-10h30: *Coffee Break.*

10h30-11h: Nizar Touzi (CMAP, Ecole Polytechnique).
On the continuous-time Principal-Agent problem.

11h-11h30: Jean-Charles Rochet (Institute of Economics and Econometrics, Université de Genève).
Insurance Capacity.

11h30-12h: Darrell Duffie (Graduate School of Business, Stanford University).
Size Discovery Trading and the Cost of Market Fragmentation.

Afternoon

14h-14h30: Shige Peng (School of Mathematics and Qilu Institute of Finance, Shandong University).
Recent progresses in LLN and CTL under Uncertainty.

14h30-15h: Anis Matoussi (LMM, Le Mans Université).
Quadratic Exponential Semimartingales and Application to BSDEs with jumps.

15h-15h30: Mingyu Xu (Institute of Applied Mathematics, AMSS, Chinese Academy of Sciences).
Hedging distributions via BSDE.

15h30-16h: Marie-Claire Quenez (LPSM, Université Paris Diderot).
European options in a non-linear incomplete market model with default.

16h-16h30: *Coffee Break.*

16h30-16h45: Claudia Ravanelli (Department of Banking and Finance, University of Zurich).
Economic Valuation and Financial Management of an Insurance Firm.

16h45-17h: Nabil Kazi-Tani (ISFA, Université Lyon 1).
Prevention efforts, insurance demand and price incentives under coherent risk measures.

17h-17h15: Alexandre Boumezoued (Milliman).
Markov "Happy birthday!" in the Hawkes model.

17h15-17h45: Stéphane Loisel (ISFA, Université Lyon 1).
On the longevity adventure with Nicole and LoLitA.

17h45-18h15: Paul Embrechts (Department of Mathematics ETH Zurich).
Operational Risk Revisited.

Cocktail and musical evening Duo Noluen Le Buhe and Marthe Vassallo

Patio and Amphi 15, Campus Jussieu.

Friday

Morning

9h-9h30: Wolfgang Runggaldier (Dipartimento di Matematica Pura ed Applicata, Università degli Studi di Padova).
Examples relating to no-arbitrage concepts in discrete time models.

9h30-10h15: Sylvie Méléard (CMAP, Ecole Polytechnique) and Meriem El Karoui (University of Edinburgh)
Stochastic Modeling in Escherichia coli.

10h15-10h45: Monique Jeanblanc (Département de Mathématiques, Université d'Evry Val-d'Essonne).
Models of default times.

10h45-11h15: *Coffee Break.*

11h15-11h45: Rama Cont (LPSM-CNRS & Oxford).
Calcul d'Ito sans probabilités: pathwise calculus for processes with irregular trajectories.

11h45-12h15: Bernard Lapeyre (CERMICS, Ecole des Ponts ParisTech).
Deep learning regressions for Bermudan option pricing.

12h15-12h45: Gilles Pagès (LPSM, Sorbonne-Université).
Preserving and propagating convex order : a master asset for numerical schemes (not only) in Finance.

Michel Benaïm, Institut de mathématiques, Université de Neuchâtel

Stochastic Persistence

Abstract: An important issue in ecology is to understand under which conditions a group of interacting species - whether they are plants, animals, or viral particles - can coexist over long periods of time. A fruitful approach to this question has been the development of nonlinear models of deterministic interactions, leading to what is now known as the Mathematical theory of persistence. Beside biotic interactions, environmental fluctuations play a key role in population dynamics. In order to take into account these fluctuations and to understand how they may affect persistence, deterministic models need to be replaced by stochastic ones and the theory needs to be revisited. This talk will survey recent results in this direction laying the groundwork for a mathematical theory of stochastic persistence.

Alexandre Boumezoued, Milliman

Markov "Happy birthday!" in the Hawkes model

Abstract: We study the age pyramid of the Hawkes model, which evolves according to immigration and births, and show how to design a Markov birthdays process. This is used to compute new distribution properties for a class of linear Hawkes processes with general immigrants which generalize the popular exponential fertility function.

Rama Cont, LPSM-CNRS & Oxford

Calcul d'Ito sans probabilités: pathwise calculus for processes with irregular trajectories.

Abstract: In his seminal paper Calcul d'Ito sans probabilités (1981) Hans Föllmer showed that the Ito formula holds pathwise for functions paths with finite quadratic variation along a sequence of partitions. Building on Föllmer's insight, we construct a pathwise calculus for smooth functionals of continuous paths with finite p-th variation along a sequence of time partitions, for arbitrary large p >0. We construct a pathwise integral, defined as a pointwise limit of compensated Riemann sums, which satisfies a change of variable formula and an isometry formula. Results for functions are extended to path-dependent functionals using a concept of functional derivative introduced by Dupire. As a result we obtain a unique "signal plus noise" decomposition for regular functionals of paths with strictly increasing p-th variation. Our results apply to sample paths of semimartingales as well as fractional Brownian motion with arbitrary Hurst parameter H>0 and other 'rough' processes. We show that the robustness of this construction with respect to the choice of the partition is linked to a roughness property of the underlying paths.

Dans son article Calcul d'Ito sans probabilités (1981) Hans Föllmer dériva une formule d'Ito pour les trajectoires possédant une variation quadratique le long d'une suite de partitions de temps et construction d'integrales trajectorielles comme limites (ponctuelles) de sommes de Riemann. Nous passons en revue des résultats récents sur divers aspects de cette construction: la continuité de l'intégrale trajectorielle de Föllmer, l'extension au cas fonctionnel et l'extension aux trajectoires moins regulieres, caracterisée par des variations d'ordre p>2, conduisant a des formules d'Ito d'ordre supérieur. Nous abordons également la question de l'invariance de cette construction par rapport au choix de la suite de partitions de temps.

Based on joint work with: Anna Ananova (Oxford), Henry Chiu (Imperial College London), Purba Das (Oxford) and Nicolas Perkowski (Humboldt).

Darrell Duffie, Graduate School of Business, Stanford University

Size Discovery Trading and the Cost of Market Fragmentation

Abstract: At size-discovery venues, prices are temporarily frozen and large trades are executed without price impact. Size-discovery accounts for about half of inter-dealer trade in treasuries and swaps, and a substantial amount of dark-pool exchange of equities. Despite its attractiveness to individual investors, size discovery reduces the depth of exchange-based markets to the point that all investors would be better off size discovery venues were eliminated.

Bruno Dupire, Bloomberg L.P.

The Perils of Parameterization.

Abstract: Automation, risk management and taste for Markov models lead markets to adopt parametric forms, for volatility for instance. It means that in the space of asset price vectors, the possibles states at a future date lie on a low dimensional manifold that sometimes can be separated from the current price vector by a hyperplane, creating an arbitrage. We illustrate this principle with several situations (European type profiles, sticky strike assumption, term structure parameterization, recalibration issues with Black-Scholes, Heston and SABR models). We show that if every day the implied variance, defined as the square of implied volatility times the residual maturity, converges as strikes go to infinity (common assumption in FX options), this level can never go up. In the case of a market that uses a Black-Scholes model every day (flat volatility surface every day but its level may change from one day to the next), we construct explicitely a portfolio of options that gains in value whenever the volatility level has changed, at any time before the first maturity, for any spot price.

Meriem El Karoui, University of Edinburgh
Sylvie Méléard, CMAP, Ecole Polytechnique

Stochastic Modeling in Escherichia coli

Abstract: We present our joint work on the modelling of quiescence in bacteria. After a description of the biological mechanisms, we develop the stochastic model and its approximation in large populations. We calibrate the model according to the experiments and deduce the dynamics of the bacteria population. This model will be a tool to understand how quiescence impacts the effect of antibiotics.

Noureddine El Karoui, UC Berkeley and Criteo AI Lab

Can we trust the bootstrap? (for moderately difficult statistical problems)

Abstract: The bootstrap is an important and widely used tool for answering inferential questions in Statistics. It is particularly helpful in many analytically difficult situations.

I will discuss the performance of the bootstrap for simple inferential problems in moderate and high-dimension.

For instance, one can ask whether the bootstrap provides valid confidence intervals for individuals parameters in linear regression when the number of predictors is not infinitely small compared to the sample size. Similar questions related to Principal Component analysis are also natural from a practical standpoint.

We will see that the answer to these questions is generally negative.

Our assessment will be done through a mix of numerical and theoretical investigations. The theory will be developed under the assumptions that the ratio of number of predictors to number of observations is kept fixed in our asymptotics. This is a way to keep the "statistical difficulty" of the problem fixed in the asymptotics. These asymptotic results tend to reflect the finite sample behavior of statistical methods better than traditional asymptotics. Interestingly, bootstrap methods that are thought to be perform equivalently well for inference - based on classical asymptotic arguments - will be shown to have very different behavior numerically and in our theoretical framework. For instance, some are very conservative and some are very anti-conservative, while they are equally "intuitive".

I will also discuss the behavior of other resampling plans, such as the jackknife, as well as ways to fix some of the problems we have identified.

Based on joint papers with Elizabeth Purdom.

Paul Embrechts, Department of Mathematics ETH Zurich

Operational Risk Revisited

Abstract: Coming out of the then Basel II guidelines, Operational Risk became the third kid on the regulatory block. By now we know that, and this mainly as a consequence of the Financial Crisis, this "third kid" is causing a lot of problems. How has quantitative modelling responded to its appearance, and does it hold any promise. This talk will give some thoughts on these questions.

Hans Föllmer, Institut für Mathematik, Humboldt University of Berlin

Entropy on Wiener Space

Abstract: We discuss the interplay between large deviations, relative entropy and optimal couplings on Wiener space, and in particular a new version of Talagrand's transport inequality.

Jean-Pierre Fouque, Department of Statistics and Applied Probability, University of California Santa Barbara

On Fairness of Systemic Risk Measures

Abstract: In our previous paper, "A Unified Approach to Systemic Risk Measures via Acceptance Set" (Mathematical Finance, 2018), we have introduced a general class of systemic risk measures that allow for scenario-dependent capital requirements to individual banks before aggregation of their risks.
Here, we address the question of fairness of risk allocations using the dual representation of the systemic risk measures as well as related utility maximization problems relevant to individual banks. The results are illustrated with exponential utilities which allow for explicit computations.

Joint work with Francesca Biagini, Marco Frittelli, and Thilo Meyer-Brandis.

Emmanuel Gobet, CMAP, Ecole Polytechnique

Central limit theorem for discretization errors based on general stopping time sampling

Abstract: Stopping times have been a very active research topics for Nicole El Karoui: see her research works on optimal stopping, her Master lectures on barrier options etc... In this talk I will present recent asymptotic fluctuation results when one studies errors arising from stopping iteratively a multidimensional semimartingale at its exit time from random domains or at Poisson type jumps. Remarkably, a Functional Central Limit Theorem holds under great generality on the semimartingale and on the form of stopping times. Furthermore, the asymptotic characteristics are quite explicit.

Julien Guyon, Bloomberg L.P.

The Joint S&P 500/VIX Smile Calibration Puzzle Solved: A Dispersion-Constrained Martingale Transport Approach

Abstract: Since VIX options started trading in 2006, many researchers have tried to build a model that jointly and exactly calibrates to the prices of S&P 500 (SPX) options, VIX futures and VIX options. So far the best attempts, which used parametric continuous-time jump-diffusion models on the SPX, could only produce an approximate fit. In this talk we solve this puzzle using a nonparametric discrete-time model. Given a VIX future maturity T_1, we build a joint probability measure on the SPX at T_1, the VIX at T_1, and the SPX at $T_2 = T_1$ + 30 days which is perfectly calibrated to the SPX smiles at T_1 and T_2, and the VIX future and VIX smile at T_1. Our model satisfies the martingality constraint on the SPX as well as the requirement that the VIX at T_1 is the implied volatility of the 30-day log-contract on the SPX. We prove by duality that the existence of such model means that the SPX and VIX markets are jointly arbitrage-free. The discrete-time model is cast as a dispersion-constrained martingale transport problem and solved using the Sinkhorn algorithm, in the spirit of De March and Henry-Labordère (2019). The algorithm identifies joint SPX/VIX arbitrages should they arise. Our numerical experiments show that the algorithm performs very well in both low and high volatility environments. Finally we explain how to handle the fact that the VIX future and SPX option monthly maturities do not perfectly coincide, and how to extend the two-maturity model to include all available monthly maturities.

Said Hamadène, LMM, Le Mans Université

McKean-Vlasov backward-forward stochastic differential equations and McKean-Vlasov (or MF) nonzero-sum LQ stochastic differential games

Abstract: In this talk we discuss the problem of existence of a solution of a class of backward-forward stochastic differential equations of McKean-Vlasov (or mean-field) type. We show existence and uniqueness of a solution. As an application we discuss the problem of existence of an open-loop Nash equilibrium point for the McKean-Vlasov (or mean-field) nonzero-sum linear-quadratic stochastic differential game. Mainly, this problem turns into the resolution of a backward-forward stochastic differential equation considered in the first part for which we provide a solution.

Joint work with Boualem Djehiche, KTH Stockholm, Sweden.

Monique Jeanblanc, Département de Mathématiques, Université d'Evry Val-d'Essonne

Models of default times

Abstract: In the literature, default times are often constructed starting from a given intensity. We present different constructions of default times, based on other related processes: Azéma's supermartingale, conditional survival conditional expectation, conditional densities, dual projections of the default process. In particular, we show how to obtain conditional density processes.

Joint work with Libo Li, Yiqing Lim and Liming Yin.

Sarah Kaaκaï, LMM, Le Mans Université

On the “blue death" and Poisson measures

Abstract: In this talk, I will present some results on stochastic heterogeneous population dynamics in random environment, obtained during my PhD with Nicole.
I will first introduce some motivations based on the historical example of the "blue death" and recent developments in the evolution of human longevity.
Then, I will present a general class of heterogeneous population dynamics structured by discrete subgroups, including changes of characteristics. The variability of the environment is also taken into account, which leads us to introduce a pathwise representation of such processes based on stochastic differential equations driven by extended Poisson measures.
In the presence of two timescales, we prove an averaging result for aggregated “macro" population, extending classical averaging results obtained in the Markov case. In particular, we illustrate the emergence of density dependence for demographic rates in the presence of heterogeneity.

This talk is based on joint works Nicole El Karoui and Kaouther Hadji.

Ioannis Karatzas, Department of Mathematics, Department of Statistics Columbia University

Conservative diffusion as entropic gradient flux

Abstract: We provide a very detailed probabilistic interpretation, based on stochastic calculus, for the variational characterization of conservative diffusion as entropic gradient flux. Jordan, Kinderlehrer, and Otto showed in 1998 that, for diffusions of Langevin-Smoluchowski type, the Fokker-Planck probability density flow minimizes the rate of relative entropy dissipation, as measured by the distance traveled in terms of the quadratic Wasserstein metric. Using a very direct perturbation analysis we obtain novel, stochastic-process versions of these features. These are valid along almost every trajectory of the diffusive motion and in both the forward and, most transparently, the backward, directions of time. The original results follow then simply by taking expectations. As a bonus, we obtain the Cordero-Erausquin version of the so-called HWI inequality relating relative entropy, Fisher information and Wasserstein distance.

Joint work with W. Schachermayer and B. Tschiderer, from the University of Vienna.

Nabil Kazi-Tani, ISFA, Université Lyon 1

Prevention efforts, insurance demand and price incentives under coherent risk measures

Abstract: Prevention refers either to self-protection (reduction of a loss probability) or to self-insurance activities (reduction of a loss size). After briefly explaining some results related to prevention in the insurance economics literature, we investigate an equilibrium model between an insurance buyer and an insurance seller, where both agents' risk preferences are given by convex risk measures. The interaction is modeled through a Stackelberg type game, where the insurance seller plays first by offering a price, in the form of a safety loading. Then the insurance buyer chooses his optimal proportional insurance share and his optimal prevention effort in order to minimize his risk measure. The formulated game admits a unique equilibrium, that we can explicitly solve by further specifying the agents criteria and the loss distribution. In this context, we highlight the conditions under which the main conclusions of the classical results in insurance theory (Ehrlich and Becker, 1972) still hold true.

This is a joint work with Sarah Bensalem (Université Lyon 1) and Nicolas Hernandez (University of Michigan).

Bernard Lapeyre, CERMICS, Ecole des Ponts ParisTech

Deep learning regressions for Bermudan option pricing

Abstract: Computing American options in large dimension remains a challenging task and neural network methods are often proposed as a way to solve this curse of dimensionality. In this talk we show how the Longstaff-Schwartz algorithm can be modified to use neural network approximation for the conditional expectation and prove a convergence result for this modified algorithm.

Ongoing work with Jerôme Lelong.

Stéphane Loisel, ISFA, Université Lyon 1

On the longevity adventure with Nicole and LoLitA.

Abstract: In this talk, we start with an overview of longevity risk models and transfer solutions. We explain the importance of individual characteristics and of their evolution for longevity models. After highlighting some results obtained with the ANR project LoLitA on longevity and their applications, we present and solve a quickest detection problem under a generalized Lorden criterion. We show applications on simulated and real-world insurance data.

This talk is based on joint works with Nicole El Karoui and Yahia Salhi, as well as the ANR LoLitA team.

Anis Matoussi, LMM, Le Mans Université

Quadratic Exponential Semimartingales and Application to BSDEs with jumps

Abstract: We study a class of Quadratic Backward Stochastic Differential Equations (QBSDE in short) with jumps and unbounded terminal condition. For this propose, we introduce a new class of Quadratic semimartingale. The properties arising from this class lead us to prove existence result of solution of a Quadratic BSDE's with jumps .We discuss the cases of finite and infinite activity of jumps.

This talk is based on joint works with Nicole El Karoui, Armand Ngoupeyou and Rym Salhi.

Brahim Mezerdi, King Fahd University of Petroleum and Minerals, Department of Mathematics and Statistics

Existence and optimality conditions in stochastic mean-field optimal control

Abstract: In this talk, we deal with optimal control of systems driven by mean-field stochastic differential equations. These equations are obtained as limits of interacting particle systems, as the number of particles tends to infinity. The mean-field equation, represents in some sense the average behavior of the infinite number of particles. Since the earlier papers by Lasry-Lions and Huang-MalhamÃľ-Caines, mean-field control theory and mean-field game theory has raised a lot of interest, motivated by applications to various fields such as game theory, mathematical finance, communications networks, management of oil ressources. Mean-field control problems occur in many applications, such as in a continuous-time Markowitz's mean–variance portfolio selection model where the variance term involves a quadratic function of the expectation. We are interested in relaxed controls which are measure valued processes. We prove that the strict and relaxed control problems have the same value function and that an optimal relaxed control exists. Moreover, we present necessary conditions for optimality in the form of a relaxed stochastic maximum principle, obtained via the first and second order adjoint processes.

Mohamed Mrad, LAGA, Université Paris 13

Consistent Dynamic Utilities

Abstract: In this talk, I will present an overview of the theory of Consistent Dynamic Utilities, on which I have been working with Nicole for a decade. I will go over some new results using flows techniques, and develop some applications on long term yield curve, learning utility from observed characteristic process. Finally, I will discuss on the problem of economic equilibrium as described by He and Leland, which can be solved within this framework.

This is also based on joint works with Caroline Hillairet.

Gilles Pagès, LPSM, Sorbonne-Université

Preserving and propagating convex order : a master asset for numerical schemes (not only) in Finance

Abstract: In this talk we will show that the Euler scheme of martingale diffusions propagates and preserves convex order. We provide several applications to possibly multi-dimensional local volatility models for pricing path-dependent and American options. Then we will the show how a recursive dual quantization of such an Euler scheme provides a natural spatial discretization for an efficient treatment of the Martingale Optimal Transport (MOT) problem in medium dimensions.

Parts of this talk relies on collaborations with A. Fadili and B. Jourdain

Shige Peng, School of Mathematics and Qilu Institute of Finance, Shandong University

Recent progresses in LLN and CTL under Uncertainty

Abstract: Under the sublinear expectation for a given set of linear expectations, review some recent important progresses in law of large numbers (LLN) and central limit theorem (CLT) in situations with probability measure uncertainties. We also present some interesting special cases and discuss a related statistical inference problem.
The theory are based on my 2007's nonlinear LLN and CTL.

Marie-Claire QUENEZ, LPSM, Université Paris Diderot

European options in a non-linear incomplete market model with default.

Abstract: This paper studies the superhedging prices and the associated superhedging strategies for European options in a non-linear incomplete market model with default. We present the seller's and the buyer's point of view. The underlying market model consists of a risk-free asset and a risky asset driven by a Brownian motion and a compensated default martingale. The portfolio processes follow non-linear dynamics with a non-linear driver f. By using a dynamic programming approach, we first provide a dual formulation of the seller's (superhedging) price for the European option as the supremum, over a suitable set of equivalent probability measures $Q \in \mathcal{Q}$, of the f-evaluation/expectation under Q of the payoff. We also provide a characterization of the seller's (superhedging) price process as the minimal supersolution of a constrained BSDE with default. By a form of symmetry, we derive corresponding results for the buyer. Our results rely on first establishing an optional $\mathcal{E}^f$-decomposition for processes which are $\mathcal{E}^f$-strong supermartingales under Q, for all $Q \in \mathcal{Q}$.

This presentation relies on a joint work with M. Grigorova and A.Sulem

Claudia Ravanelli, Department of Banking and Finance, University of Zurich

Economic Valuation and Financial Management of an Insurance Firm

Abstract: We develop a theoretical framework for the economic valuation of insurance firms and use it to investigate optimal decision making of a value-maximizing insurer with a broad ownership base.

The insurer may invest in liquidly-traded risky assets but its idiosyncratic risk cannot be hedged by trading. This leads to an incomplete market and thus to infinitely many market-consistent pricing measures. We prove that only one of these measures is consistent with the insurer's broad ownership base and the resulting indifference to idiosyncratic risk. Using this unique economic valuation measure, we derive the optimal capital-management and investment policies that realize the economic value of the firm. In particular, we address the controversial question of whether insurers should invest in liquidly-traded risky assets and find that there are circumstances in which such investments add value.

Joint work with Pablo Koch-Medina, Santiago Moreno-Bromberg and Mario Sikic.

Jean-Charles Rochet, Institute of Economics and Econometrics, Université de Genève

Insurance Capacity

Abstract: Insurance capacity is an important concept for insurance practitioners but it has surprisingly received little attention by academic researchers. It is usually defined as the largest amount of insurance or reinsurance available from a company or the market in general. We build a simple Markovian model of an insurance market with financial frictions in which capacity is endogenously determined as a function of the total capitalisation of the insurance industry and of the concentration of the insurance market. We study the dynamics of this capacity, the corresponding market price of risk and their stationary distributions. We discuss the effects of capital-based regulation and compare with empirical evidence during the Great Recession.

Joint work with Elisa Luciano (U. Torino).

Sylvie Roelly, Institut für Mathematik, Universität Potsdam

Bridges (ou comment distinguer les vrais des faux...)

Abstract: We present in our talk a characterization of bridges of diffusions - resp. of bridges of Lévy processes - through a functional equation. We underline the decisive role of invariant functions (not depending on the fixed conditions at initial and final time), which allow to distinguish between "true" and "fake" bridges.

Wolfgang Runggaldier, Dipartimento di Matematica Pura ed Applicata, Università degli Studi di Padova

Examples relating to no-arbitrage concepts in discrete time models.

Abstract: We investigate weaker no-arbitrage conditions than the classical NA in discrete time models where, under natural constraints on the investment strategies, the various no-arbitrage conditions are commonly known to be equivalent. At hand of examples we show that restrictions beyond the natural constraints and relating to the support and the dependence structure of the driving random quantities imply that certain no-arbitrage conditions are indeed weaker than the classical NA.

Ongoing work with Claudio Fontana.

Denis Talay, Inria Sophia Antipolis and Ecole Polytechnique

On two stochastic modelling issues

Abstract: Many papers by Nicole deal with modelling issues. In this talk, we address two different questions related to stochastic modelling.
We first introduce a Wasserstein type distance between solutions to martingale problems and show that this distance can be represented in terms of the solution to a stochastic control problem. Second, we study the sensitivity of some extremely irregular functionals of solutions to SDEs w.r.t. the Hurst parameter of the driving noise and illustrate the robustness of the Brownian hypothesis.

The talk is based on joint works with, respectively, Jocelyne Bion-Nadal (Ecole Polytechnique) and Alexandre Richard (Ecole Centrale Paris).

Nizar Touzi, CMAP, Ecole Polytechnique

On the continuous-time Principal-Agent problem

Abstract: Motivated by the approach introduced by Sanninkov to solve principal-agent problems, we provide a solution approach which allows to address a wider range of problems, including volatility control, limited liability constraint, and general controlled jump diffusions. The key argument uses a representation result from the theory of backward stochastic differential equations. Explicit solutions are obtained in the context of a problem of incentive tarification of electricity (demand-response programs), and a problem of a trading platform mechanism design (optimal maker-taker fees).

Mingyu Xu, Institute of Applied Mathematics, AMSS, Chinese Academy of Sciences

Hedging distributions via BSDEs

Abstract: In the classical backward stochastic differential equation (BSDE) theory, one studies the problem of hedging given random variables. In this paper, we introduce the notation of hedging distributions, that is, hedging random variables following a given distribution, via BSDEs. We also introduce a related efficient hedging problem, that is, to find the minimum cost to hedge a given distribution. The problems have been considered both under linear and nonlinear dynamics. As an example, the efficient hedging and portfolio selection problems in a market with different deposit and loan rates are studied. We also introduce the concept of law-invariant g-exception, and give a class of them explicitly. A portfolio selection problem in behavioral finance is given to demonstrate its applications.

Joint work with Zuoquan Xu and Xunyu Zhou.