CREST and Sakigake International Symposium

Asymptotic Statistics, Risk and Computation in Finance and Insurance 2010

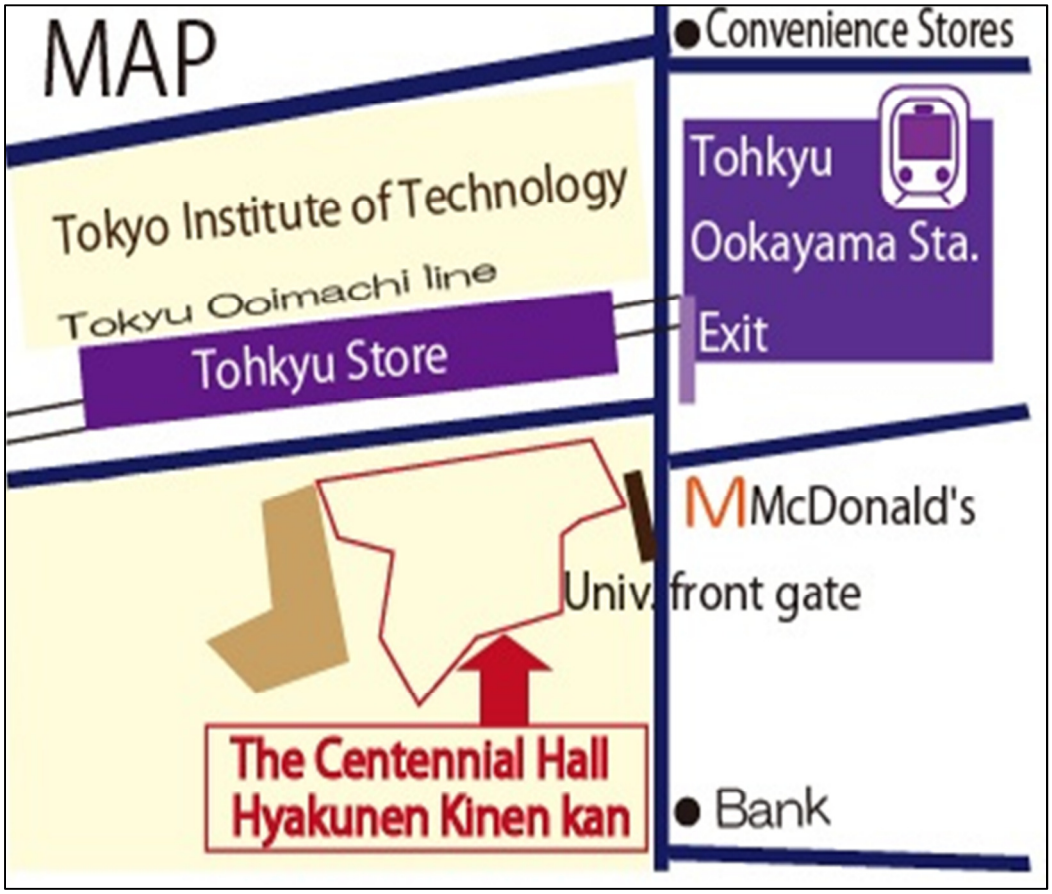
14th-18th December 2010, Tokyo Institute of Technology

Schedule (NB. 1 lecture = 50min talk + 5min questions + 5min break)

	14th,Dec. Tuesday	15th,Dec. Wednesday	16th,Dec. Thursday	17th,Dec. Friday	18th,Dec. Saturday
	Asymptotic Expansions and Financial Models Chairman: M.Fukasawa	Statistics and Computation Chairman: Y.Shimizu	Derivatives Chairman: L.P.Hughston	Credit Risk Chairman: T.Ohmoto	Risk and Computational Finance Chairman: Y.Nakano
9:00					
9:30	Opening remarks	**N. Yoshida** Statistical inference for volatility and related limit theorems	**Y. Nakano** On the design of catastrophe bonds	**M. Rutkowski** A multiplicative approach to random time	**Y. Muromachi** An application of the implied copula model to the risk evaluation of a portfolio
10:00	**L. P. Hughston** Zeta processes and their financial applications				
10:30		**M. Uchida** Adaptive estimation of discretely observed ergodic diffusions	**T. Arai** Shortfall risk based good-deal bounds for American derivatives	**Y. Jiao** Density approach in the credit risk modelling	**S. Hitier** Default copula implied by dynamic credit models
11:00	**V. Konakov** Discrete “parametrix” method and its applications				
11:30		**S. Iacus (I)** On LASSO type estimation for discretely observed diffusion processes	**S. Kou** Pricing Asian options under a general jump diffusion model	**S. Crépey** Dynamic hedging of counterparty exposure	**Y. Umezawa** An extension of CreditGrades model approach with Lévy processes
12:00	Lunch Time				
12:30		Lunch Time	Excursion Higashi Koganei city	Lunch Time	Lunch Time
13:00	**J. Kampen** Analytic expansions of characteristic functions and densities, and applications in finance				
13:30		**H. Masuda** Non-Gaussian quasi-likelihood estimation of jump processes		**X. Guo** From default to recovery, and to (economic) default	**M. Egami** Precautionary Measures for Credit Risk Management in Jump Models
14:00	**Y. Osajima** Asymptotic and Analytic method for SABR				
14:30		**S. Kusuoka** Approximation of expectation of diffusion processes		**W. Runggaldier** Credit risk and incomplete information: filtering and EM parameter estimation	**W. Shaw** Portfolio optimization for general investor risk-return objectives and general portfolio distributions
15:00	Coffee Break				
15:30	**R. Lee** Asymptotics of implied volatility	Coffee Break		Coffee Break	Coffee Break
16:00		**S. Ninomiya** On an extension of an algorithm of higher-order weak approximation to SDEs		**W. Kang** Large deviations, importance sampling, and credit risk	**S. Iacus (II)** The "yuima" package: an R framework for simulation and inference of SDEs
16:30					
17:00	Welcome Party "Tsunobue" Restaurant (Tokyo Institute of Technology University)		~18:00		Closing remarks
	~19:00			Symposium dinner "Hinone Mizu No Ne" Restaurant (Ebisu)	
				~21:00	

Information

Workshop location (Centennial Hall)



Restaurant inside Centennial Hall

Name	Food	Address	TEL
Tsunobue (1)	various western and Japanese food	4th floor in Centennial Hall	03-3729-7762

Restaurants around Ookayama Station (2)
(See also the map below)

Name	Food	Address	TEL
Tsukasa (3)	Japanese	1-49-3 Kitasenzoku Ohta-ku Tokyo	03-3724-5945
Kue (4)	Japanese	2-2-1 Ookayama Meguro-ku Tokyo	03-5731-5230
Muramoto	Ra-men	3-31-6 Kitasenzoku Ohta-ku Tokyo	03-3727-8282
Osteria Piccolo Mago	Italian	3-35-3 Kitasenzoku Ohta-ku Tokyo	03-5754-4233
ROYAL BLUE Seiyouken		2-12-1 Ookayama Meguro-ku Tokyo	03-5754-4351

(1) Lunch time in Tsunobue restaurant is from 11:30 to 13:30.

(2) At Ookayama station exit, there is a shopping street (“shotengai”) where you can also find some other restaurants and convenience stores.

(3) (4) These are restaurants where students go, with cheap food and fast service.

Restaurants Map

A Tsukasa

B Kue

C Muramoto

Shotengai (shopping street)

D Osteria Piccolo Mago

E ROYAL BLUE Seiyouken

★ **Centennial Hall [Hyakunen-Kinenkan]**

Excursion

Edo-Tokyo Open Air Architectural Museum

This is a museum of historic Japanese buildings of different styles, periods, and purposes. It aims to relocate, reconstruct, preserve and exhibit historical buildings of great cultural value. Besides, items that show how people conducted their lives and businesses in days gone by are exhibited inside.

Edo-Tokyo Open Air Architectural Museum

Ooedo-Onsen-Monogatari

An *onsen* is a term for *hot springs* in the Japanese language, though the term is often used to describe the bathing facilities and inns around the hot springs.
Ooedo-Onsen-Monogatari opened in 2003 as Tokyo's first and only onsen theme park. Inside the building, constructed in traditional Japanese style, there are baths fed by natural hot springs pumped from 1,400 meters underground, open-air baths, a foot bath set in a large Japanese-style garden, and plenty of other bathing facilities.
Remarks:

- For hygiene reasons, bathers in onsen are not allowed to wear swimsuits in the baths; they have to be naked or use a small towel (you should bring one with you from the hotel). But, if you would not like to take a bath, then a foot bath and Japanese-style full-body and foot massages are also available (and you have not there to be naked!).
- Women and men are separate in the onsen bath (but not in the foot bath).
- The general admission fee is 1480 Yen.

Ooedo-Onsen-Monogatari

Jindaiji Temple

Jindaiji Temple, founded in 733, is the second oldest temple in Tokyo.
The temple bell and the Buddha statue made in Hakuho period are designated as cultural assets of natural importance. The approach to the temple is lined with soba shops serving a local specialty, Jindaiji-soba, and others.

Jindaiji Temple

List of talks and abstracts

Program

1 lecture=50min talk+5min questions+5min break.

14th Dec.

9:30	∼	10:00	Opening Remarks
10:00	∼	11:00	Zeta processes and their financial applications Lane P. Hughston
11:00	∼	12:00	Discrete "parametrix" method and its applications Valentin Konakov
12:00	∼	13:00	Lunch Time
13:00	∼	14:00	Analytic expansions of characteristic functions and densities, and applications in finance. Joerg Kampen
14:00	∼	15:00	Asymptotic and Analytic method for SABR Yasufumi Osajima
15:00	∼	15:30	Coffee Break
15:30	∼	16:30	Asymptotics of implied volatility Roger Lee
17:00	∼	19:00	Welcome Party

15th Dec.

9:30	∼	10:30	Statistical inference for volatility and related limit theorems Nakahiro Yoshida
10:30	∼	11:30	Adaptive estimation of discretely observed ergodic diffusions Masayuki Uchida
11:30	∼	12:30	On LASSO type estimation for discretely observed diffusion processes Stefano Iacus (I)
12:30	∼	13:30	Lunch Time
13:30	∼	14:30	Non-Gaussian quasi-likelihood estimation of jump processes Hiroki Masuda
14:30	∼	15:30	Approximation of expectation of diffusion processes Shigeo Kusuoka
15:30	∼	16:00	Coffee Break
16:00	∼	17:00	On an extension of an algorithm of higher-order weak approximation to SDEs Syoiti Ninomiya

16th Dec.

9:30	∼	10:30	On the design of catastrophe bonds Yumiharu Nakano
10:30	∼	11:30	Shortfall risk based good-deal bounds for American derivatives Takuji Arai
11:30	∼	12:30	Pricing Asian options under a general jump diffusion model Steven Kou
12:30	∼	18:00	Excursion

17th Dec.

9:30	∼	10:30	A multiplicative approach to random times Marek Rutkowski
10:30	∼	11:30	Density approach in the credit risk modelling Ying Jiao
11:30	∼	12:30	Dynamic hedging of counterparty exposure Stéphane Crépey
12:30	∼	13:30	Lunch Time
13:30	∼	14:30	From default to recovery, and to (economic) default Xin Guo
14:30	∼	15:30	Credit risk and incomplete information: filtering and EM parameter estimation Wolfgang Runggaldier
15:30	∼	16:00	Coffee Break
16:00	∼	17:00	Large deviations, importance sampling, and credit risk. Wanmo Kang
18:00	∼		Symposium Dinner

18th Dec. (Sat)

9:30	∼	10:30	An application of the implied copula model to the risk evaluation of a portfolio Yukio Muromachi
10:30	∼	11:30	Default copula implied by dynamic credit models Sébastien Hitier
11:30	∼	12:30	An extension of CreditGrades model approach with Lévy processes Yuji Umezawa
12:30	∼	13:30	Lunch Time
13:30	∼	14:30	Precautionary measures for credit risk management in jump models. Masahiko Egami
14:30	∼	15:30	Portfolio optimization for general investor risk-return objectives and general portfolio distributions William Shaw
15:30	∼	16:00	Coffee Break
16:00	∼	17:00	The "yuima" package: an R framework for simulation and inference of stochastic differential equations Stefano Iacus (II)
17:00			Closing Remarks

Abstracts

Abstracts are listed in alphabetical order.

Shortfall risk based good-deal bounds for American derivatives

Takuji Arai (Keio University)

Abstract: The aim of this talk is to obtain upper and lower bounds of good-deal bounds induced by shortfall risk for American type derivatives. For European type derivatives, these bounds are given through shortfall risk measure, which is a convex risk measure. Since an American derivative is described as a process, we have to define a new type shortfall risk measure as a functional defined on processes. Moreover, we have to consider upper and lower bounds separately when we treat American derivatives, that is, we define shortfall risk measure from seller's view and one from buyer's view individually. I shall introduce some properties and representation results of these shortfall risk measures for American derivatives.

Dynamic hedging of counterparty exposure

Stéphane Crépey (Université d'Évry-Val-d'Essonne)

Abstract: We consider the issue of counterparty credit risk valuation and hedging. Counterparty risk in general is the risk that a party to an OTC derivative contract may fail to perform on its contractual obligations, causing losses to the other party. A major issue in this regard is the so-called wrong way risk, namely the risk that the value of the contract is particularly high from the perspective of the other party at the moment of default of the counterparty. Since the sub-prime crisis, counterparty risk and wrong way risk are a crucial issue in connection with valuation and risk management of credit derivatives. We first derive a general representation for the Credit Valuation Adjustment (CVA, namely the correction in value accounting for counterparty risk) of a portfolio of OTC derivatives, with netting and collateralization, and a general equation for the dynamics of the CVA. The previous results are essentially model free. However they do not immediately lend themselves to any practical computations. We therefore subsequently them to the counterparty risk of a portfolio of credit derivatives including, for instance, CDSs and/or CDOs, considered in a suitable Markovian model. Wrong way risk is represented in the model by the possibility of simultaneous defaults. Moreover a common shocks interpretation of the model is possible so that efficient convolution recursion procedures are available for pricing portfolio loss derivatives, conditionally on any given state of the Markov model. These pricing procedures allow one to derive an exact Monte Carlo scheme for the CVA of the portfolio. By exact we mean that the Monte Carlo involves no time-discretisation error, nor any approximation error regarding the mark-to-market of the portfolio at the time of default of the counterparty. The only error left is thus the statistical Monte Carlo error. We then deal with the issue of dynamic hedging of the CVA in the Markov model. We establish a rigorous connection between the CVA, which represents the price of the counterparty risk, and a suitable notion of Expected Positive Exposure (EPE). Specifically, the EPE emerges as the key ingredient of the min-variance hedging ratio of the CVA by a CDS on the counterparty. Related notions of EPE have actually long been used in an ad-hoc way by practitioners for hedging their CVA. Our analysis thus justifies rigorously this market practice, making also precise the proper definition of the EPE which should be used in this regard, and the way in which the EPE should intervene in the hedging strategy.

References

[1] Assefa, S., Bielecki, T. R. and Crepey, S.: Dynamic Hedging of Counterparty Exposure. In Preparation.

Precautionary measures for credit risk management in jump models.

Masahiko Egami (Kyoto University)

Abstract: Sustaining efficiency and stability by properly controlling the equity to asset ratio is one of the most important and difficult challenges in bank management. Due to unexpected and abrupt decline of asset values, a bank must closely monitor its net worth as well as market conditions, and one of its important concerns is when to raise more capital so as not to violate capital adequacy requirements. In this paper, we model the tradeoff between avoiding costs of delay and premature capital raising, and solve the corresponding optimal stopping problem. In order to model defaults in a bank's loan/credit business portfolios, we represent its net worth by appropriate Lévy processes, and solve explicitly for the double exponential jump diffusion process. In particular, for the spectrally negative case, we generalize the formulation using the scale function, and obtain explicitly the optimal solutions for the exponential jump diffusion process.

From default to recovery, and to (economic) default

Xin Guo (University of California, Berkeley, Department of Industrial Engineering and Operations Research)

Default copula implied by dynamic credit models

Sébastien Hitier (BNP Paribas)

Abstract: When dealing with multi-issuer credit derivatives such as CDO, it is customary to refer the reader to either of two approaches: "static models" which focus on the copula between the variables of interest, and "dynamic models" where the diffusion of the underlying variables is described directly. While the former is widely used due to its simplicity, it is not clear that there is a well behaved dynamic model consistent with a given static approach. For this reason, it is often argued that an understanding of the dynamics used in model for CDO is required to bring it to par with derivative models used for other asset classes, such as the risk neutral diffusion models used for equity, currency and commodity options derived from Black and Scholes, or the characterization of arbitrage free term structure of interest rates obtained by HJM.

Clearly, a "dynamic model" implies a certain copula between the random variables of interest. The goal of this article is to develop a unified view compatible with both approaches, and reach a better understanding of the properties that a good "dynamic model" used for pricing and hedging would have when seen as a static model.

We focus on credit models where large homogeneous pool portfolio are mathematically possible, a common assumption among practitioners. In a general credit term structure dynamics framework similar to HJM, we identify a "systemic loss" process linked to the survival dynamics that allows to identify the density of loss for large portfolios, and to explicit the default copula between the issuers. We then apply these results to different classes of CDO models that have been put forward for their tractability, to see what copula is implied by given a dynamic model, and what dynamic models could give rise to some popular copula model. The three classes we review are the one factor copula models, the Markovian loss intensity models, and the systemic intensity jump diffusion models.

Zeta processes and their financial applications

Lane P. Hughston (Imperial College London, Department of Mathematics)

Abstract: The zeta distribution, sometimes also called the Zipf distribution, is the discrete analogue of the so-called Pareto distribution, and has been used to model a great variety of interesting phenomena with fat-tailed behaviour. It makes sense therefore to consider financial contracts for which the payoff is represented by a random variable of that type. This talk will present an overview of some of the basic properties of the zeta distribution and the associated multiplicative Levy process, which we shall call the zeta process, with a view to financial applications, both in risk management and in the design of new contracts. A simple model for a security with a Zipfian payoff is constructed satisfying the conditions required to ensure absence of arbitrage. Based on work with D. Brody, S. Lyons, and M. Pistorius.

On LASSO type estimation for discretely observed diffusion processes

Stefano Iacus (University of Milano)

Abstract: The LASSO is a widely used statistical methodology for simultaneous estimation and variable selection. In the last years, many authors analyzed this technique from a theoretical and applied point of view.

We introduce and study the adaptive LASSO problem for discretely observed ergodic diffusion processes. We prove oracle properties also deriving the asymptotic distribution of the LASSO estimator.

We present simulated and real data analysis to provide some evidence on the applicability of this method.

The "yuima" package: an R framework for simulation and inference of stochastic differential equations

Stefano Iacus (University of Milano)

Abstract: Most of the theoretical results in modern finance rely on the assumption that the underlying dynamics of asset prices, currencies exchange rates, interest rates, etc are continuous time stochastic processes driven by stochastic differential equations. Continuous time models are also at the basis of option pricing and option pricing often requires Monte Carlo methods. In turn, the Monte Carlo method requires a preliminary good model to simulate whose parameters has to be estimated from historical data. Most ready-to-use tools in computational finance relies on pure discrete time models, like arch, garch, etc. and very few examples of software handling continuous time processes in a general fashion are available also in the R community.

There still exists a gap between what is going on in mathematical finance and applied finance. The "yuima" package is intended to help in filling this gap.

The Yuima Project is an open source and collaborative effort of several mathematicians and statisticians aimed at developing the R package named "yuima" for simulation and inference of stochastic differential equations. The "yuima" package is an environment that follows the paradigm of methods and classes of the S4 system for the R language.

In the "yuima" package stochastic differential equations can be of very abstract type, e.g. uni or multidimensional, driven by Wiener process of fractional Brownian motion with general Hurst parameter, with or without jumps specified as L .A Nivy noise. L Nivy processes can be specified via compound Poisson description, by the specification of the L Nivy measure or via increments and stable laws.

The "yuima" package is intended to offer the basic infrastructure on which complex models and inference procedures can be built on.

In particular, the basic set of functions includes the following: 1) Simulation schemes for all types of stochastic differential equations (Wiener, fBm, L .A Nivy). 2) Different subsampling schemes including random sampling with user specified random times distribution, space discretization, tick times, etc. 3) Automatic asymptotic expansion for the approximation and estimation of functionals of diffusion processes with small noise via Malliavin calculus, useful in option pricing. 4) Efficient quasi-likelihood inference for diffusion processes and diffusion processes with jumps; 5) changepoint analysis, etc.

All simulation schemes, subsampling and inference are designed to work on both regular or irregular grid times (i.e. regular or irregular time series). In special cases also asynchronous data and sampling schemes can be handled.

Density approach in the credit risk modelling

Ying Jiao (U.F.R. de Mathématiques Université Paris 7)

Abstract: To analyze the impact of a default event, we propose a new credit risk modelling framework which is based on the conditional density of default with respect to the "default-free" filtration and on the progressive enlargement of filtration. We first distinguish different types of information and clarify the link with the widely-used credit intensity approach. We then establish a martingale characterization result in the enlarged filtration which allows to propose "after-default" density models by using a Girsanov's theorem. Further applications show that this approach is efficient in dealing with counterparty risks and with multiple defaults.

Analytic expansions of characteristic functions and densities, and applications in finance.

Joerg Kampen (University of Wuppertal, Germany)

Abstract: Considerable classes of densities and characteristic functions are determined by partial integro-differential equations where initial data are Dirac delta-distributions and their Fourier transforms (analytic data), respectively. In [Belomestny, D., Kampen, J., Schoenmakers, J.G.M.] it is observed that certain sets of analytic data form a class of analytic vectors for classes of processes with affine generators. This observation can be used in order to construct the characteristic function of a considerable class of affine processes from its operator symbol. Moreover, for this class characteristic functions can be locally represented by a functional series consisting of operator symbol functions and their formal derivatives, and with integer coefficients which can be explicitly computed (cf. [Kampen, J.(b)]). But it is difficult to generalize this (go beyond affine processes). We explain why. For a certain class of local operators with nonlinear coefficients, i.e. classical strictly parabolic operators of second order with smooth bounded coefficients, related densities may be locally expanded in WKB-form. This may lead to efficient and accurate approximations. Indeed, in a realistic situation of a Libor market model environment we computed interest rate options with maturity of 10 years in one time step using only the first two correction terms of the Gaussian in the WKB-expansion of a related density (cf. [Kampen, J.; Kolodko, A., Schoenm., J.]). However, higher order approximations in WKB-form can be numerically unstable. In order to obtain stable higher order expansions we consider local expansions of the form

$$p(t,x,y) = \frac{1}{\sqrt{4\pi t}^n} \exp\left(-\frac{\sum_{i=1}^n d_R^2(x,y)}{4t}\right)\left(\sum_{k=0}^{\infty} d_k(t,x,y)t^k\right),$$

where d_R is Varadhans leading term (a Riemannian metric with line-element determined by the inverse of the diffusion matrix) but -different to the WKB-expansion-the higher order corrections d_k, $k \geq 0$ are not part of the exponent. They are solutions of first order equations (more complicated than in the case of WKB). However, in case of an Euclidean leading term and for a consideable class of nonlinear drifts we can compute them explicitly and determine the radius of convergence (cf. [Kampen, J.(c)]). We also discuss the extension to the general case with the analysis of the eikonal equation which determines the Riemannian metric dR. While this metric exists only for strictly parabolic operators (at least in a regular sense), we finally discuss how density expansions of type (1) may be used for computation of specific semi-elliptic problems arising in applications such as Greeks for American options (cf. [Kampen, J.(a)]) or reduced Libor market models (cf. [Fries & Kampen (a), Fries C., Kampen, J. (b)].

Belomestny, D., Kampen, J., Schoenmakers, J.G.M. Holomorphic transforms with applications to affine processes, Journal of Functional Analysis, 2009; 257 (4), 1222-1250.

Fries, C., Kampen, J.: Proxy Simulation Schemes for generic robust Monte Carlo sensitivities, process oriented importance sampling and high accuracy drift approximation (with applications to the LIBOR market model), Journal of Computational Finance, Vol. 10, Nr. 2, 97-128, 2007.

Fries, C., Kampen, J.(b): On a class of Semi-Elliptic Diffusion Models. Part I: a constructive analytical approach for global solutions, arXiv:1002.5031v2

Kampen, J.; Kolodko, A., Schoenm., J.: Monte Carlo Greeks for financial products via approximative transition densities Siam J. Sc. Comp., vol. 31, p. 1-22, 2008.

Kampen, J.(a): Global regularity and probabilistic schemes for free boundary surfaces of multivariate American derivatives and their Greeks, SIAM Journal of Appl. Math, 2nd round (tentatively accepted)

Kampen, J.(b) Characteristic functions of affine processes via calculus of their operator symbols, (Februar 2010), arXiv:1002.2764v2 [math.FA].

Kampen, J.(c) On local analytic representations of the density for a class of linear parabolic equations (to appear in arXiv in Octobre 2010)

Large deviations, importance sampling, and credit risk.

Wanmo Kang(KAIST)

Abstract: The measurement of credit risk is a very important problem for the management of portfolios. Even though there have been debates on the validity of various credit models, some of them are popular in practice. We consider the computational issues of some credit risk models adopted by commercial softwares. We focus on the efficient computations of credit risk under heterogeneous environments. Some recent progresses will be summarized as well.

Discrete “parametrix” method and its applications

Valentin Konakov (Central Economic Mathematical Institute, Russian Academy of Sciences)

Abstract: We discuss a discrete counterpart to the well known ”parametrix” method introduced by E. Levy. Parametrix is a powerful technique appeared in second order partial differential equations about one hundred years ago. It relates to some special representation for fundamental solutions of PDE's or, in probability terms, for transition densities of stochastic differential equations. This representation helps reduce usual Malliavin calculus smoothness assumptions. We suppose to discuss an advanced discrete version of this technique suitable for approximations of PDEs or SDEs. We develop this result for proving new local limit theorems for families of Markov chains weakly converging to diffusions, for proving Edgeworth type expansions, for Euler scheme corresponding to SDEs driven by symmetric stable process, for degenerate diffusions corresponding to Kolmogorov equation, for transport processes in R^d (random walk over ellipsoids in R^d).

Pricing Asian options under a general jump diffusion model

Steven Kou (Columbia University, Department of Industrial Engineering and Operations Research)

Abstract: We obtain a closed-form solution for the double-Laplace transform of Asian options under the hyper-exponential jump diffusion model (HEM).

Similar results are only available previously in the special case of Black- Scholes model (BSM). Even in the case of BSM, our approach is simpler as we essentially use only the Ito's formula and do not need more advanced results such as those of Bessel processes and Lamperti's representation. Furthermore, our approach is more general as it applies to the HEM. As a by-product we also show that a well-known recursion relating to Asian options has a unique solution in a probabilistic sense. The double-Laplace transforms can be inverted numerically via a two-sided Euler inversion algorithm. Numerical results indicate that our pricing method is fast, stable, and accurate.

This is a joint work with Ning Cai, Hong Kong Univ. of Science and Technology

Approximation of expectation of diffusion processes

Shigeo Kusuoka (The University of Tokyo)

Asymptotics of implied volatility

Roger Lee (University of Chicago, Department of Mathematics)

Abstract: We solve for the asymptotics of the implied volatility surface at extreme strikes. Our results sharpen the moment formula and other approximations to implied volatility.

Non-Gaussian quasi-likelihood estimation of jump processes

Hiroki Masuda (Kyushu University)

Abstract: We consider parametric estimation of stochastic differential equations with jumps when the process is discretely observed at high frequency. Since the exact transition probability generally does not have a closed form, the maximum likelihood estimation cannot be of practical use, and therefore we are forced to resort to some other feasible estimation procedure. The Gaussian quasi-likelihood estimation (based on fitting local mean and local variance, and known to be asymptotically efficient in case of diffusion processes) is one of natural candidates as in the case of diffusions, and actually it leads to asymptotically normally distributed estimator. However, the Gaussian quasi-likelihood estimation loses much asymptotic efficiency in the presence of jumps. We propose yet another quasi-likelihood estimation procedure based on non-Gaussian type contrast functions, and show that the resulting estimator may exhibit better theoretical performances than the one based on the Gaussian quasi-likelihood.

An application of the implied copula model to the risk evaluation of a portfolio

Yukio Muromachi (Tokyo Metropolitan University)

Abstract: In this article, we propose a simple application of the implied copula model to the risk evaluation of a portfolio. The implied copula was proposed by Hull and White (2006) for pricing CDOs (Collateralized Debt Obligations), especially the synthetic CDOs. In the implied copula model, the hazard rates of the reference entities have a certain distribution, and the default times of the entities are assumed to be conditionally independent given the history of the hazard rates of all entities. Hull and White (2006) described the distribution of the hazard rates as a non-parametric manner, and calibrated the distribution numerically so that all the market prices of CDO tranches could be explained by the model. Their numerial examples showed that there existed a small probability mass in the extremely high default probability region, which implied the latent fear of the major market participants against catastrophic default events. Combining this implied copula model and a general framework for constructing a risk evaluation model proposed by Kijima and Muromachi (2000), we propose a simple and new risk evaluation model for a portfolio. For simplicity, we use the distribution functions of default times (the cumulative default probabilities) instead of the hazard rates. In order to construct a distribution of the future value of the portfolio, we need two different probability measures: the risk-neutral probability measure for pricing assets, and the physical probability measure for generating stochastic future scenarios. We impose some simple relations on the interest rate and default processes under these two probability measures, and under each measure, a similar stochastic structure is assumed to the implied copula model. Most of the previous risk evaluation models use mainly the historical data, but we use the historical data and the risk premiums included in the market prices so that our model could reflect the latent fear of the major market participants on the estimates of the risk measures. Our model might be used as a complementary tool to the existing risk evaluation models.

On the design of catastrophe bonds

Yumiharu Nakano (Tokyo Institute of Technology)

Abstract: The aim of this presentation is to solve the optimal design problem of catastrophe bonds in the situation where the agents can make risky investments in continuous time. We derive explicit representations for an optimal price and coupon payments by finding the optional decomposition of the minimal hedging price process defined by the principal of the bond.

On an extension of an algorithm of higher-order weak approximation to SDEs

Syoiti Ninomiya (Tokyo Institute of Technology)

Abstract: In this talk, a trial on the extension of the higher-order weak approximation method of SDEs proposed in [1] is reported. Some algebraic correspondenses between the free Lie algebra and rings of polynomials will be reported. This is a collaborative work with Mariko Ninomiya.

References

[1] "A new higher-order weak approximation scheme of stochastic differential equations and the Runge-Kutta method" (with Mariko Ninomiya), Finance and Stochastics vol. 13, No. 3 (September, 2009), pp. 415–443.

Asymptotic and Analytic method for SABR

Yasufumi Osajima (BNP Paribas (Tokyo))

Credit risk and incomplete information: filtering and EM parameter estimation

Wolfgang J. Runggaldier (Hosei University/ University of Padova)

Abstract: We consider a reduced-form credit risk model where default intensities and interest rate are functions of a not fully observable Markovian factor process, thereby introducing an information-driven default contagion effect among defaults of different issuers. We determine arbitrage-free prices of OTC products coherently with information from the financial market, in particular yields and credit spreads and this can be accomplished via a filtering approach coupled with an EM-algorithm for parameter estimation.

A Multiplicative approach to random times

Marek Rutkowski (The University of Sydney)

Abstract: We first show, using the concept of a multiplicative system introduced in Meyer [3], that for any given positive $\mathbb{F}$-supermartingale G such that $G_\infty = 0$, there exists a random time τ on a suitable extension $(\widehat{\Omega}, \widehat{\mathcal{F}}, \widehat{\mathbb{F}}, \widehat{\mathbb{P}})$ of the underlying probability space $(\Omega, \mathcal{F}, \mathbb{F}, \mathbb{P})$ such that G is the Azéma supermartingale of τ or, more explicitly, $G_t = \widehat{\mathbb{P}}(\tau > t \,|\, \mathcal{F}_t)$ for every $t \in \mathbb{R}_+$. Moreover, the restriction of the probability measure $\widehat{\mathbb{P}}$ to the filtration $\mathbb{F}$ coincides with $\mathbb{P}$. This provides a solution to the problem of finding a random time with a given Azéma semimartingale. We analyze the properties of solutions to the abovementioned problem in terms of the so-called hypotheses (H) and (HP). Subsequently, we derive, under suitable technical assumptions, the semimartingale decomposition of an $\mathbb{F}$-local martingale with respect to the progressively enlarged filtration $\mathbb{G}$. We compare our result with previously established semimartingale decompositions for the special cases when τ is an honest time or an initial time. Finally, the univariate construction is extended to the case of several correlated random times with predetermined Azéma semimartingales. Related results were obtained in a recent work by Jeanblanc and Song [1], who developed an approach different from ours and who worked under more restrictive conditions on G.

References

[1] Jeanblanc, M. and Song, S.: An explicit model of default time with given survival probability. Working paper, University of Evry, 2010.

[2] Li, L., and Rutkowski, M.: Constructing random times through the multiplicative system. Working paper, University of Sydney, 2010.

[3] Meyer, P.-A.: Représentations multiplicatives de sousmartingales d'après Azéma. In: *Séminaire de Probabilités XIII, Lecture Notes in Math. 721.* Springer-Verlag, Berlin, 1979.

Portfolio optimization for general investor risk-return objectives and general portfolio distributions

William Shaw (King's College London, Department of Mathematics)

Abstract: We consider the problem of optimizing a general investor objective (MV, Sharpe, VaR, CVaR, Utility, Omega, Behavourial Prospect....) with no restrictions on the terminal distributions of the assets comprising a portfolio. The solution proposed, initially for long-only portfolios of small to modest dimension, is based on introducing an efficient random sampling of the simplicial structures characterizing portfolio configurations. The sample may be optimized in combination with a treatment of risk functions that are either simple analytical objects or entities also requiring Monte Carlo simulation of the return distribution. Examples will be given. Further details are available at: ssrn.com/abstract=1680224

Adaptive estimation of discretely observed ergodic diffusions

Masayuki Uchida (Osaka University)

Abstract: We consider the adaptive estimation of both drift and diffusion coefficient parameters for an ergodic diffusion process based on discrete observations. Two kinds of the adaptive maximum likelihood type estimators are proposed and asymptotic properties of the adaptive estimators, including convergence of moments, are obtained.

An extension of CreditGrades model approach with Lévy processes

Yuji Umezawa (Mizuho-DL Financial Technology)

Abstract: We proposes an extended CreditGrades model called the Lévy CreditGrades model, which is driven by a Lévy process. In this setting, quasi closed-form formulae for pricing equity options to a reference firm and for calculating its survival probabilities are derived.

Statistical inference for volatility and related limit theorems

Nakahiro Yoshida (The University of Tokyo)

Abstract: Statistical inference for volatility is compounded from asymptotic statistics and limit theorems. The following topics are to be discussed.

1 . Quasi-likelihood analysis for estimation of the volatility parameter and nondegeneracy of the associated statistical random field

2 . Limit theorems in semiparametric estimation of the volatility: irregular sampling, nonsynchronous sampling, and asymptotic expansion