Research Students Presentation Event

Wednesday 17 June 2009

10:45 – 11:00	Introduction
11:00 – 11:30	**Felix Ren**: An algebraic approach to moment methods for Stochastic Flowgraph models
11:30 – 12:00	**Takeshi Yamada**: Approximation of swaption prices with a moment expansions
12:00 – 12:30	**Flavia Giammarino**: A semiparametric model for the systematic factors of portfolio credit risk premia
12:30 – 13:30	*Lunch*
13:30 – 14:00	**Deniz Akinc**: Pairwise likelihood inference for factor analysis type models
14:00 – 14:30	**Neil Bathia**: Methodology and convergence rates for factor modeling of multiple time series
14:30 – 15:00	**Noha Youssef**: A 2-stage design procedure for computer experiments - A comparative study between space-filling design and Model based optimal design
15:00 – 15:30	*Break (tea and coffee)*
15:30 – 16:00	**Young Lee**: A brief review on the minimal entropy martingale measure
16:00 – 16:30	**Roy Rosemarin**: Dimension reduction in estimating conditional densities

Thursday 18 June 2009

13:00 – 13:30	**Xiaonan Che**: Markov-type models of the Real Time Gross Settlement payment system in the UK
13:30 – 14:00	**Malvina Marchese**: Asymptotic distribution of the pooled OLS estimator in large panels with mixed stationary and non stationary regressors
14:00 – 14:30	**Sujin Park**: Nonparametric prewhitened Kernel estimator of Ex-post variation
14:30 – 15:00	*Break (tea and coffee)*
15:00 – 15:30	**Daniel Hawellek**: How hot are climate models?
15:30 – 16:00	**Hongbiao Zhao**: Dynamic Contagion Process and Its Application in Credit Risk
16:00 – 16:30	**James Abdey**: Ménage à Trois Inference Style: The Unholy Trinity
16:30 – 18:00	Poster session **James Abdey:** Ménage à Trois Inference Style: The Unholy Trinity **Roman Binter:** Linking Information Measures **Sarah Higgins:** The robustness of parameters estimated with small datasets **Ilya Sheynzon:** Continuous Time Modeling of Market Liquidity Hedging, and Crashes

Presentation titles and abstracts

Name: **James Abdey**	*Title:* Ménage à Trois Inference Style: The Unholy Trinity

Abstract:
Three prominent 'schools' of hypothesis testing exist, propelled by Fisher, Jeffreys and Neyman. Fisher extolled the virtue of the p-value, whose magnitude signals the strength of evidence in the null hypothesis. In contrast, Jeffreys' approach favours the use of objective posterior probabilities using a Bayesian framework, whilst Neyman resorted to fixed error probabilities, namely the computation of Type I and Type II errors. Here a unified framework of the competing doctrines is offered, using a new conditioning statistic which accommodates the p-value density under the alternative hypothesis for both simple and composite tests. Critical p-value curves and surfaces can be derived to quickly allow conclusions to be drawn.

Name: **Deniz Akinc**	*Title:* Pairwise likelihood inference for factor analysis type models

Abstract:
The standard likelihood based inference in Generalized Linear Models with latent variables requires high dimensional integrations that increase heavily the computations. Since exact methods for computing and maximizing the full-likelihood function are usually not feasible, a different approach, called "pairwise likelihood estimation" will be used (Cox and Reid, 2004). The aim of this approach is to reduce the computational complexity without losing information. This method maximizes the likelihood function based on the bivariate probabilities of the responses, which have a simple statistical structure .

First we will evaluate the efficiency of pairwise estimation in the case of estimating the mean and covariance matrix of a multivariate normal distribution. Then we will extent the pairwise estimation to factor analysis models with continuous variables. The pairwise estimation will be compared with full maximum likelihood estimation (MLE), least squares estimation (LSE), unweighted least squares estimation (ULS) and some other robust likelihood based estimation methods. Comparisons will be made on the estimates, standard errors and goodness-of-fit statistics.

Name: **Neil Bathia**	*Title:* Methodology and convergence rates for factor modeling of multiple time series

Abstract:
An important task in modeling multiple time series is to obtain some form of dimension reduction. We tackle this problem using a factor model where the estimator of the factor loading space is constructed via eigenanalysis of the sample autocovariance matrices and the number of factors is equal to the number of 'non-zero' eigenvalues of these autocovariance matrices. We use the term 'non-zero' loosely because in practice it is unlikely that we will have any eigenvalues which are exactly equal to zero. However, our theoretical results suggest that the sample eigenvalues whose population counterparts are zero are super-consistent (i.e. they converge to zero at a n rate) whereas the sample eigenvalues whose population counterparts are non-zero converge at an ordinary parametric rate of root-n. This striking result is supported by simulation evidence and consequences for the bootstrap are discussed. In addition we study the asymptotic properties of the resulting factor loading space under very general conditions (including possible non-stationarity) and a simple white noise test for empirically determining the number of non-zero eigenvalues is proposed and theoretically justified.

Name: **Xiaonan Che**	*Title:* Markov-type models of the Real Time Gross Settlement payment system in the UK

Abstract:
We undertook a statistical analysis of the system data of the RTGS in the UK, CHAPS. Some key questions about it are answered, the most important are, with the consideration of pairwise banks, the distribution of payment values sent between two banks, the distribution of payment arrivals and hence the existence of bilateral limit in the system. We use the in-homogeneous Poisson process (which will extend to Doubly stochastic Poisson process in the further) to model the payment arrival process while the sizes of the payments follow an exponential distribution. The overall model of the net cash position change of bank A comparing with bank B is modelled as a jump process, hence, some probability functions are found by applying the piecewise deterministic Markov process theory. Moreover, in particular, the existence and timing of the bilateral limit is investigated according to the proposed model. Considering the evidence of the particular distribution about the system, the pervious simulator is modified in order to meet the reality and the solution will be provided.

Name:	*Title:*
Flavia Giammarino	A semiparametric model for the systematic factors of portfolio credit risk premia

Abstract:
The aim of this paper is to investigate the empirical relationship between daily fluctuations in the risk premium for holding a large diversified credit portfolio, which we approximate by a benchmark credit index, and some tradeable market factors which capture systematic risk. The analysis is based on an adaptive nonparametric modelling approach which allows for the data-driven estimation of the nonlinear dynamic relationship between portfolio credit risk premia and their hypothetical components. Our main finding is that the empirical weights of the systematic factors display sudden jumps during market crises and a less intense time-dependent behaviour during normal market conditions. In addition, we find that during market crises the directions of the empirical relationships are often inconsistent with ordinary economic intuition, as they are influenced by the specific circumstances of financial markets distress.

Name:	*Title:*
Daniel Hawellek	How hot are climate models?

Abstract:
Given a set of imperfect models, some confidence can be derived where they agree in distribution. Ensemble temperature simulations from six climate models are analysed in the non-parametric framework developed by Puri (1964) to detect significant differences in scale, location and range. It is shown that differences in median temperatures are large relative to the internal variability of the models. This, as well as the fact that most models fail to capture the observations entirely, is easily hidden in anomaly spaces. If time permits, first insights from hurricane data are presented and an outline of future research given.

Name:	*Title:*
Young Lee	A brief review on the minimal entropy martingale measure

Abstract:
We give a brief overview on the entropy measure for several popular models in the literature and the methods used to evaluate them. We end our talk by giving results on the entropy minimizer for a general jump diffusion model.

Name:	*Title:*
Malvina Marchese	Asymptotic distribution of the pooled OLS estimator in large panels with mixed stationary and non stationary regressors

Abstract:
This work investigates the behaviour of the pooled ols estimator in panel data models with mixed stationary and nonstationary regressors,when both the cross section and the time series dimensions are allowed to go to infinity. Under the assumption of independence among the cross section,we prove the consistency and derive the rate of convergence of our estimator for both the cointegrated and non cointegrated case.Our main improvement with respect of the current literature, is that the inclusion of an extra stationary regressor speeds the rate of convergence of the estimator sqrt N, this is indeed a further instance of the ability of panel data to identify and consistently estimate effects that are simply not detectable with pure cross section or time series data.

Name:	*Title:*
Sujin Park	Nonparametric prewhitened Kernel estimator of Ex-post variation

Abstract:
We propose new bias corrected realized kernel to estimate the ex-post variation of log-prices. Our new estimator is based on multiplicative bias correction of the crude spectral density estimator under the second-order spectral window, which can be viewed as generalization of prewhitening method. In the literature, the nonparametric prewhitened spectral density estimator is known to achieve faster convergence in the mean squared error without inflating the variance or sacrificing positive definiteness. Our simulation study shows that the proposed estimator reduces bias and mean squared error in estimating ex-post variation in the presence of microstructure noise, compared with the bias-uncorrected estimator.

Name:	*Title:*
Felix Ren	An algebraic approach to moment methods for Stochastic Flowgraph models

Abstract:
Multistate models are used to describe longitudinal, time-to-event data that result from a stochastic process. They model stochastic processes that progress through various stages. The analysis focuses on modeling the passage times between two states of interest or the waiting times until events of interest occur. Stochastic Flowgraph models are one type of multistate model, and can be considered as a type of Semi-Markov model. They model potential outcomes, probabilities of outcomes, and waiting times for the outcome to occur. For example, in medicine survival analysis, the process can be a disease such as cancer and the stages can be diagnosis, remission, and absorbing stage of death. In an engineering context of reliability problem, processes include the movement between functioning and failure states in a pump system. In finance, the process can be seen as the credit rating process of companies in credit risk problem.

A flowgraph is a graphical representation of stochastic network system. It consists of nodes represent the actual outcomes or system states, and directed line segments called branches. Each branch has a transition probability and waiting time distribution. The Stochastic flowgraph model methods give us the MGF of the waiting times distribution of interest. The objective is to compute the probability density function of the waiting time, we will discuss the inversion of MGFs using saddlepoint approximation. In the special case where the waiting time are exponentials distributions with integer-valued shape parameters, exact inversion of MGF using symbolic algebra is possible.

An important goal is to present several general methods for computing the moment generating functions(MGFs) of waiting times between two states of interest, and transform it into the suitable algebraic form for using Method of Moment. The general methods can be applied to any finite state stochastic network that is a Markovian systems and also extend to Semi-Markov process by including non-exponential waiting times. Three closely related methods are discussed, namely, the Mason's rule, the cofactor rule and so-called topological equation method. We will describe how to apply these method in series, parallel and loop network structures. A consolidate approach for computing the MGF, based on the determinant of Markov transition matrix is introduced.

Name:	*Title:*
Roy Rosemarin	Dimension reduction in estimating conditional densities

Abstract:
Estimation of conditional density function for highly-dimensional data is of major importance in the theory and practice of statistics. In this talk I would like to discuss approximation of the conditional density of a stationary random variable Y given a dependent stationary random vector X by that of Y given θ^{T}x. The approach combines the ideas of kernel density estimation and minimizing the Kullback-Leibler information distance with respect to the index parameter θ. Consistency of the estimator of θ is shown to hold under strong-mixing conditions.

Name:	*Title:*
Takeshi Yamada	Approximation of swaption prices with a moment expansions

Abstract:
In this research, we propose two approximation methods for swaption pricing based on the moment expansion. The first one is based on the Gram-Charlier expansion. Pricing swaption is reduced to calculating the higher order moments of the swap value. We assume the Affine-type jump-diffusion process under which the higher order moments of the swap value are computed by solving the ordinary differential equations. Another approximation is based on the generalized Edgeworth expansion. In this method, an arbitrary distribution can be used. A candidate for the approximating distribution is the distribution of one zero-coupon bond at swap expiry.

Name:	*Title:*
Noha Youssef	A 2-stage design procedure for computer experiments - A comparative study between space-filling design and Model based optimal design

Abstract:
Computer models are considered important tools to predict the outputs of complex models arising from industrial and engineering systems. This prediction process which we refer to as emulation contains some amounts of uncertainty. The uncertainty can be reduced by controlling both the inputs and the outputs of the computer model. A clever choice of the design inputs helps in reducing the uncertainty. Space filling designs techniques like Latin hypercube, lattice points, Sobol's sequences, etc …, can be used to select a good design for running the emulator. Also, model-based optimal design techniques can be used with a predetermined criterion like D-optimality, A-optimality, maximum entropy sampling, etc …. Searching for the best design can be implemented over n-stages, which allows for updating the estimates of the unknown covariance parameters using the information obtained from the current design and substituting this new information in our analysis to obtain the next design.

In this study we implement a two-stage design using a combination of space filling designs and model-based designs. The classic kriging model is used in our analysis. In addition, a comparison has been made between implementing this 2-stage design using space-filling design techniques only versus using a combination of both techniques. A case study is presented to illustrate the proposed methods for choosing a design.

Name:	*Title:*
Hongbiao Zhao	Dynamic Contagion Process and Its Application in Credit Risk

Abstract:
In this paper, we introduce a new point process, by generalising the self-exciting Hawkes process (with exponential decay) by Hawkes (1971) and the Cox process with shot noise intensity by Dassios and Jang (2003). Our process includes both self excited and externally excited dependency, which can be used to model the dynamic contagion impact from endogenous and exogenous factors of the underlying system. We have systematically analysed the theoretical properties of this new process, based on the piecewise deterministic Markov process theory developed by Davis (1984), and the extension of the martingale methodology used by Dassios and Jang (2003). The analytic expressions of the Laplace transform of the intensity process and probability generating function of the point process have been derived. An explicit example of specified jumps with exponential distributions is also given. The object of this study is to produce a general mathematical framework for modelling the dependence structure of arriving events with dynamic contagion, which has the potential to be applicable to a variety of problems in economics, finance and insurance, such as credit risk and catastrophe risk. We provide an application of this process to credit risk.