

Advanced Methods in Mathematical Finance



Report of Contributions

Contribution ID: 7

Type: **not specified**

On optimal stopping with expectation constraints

Friday, 4 September 2015 14:30 (30 minutes)

The talk is about optimal stopping with the constraint that the expectation of any stopping time has to be bounded by a given constant. We show that by introducing a new state variable one can derive a dynamic programming principle. This allows to characterize the value function as the solution of a PDE and to obtain a verification theorem.

Finally we compare our approach with alternative solution methods and discuss some examples.

Primary author: ANKIRCHNER, Stefan (University of jena)

Presenter: ANKIRCHNER, Stefan (University of jena)

Contribution ID: 8

Type: **not specified**

Multi-Dimensional Backward Stochastic Differential Equations of Diagonally Quadratic generators

Friday, 4 September 2015 15:50 (40 minutes)

The paper is concerned with adapted solution of a multi-dimensional BSDE with a “diagonally” quadratic generator, the quadratic part of whose i th component only depends on the i th row of the second unknown variable. Local and global solutions are given. In our proofs, it is natural and crucial to apply both John-Nirenberg and reverse Hölder inequalities for BMO martingales.

Primary author: Mr HU, Ying (Université Rennes 1)

Presenter: Mr HU, Ying (Université Rennes 1)

Contribution ID: 9

Type: **not specified**

Degenerate Backward SPDE with Singular Terminal Value and Related Applications in Mathematical Finance

Friday, 4 September 2015 16:30 (30 minutes)

We study the degenerate backward stochastic partial differential equation with singular terminal value, and prove the existence and uniqueness of its non-negative solution by the comparison theorem and the gradient estimate of solution. This kind of equation has an application in the portfolio liquidation problem. This is a joint work with Ulrich Horst and Jinniao Qiu.

Primary authors: Dr QIU, Jinniao (Humboldt University of Berlin); Dr ZHANG, Qi (Fudan University); Prof. HORST, Ulrich (Humboldt University of Berlin)

Presenter: Dr ZHANG, Qi (Fudan University)

Contribution ID: 11

Type: **not specified**

Dynamics of order positions and related queues in a limit order book

Tuesday, 1 September 2015 14:00 (40 minutes)

One of the most rapidly growing research areas in financial mathematics is centered around modeling LOB dynamics and/or minimizing the inventory/execution risk with consideration of microstructure of LOB. A critical yet missing piece of the puzzle, is the dynamics of an order position in a LOB.

In this talk, we will present some of our recent progress regarding the limiting behavior of the dynamics of order positions in a LOB. As a corollary, we will present some explicit expressions for various quantities of interests, including the distribution of a particular limit order being executed by a given time, its expected value and variance.

Our analysis builds on techniques and results from classical probability theory: the functional central limit theorems of Glynn and Ward (1988) and Bullinski and Shashkin (2007), the convergence of stochastic processes by Kurtz and Protter (1991), and the sample path large deviation principle of Dembo and Zajic (1998).

Based on joint work with Z. Ruan (UC Berkeley) and L. J. Zhu (U. of Minnesota).

Primary author: Prof. GUO, xin (UC Berkeley)

Presenter: Prof. GUO, xin (UC Berkeley)

Contribution ID: 12

Type: **not specified**

No arbitrage conditions in the multi-curve modelling of the term structure of interest rates

Tuesday, 1 September 2015 09:50 (40 minutes)

The context of the talk is the multi-curve modelling of the term structure of interest rates as it arose after the big financial crisis. In particular, we discuss possible extensions of the no-arbitrage drift condition in an HJM framework.

(Based on joint work with Zorana Grbac)

Primary author: Prof. RUNGGALDIER, Wolfgang (University of Padova, Dipartimento di Matematica)

Presenter: Prof. RUNGGALDIER, Wolfgang (University of Padova, Dipartimento di Matematica)

Contribution ID: 13

Type: **not specified**

A measure-valued SDE with applications to interest rates and stochastic volatility

Tuesday, 1 September 2015 10:50 (30 minutes)

This talk will discuss a certain stochastic evolution equation in the space of probability measures, including existence and uniqueness results. A solution of this equation gives rise, in a natural way, to an interest rate term structure model, in the same spirit as the Heath-Jarrow-Morton framework. Furthermore, such a measure-valued process gives rise to a market model of the dynamics of the implied volatility surface, at least under some conditions.

Primary author: Dr TEHRANCHI, Michael (University of Cambridge)

Co-author: Mr CHENG, Si (University of Cambridge)

Presenter: Dr TEHRANCHI, Michael (University of Cambridge)

Contribution ID: 14

Type: **not specified**

Joint distribution of spectrally negative Lévy process and its occupation time, with step option pricing in view

Wednesday, 2 September 2015 11:40 (40 minutes)

We are interested in the joint distribution of a spectrally negative Lévy process and its occupation time when both are sampled at a fixed time. The result is expressed in terms of scale functions of the underlying process.

This result can be used to price step options and the particular case of an exponential spectrally negative Lévy jump-diffusion will be presented.

This is a joint work with J.F. Renaud.

Primary authors: Dr GUÉRIN, Hélène (IRMAR); Prof. RENAUD, Jean-François (UQÀM)

Presenter: Dr GUÉRIN, Hélène (IRMAR)

Contribution ID: 15

Type: **not specified**

On the Estimation Methods for Risk Measurement

Thursday, 3 September 2015 11:50 (30 minutes)

Banks and financial institutions can use either the internal models-based approach or the standardized approach to assess and report the risk of the trading book for future periods. In this paper, we examine relevant estimation methods for computing Value at Risk (VaR) and Expected Shortfall (ES) for banks at both desk level and bank-wide level. We provide a benchmark method for estimation and study financial and statistical properties of the method. We provide numerical results for different hypothetical portfolios.

Primary author: Dr OMIDI FIROUZI, HASSAN (LABEXREFI)

Co-author: Prof. LAURENT, Jean-Paul (Université Paris 1 Panthéon-Sorbonne)

Presenter: Dr OMIDI FIROUZI, HASSAN (LABEXREFI)

Contribution ID: 16

Type: **not specified**

Continuity Problems in Boundary Crossing Problems

Tuesday, 1 September 2015 17:10 (40 minutes)

Computing the probability for a given diffusion process to stay under a particular boundary is crucial in many important applications including pricing financial barrier options. It is a rather tedious task that, in the general case, requires the use of some approximation methodology. One possible approach to this problem is to approximate given (general curvilinear) boundaries with some other boundaries, of a form enabling one to relatively easily compute the boundary crossing probability. We discuss results on the accuracy of such approximations for both the Brownian motion process and general time-homogeneous diffusions, their extensions to the multivariate case, and also some contiguous topics.

Primary author: Prof. BOROVKOV, Konstantin (University of Melbourne)

Presenter: Prof. BOROVKOV, Konstantin (University of Melbourne)

Contribution ID: 17

Type: **not specified**

Enlargement of filtration in a discrete time setting

We study classical problems of enlargement of filtration, giving the formula of decomposition of martingales in a filtration F as semi martingales in a larger filtration.

The goal is to show that all the formula are simple and easy to understand.

Primary author: Mrs BLANCHET-SCALLIET, Christophette (Ecole Centrale Lyon)

Co-authors: Mr ROMO, Ricardo (UEVE); Mr ANKIRCHNER, Stefan (Iena university)

Presenter: Mrs BLANCHET-SCALLIET, Christophette (Ecole Centrale Lyon)

Contribution ID: 18

Type: **not specified**

Information Asymmetries, Volatility, Liquidity, and the Tobin Tax

Tuesday, 1 September 2015 15:50 (40 minutes)

Information asymmetries and trading costs, in a financial market model with dynamic information, generate a self-exciting equilibrium price process with stochastic volatility, even if news have constant volatility. Intuitively, new (constant volatility) information is released to the market at trading times that, due to traders' strategic choices, differ from calendar times. This generates an endogenous stochastic time change between trading and calendar times, and stochastic volatility of the price process in calendar time. In equilibrium: price volatility is autocorrelated and is a non-linear function of number and volume of trades; the relative informativeness of number and volume of trades depends on the data sampling frequency; volatility, the limit order book, tightness, depth, resilience, and trading activity, are jointly determined by information asymmetries and trading costs. Our closed form solutions rationalize a large set of empirical evidence and provide a natural laboratory for analyzing the equilibrium effects of a financial transaction tax.

Primary author: Dr DANILOVA, Albina (LSE)

Co-author: Dr JULLIARD, Christian (LSE, Department of Finance)

Presenter: Dr DANILOVA, Albina (LSE)

Contribution ID: 19

Type: **not specified**

On the dual problem of utility maximization in incomplete markets

Wednesday, 2 September 2015 14:50 (40 minutes)

We study the dual problem of the expected utility maximization in incomplete markets with bounded random endowment. We start with the duality results of [Cvitanic-Schachermayer-Wang, 2001], in which the optimal strategy is obtained by first formulating and solving a dual problem. We observe that: in the Brownian framework, the countably additive part Q^r of the dual optimizer $Q \in (L^\infty)^*$ in the settings of [Cvitanic-Schachermayer-Wang, 2001] can be represented by the terminal value of a supermartingale deflator Y defined in [Kramkov-Schachermayer, 1999], which moreover is a local martingale.

Primary author: Dr LIN, Yiqing (University of Vienna)

Co-authors: Mr YANG, Junjian (University of Vienna); Mrs GU, Lingqi (University of Vienna)

Presenter: Dr LIN, Yiqing (University of Vienna)

Contribution ID: 20

Type: **not specified**

Universal Arbitrage Aggregator in Discrete Time under Uncertainty,

Tuesday, 1 September 2015 09:00 (40 minutes)

In a model independent discrete time financial market, we discuss the richness of the family of martingale measures in relation to different notions of Arbitrage, generated by a class S of significant sets, which we call Arbitrage de la classe S . The choice of S reflects into the intrinsic properties of the class of polar sets of martingale measures. In particular: for $S = \{\Omega\}$, absence of Model Independent Arbitrage is equivalent to the existence of a martingale measure; for S being the open sets, absence of Open Arbitrage is equivalent to the existence of full support martingale measures. These results are obtained by adopting a technical filtration enlargement and by constructing a universal aggregator of all arbitrage opportunities. We further introduce the notion of market feasibility and provide its characterization via arbitrage conditions. We conclude providing a dual representation of Open Arbitrage in terms of weakly open sets of probability measures, which highlights the robust nature of this concept.

Primary author: Prof. FRITTELLI, Marco (Università degli Studi di Milano)

Co-authors: BURZONI, Marco (Università degli Studi di Milano); MAGGIS, Marco (Università degli Studi di Milano)

Presenter: Prof. FRITTELLI, Marco (Università degli Studi di Milano)

Contribution ID: 21

Type: **not specified**

On the Chaotic Representation Property of Certain Families of Martingales

Wednesday, 2 September 2015 09:50 (40 minutes)

In this talk, we shall discuss the chaotic representation property for certain families of square integrable martingales. Our approach extends well-known results on the Brownian motion or the compensated Poisson process in which case the family would only consist of a single martingale. The starting point for these investigations has been the problem of finding appropriate families of martingales related to Lévy processes satisfying the chaotic (or only predictable) representation property. In particular, we extend the results of Nualart and Schoutens on the chaotic representation property of the Teugels martingales. In the context of Mathematical Finance, families of martingales enjoying the chaotic (and hence predictable) representation property can serve for the completion of an (incomplete) financial market. As a linear or geometric Lévy market is normally incomplete, our approach can be applied to construct different completions of the market, in the sense that there will be added to the stock and the bank account a certain family of contingent claims, the terminal values of the martingales from the family under consideration.

Primary author: ENGELBERT, Hans-Jürgen (Friedrich Schiller-University of Jena)

Presenter: ENGELBERT, Hans-Jürgen (Friedrich Schiller-University of Jena)

Contribution ID: 22

Type: **not specified**

Malliavin differentiability of BSDEs

Friday, 4 September 2015 10:50 (30 minutes)

In this talk we will revisit conditions under which the solution to a BSDE is Malliavin differentiable. To this end, we provide a new characterization of the Malliavin-Sobolev spaces which is particularly suitable for our purpose. This talk is based on joint works with Thibaut Mastrolia, Peter Imkeller and Dylan Possamai.

Primary author: Prof. REVEILLAC, ANTHONY (INSA de Toulouse - Institut de Mathématiques de Toulouse)

Presenter: Prof. REVEILLAC, ANTHONY (INSA de Toulouse - Institut de Mathématiques de Toulouse)

Contribution ID: 23

Type: **not specified**

A martingale fixed-point problem in optimal reserve exploration

Thursday, 3 September 2015 11:20 (30 minutes)

A martingale fixed-point problem in optimal reserve exploration

We show how diverse problems in the area optimal resource management, exploration of natural reserves, and environmental protection by cap-and-trade mechanism can be naturally formulated under a unified framework, as stochastic control problems of a specific type. Moreover, it turns out that solutions to these control problems are equivalently described in terms of fixed-point equations for martingales. Such fixed point martingale processes can be interpreted as a market price for a virtual allowance which gives the right to use the resources remaining in the reserve after the exploration. We suggest numerical schemes for solution of these fixed point equations and elaborate on their applications.

Primary author: Prof. HINZ, Juri (UTS)

Presenter: Prof. HINZ, Juri (UTS)

Contribution ID: 24

Type: **not specified**

Incomplete stochastic equilibria and a system of quadratic BSDEs

Friday, 4 September 2015 11:50 (30 minutes)

We tackle a number of problems related to the existence of continuous-time stochastic Radner equilibria with incomplete markets. Various assumptions of “smallness” type-including a new notion of “closeness to Pareto optimality”-are shown to be sufficient for existence and uniqueness. Central role in our analysis is played by a fully-coupled nonlinear system of quadratic BSDEs.

This is a joint work with Kostas Kardaras and Gordan Zitkovic.

Primary author: Mr XING, Hao (London School of Economics)

Co-authors: Prof. ZITKOVIC, Gordan (University of Texas at Austin); Prof. KARDARAS, Kostas (London School of Economics)

Presenter: Mr XING, Hao (London School of Economics)

Contribution ID: 25

Type: **not specified**

On the supremum of fractional Brownian motion and related processes

Wednesday, 2 September 2015 18:20 (30 minutes)

This paper studies the expected value of the supremum of fractional Brownian motion and related Gaussian processes. We obtain upper and lower bounds for the expected supremum and bounds for the approximation of the supremum of a continuous process by random walks. As corollaries, we obtain results on the structure of fractional Brownian motion when the Hurst parameter H tends to zero.

This is a joint work with Konstantin Borovkov, Yulia Mishura and Alexander Novikov.

Primary author: ZHITLUKHIN, Mikhail (Steklov Mathematical institute)

Presenter: ZHITLUKHIN, Mikhail (Steklov Mathematical institute)

Contribution ID: 26

Type: **not specified**

An Analytical Approximation for Pricing VWAP Options

Friday, 4 September 2015 09:50 (40 minutes)

This paper proposes a unified approximation method for various options whose payoffs depend on the volume weighted average price (VWAP). Despite their popularity in practice, quite few pricing models have been developed in the literature. Also, in previous works, the underlying asset process has been restricted to a geometric Brownian motion. In contrast, our method is applicable to the general class of continuous Markov processes such as local volatility models, stochastic volatility models, and their combinations. Moreover, our method can be used for any type of VWAP options with fixed-strike, floating-strike, continuously sampled, discretely sampled, forward-start, and in-progress transactions. (joint work with H. Funahashi)

Primary author: Prof. KIJIMA, Masaaki (Tokyo Metropolitan University)

Presenter: Prof. KIJIMA, Masaaki (Tokyo Metropolitan University)

Contribution ID: 27

Type: **not specified**

Debt negotiation with firms' cross-holdings of securities

Wednesday, 2 September 2015 17:10 (30 minutes)

We analyze the interaction of the debt renegotiation between two firms that cross-hold their issuing debts and equities. When the firms are reciprocally the major shareholder and/or debt holder of the other firms, the possibility of debt renegotiation will affect each other. We first develop models of debt renegotiation scheme: debt equity swap and strategic debt service with game-theoretic setting under continuous time models. We then derive the optimal boundaries in each model to offer debt renegotiation by equity holders of the one firm to those of the other firm. We show that the simultaneous debt renegotiation can happen when firms cross-hold their debts and we present the comparative statics of the renegotiation boundaries.

Primary author: Mr SUZUKI, Teruyoshi (Hokkaido University)

Co-author: Dr YAGI, Kyoko (Faculty of Systems Science and Technology, Akita Prefectural University)

Presenter: Mr SUZUKI, Teruyoshi (Hokkaido University)

Contribution ID: 28

Type: **not specified**

Group solvency tests, intragroup transfers and intragroup diversification: a set-valued perspective

Thursday, 3 September 2015 10:50 (30 minutes)

The aim of risk-based solvency frameworks, such as Solvency II to be introduced in the EU and the Swiss Solvency Test (SST) that has been in force in Switzerland since 2011, is to assess the financial health of insurance companies. This is achieved by quantifying capital adequacy by calculating the solvency capital requirement (SCR). These calculations are based on scalar risk measures. Assessing the financial health of insurance groups (of several connected companies) is an even more challenging task; a variety of approaches can be taken to tackle the issue. Aspects of the most well-known approaches, and modified versions of them, are discussed based on a set-valued perspective.

Primary author: Dr SCHMUTZ, Michael (University of Berne)

Co-authors: Mr HAIER, Andreas (University of Berne); Prof. MOLCHANOV, Ilya (University of Berne)

Presenter: Dr SCHMUTZ, Michael (University of Berne)

Contribution ID: 29

Type: **not specified**

Agency, Firm Growth and Managerial Turnover

Wednesday, 2 September 2015 15:50 (40 minutes)

We consider managerial incentive provision under moral hazard in a firm that is subject to stochastic growth opportunities. In the model that we study, managers are dismissed after poor performance as well as when an opportunity to improve the firm's profitability that requires a change of management arises. The optimal contract may induce managerial entrenchment, whereby, ex post-attractive growth opportunities are foregone after good performance because of contractual commitments. Realised growth depends on the frequency and size of growth opportunities as well as on the severity of moral hazard. The prospect of growth-induced turnover limits the firm's ability to rely on deferred compensation as a disciplinary device.

Primary authors: Prof. BUSTAMANTE, M. Cecilia (University of Maryland); Prof. ZERVOS, Mihail (London School of Economics); Prof. ANDERSON, Ronald W. (London School of Economics); Prof. GUIBAUD, Stephane (SciencesPo)

Presenter: Prof. ZERVOS, Mihail (London School of Economics)

Contribution ID: 30

Type: **not specified**

Recent development in martingale optimal transport

Thursday, 3 September 2015 09:00 (40 minutes)

We study the optimal transport between two probability measures on the real line, where the transport plans are laws of one-step martingales. A quasi-sure formulation of the dual problem is introduced and shown to yield a complete duality theory for general marginals and measurable reward (cost) functions: absence of a duality gap and existence of dual optimizers. Both properties are shown to fail in the classical formulation. As a consequence of the duality result, we obtain a general principle of cyclical monotonicity describing the geometry of optimal transports.

Primary author: Prof. TOUZI, Nizar (Ecole Polytechnique)

Presenter: Prof. TOUZI, Nizar (Ecole Polytechnique)

Contribution ID: 31

Type: **not specified**

Polynomial preserving processes and discrete-tenor interest rate models

Tuesday, 1 September 2015 16:30 (30 minutes)

The class of polynomial preserving Markov processes has proved to be very suitable for modeling purposes in mathematical finance due to its flexibility and analytical tractability, which allows to obtain closed/semi-closed pricing formulas for various derivatives. In this work we focus on an application of this class for interest rate models on a discrete tenor. Here the polynomial preserving property of the driving process is key already in the model construction which is based on polynomial functions. This includes Libor-type models, as well as extensions to the multiple-curve term structure. The main advantage of this model class is the possibility to obtain at the same time semi-analytic pricing formulas for both caplets and swaptions that do not require any approximations. Moreover, additive constructions allow to easily ensure, if desired, properties such as positivity of interest rates and spreads and monotonicity of spreads with respect to the tenor - in view of the current market situation a model in which the reference OIS interest rates can become negative and the spreads still remain positive is of particular interest.

We conclude by presenting a model specification driven by a Lévy-type polynomial preserving process and a corresponding Fourier transform formula used in pricing of caplets and swaptions. This is joint work with K. Glau and M. Keller-Ressel.

Primary author: Dr GRBAC, Zorana (Université Paris Diderot)

Presenter: Dr GRBAC, Zorana (Université Paris Diderot)

Contribution ID: 32

Type: **not specified**

A result on integral functionals with infinitely many constraints

Wednesday, 2 September 2015 14:00 (40 minutes)

A classic result (due to Borwein and Lewis) in the theory of optimisation under constraints says the following. Suppose we have n measurable functions a_i in L^q on a finite measure space and a nonnegative function x in L^p . Call b_i the integrals of x against a_i . Then there exists a function z in the norm interior of L^{∞} which has the same integrals b_i against a_i as x . So if the constraints given by the a_i are feasible in L^p_+ , they are also feasible in L^{∞}_{++} .

We present an extension of this result to a setting with infinitely many, measurably parametrised constraints, and we show how this comes up and can be used in arbitrage theory.

This is based on joint work with Tahir Choulli (University of Alberta, Edmonton).

Primary author: Prof. SCHWEIZER, Martin (ETH Zurich)

Co-author: Dr CHOULLI, Tahir (UNiversity of Alberta)

Presenter: Prof. SCHWEIZER, Martin (ETH Zurich)

Contribution ID: 33

Type: **not specified**

Multidimensional quadratic BSDEs with separated generators

Friday, 4 September 2015 11:20 (30 minutes)

We consider multidimensional quadratic BSDEs with generators which can be separated into a coupled and an uncoupled part which allows to analyse the degree of coupling of the system in terms of the growth coefficients. We provide conditions on the relationship between the size of the terminal condition and the degree of coupling which guarantee existence and uniqueness of solutions.

Primary author: Mr LUO, Peng (University of Konstanz)

Presenter: Mr LUO, Peng (University of Konstanz)

Contribution ID: 34

Type: **not specified**

Variational View to Optimal Stopping with Application to Real Options

Friday, 4 September 2015 15:00 (30 minutes)

We describe a variational approach to solving optimal stopping problems for diffusion processes. In the framework of this approach, one can find optimal stopping time over the class of first exit time from the set (for a given family of sets). For the case of one-parametric family of sets we give necessary and sufficient conditions for optimality of stopping time over this class.

For one-dimensional diffusion processes and two families of 'semi-intervals', we set necessary and sufficient conditions under which the optimal stopping time has a threshold structure.

We study smooth pasting condition from a variational view, present some examples when the solution to the free-boundary problem is not the solution to the optimal stopping problem, and give some results about a relation between solutions to free-boundary problem and optimal stopping problem. At last, some applications of these results to both investment timing and optimal abandonment models are considered.

Primary author: Dr SLASTNIKOV, Alexander (CEMI)

Co-author: Prof. ARKIN, Vadim (CEMI)

Presenter: Dr SLASTNIKOV, Alexander (CEMI)

Contribution ID: 35

Type: **not specified**

Sensitivity Analysis in Lévy Fixed Income Theory

Wednesday, 2 September 2015 10:50 (40 minutes)

A brief introduction into the Lévy Libor and the Lévy forward process model is given. Basic properties of these two frameworks are discussed. The main goal is to derive formulas for price sensitivities of standard fixed income derivatives. Two approaches are discussed. The first approach is based on the integration-by-parts formula, which lies at the core of the application of the Malliavin calculus to finance. The second approach consists in using Fourier based methods for pricing derivatives. We illustrate the result by applying the formulas to a caplet price where the underlying model is driven by a time-inhomogeneous Gamma process and alternatively by a Variance Gamma process. A comparison between the two approaches which come from totally different mathematical fields is made.

This is joint work with M'hamed Eddahbi and Sidi Mohamed Lalaoui

Primary author: Prof. EBERLEIN, Ernst (University of Freiburg)

Presenter: Prof. EBERLEIN, Ernst (University of Freiburg)

Contribution ID: 36

Type: **not specified**

General one-dimensional diffusion: characterization, optimal stopping problem

Friday, 4 September 2015 14:00 (30 minutes)

The talk is devoted to the general one-dimensional diffusion. We discuss the definition and characterization of such processes: scale, speed measure, killing measure. The generating operator is considered on an extended space of functions (as compared with a classical approach). We give a local characterization potential functions and excessive functions. For the general one-dimensional diffusion we give a necessary and sufficient conditions that the optimal strategy in the optimal stopping problem has a threshold or an island character.

Primary author: Prof. PRESMAN, Ernst (CEMI RAN)

Co-author: Dr SLASTNIKOV, Alexander (CEMI)

Presenter: Prof. PRESMAN, Ernst (CEMI RAN)

Contribution ID: 37

Type: **not specified**

Grossissement de filtration en temps discret

Tuesday, 1 September 2015 14:50 (40 minutes)

Nous étudions le cas de grossissement de filtration en temps discret et obtenons très simplement les formules connues en temps continu. L'exposé a un but essentiellement pédagogique.

Primary author: Mrs JEANBLANC, Monique (université Evry Val d'ESSONNE)

Presenter: Mrs JEANBLANC, Monique (université Evry Val d'ESSONNE)

Contribution ID: 38

Type: **not specified**

Rare event simulation related to financial risks: efficient estimation and sensitivity analysis

Thursday, 3 September 2015 09:50 (40 minutes)

We develop the reversible shaking transformation methods of Gobet and Liu (2014) to estimate the rare event probability arising in different financial risk settings driven by general Gaussian noise. The underlying Markov chains introduced in our approaches take values directly in the path space. We provide theoretical justification for few key properties of these Markov chains which are required for their ergodicity. Further, using these properties, we prove consistency results for the simulation estimator. The examples in our work cover usual semi-martingale stochastic models (not necessarily Markovian) driven by Brownian motion, and, also fractional Brownian motion based models to address various financial risks. Our approach also handles the important problem of sensi- tivities of rare event probability. We compare our numerical studies to the already existing results and demonstrate improved computational performance.

(Joint work with A. Agarwal, S. De Marco, G. Liu.)

Summary

see abstract

Primary author: GOBET, Emmanuel (Po)

Presenter: GOBET, Emmanuel (Po)

Contribution ID: 39

Type: **not specified**

Optimal Contract with Moral Hazard in Public Private Partnerships

Public-Private Partnership (PPP) is a contract between a public entity and a consortium, in which the public outsources the construction and the maintenance of an equipment (hospital, university, prison...). One drawback of this contract is that the public may not be able to observe the effort of the consortium but only its impact on the social welfare of the project. We aim to characterize the optimal contract for a PPP in this setting of asymmetric information between the two parties. This leads to a principal-agent problem with moral hazard. Considering a wider set of information for the public and using martingale arguments in the spirit of Sannikov, the maximisation problem can be reduced to a classic stochastic control problem, that is solved numerically. It is then proved that for the optimal contract, the effort of the consortium is explicitly characterized. In particular, it is shown that the optimal rent is not a linear function of the effort, contrary to some models of the economic literature on PPP contracts. This is a joint work with I. Hajjej, M. Mnif and M. Pontier

Primary author: HILLAIRET, Caroline (CMAP ecole polytechnique)

Presenter: HILLAIRET, Caroline (CMAP ecole polytechnique)

Contribution ID: 40

Type: **not specified**

Existence and uniqueness of viscosity solutions for second order integro-differential equations without monotonicity condition

Friday, 4 September 2015 17:10 (30 minutes)

In this talk, we discuss a new existence and uniqueness result of a continuous viscosity solution for integro-partial differential equation (IPDE in short).

The novelty is that we relax the so-called monotonicity assumption on the driver which is classically assumed in the literature of viscosity solution of equation with a non local term. Our method is based on the link of those IPDEs with backward stochastic differential equations (BSDEs in short) with jumps for which we already know that the solution exists and is unique.

Primary author: Mr HAMADENE, said (LMM, Universite du Maine, Le Mans, France)

Co-author: Dr MORLAIS, Marie-Amélie (LMM, University of Maine, Le Mans, F.)

Presenter: Mr HAMADENE, said (LMM, Universite du Maine, Le Mans, France)

Contribution ID: 41

Type: **not specified**

On the Skorokhod embedding problem and FBSDE

Wednesday, 2 September 2015 09:00 (40 minutes)

A link between martingale representation and solutions of the Skorokhod embedding problem has been established by R. Bass. A generalization of his approach to FBSDE leads us to solutions of the Skorokhod embedding problem for diffusion processes with deterministic drift. This is joint work with Alexander Fromm and David Prömel.

Primary author: Prof. IMKELLER, Peter (Mathematisches Institut der Humboldt-Universität zu Berlin)

Presenter: Prof. IMKELLER, Peter (Mathematisches Institut der Humboldt-Universität zu Berlin)

Contribution ID: 42

Type: **not specified**

Risk Minimization under Mortality and Its Stochastics.

Tuesday, 1 September 2015 11:20 (30 minutes)

In this talk, I will present our contributions in two topics that complement each other. The first topic deals with risk minimization when the mortality is taken into consideration. For this theme, we adopt the popular risk-minimization framework of Follmer and Sonderman. In this line of research, we quantify the impact of the mortality uncertainty, as well as the intrinsic risk of its correlation with the financial market, on the optimal risk-minimizing strategy. These achievements is based essentially on new stochastic developments that sound tailored made for them. In this stochastic part, which represents our second topic of contribution and originality, we obtained two principal results. On the one hand, we introduced and analyzed two new classes of martingales in the enlarged filtration. On the other hand, thanks to our new spaces of martingales, we elaborated a complete, precise and explicit optional decomposition for martingales of the large filtration stopped at the death time. This decomposition is vital in the analysis of the first topic if one wants to address fully the mortality risk without excluding any mortality model and/or market model.

This talk is based on joint works with Catherine Daveloose and Michele Vanmaele.

Primary author: Dr CHOULLI, Tahir (UNiversity of Alberta)

Presenter: Dr CHOULLI, Tahir (UNiversity of Alberta)

Contribution ID: 43

Type: **not specified**

Robust Detection of Unobservable Disorder in Poisson rate

Friday, 4 September 2015 09:00 (40 minutes)

We consider the non-Bayesian quickest detection problem of an unobservable time of change in the rate of an inhomogeneous Poisson process. We seek a stopping rule that minimizes the robust Lorden criterion. The latter is formulated in terms of the number of events until detection, both for the worst-case delay and the false alarm constraint. In the Wiener case, such a problem was solved using the so-called cumulative sums (cusum) strategy by many authors (Moustakides (2004), or Shyraiev (1963,..2009)). In our setting, we derive the exact optimality of the cusum stopping rule by using finite variation calculus and elementary martingale properties to characterize the performance functions of the cusum stopping rule in terms of scale function. These are solutions of some delayed differential equations that we solve elementary. The case of detecting a decrease in the intensity is easy to study because the performance functions are continuous. In case of increase where the performance functions are not continuous, martingale properties require using a discontinuous local time. Nevertheless, from an identity relating the scale functions, the optimality of the cusum rule still holds. Numerical applications are provided. This is joint work with S.Loysel (ISFA) and Y.Sahli (ISFA).

Primary author: Prof. EL KAROUI, Nicole (UPMC)

Presenter: Prof. EL KAROUI, Nicole (UPMC)

Contribution ID: 44

Type: **not specified**

Brownian trading excursions

Tuesday, 1 September 2015 11:50 (30 minutes)

In a model for the limit order book with arrivals and cancellations, we derive an SPDE with one heating source and two cooling elements on a finite rod for the order volume which we solve in terms of local time. Moreover, via Brownian excursion theory, we provide a hyperbolic function table for the Laplace transforms of various times of trade. A bivariate Laplace-Mellin transform is introduced for the joint excursion height and length and expressed in terms of the Riemann Xi function. Finally, we show that two different disintegrations of the Ito measure are equivalent to Jacobi's Theta transformation formula.

This is joint work with Friedrich Hubalek, Paul Krühner and Sabine Sporer.

Primary author: Prof. RHEINLANDER, Thorsten (TU Vienna)

Presenter: Prof. RHEINLANDER, Thorsten (TU Vienna)

Contribution ID: 45

Type: **not specified**

Random Periodic Processes, Periodic Measures and Ergodicity

Friday, 4 September 2015 17:40 (40 minutes)

An ergodic theorem and a mean ergodic theorem in the random periodic regime on a Polish space is proved.

The idea of Poincaré sections is introduced and under the strong Feller and irreducible assumptions on Poincaré

sections, the weak convergence of the transition probabilities at the discrete time of integral multiples of the period is

obtained. Thus the Khas'minskii-Doob type theorem is established and the ergodicity of the invariant measure, which

is the mean of the periodic measure over a period interval, is obtained. The Krylov-Bogoliubov type theorem for the

existence of periodic measures by considering the Markovian semigroup on a Poincaré section at discrete times of

integral multiples of the period is also proved. It is proved that three equivalent criteria give necessary and sufficient

conditions to classify between random periodic and stationary regimes. The three equivalent criteria are given in terms

of three different notion respectively, namely Poincaré sections, angle variable and infinitesimal generator of the induced

linear transformation of the canonical dynamical system associated with the invariant measure. It is proved that infinitesimal

generator has only two simple eigenvalues, which are 0 and the quotient of 2π by the minimal period, while the

classical Koopman-von Neumann theorem says that the generator has only one simple eigenvalue 0 in the stationary

and mixing case. The "equivalence" of random periodic processes and periodic measures is established.

The strong law of large numbers (SLLN) is also proved for random periodic processes.

This is a joint work with Chunrong Feng.

Primary author: Prof. ZHAO, Huaizhong (Loughborough University)

Presenter: Prof. ZHAO, Huaizhong (Loughborough University)

Contribution ID: 46

Type: **not specified**

Evolution of models in evolving markets

Wednesday, 2 September 2015 16:40 (30 minutes)

Mathematical models are developed to capture market behaviour at a point in time and are used to gain competitive advantage over time. In the option business, for example, they are calibrated to liquid information and used to price and trade more exotic and hence less liquid products. However market liquidity changes over time, it can increase or evaporate depending on the economic conditions. This is one of the factors that drive evolution of models which need to be adapted to the changing market conditions.

In this talk I will use the evolution of classical option pricing models as an example of the feedback loop: from academia to industry and back.

Primary author: Mr MUSIELA, Marek (Oxford Man Institute)

Presenter: Mr MUSIELA, Marek (Oxford Man Institute)

Contribution ID: 47

Type: **not specified**

Investment timing, collateral, and financing constraints

Wednesday, 2 September 2015 17:50 (30 minutes)

Primary author: Prof. SHIBATA, Takashi (Tokyo Metropolitan University)

Presenter: Prof. SHIBATA, Takashi (Tokyo Metropolitan University)