Arai Takuji (Keio University)

Local risk-minimization for Barndorff-Nielsen and Shephard models

We aim to obtain explicit representations of locally risk-minimizing (LRM) of call and put options for the Barndorff-Nielsen and Shephard models: jump type stochastic volatility models whose squared volatility process is given by a non-Gaussian Ornstein-Uhlenbeck process. The general form of Barndorff-Nielsen and Shephard models includes two parameters: volatility risk premium beta and leverage effect rho≥0. Firstly, we derive representations of LRM under constraint beta=-1/2. In particular, we investigate the Malliavin differentiability of the density of the minimal martingale measure. Next, we relax the restriction on beta; and restrict rho=0 instead. In this case, we introduce a Malliavin calculus under the minimal martingale measure.

Ararat Cagin (Bilkent University)

Systemic risk measures and their dual representations

In the event of a financial crisis, it becomes important to measure and allocate the risk of a network of financial institutions. Such risk which takes into account the interconnectedness of the financial institutions is called “systemic risk”. In this talk, we will focus on a recent multivariate approach for measuring systemic risk where the state of the financial network is modeled as a random vector of individual equities/losses. Then, the systemic risk measure is defined as the set of all capital allocation vectors that make the “impact of the system to the society” acceptable. We present a dual representation theorem for the systemic risk measure and provide economic interpretations of the dual variables. We also show that the systemic risk measure can be seen as a “multivariate shortfall risk measure under model uncertainty.” As a special case, we will consider a financial system with exponential aggregation mechanism, where the distances of the financial institutions with respect to the society are measured in terms of relative entropies.

Belak Christoph (Kaiserslautern)

Pricing contingent claims in the presence of jump uncertainty

We study the pricing problem of contingent claims in the presence of uncertainty about the timing and the size of a jump in the price of the underlying. We characterize the price of the claim as the minimal solution of a constrained BSDE and derive a pricing PDE in the special case of a Markovian market model. Finally, we provide extensive numerical results in a Black-Scholes market under jump uncertainty and calibrate the model to market data.

Belkina Tatiana (CEMI)

Asymptotic investment behaviors under a jump-diffusion risk process

We study an optimal investment control problem for an insurance company. The surplus process follows the Cramer-Lundberg process with perturbation of a Brownian motion. The company can invest its surplus into a risk free asset and a Black-Scholes risky asset. The optimization objective is to minimize the probability of ruin. We show by new operators that the minimal ruin probability function is a classical solution to the corresponding HJB equation. Asymptotic behaviors of the optimal investment control policy and the minimal ruin probability function are studied for low surplus levels with a general claim size distribution. Some new asymptotic results for large surplus levels in the case with exponential claim distributions are obtained.

Bererezovsky Rostislav (HSE, Moscow)

On duality theory of coherent and convex risk measures

Boguslavskaya Elena (Brunel University)

A-transform and some of its applications in probability

Here we introduce the so-called A-transform built on a random variable η. The A-transform, if applied to a monomial x^n results in a well-known Appell polynomial Q_n^\eta(x). Not surprisingly, the transformed function has properties similar to an Appell polynomial. For example, the transformed function is a martingale if the transform is built on a martingale. As a consequence of the above, the A-transform is especially useful for solving problems related to processes with independent increments. For instance, it gives a straightforward formula for the calculation of European-type functionals of Lévy processes. In the context of optimal stopping, one can obtain an optimal stopping rule by studying the geometrical properties of the transformed payoff. If compared to the standard approach, the A-transform method benefits from the absence of integro-differential equations, making the process of obtaining the solution much easier. We illustrate the method with some examples.

Burnaev Eugene (IITP)

Analysis of coal prices variability: evidence from Russia

Coal is one of the main energy sources for the production of electricity in Russia and many other countries. Further, electricity is an input into the production of many goods and services. Thus, an understanding of the evolution of coal prices is relevant for many planning and forecasting models. Monthly coal prices time series data are tested to determine the persistence of shocks. Results show that prices have a variance that changes over time and tend to be highly persistent. We investigate the relationship with other important external and in-house economic indicators such as Libor, inflation index, exchange rate, oil prices, etc. The main tool used for analysis is a multivariate autoregression with conditional heteroskedasticity.

Carassus Laurence (Reims)

Non concave optimization: a measure theory approach

We propose a complete treatment of the No Arbitrage condition characterization and of the expected utility maximisation problem in a (generically incomplete) discrete-time financial market model with finite time horizon. We consider a probability space with incomplete sigma-algebras and non-concave usc random utility functions with domain of definition equal to the non-negative half-line. We use a dynamic programming framework together with measurable selection arguments to establish both the No Arbitrage condition characterization and the existence of an optimal portfolio.

Cayé Thomas (ETHZ)

Nonlinear transactions costs, portfolio choice, and time-varying investment opportunities.

We consider a market with one safe asset and one risky asset with general, not necessarily

Markovian dynamics. In this setting, we study the tradeoff between expected returns, the variance of the corresponding positions, and nonlinear trading costs proportional to a power of the order flow. In the limit for small costs, explicit formulas obtain.

Cho Hye-jin (Paris 1)

Speculative bubble burst

Central to market fundamentals are three ideas: (1) Nominal money (2) Dividend (3) Existing stock. In connection with the cumulative dividend stream criterion of fundamental and noise movement, the conception of sequentially stable Markov process is grounded on the theory of bubbles. This paper firstly embodies the origin of speculative bubble burst with overconfidence. Then, unique equilibrium with inertia is re-illuminated by the overconfidence.
Keywords: externalities, speculative bubbles, heterogeneous beliefs, overconfidence, speculative bubble burst, equilibrium with inertia.

Choi Youngna (Montclair State University)

Tracking financial instability contagion: modeling and data calibration

This is a continuation of our ongoing research on financial market instability and systemic risk. Previously we used a multi-agent model and theories of dynamical systems to establish the market instability indicator, an early warning system, and the elasticity coefficient that measures the sensitivity of an agent's outgoing cash flow to the change of its wealth. Using these two was proposed the quantitative definition of financial instability contagion. In this article we use the macroeconomic data of the United States and selected Eurozone countries to test the validity and applicability of the market instability indicator and the elasticity coefficient in real life, and suggest different ways of estimating them. Furthermore we use them to search empirical evidence of financial instability contagion and track the path of risk transmission in recent financial crises, the U.S. subprime crisis and the Eurozone sovereign credit crisis. We also provide quantitative reasoning about the limitations of available macroeconomic data in monitoring the level of financial instability, and make suggestions for improving data collection practices.

Choulli Tahir (Alberta)

Optional representation theorem with applications

In this talk, I will consider a market model where there are two flows of information. One flow is public, while the other flow contains additional information generated by a random time. This random time can represent the death time, the default time of a firm, and/or any occurrence time of an influential event. In the large filtration (flow of information), we introduced and analyzed two new classes of (local) martingales. Then, via these new spaces of (local) martingales, we provide a complete, precise and explicit optional decomposition for martingales --with respect to the large filtration--- that are stopped at the death time. This optional decomposition/representation is an alternative to the Predictable Representation result when this one fails. Furthermore, if time permits, we will explain its possible numerous applications in risk management and optimal portfolio analysis.
This talk is based on two joint works with Catherine Daveloose/Michele Vanmaele and Sina Yansori respectively.

Cont Rama (Imperial College)

Functional calculus, pathwise integration and pathwise hedging

We develop a calculus for functionals of paths of finite quadratic variation along a sequence of partitions, in the sense of Follmer (1981). The functionals are assumed to have certain directional derivatives in the sense of Dupire (2009). As a by-product we are able to define pathwise integrals as limits of Riemann sums for integrands which are of "gradient" form.
This class of integrands includes continuous (delta-)hedging strategies, which allows us to develop a pathwise framework for scenario-based analysis of continuous-time hedging strategies, without any underlying probabilistic assumptions.

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Corcuera José Manuel (Barcelona)

Contingent convertible under short-term uncertainty

In this paper we follow this approach by extending the short-term uncertainty model to the case we have to noises in the model. It is a combination of the ideas of Duffie and Lando (2001 and Jeanblanc and Valchev (2005) share quotations of the firm are available at the financial market, and these can be seen as noisy information about the fundamental value, or the firm's asset, from which a low level produces the credit event. We assume there are also reports of the firm, release times, where this short-term uncertainty uncertainty disappears following here Jeanblanc and Valchev (2005). These credit event model is used to describe conversion and default in a Coco bond.

Cox Ciaran (Brunel University)

On trading two correlated mean reverting assets

Two correlated Ornstein-Unlenbeck processes with the same mean reversion rate are used as the model of two synthetic spread assets. A wealth process is created with two stochastic controls as the amount of each spread to hold over the finite investment period. Each control was found explicitly when maximising the expectation of an investors' terminal utility function, conditional on the time till maturity. The maximisation problem was solved for the log, power and exponential utility functions. Average returns and volatilities of wealth are compared through simulations for different investors risk appetites under the utility functions in question, and how these returns and volatilities change for different values of correlation between the spreads. The work is based on my master thesis ``Trading Mean Reverting Processes under Different Utility Functions'' from my MSc in Financial Mathematics at Brunel University, and will result in a paper with Elena Boguslavskaya.

Crépay Stephane (Evry)

Central clearing valuation adjustment

We develop an XVA (costs) analysis of centrally cleared trading, parallel to the one that has been developed in the last years for bilateral transactions. A dynamic framework incorporates the sequence of cash-flows involved in the waterfall of resources of a clearinghouse (CCP for short, or central counterparty). The total cost of the clearance framework for a member of the clearinghouse, called CCVA for central clearing valuation adjustment, is decomposed into a credit valuation adjustment (CVA) corresponding to the cost of its losses on the default fund in case of defaults of other members, a margin valuation adjustment (MVA) corresponding to the cost of funding its margins and a capital valuation adjustment (KVA) corresponding to the cost of the capital it implicitly provides to the CCP through its default fund contribution. This framework can be used by a CCP to assess the right balance between initial margins and default fund in order to minimize the CCVA of its members, hence optimize its costs for a given level of resilience. A CCP can also use it to analyze the benefit for a dealer to trade centrally as a member, rather than on a bilateral basis, or to help its members risk manage their CCVA. The potential netting benefit of central clearing and the impact of the credit risk of the members are illustrated numerically.

Cuchiero Christa (Vienna)

Polynomial processes in stochastic portfolio theory

Inspired by volatility stabilized market models introduced by Robert Fernholz and Ioannis Karatzas, we characterize the class of polynomial diffusion models for the asset price process whose market weights process is again a polynomial diffusion process on the unit simplex. Explicit parameter conditions assuring the existence of relative arbitrages with respect to the market portfolio are given and the connection to non-attainment of the boundary is discussed. We also consider extensions to models with jumps and the computation of optimal relative arbitrage strategies.

Czichowsky Christoph (London School of Economics)

Portfolio optimisation under proportional transaction costs and fractional Brownian motion
While absence of arbitrage in frictionless financial markets requires price processes to be semimartingales, non-semimartingales can be used to model prices in an arbitrage-free way, if proportional transaction costs are taken into account. In this talk, I will present an overview over several results that provide a way how to use non-semimartingale price processes such as the fractional Black-Scholes model in portfolio optimisation under proportional transaction costs by establishing the existence of a so-called shadow price. This is a semimartingale price process, taking values in the bid ask spread, such that frictionless trading for that price process leads to the same optimal strategy and utility as the original problem under transaction costs.
The talk is based on joint work with Walter Schachermayer.

Delbaen Freddy (ETHZ)

«Risk measures with convex level sets».

(Joint work with Bellini, Bignozzi and Ziegel)

Ekren Ibrahim (ETHZ)

El Karoui Nicole (Paris 6)

Ellanskaya Anastasia (Angers)

Engelbert Hans-Juergen (Jena)

Feinberg Eugene (Stony Brook)

Solutions to Kolmogorov's equations for jump Markov processes and their applications

Gainullin Rashit (HSE)

Galtchouk Leonid

About stochastic integrals with respect to integer-valued measures

The talk deals with some questions of stochastic calculus related to jumps of semimartingales at predictable stopping times. For a given semimartingale, we define separately a random measure μ generated by the jumps at totally inaccessible stopping times and an other random measure π generated by the jumps at predictable stopping times. Stochastic integrals with respect to $\mu-\mu^p$ and π are defined, where μ^p is the predictable compensator of μ. Some basic results of stochastic calculus are revised by making use of this construction of stochastic integrals.

Grbac Zorana (Université Paris 7)

No arbitrage conditions in the multiple curve HJM term structure models

Multiple interest rate curves emerged in the fixed income markets as a consequence of the financial crisis, which created a need for new interest rate models referred to in general as multiple curve models. The goal of this talk is to present several possible extensions of the classical HJM setup to include multiple curves and to study the related no-arbitrage drift conditions. Based on a specific interpretation of the interest rates and the implied zero-coupon bonds in a given multiple curve HJM-type model, we shall distinguish between what we call the "true" and the "pseudo" no-arbitrage conditions. We then derive the corresponding drift conditions in each model and discuss their relationship.
This is joint work with Wolfgang Runggaldier.

Grigorieva Lioudmila (Konstanz)

Volatility forecasting using global stochastic financial trends extracted from non-synchronous data

We introduce a method based on the use of various linear and nonlinear state space models that uses non-synchronous data to extract global stochastic financial trends (GST). These models are specifically constructed to take advantage of the intraday arrival of closing information coming from different international markets in order to improve the quality of volatility description and forecasting performances. A set of three major asynchronous international stock market indices is used in order to empirically show that this forecasting scheme is capable of significant performance improvements when compared with those obtained with standard models like the dynamic conditional correlation (DCC) family.
Based on a joint paper with Lyudmila Grigoryeva (Universitaet Konstanz, Germany) and Juan-Pablo Ortega (CNRS, Besancon, France).

Guo Gaoyue (Ecole polythechnique)

Gusak Julia (Lomonosov Moscow State University)

Gushchin Alexander (Steklov Institute)

The joint law of the terminal values of an integrable increasing process and its compensator

Hamadene Said (Université du Maine)

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

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 nonlocal 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.

Harms Philipp (ETHZ)

A Markovian perspective on fractional processes

Fractional processes have gained popularity in financial modeling due to the dependence structure of their increments and the roughness of their sample paths. The non-Markovianity of these processes gives, however, rise to conceptual and practical difficulties in computation and calibration. To address these issues, we show that a certain class of fractional processes can be represented as linear functionals of an infinite dimensional affine process. We demonstrate by means of several examples that the affine structure allows one to construct tractable financial models with fractional features.

Haslip Gareth (JP Morgan UK)

On the efficient evaluation of Fourier transforms applying B-spline approximation

We introduce a general framework for the efficient evaluation of Fourier integrals, applying Bspline approximation of appropriately expressed underlying integrant functions. Fourier integrals arise in many fields including applied probability, econometrics, and quantitative finance and have important applications across a wide range of topics including numerical evaluation of density and distribution functions, Monte Carlo simulation, maximum likelihood estimation, and derivative pricing. This paper builds upon and generalises the results of Haslip and Kaishev (2015) and Haslip and Kaishev (2014) which focus on the application of the Fourier Transform B-spline (FTBS) method to pricing European and Lookback options under continuous time asset models from the family of exponential semimartingale processes.

As is well known, the characteristic function of a stochastic process completely defines the underlying process, and is often tractable and available in an analytical closed-form. In contrast, explicit forms for density, distribution, and quantile functions, and option prices are not available for many popular stochastic processes arising in the above disciplines. We introduce B-spline interpolation theory to provide an accurate closed-form representation of the above metrics under an inverse Fourier transform.

This paper considers the Fourier integrals that arise in "numerically inverting" the characteristic function to directly obtain a required metric such as the density, distribution, and quantile functions, and the prices of options. The general form of Fourier integrals considered involve the product of: (i) function that is dependent on an input parameter specific to the problem under consideration, e.g. such as the strike price of the option, or the observed historical share prices of the econometric process being estimated, and (ii) a function related to the characteristic function of the stochastic process.

Using B-spline interpolation theory we closely approximate the function related to the characteristic function which enables us to interpret the Fourier integral as a Peano representation of a divided difference. This provides an explicit, closed-form expression for the Fourier integral in the form of a linear combination of the B-spline coefficients and low order divided differences of simple analytical functions that are independent of the choice of stochastic process.

A key innovation of the FTBS method is that it allows to pre-compute the divided differences at a high resolution with respect to the input parameter. This means that for a given choice of characteristic function, the Fourier integral can be evaluated by evaluating a simple linear combination of the Bspline coefficients with pre-computed divided differences corresponding to the required input parameter. This innovation is important as it enables the FTBS method to compute output metrics with significant efficiency across a large list of input values. For example, when computing a density, distribution, or quantile function for a range of input values, and option prices

for a range of different strike prices.

We demonstrate that the FTBS method is extremely fast and accurate through a series of numerical applications spanning probability, econometrics, and derivative pricing.

This is a joint work with Vladimir Kaishev.

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Horvath Blanka (ETHZ)

Mass at zero and small strike implied volatility expansions in the SABR model

We study the probability mass at the origin in the SABR stochastic volatility model, and derive several tractable expressions for it, in particular when time becomes small or large. In the uncorrelated case, saddlepoint expansions allow for (semi) closed-form asymptotic formulae. In passing, we compute asymptotics for the density of time-changed Brownian motion, which is of independent probabilistic interest. As an application–the original motivation for this paper– we derive small-strike expansions for the implied volatility when the maturity becomes short or large. These formulae, by definition arbitrage free, allow us to quantify the impact of the mass at zero on currently used implied volatility expansions. In particular we discuss how much those expansions become erroneous.

Jeanblanc Monique (Evry)

Kabanov Yuri (Besançon)

Kardaras Kostas (LES)

Viability and hedging with infinite number of assets

We consider a continuous-time market market with potentially infinite number of liquid continuous-path assets. Such abstraction is needed, for example, in the study of bond markets (where there is a continuum of maturities), markets with traded options (where there is a continuum of maturities and/or strikes), or in the post-limit study of large financial markets. Under a spatial continuity requirement across assets in the volatility and drift coefficients, which is always satisfied in the case where the assets are at most countable, we provide exact versions of the fundamental theorem of asset pricing and hedging duality. Important in the development is a study of infinite-dimensional integration theory for continuous semimartingales which uses elements of Reproducing Kernel Hilbert Space theory.

Kijima Masaaki (Tokyo Metropolitan University)

Kordzakhia Nino (Macquarie, Australia)

Kornprobst Antoine (Paris 1)

Financial crisis indicators and trading strategies based on random matrices.

Our aim is to build financial crisis indicators based on market data and our basic financial intuition is that correlation and volatility govern the financial market: when correlations between asset prices increase or develop abnormal patterns, when volatility starts to increase, then a crisis might be forthcoming. The first type of indicators relies on the Hellinger distance, computed between the spectral distribution of the empirical covariance matrix and the spectral distribution of a reference covariance matrix. Indicators of the second type study the spectral radius and the trace of the covariance and correlation matrices after applying various market-related (volume traded, debt to market capitalization ratio) to them. This enables us to study the volatility and correlation signals directly. Both kinds of indicators enable us to obtain optimal investment and trading strategies, which is our ultimate goal.

Kreinin Alexandre (University of Toronto)

Multivariate Poisson processes and extreme measures

In this talk we discuss a backward simulation approach to modeling multivariate Poisson processes. We define an extreme measure as a joint distributions maximizing or minimizing linear correlations of the components. An algorithm for efficient computation of the extreme measures is considered. The backward simulation approach can be generalized for the class of mixed Poisson processes and the multivariate processes having Brownian and Poisson components.

Kutoyants Yuri (Université du Maine)

On multi-step MLE-processes in approximation of the solution of BSDE

We consider the problem of approximation of the solution of BSDE in the Markovian case with the help of the multi-step MLE-processes. We suppose that the forward equation depends on some unknown finite-dimensional parameter. The approximation is constructed with the help of the solution of the corresponding PDE where we substitute the estimator of unknown parameter. This approximation is realized in several steps. First we construct a preliminary estimator by the observations on some learning period. Then this estimator is improved up to asymptotically efficient with Multi-step device. This multi-step procedure allows us to reduce the duration of the learning interval and to make it as small as we want. As the models of observations we consider the following forward equations: small noise diffusion (continuous time), unknown volatility (discrete time), ergodic diffusion (continuous time).

Lépinette Emmanuel (Paris Dauphine)

Arbitrage theory for non convex financial market models

We study the absence of arbitrage opportunity in a general non convex financial market model defined by a liquidation value process. First, we provide an asymptotic no arbitrage condition that charaterizes the existence of an equivalent separating probability measure for the non-convex market. We then study the link between this market and an extended one, which is conical, by considering a notion of weak arbitrage opportunity. This is a joint work with T. Tran.

Li Xinpeng (Shandong University)

Some results on optimal transport with marginal uncertainty and applications

In this talk, we consider the optimal transportation problem with uncertainty, i.e., the fixed two marginal distributions are not unique. The generalized Kantorovich-Rubinstein duality formula is obtained. We also discuss the applications of our results. The talk is based on joint works with Yiqing LIN (Ecole Polytechnique) and Weicheng XU (Shandong University).

Martynov Gennady (IITP, Moscow)

Anderson-Darling statistic and its analogues

Melnyk Yaroslav (EPFL)

Portfolio optimization with recursive utility under small transaction costs

We investigate the portfolio problem of an investor with Epstein-Zin recursive utility under proportional transaction costs. We characterize the solution via variational inequalities and prove existence of classical solutions for small cost parameters. We also provide a suitable verication theorem. This allows us to derive rigorous asymptotic expansions for optimal no-trade regions and consumption strategies and to investigate the effects of the investor's relative risk aversion and the elasticity of intertemporal substituion (EIS) on the optimal strategies. Our main findings are: (a) At the leading order, the no-trade region is the same as with additive expected utility; in particular, it is determined solely by the relative risk aversion. The no-trade region depends on the investor's EIS only at the next-to-leading order, and only indirectly thought the frictionless optimal consumption rate. (b) The investor's optimal consumption depends on his EIS also at the leading order. The consumption-wealth ratio is higher than in the frictionless case if and only if EIS > 1.
Based on joint work with Johannes Muhle-Karbe and Frank Thomas Seifried

Molchanov Ilya (University of Bern)

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

The talk suggests an approach based on set-valued portfolios and selection risk measures that makes it possible to formalise various solvency tests for groups of companies. These tests range from consolidated to granular ones depending on the family of allowed Capital and Risk Transfer Instruments. The intermediate tests can be describe using random sets that reflect the fungibility constraints.
Joint work with Andreas Haier and Michael Schmutz (FINMA Switzerland).

Mueller Marvin (TU Dresden)

SPDE models for limit order books

We introduce a class of continuous models for the limit order book density with infinitesimal tick size, where the evolution of buy and sell side is described by second-order stochastic partial differential equation. Starting with linear equations for the centered order book, we derive properties for the prediction of global volume imbalance and the order flow imbalance (OFI). Following empirical observations by Cont et al (2013), we can use the OFI as a predictor for the direction of the next price move. In this way, the SPDE induces a model the dynamics of the mid-price process. Finally, we discuss extensions of this model, introducing a class of stochastic moving

boundary problems, and the challenges from stochastic analysis in infinite dimensions.

Muravlev Alexei (Steklov Institute)

Upper and lower estimates for boundaries in non-linear optimal stopping problems

We consider optimal stopping problem with non-linear cost of observation for a standard Brownian motion. Using standard technique one may characterize optimal stopping boundaries as an unique solution of a system of non-linear integral equations, which can be used for numerical evaluation via backward induction technique. However, for this, one needs to have some end-point T, after which the values of optimal boundaries are known. The main point of the talk is how to obtain some upper and lower estimates for the boundaries which provide the choice of such a T. In contrast to known methods based on the study of corresponding free-boundary problem, our approach seems to be more probabalistic.

Muromskaya Anastasia (Lomonosov Moscow State University)

Actuarial models with dividends and reinsurance

We consider the following actuarial models. The first one deals with the classical compound Poisson model of risk theory with dividend payments. We investigate a modified barrier strategy according to which the barrier can be changed after each claim occurrence. The function representing the value of expected discounted dividends paid until ruin is obtained.
In the second model we study a discrete-time model of insurance company performance with reinsurance and capital injections. In order to avoid the ruin the company can choose a reinsurance level at the beginning of each period. The optimal reinsurance strategy is established under different assumptions on system parameters.
For both models numerical results are provided. Joint work with Julia Gusak.

Novikov Alexander (UTS, Australia)

Pricing of Asian-type and basket options via bounds under the Levy processes framework

We provide a general framework for the pricing of average-type options via lower and upper bounds. This class includes Asian options with discrete and continuous monitoring times, options on the basket-spreads and volume-weighted average prices (VWAP). We demonstrate that the use of lower and upper bounds provides reasonably accurate analytical and numerical approximations to the prices and sensitives of the options under a geometric Levy model for underlying assets.
Joint work with Scott Alexander (UTS), Nino Kordzakhia (Macquarie University, Sydney), and Tim Ling (UTS).

Ortega Juan-Pablo (Besançon)

Ovari Keita (Tokyo)

On robust utility indifference valuation with semi-static strategies

Inspired by the recent developments on model-free super/sub-hedging of exotic options through martingale optimal transport theory, we consider in this talk a robust utility maximisation and

associated indifference valuation with semi-static trading strategies, where we are given a family of arbitrage-free real-world models consistent with calibration. We prove a general duality formula in discrete time, and also in a certain continuous time framework, where the dual is a minimisation over all martingale measures on the path-space with given marginals, similar to the one in optimal transport but with an additional penalty term. We then discuss some consequences, the connection to the model-free super/sub-hedging, as well as some possible choices of the family of real-world models.

Palamarchuk Ekaterina (HSE)

On asymptotics of linear SDEs and LQG control with non-uniform discounting

We study the asymptotic behavior of solutions to linear stochastic differential equations with subexponentially stable matrix. The result established in the form of the strong law of large numbers is applied to linear-quadratic Gaussian control problems over an infinite time-horizon with non-uniform discounting of losses. The case when a subject assigns more weight to future costs of control will be considered. We also provide sufficient conditions that guarantee the existence of average optimal and pathwise optimal controls.

Pavlov Igor (Rostov-on-Don)

Existence of interpolating martingale measures for (B,S)-markets on countable probability spaces

On one-step filtration (*F*_0;*F*_1) , where *F*_0 is trivial and *F*_1 is generated by a decomposition of on countable many atoms, let us consider a discounted arbitrage-free financial market S_0 = a, S_1 takes values b_1, b_2,... (numbers b_1, b_2,... are different and r.v. S_1 can take every value b_k on a finite or countable collection of atoms). We impose several new types of conditions on the numbers a and b_k providing the existence of so-called interpolating martingale measures P. With the help of such P and using a class of Haar filtrations with infinite horizon it is possible to interpolate the market under study so that the interpolating market will be complete. For example, if the set {b1, b2,... } is finite and consists of rational numbers, then interpolating martingale measures exist. If the number a is irrational, the set {b_1, b_2,... } is infinite, consists of rational numbers, and r.v. S_1 takes at least two different values infinite many times, then interpolating martingale measures exist too.

Pergamenshchikov Serguei (Rouen)

Stochastic differential equations of second order with a small parameter

We consider boundary value problems for stochastic differential equations of second order with a small parameter. For this case we prove a special existence and unicity theorem for strong solutions. The asymptotic behavior of these solutions as small parameter goes to zero is studied. The stochastic averaging theorem for such equations is shown. The limits in the explicit form for the solutions as a small parameter goes to zero are found.

Pham Huyen (Paris 7)

Bellman equation and viscosity solutions for mean-field stochastic control problem

We consider the stochastic optimal control problem of McKean-Vlasov stochastic differential equation. By using feedback controls, we reformulate the problem into a deterministic control

problem with solely the marginal distribution as controlled state variable, and prove that dynamic programming principle holds in its general form. Then, by relying on the notion of differentiability with respect to probability measures recently introduced by P.L. Lions,and a special Itô formula for stochastic flows of probability measures, we derive the (dynamic programming) Bellman equation for mean-field stochastic control problem. This Bellman equation reduces to the classical finite dimensional partial differential equation in the case of no mean-field interaction. We prove a verification theorem in our McKean-Vlasov framework, and give explicit solutions to the Bellman equation for the linear quadratic mean-field control problem, with applications to the mean-variance portfolio selection and a systemic risk model. Finally, we introduce a notion of viscosity solutions f for the Bellman equation in the space of probability measures, and show the viscosity property of the value function to the McKean-Vlasov control problem.

Proemel David (ETHZ)

Continuity of the Ito map on Nikolskii spaces

One initial motivation of rough path theory was to obtain the continuity of the solution map of a differential equation called Ito map. Terry Lyons first restored this continuity in a p-variation topology by introducing the notion of rough paths. Providing a new characterization of Nikolskii spaces in terms of p-variation, we show that the continuity of the Ito map in Nikolskii topology can be deduced from Lyons' result. This talk is based on a joint work with Peter Friz.

Ren Zhenjie (Polythechnique)

Comparison result for fully nonlinear path-dependent PDE's

We prove a comparison result for viscosity solutions of (possibly degenerate) parabolic fully nonlinear path-dependent PDE's. In contrast with the previous result in Ekren, Touzi & Zhang, our conditions are easier to check and allow for the degenerate case, thus including first order path-dependent PDE's. Our argument follows the regularization method as introduced by Jensen, Lions & Souganidis in the corresponding finite-dimensional PDE setting.

Rásonyi Miklós (Alfred Renyi Institute, Budapest)

Optimal investment in the APM of Ross

We highlight the difficulties of treating optimal investment problems with an expected utility criterion in the context of large financial markets. Under appropriate assumptions, we solve these difficulties in the particular case of the Arbitrage Pricing Model proposed by S. Ross.

Rüschendorf Ludger (University of Freiburg)

Risk bounds with partial dependence information.

We describe several approaches to improve risk bounds for aggregated portfolios of risks based on marginal information. By a series of papers it has become clear that the dependence uncertainty on the aggregated risks based on marginal information only is typically too wide to be acceptable in applications. Several approaches to reduce DU-uncertainty have been developed recently to include partial dependence information in order to reduce the model uncertainty. These include higher order

marginals, global variance bounds, positive or negative dependence restrictions and structural information given by common risk factors (risk factor models).

Schweizer Martin (ETHZ)

Schachermayer Walter (Vienna)

Duality methods in portfolio optimization under transaction costs

We review several recent results for portfolio optimization under proportional transaction costs, such as a Tobin tax. Special emphasis will be put on financial models based on fractional Brownian motion.

Seiferling Thomas (University Kaiserslautern)

Shibata Takashi (Tokyo Metropolitan University)

Investment timing under financing constraints based on collateral

We examine the optimal investment timing decision problem of a firm constrained to a debt issuance limit determined by collateral value. We find two interesting results which are contrary to our intuition. First, debt issuance limit does not always delay the investment. That is, debt issuance limit may accelerate the investment. Second, debt issuance does not always accelerate the investment if the upper limit of debt issuance is constrained. This result is always obtained if it is not.

Shiryaev Albert (Steklov Institute)

CUSUM statistic and optimality for a minimax criterion in the disorder problems

Tan Xiaolu (Université Paris Dauphine)

A general Doob-Meyer-Mertens decomposition for g-supermartingale systems

We provide a general Doob-Meyer decomposition for g-supermartingale systems, which does not require any right-continuity on the system. In particular, it generalizes the Doob-Meyer decomposition of Mertens (1972) for classical supermartingales, as well as Peng's (1999) version for right-continuous g-supermartingales. As examples of application, we prove an optional decomposition theorem for g-supermartingale systems, and also obtain a general version of the well-known dual formation for BSDEs with constraint on the gains-process, using very simple arguments. This is a joint work with Bruno Bouchard and Dylan Possamaï.

Tankov Peter (Université Paris 7)

Asymptotic lower bounds for optimal tracking: a linear programming approach

We consider the problem of tracking a target whose dynamics is modeled by a continuous Itô semi-martingale. The aim is to minimize both deviation from the target and tracking efforts. We establish the existence of asymptotic lower bounds for this problem, depending on the cost structure. These lower bounds can be related to the time-average control of Brownian motion, which is characterized

as a deterministic linear programming problem. A comprehensive list of examples with explicit expressions for the lower bounds is provided.

Teichmann Josef (ETHZ)

Tractable American option problems

Following ideas of Soren Christensen, Benjamin Jourdain, Jan Kallsen and Claude Martini we analyse the question which American options can be statically hedged by European options and which multivariate numerical techniques follow from such relationships. Mathematically speaking this is related to analyzing the range of maximal functionals of analytic semigroups. This is a joint work with Oleg Reichmann.

Thai Nguen (Universitaet Ulm)

Optimal investment and consumption with downside risk constraint in jump-diffusion models

We extends the results of the article [C. Klüppelberg and S. Pergamenchtchikov. Optimal consumption and investment with bounded downside risk for power utility functions. In Optimality and Risk: Modern Trends in Mathematical Finance. The Kabanov Festschrift, pages 133-169, 2009.] to a jump-diffusion setting. We show that under the assumption that only positive jumps in the asset prices are allowed, the explicit optimal strategy can be found in the subset of admissible strategies satisfying the same risk constraint as in the pure diffusion setting. When negative jumps probably happen, the regulator should be more conservative. In that case, we suggest to impose on the investor's portfolio a stricter constraint which depends on the probability of having negative jumps in the assets during the whole considered horizon.

Touzi Nizar (Polythechnique)

Branching diffusion representation of nonlinear PDEs

Voss Moritz (TU Berlin)

Hedging with transient price impact

We consider the problem of hedging a European contingent claim in a Bachelier model with transient price impact as proposed by Almgren and Chriss. Following the approach of Rogers and Singh and Naujokat and Westray, the hedging problem can be regarded as a cost optimal tracking problem of the frictionless hedging strategy. We solve this problem explicitly for general predictable target hedging strategies. It turns out that, rather than towards the current target position, the optimal policy trades towards a weighted average of expected future target positions. This generalizes an observation of Garleanu and Pedersen from their homogenous Markovian optimal investment problem to a general hedging problem. Our findings complement a number of previous studies in the literature on optimal strategies in illiquid markets where the frictionless strategy is confined to diffusions. The consideration of general predictable reference strategies is made possible by the use of a convex analysis approach instead of the more common dynamic programming methods. Passing to a more general setup where the transient price impact is stochastic and the underlying unaffected price process follows a continuous semimartingale, the general structure of the optimal frictional hedge of tracking a weighted average of expected future

target positions is preserved. In this case, the solution of the hedging problem is linked to the solvability of a general backward stochastic Riccati equation.This is joint work with Peter Bank and H. Mete Soner.

Vostrikova Lioudmila (Angers)

On exponential functionals of processes with independent increments

Exponential functionals arise in many areas, as self-similar Markov processes, mathematical finance, random processes in random environment (see Bertoin-Yor, 2005). In mathematical finance exponential functionals appear when log price process is not homogeneous in time, like non-homogeneous Poisson process, Lévy process subjected to deterministic time change, integrals of Lévy processes with deterministic integrands, hitting times for diffusions. For integral functional of PII which are semi-martingales, we derive recurrent integral equations for Mellin transform, Laplace transform and moments.

Zavalin Mikhail (Brunel University))

A case of perpetual stopping problem with n correlated Brownian motions that can be reduced to one-dimensional problem

We study a perpetual optimal stopping problem for n correlated Brownian motions, and consider the case of the polynomial reward function of several variables. We formulate and prove the criterion when this problem can be reduced to a one-dimensional optimal stopping problem with a polynomial reward function of one variable and a single Brownian motion. In the end, as an example, we solve the appropriate two-dimensional optimal stopping problem by reducing it to a one-dimensional optimal stopping problem for a single Brownian motion with the reward function $g(x)=x^2+px+q$.