

Abstracts

Speaker: Umberto, Cherubini (University of Bologna, Italy)

Title: Systemic Risk and Contagion in the European Banking System

Abstract: We present a model that is able to represent systemic risk and contagion in a system, with a methodology for distinguishing between the two, particularly with a large set of data. The main idea is to assume, for a set of n obligors, a set of n idiosyncratic shocks, and a shock that triggers the default of all the obligors in the system. All shocks are assumed to be linked by a dependence relationship. This model is able to encompass both systemic risk and contagion, with the Marshall-Olkin pure systemic risk model and the Archimedean contagion model as extreme cases. The model can be estimated by applying a moment matching procedure to the bivariate marginals. The model is applied to a selected sample of banks for 8 European countries.

Speaker: Pierre, Del Moral (University of New South Wales, Australia)

Title : Particle Methods in Risk Analysis

Abstract In the last three decades, there has been a dramatic increase in the use of particle methods as a powerful tool in real-world applications of Monte Carlo simulation in computational physics, population biology, computer sciences, and statistical machine learning. In this talk, we discuss a new range of applications related to risk analysis, including calibration and uncertainty propagations in numerical codes and black box models, sensitivity measure computations and rare event simulation. We illustrate these advanced particle Monte Carlo methodologies in a couple of concrete industrial risk applications. The first one is concerned with nuclear plant security, and the second one relates to the reliability of offshore platforms in extreme sea conditions.

Speaker: Arnaud, Doucet (Oxford University, UK)

Title: An Introduction to Sequential Monte Carlo methods

Abstract: This lecture provides an introduction to Sequential Monte Carlo methods and their application domains. We discuss forward and backward particle algorithms and unbiased estimates of normalizing constants. We also present more advanced approaches that combine particle and MCMC methodologies. In the final part we illustrate these particle MCMC methods in the context of rare event simulation and risk analysis.

Speaker: Robert J, Elliott (University of Adelaide, Australia)

Title: GARCH models and their continuous time limits

Abstract: The weak convergence of a general class of non-Gaussian GARCH models under both physical and risk-neutral settings is discussed. The locally risk neutral valuation relationship cannot be applied in this setting so the continuous time limit is derived using the extended Girsanov principle of Elliott and Madan. and an exponential affine pricing kernel given by a conditional Esscher transform. The convergence of GARCH based European option prices to their diffusion counterparts is numerically tested.

This is a joint work by Alex Badescu and Juan-Pablo Ortega.

Speaker: Gary, Froyland (University of New South Wales, Australia)

Title: Optimally Mitigating Risk for Airlines

Abstract: Airline operations are a poster child for applications of discrete optimization due to almost pure combinatorial aspects of the component problems: schedule design, fleet assignment, aircraft routing, crew planning, and passenger routing.

Two aspects are the focus of current international attention: integration (optimising two or more component problems simultaneously) and robustness (recognising that unforeseen flight-delaying events occur and including these considerations in schedules).

I will talk about recent research that combines these two aspects to produce airline schedules that suffer minimal delays when disruptions occur and can quickly recover to a normal state of operation.

Speaker: Jean-Pierre, Fouque (University of California, USA)

Title: Portfolio Optimization in Stochastic Environment

Abstract: We present some recent results on the Merton problem of portfolio optimization over a finite horizon when volatility is stochastic and fluctuating on different time scales. Using a perturbation method for the associated nonlinear PDE, we provide approximation for the value function and we propose simplified strategies (joint work with Ronnie Sircar and Thaleia Zariphopoulou). The case with unobserved stochastic drift in asset returns involving filtering is also discussed.

joint work with Andrew Papanicolaou and Ronnie Sircar.

Speaker: Beniamin, Goldys (University of Sydney, Australia)

Title: Continuous Time Limits of ARMA and GARCH Time Series

Abstract: Time series such as ARMA and GARCH are frequently used in Econometrics for modelling various quantities such as stochastic volatility, while in Mathematical Finance continuous time models of stochastic volatility are frequently used. In this talk we characterise continuous time stochastic volatility models that can be obtained as limits (in the weak convergence sense) of the discrete time series. In general, they are very different from processes used as models of stochastic volatility in Finance.

The talk is based on joint works with William Dunsmuir and Cuong Tran.

Speaker: Michael, Hanke (Universität Liechtenstein, Liechtenstein)

Title: No-Arbitrage ROM Simulation

Abstract: Ledermann et al. (2011, Linear Algebra Appl. 434, 1444–1467) propose random orthogonal matrix (ROM) simulation for generating multivariate samples matching means and covariances exactly. Its computational efficiency compared to standard Monte Carlo methods makes it an interesting alternative. In this talk we enhance this method's attractiveness by focusing on applications in finance. Many financial applications require simulated asset returns to be free of arbitrage opportunities. We analytically derive no-arbitrage bounds for expected excess returns to be used in the context of ROM simulation, and we establish the theoretical relation between the number of states (i.e., the sample size)

and the size of (no-)arbitrage regions. Based on these results, we present a No-Arbitrage ROM simulation algorithm, which generates arbitrage-free random samples by purposefully rotating a simplex. Hence, the proposed algorithm completely avoids any need for checking samples for arbitrage. Compared to the alternative of (potentially frequent) re-sampling followed by arbitrage checks, it is considerably more efficient. As a by-product, we provide interesting geometrical insights into affine transformations associated with the No-Arbitrage ROM simulation algorithm.

Speaker: Monique, Jeanblanc (Evry University, Evry, France)

Title: Enlargement of filtration and arbitrages

Abstract: We present results on enlargement of filtration and show how a new information can lead to arbitrage opportunities (classical arbitrages or arbitrages of the first kind) in the particular case of progressive enlargement of filtration.

Joint work with Anna Aksamit, Tahir Choulli, Jun Deng, Claudio Fontana and Shiqi Song.

Speaker: Geoff, Kingston (Macquarie University, Australia)

Title: Asset Allocation for Self-Funded Retirees

Abstract: Self-funded retirees in accumulation (defined-contribution) schemes and of middle means face a '*retirement risk zone*'. It begins 5 years or so before retirement and recedes 10 to 15 years afterwards. While passing through the zone, allocations to growth assets should be restricted to around half of the portfolio. The reasons for the zone, in decreasing order of importance, are the discretionary nature of bequests, the presence of essential expenditures in the budget (e.g. energy) and the reduced annualized volatility of returns to growth assets over long horizons. The newly-retired household should consider acquiring long-dated put options of the kind embedded in some structured retirement products.

Speaker: Arturo Kohatsu-Higa (Ritsumeikan University, Japan)

Title: The Parametrix Method and its Probabilistic Interpretations

Abstract: In this talk I will introduce some probabilistic arguments that lead to the parametrix method used in partial differential equations which may have applications in simulation.

Speaker: Robert, Kohn (University of New South Wales, Australia)

Title: Particle Methods for SV Factor Model

Abstract: TBA

Speaker Ermanno Pitacco (University of Trieste, Italy)

Title: Monitoring in a risk-management framework: inference from mortality experience in a life annuity portfolio

Abstract: Enterprise Risk Management (ERM) provides a unitary point of view also for insurance-related problems. In particular, through the various steps of the ERM process (risk identification, risk assessment, impact assessment, analysis and choice of actions, monitoring) all the problems inherent in the management of a life annuity portfolio can be analyzed, and solution can be proposed. In this talk we specifically address the monitoring step, and we focus on the experience-based adjustment of mortality assumptions, which play a critical role in long-term business heavily exposed to the aggregate longevity risk.

Speaker: Marek, Rutkowski (University of Sydney, Australia)

Title: Properties of Arbitrage Prices under Funding Costs and Collateralization

Abstract: In Bielecki and Rutkowski (2013), the authors introduced and studied a generic nonlinear market model, which includes several risky assets, multiple funding accounts and margin accounts. In this talk, we examine the pricing and hedging of contract both from the perspective of the hedger and the counterparty with arbitrary initial endowments. We derive inequalities for unilateral prices and we study the range for either fair bilateral prices or bilaterally profitable prices. We also study the monotonicity of a unilateral price with respect to the initial endowment. Our study hinges on auxiliary results for BSDE driven by continuous martingales, but we also derive the non-linear pricing PDEs for path-independent contingent claims of European style in a Markovian framework.

This is a Joint work with Tianyang Nie.

Speaker: Michael, Sherris (University of New South Wales, Australia)

Title: Longevity Risk, Health Status and Annuity Pricing

Abstract: Annuities are increasingly being offered as enhanced annuities to take into account both health status and survival prospects. Frailty models and Markov ageing models with phase-type distributions have been used to model health status and mortality. Given the limited availability of Individual level data to calibrate multiple state models for pricing of enhanced annuities, we develop a multiple state model that assumes differing mortality rates for a small number of health states with time in-homogenous transition rates. The model includes cohort effects, Gompertz age effects, systematic mortality trends, uncertainty in mortality rates and allows (approximate) calibration to population level health and mortality data. Uncertainty in mortality is modelled with a gamma random variate. We calibrate the model to Australian population level health data and cohort survival data using health status based on relative mortality rates for a range of health conditions. We use the calibrated model to determine life annuity expected values and variances and compare the results with those from other models. We experiment with including a loading into the model and illustrate the impact on annuity prices based on health status.

This is a joint work with Qiming Zhou.

Speaker: Pavel, Shevchenko (CSIRO, Australia)

Title: Modelling Annuity Portfolios and Longevity Risk with Extended CreditRisk+

Abstract: Longevity risk is a major issue for life insurers and pension funds in all over the world. Here we propose a stochastic model to derive losses and risk measures in annuity

portfolios via an extended version of CreditRisk+. In our model, defaults are driven by common risk factors which may be interpreted as death causes like neoplasms, cardiovascular diseases or idiosyncratic components. In particular, our model provides the possibility of stress testing, as well as the insight of how certain health scenarios would influence annuity payments of an insurer. Such scenarios may include improvement in treatments and better medication. We also provide different estimation procedures which can be applied to other setups of extended CreditRisk+.

This is joint work with Uwe Schmock and Jonas Hirz from Vienna University of Technology