CP1

A sequential quadratic programming method for volatility estimation in option pricing

Our goal is to identify the volatility function $\sigma(T, E)$ in Dupire's equation

$$V_T(T, E) - \frac{1}{2}\sigma^2(T, E)E^2V_{EE}(T, E) + rEV_E(T, E) = 0,$$

with maturity $T > 0$ and exercise price $E > 0$ from given option prices. We follow an optimal control approach using a Lagrangian framework. We propose a globalized SQP (Sequential Quadratic Programming) algorithm with a modified Hessian to ensure that every SQP step is a descent direction and implement a line search strategy. In each level of the SQP method a linear–quadratic optimal control problem with box constraints is solved by a primal–dual active set strategy based on a generalized Moreau–Yosida approximation of the indicator function of the admissible control set. This guarantees L^∞ constraints for the volatility, in particular assuring its positivity. The proposed algorithm is founded on a thorough first– and second–order optimality analysis. We prove the existence of local optimal solutions and of a Lagrange multiplier associated with the inequality constraints. Furthermore, we prove a sufficient second–order optimality condition and present some numerical results.

Stefan Volkwein
University of Graz
Institute for Mathematics and Scientific Computing
stefan.volkwein@uni-graz.at

Bertram Düring
J. Gutenberg-University Mainz, Germany
duering@uni-mainz.de

Ansgar Jüngel
Institut f. Mathematik
Johannes Gutenberg-Univ. Mainz, Germany
juengel@mathematik.uni-mainz.de

CP1

Zero-Level Pricing with Transaction Costs

We shall extend Luenbergers paper (2002) on zero-level pricing to the market with transaction costs. Zero-level pricing scheme was proposed to provide price information, especially, when the no-arbitrage pricing method yields a wide price interval in the incomplete market. We shall incorporate the transaction cost into the model. Although the zero-level price in general depends on the utility function and wealth, Luenberger proposed the concept of universal property to ease this situation. In our research, we shall examine the universal property as well.

Sy-Ming Guu
College of Management, Yuan Ze University
iesmguu@saturn.yzu.edu.tw

Jying-Nan Wang
Graduate School of Management
Yuan Ze University
jnwang@saturn.yzu.edu.tw

Sheng-Ching Wu
Department of Finance, College of Management, Yuan Ze Univer
s929801@mail.yzu.edu.tw

CP1

Spectral Schemes for Stochastic Partial Differential Equations

The use of stochastic partial differential equations as mathematical models is becoming increasingly widespread in many areas of application, including mathematical finance. In this talk, spectral schemes for the numerical simulation of solutions to stochastic PDE's will be described. This algorithmic approach is verified through computational studies of some exactly solvable benchmark problems involving both additive and multiplicative noise.

David J. Horntrop
Department of Mathematical Sciences
New Jersey Institute of Technology
david.horntrop@njit.edu

CP1

A Hamilton-Jacobi Level Set Model for Yield Curve Dynamics

A Hamilton-Jacobi (H-J) framework for interest-rate yield curves is derived by applying a minimum Fisher information criterion to the implied probability density. A level set formulation, which mitigates the curse of dimensionality, solves the dynamic equations for the observed bond prices. The modal structure of the yield curve dynamics is demonstrated to follow the pattern of advancing fronts. The Nelson-Siegel model is extended by the H-J scheme. Numerical simulations demonstrate the efficacy of the formulation.

Ravi C. Venkatesan
Systems Research Corporation
ravicv@eth.net

CP2

Optimal Portfolio and Dividend Distribution Policies in An Insurance Company

We consider that the reserve of an insurance company follows a compound-Poisson-process. The management has the possibility of investing part of the reserve in a risky asset. Our aim is to find a dynamic choice of both the investment policy and the dividend distribution strategy which maximizes the cumulative expected discounted dividend pay-outs. The optimization problem can be associated to a Hamilton-Jacobi-Bellman equation. We characterize the optimal value function as the smallest viscosity solution of the associated HJB equation and the optimal strategy as a limit band strategy . We also show some numerical examples

Nora E. Muler, Pablo Azcue
Universidad Torcuato Di Tella
nmuler@utdt.edu, pazcue@utdt.edu

CP2

Optimal Portfolio Management in Markets with Asymmetric Taxation

We consider a long-run growth rate optimization model in a Black-Scholes setting, where each rebalancing incurs transaction costs and taxation on the profits (taxation depends on the length of time the assets were held in portfolio). The resulting control problem becomes an ergodic impulse control problem. We show existence of viscosity solution to the corresponding HJB equation, and use regenerative

processes technique to obtain numerical solutions.

Cristin Buescu, Michael Taksar
University of Missouri-Columbia
cristin@math.missouri.edu, taksar@math.missouri.edu

CP2
Nonparametric Portfolio Selection

The existing mean-variance approach to optimal portfolio selection works well when returns are normally distributed. However the presence of outliers is common that contradicts normal assumption. We derive an alternative probabilistic approach to optimal portfolio selection under normal assumption and extend this approach to the case when the distribution of returns is not specified (nonparametric approach). A new definition of optimal investment is introduced. Our developments are illustrated by the daily stock portfolio selection.

Eugene Demidenko
Dartmouth College
eugened@dartmouth.edu

CP2
Portfolio Optimization with Delayed Information

Merton's portfolio optimization problems with instant information have been studied intensively. In our real life, there is always some delay for the information. In this presentation, a Merton type portfolio optimization problem with delayed information is considered. The optimal investment/consumption strategy will be derived and the results will be compared to those without delay. In addition, the effects of how long it is delayed will also be investigated.

Tao Pang
Department of Mathematics
North Carolina State University
tpang@math.ncsu.edu

CP2
Minimizing Maximum Drawdown in Portfolios

The maximum drawdown (MaxDD) is a criterion to be minimized. The lecture shows properties of the MaxDD of a convex combination of two stocks. The resulting function is piecewise differentiable and has no local maximum in (0,1). A fast algorithm is derived to calculate the portfolio with the minimal MaxDD. This can be extended to the case of the convex combination of arbitrarily many stocks.

Erich Steiner, Johann Horch
Deutscher Wertpapierdienst GmbH
Lahnstein (Germany)
e.w.steiner@web.de, jh@deutscher-wertpapierdienst.de

Peter Dierich, Sabine Leubner
University of Applied Sciences Goerlitz/Zittau (Germany)
Department of Mathematics
p.dierich@hs-zigr.de, s.leubner@gmx.de

Joerg Schulze
University of Applied Sciences Goerlitz/Zittau (Germany)
Department of Computer Sciences
joerg.schulze@hs-zigr.de

CP2
Mathematical Analysis of Investment Systems

The efficiency index for an investment system, defined as the average expected exponential growth rate per trade under the best investment size in logarithmic scale, is proposed as a measure to compare investment systems for their intrinsic merit. This efficiency index can be viewed as a generalization of Shannon's information rate for a communication channel. Tools in variational analysis are used to analyze the efficiency index. Applications are illustrated.

Qiji Zhu
Western Michigan University
Dept. of Mathematics
zhu@wmich.edu

CP3
Pricing Corporate Bonds Using Dynamic Default Barriers

Existing models based on the lognormal diffusion process, describe fairly well bond prices with long tenure, but fail to model short-term credit spreads. In this paper, we enhance the stochastic processes describing the total value of the firm assets and therefore provide solid pricing valuation of fixed income products using the concept of dynamic default barriers. We propose different diffusion processes to avoid the drawback of modeling short-term spreads implied by current structural type of models.

Irina Goldman, Fotios Harmantzis
Stevens Institute of Technology
igoldman@stevens.edu, fharmant@stevens.edu

CP3
Default Intensity Model with Stochastic Recovery for Lease and Option on Lease Valuation

Leases are interesting credit products since the propensity of a lessee to pay has two parts, the current condition of the lessee's balance sheet (operating, restructuring, or bankrupt) and the value of the underlying asset vis--vis the amount lent. If an asset is worth more than is lent against it, it is unlikely the lessee will stop making payments even if the company has defaulted on other obligations. The resolution of this is an extended credit derivative model with a stochastic recovery rate process with default likelihoods based on stochastic Loan to Value (LTV). This talk covers the general framework and considers a specific application using a Cox-Ingersoll-Ross process for default intensity and a log-normal asset distribution process for valuing a lease and options on a forward start lease.

Terry L. Leitch
Boeing Capital Corp
terry.l.leitch@boeing.com

CP3
Evidence of Persistence in the London Interbank Offer Rate

In this paper we present empirical evidence of long-range dependence in the widely referenced British Bankers' Association LIBOR rate by examining twelve monthly maturities in both the USD and CHF currency fixing. Applying the wavelet-based MLE we find a similar pattern in each of the series for both currency rates. The main result shows that the estimate of d exhibits a general increase as the

length of the maturity for each rate increases.

Jay S. Nakahara
RiskMetrics Group
Stevens Institute of Technology
jay.nakahara@riskmetrics.com

Fotios Harmantzis
Stevens Institute of Technology
fharmant@stevens.edu

CP3

Arbitrage Pricing of Credit Derivatives

Credit default swap (CDS) and single-tranch credit default swap (STCDS) markets have experienced exponential growth in recent years. The market standard for CDS pricing, however, is not based on arbitrage. In this talk, I will first present an arbitrage pricing theory for CDSs and then discuss its extension to pricing the STCDOs. Compared with other existing theories, the new theory has two distinguished features. First, the recovery rate is no longer required as an input. Second, CDSs or STCDSs can be replicated statically by cash flows of underlying bonds or tranches of collateral debt obligations (CDOs), respectively. According to our theory, the introduction of CDSs and STCDSs eliminates recovery-rate risk in underlying bonds and CDO tranches, while leaves "early redemption" as the only residual risk.

Lixin Wu
Hong Kong University of Science and Technology
malwu@ust.hk

CP3

A Structural Model for Rating Transition in Continuous Time

Modeling and understanding the dynamic of credit rating are critical for credit derivative markets from both pricing and investment propecties. We propose a structural model based on an index following the general Levy process, which includes Brownian motion and Poisson jumps, with variable coefficients in regions separated by time-dependent barriers. Each region corresponds to a particular rating and an upgrade/downgrade of the rating is triggered by barrier crossings. The barriers are determined by solving a partial integro-differential equation (PIDE) with several initial data calibrated to market data such as the CDS spreads. Implication of the generator with regard to spread dynamics is discussed.

Zhifeng Zhang
Barclays Global Investors
frank.zhang@barclaysglobal.com

Jingyi Zhu
Department of Mathematics
University of Utah
zhu@math.utah.edu

CP4

Pricing Parisians by Fourier Inversion

In this paper on consecutive Parisian options, the derivation of the Laplace Transform as in [M. Chesney, M. Jeanblanc-Pique, M. Yor, Brownian Excursions and Parisian Barrier Options, Adv. Appl. Prob. 29, 165-184, (1997)] is used to formulate the pricing problem in terms of the Fourier transform as in [P. Carr, D. B. Madan, Option Valuation Using the Fast Fourier Transform, Journal of Computational Finance 2, 61-79, (1999)]. Numerical inversion is not straightforward, in the sense that (truncation)error bounds cannot be given. Here we analyze the Fourier transform and use its oscillating properties to provide an error-controlled inversion algorithm. In the concluding numerical section we give illustrative examples of the behavior of the prices.

Jasper Anderluh, Hans Van Der Weide
TUDelft
Delft Institute of Applied Mathematics
j.h.m.anderluh@ewi.tudelft.nl,
j.a.m.vanderweide@ewi.tudelft.nl

CP4

Valuing Derivatives on Variable Universal Life Insurances.

Universal life insurance policies combine the insurance purpose (i.e., the protection against economic loss resulting from death) with long-term investment purpose. Derivatives on these insurance products have also been devised to meet special needs. In this work we develop a numerical algorithm for option valuing using Fourier transform and moment matching. This method is compared with the finite difference approach for solving partial differential equations and with the Monte-carlo simulation. Numerical results are reported.

Ruihua Liu, Ran Huang
University of Dayton
ruihua.liu@notes.udayton.edu,
ran.huang@notes.udayton.edu

CP4

Hedging Barrier Options by Robust Optimization

Static hedging strategies for barrier options can perform very poorly in a real world setting. To avoid undesired hedging losses, model parameter uncertainty as well as model errors have to be taken into account. During the talk we present a new optimization approach to derive robust static super-replication strategies in general stochastic volatility models. As it turns out, the resulting hedging strategies have attractive properties and are only marginally more expensive than the barrier option itself.

Jan H. Maruhn
University of Trier
Department of Mathematics
maruhn@uni-trier.de

CP4

Using Options to Lower Expected Transaction Costs

Black Scholes analysis shows that options are redundant in a portfolio of cash and stock when transaction costs are not present. However, we show that options are not redundant when transaction costs occur. Specifically, we consider a proportional transaction cost model where ε is a scaling parameter for the size of the proportions lost in trades. For any desired utility curve, the expected transaction cost in a cash and stock portfolio is $O\left(\varepsilon^{\frac{2}{3}}\right)$. However, by allowing options in the portfolio and determining the explicit opti-

mal strategy — which keeps the portfolio near a specific (utility dependent) ratio of cash, stock, and options — we will see that the expected costs are now reduced to a term that is only $O\left(\varepsilon^{\frac{6}{7}}\right)$.

Dan Ostrov
Santa Clara University
dostrov@scu.edu

Jonathan Goodman
Courant Institute of Mathematical Sciences,
New York University
goodman@courant.nyu.edu

CP4
Pricing American Options Using Quadrature

An efficient method for pricing American-style options is presented. Starting from a discounted expectation approach we develop a flexible algorithm for option pricing in one or several spatial dimensions. The computational complexity of the method is analyzed and error bounds are given. A strategy to control accuracy is introduced. The resulting algorithm can be applied to arbitrary market models and option types without considerable modifications. We present numerical results for options under Lévy processes.

Sebastian Quecke
University of Cologne
Math. Institute
squecke@math.uni-koeln.de

CP4
Static Arbitrage Bounds versus Black-Scholes Prices

Using tractable conditions for the absence of buy-and-hold arbitrage opportunities in a perfectly liquid, one period market, we compare static arbitrage price bounds for basket options with option prices biven by a multivariate Black-Scholes model. We show on numerical experiments that these prices are often surprisingly close.

Alexandre d'Aspremont
ORFE, Princeton University
aspremon@Princeton.EDU

CP5
Overnight Gaps in Commodity Futures

Overnight price jumps (gaps, shocks) are a common feature of futures commodity prices, both for the pit-traded contracts, and for electronic markets. Overnight gaps represent a distinct departure from continuous-time finance, and constitute a substantial part of overall risks, volatility, kurtosis, and extreme moves of commodity prices. For money managers, gaps are discrete-time trading risks which can not be hedged away. The present paper establishes main stylized facts about overnight gaps in commodity markets.

Igor Kliakhandler
Department of Mathematical Sciences
Michigan Technological University
igor@mtu.edu

CP5
On the Impact of Heavy-Tailed Returns to Popular Risk Measures: Evidence from Global Indices

We use Stable Paretian assumption to estimate popular Drawdown-type and VaR-type risk measures by testing global indices for about ten years of data. We analyze the impact of key factors such as Kurtosis, Skewness and length of tracking time on six risk measures: Maximum Drawndown, Conditional Drawdown at Risk, Drawdown at Risk, Average Drawdown, Value at Risk, and Conditional Value at Risk. Our results find some common trends, as well as individual characteristics for these particular risk measures.

Linyan Miao, Fotios Harmantzis
Stevens Institute of Technology
lmiao@stevens.edu, fharmant@stevens.edu

CP5
Risk Measures and Time Consistency

Dynamic extensions of coherent risk measures have been studied recently by a number of authors. In the dynamic setting, it is natural to impose an axiom of time consistency. Since risk measures are used for several purposes such as pricing and determination of regulatory capital, different axioms may be appropriate in different contexts. Here we consider a hierarchy of time consistency axioms and provide representation results, in terms of collections of probability measures, at each level. The hierarchy is used to develop various possible extensions of the popular Tail-Value-at-Risk measure (expected shortfall).

Hans Schumacher
Tilburg University
J.M.Schumacher@uvt.nl

Berend Roorda
Twente University
b.roorda@utwente.nl

CP5
Title Forthcoming

During 2004, crude oil prices reached a historical high triggering hedging activity by airlines. In this study, I examine the rationality of recent hedging behavior by airlines and the possibility that previously documented value created by airlines in their hedging programs is partially explained by the airlines ability to cross-hedge correct forecasts of jet fuel prices. Using difference of means tests, I test the normal distribution, seasonal behavior and price behavior following new highs of jet fuel, crude oil spot and crude oil futures prices. While jet fuel prices appear to exhibit some predictable tendencies, I find little evidence that these tendencies can be successfully hedged with crude oil futures. Moreover, attempting to hedge the price behavior examined in this study will probably result in hedging program losses, especially when transaction costs are considered.

Ray Sturm
Department of Finance, University of Central Florida
RSturm@bus.ucf.edu

CP5
Valuation of Gas Swing Options Using An Ex-

tended Least Squares Algorithm

Gas and electricity swing contracts, as traded in several deregulated energy markets, have American-type exercise rights and (bounded) volumetric choices embedded in them. These contracts, typically of a finite horizon and with all rights expiring at the same maturity date, provide the contract holder with considerable flexibility ("swing") over the dates of exercise and the volume of the commodity exercised at each date. This study provides a Monte Carlo simulation–based framework for pricing the option–component of the swing contract (swing option). In particular, an extended version of the least squares Monte Carlo algorithm is employed to accommodate the recursive payoffs of such options. A nonparametric basis (P–splines) is used to provide better control over the bias of the algorithm. Sample numerical results that quantify the influence of physical and financial parameters are provided at the end of the study. Computational issues (performance times, memory requirements, etc) will also be addressed.

Rutang K. Thanawalla
Heriot–Watt University
rutangt@gmail.com

CP5

An Implementation of a Risk Management System for the Telecommunication Market

A risk management system was designed and implemented for a big distributed telecommunication company. The system considers both common tasks and local regulations and specifics. The report presents an overview of this job: the tasks implemented, design structure as well as implementation and installation issuers.

Sergey A. Yurkevich
Ramax International
sergey.yurkevich@ramax.ru

CP6

The Cost of Assuming Continuous Trading in Underlying Financial Securities

In finance it is commonly assumed that trading of financial instruments can be performed continuously when in fact there are periods when no transactions, or close to no transactions, are taking place. In this paper we explicitly model these waiting times or duration between transactions in the equity markets and show that prices of instruments satisfy a partial-integro-differential equation. We show that it is straightforward to price European-style options. As one of our examples we show that when Brownian motion is assumed for spatial shocks, the inclusion of duration between trades generates the implied volatility observed in the markets.

Diego Del-Castillo-Negrete
Oak Ridge National Laboratory
delcastillod@ornl.gov

Alvaro Cartea
School of Economics and Math.
Birkbeck College, U. of London
a.cartea@bbk.ac.uk

CP6

A Method for Predicting Stock Prices

We will describe a possible approach for developing a stock price prediction method. Our method is based on three main elements the solutions of the following problems: - At each moment of time, how far back in the past we should look for estimating an optimal size of the correlation window for a single stock or a group of stocks? - How can we analytically calculate derivatives? - How the calculations are influenced by the multiscale effect of input data? We will present test results demonstrating the capabilities of the method.

Michael Frenkel
MVT Research
mike.frenkel@gmail.com

CP6

Parsimonious Geometric Modeling of Financial Instruments.

The problem of extracting nonlinear relationships in large high-dimensional scattered data sets is of central importance across fields of science, engineering and finance. The coherent structure or pattern in the data from apparently complicated physical phenomena suggests the possible existence of geometric structure of dimension much smaller than the ambient space. We propose a fully automatic algorithm for constructing nonlinear models from high-dimensional scattered data, up to a diffeomorphism. The placement of the functions is driven by a statistical hypothesis test that reveals geometric structure when it fails. At each step the added function is fit to data contained in a spatio-temporally defined local region to determine the scale of the local model. This multi-scale computation method has been tested on modeling and prediction of exchange rate time series and has the potential for modeling other financial instruments and their derivatives.

Michael Kirby
Colorado State University
Department of Mathematics
kirby@math.colostate.edu

Arthur Jamshidi
Colorado State University
jamshidi@math.colostate.edu

CP6

Stochastic Modeling of Trader Behavior and Hedging Feedback in the Stock Pinning Phenomena

We describe a model of market price dynamics based upon trader behavior to explore the phenomena of stock pinning. A stock is said to pin when it trades at or near an option strike price at expiration. We model hedge traders, who employ a Black-Scholes based dynamic strategy to hedge their position in options against the background of extraneous traders. We model the trading activity of individual traders explicitly as a conditional compound Poisson process. Using diffusion limits we derive a coupled system of two Ito stochastic differential equation model for the market price dynamics. We show that the assumption that the hedge traders trade much faster than the extraneous traders leads to a singularly perturbed SDE model which can be simplified to yield a single SDE for the stock price

dynamics and explain the pinning mechanism.

James Primbs
Stanford
japrimbs@stanford.edu

Muruhan Rathinam
University of Maryland, Baltimore County
muruhan@math.umbc.edu

CP6

Optimal Consumption-Investment in a Financial Market with Regime Switching

We consider a consumption-investment problem for a multiple-state financial market. An investor chooses investment and consumption processes to maximize his total expected utility of consumption with an infinite-time horizon. The rates of return and volatilities of the assets, the bank interest rate and the investors utility function depend on the state of the market, which is modeled through a finite-state Markov chain. Explicit optimal investment and consumption policies are obtained for HARA utility functions.

Luz R. Sotomayor, Abel Cadenillas
University of Alberta
rsotomayor@math.ualberta.ca, acadenil@math.ualberta.ca

CP6

Application of Machine Learning to Short-Term Equity Return Prediction.

Cooper showed how a filter method could be used to predict equity returns for the next week by using information about returns and volume for the two previous weeks. Cooper's method may be regarded as a crude method of machine learning. We have designed and applied a new method of machine learning, appropriate to the problem, that leads to a clear profit improvement compared to Cooper's approach. Implications for the Efficient Market Hypothesis are discussed.

Robert J. Yan
Computer Science Department
The University of Western Ontario
jyan@csd.uwo.ca

John Nuttall, Charles Ling
The Universtiy of Western Ontario
jnuttall@uwo.ca, cling@csd.uwo.ca

CP7

A New Moment-Matching Algorithm for Scenario Generation

A new algorithm is suggested for generating a random sample from a univariate, symmetric distribution with a specified mean, variance and kurtosis. These moments are matched exactly by the generated sample, irrespective of the accuracy of the underlying random number generator and without requiring any numerical optimisation. This algorithm is used along with Cholesky factorisation to suggest a new (non-iterative) method for generating multivariate random samples with a given correlation matrix and given marginal moments.

Paresh Date
Brunel University
paresh.date@brunel.ac.uk

CP7

Robust Replication of Exotic Volatility Derivatives

Extending the earlier Carr-Lee results on the robust hedging of contracts on realized volatility, we derive replication strategies for more exotic contracts, including joint claims on price and realized volatility (such as Sharpe Ratio derivatives) and barrier-style claims on realized volatility. Avoiding specific assumptions on the dynamics of instantaneous volatility, we need only an independence condition, which can be relaxed; in this sense the replication is robust.

Roger Lee
University of Chicago
RL@math.uchicago.edu

Peter Carr
Bloomberg LP and
Courant Institute, NYU
pcarr4@bloomberg.com

CP7

Implied
Volatility Function Movements of Arbitrage-Free Interest Rate Models

This paper empirically tested the one factor and two factor arbitrage-free interest rate models for swaptions in three currencies, U. S. dollar, Euro and Japanese yen. The models are shown to be robust in explaining the swaption valuation. Further, the implied volatility functions of the models are estimated. They are shown to be dynamic, exhibiting a three factor movement in all three currencies. The results show that the vega risks of interest rate contingent claims should be managed and that key rate vega measure may be needed to control the stochastic volatility risks.

Blessing Mudavanhu
Merrill Lynch & Co.
blessing_mudavanhu@ml.com

CP7

Using Specially Crafted Lattice Rules for Derivative Pricing

Since 1995 the usage of quasi-Monte Carlo (QMC) techniques for derivative pricing has leaped forward enormously. It was observed that for QMC a rate of convergence of $O(n^{-1})$ can be achieved, instead of $O(n^{-1/2})$ for classical Monte Carlo (with n samples). Theoretically however, the rate of QMC is $O(n^{-1}\log^s n)$ (in s dimensions). The idea of *effective dimension* has been used to explain this fortunate behavior and special construction methods have been developed. Using our fast construction method for good lattice rules we will compare the performance of a general QMC rule with a specifically crafted lattice rule.

Ronald Cools, Dirk Nuyens
Dept. of Computer Science
K.U.Leuven
ronald.cools@cs.kuleuven.be, dirk.nuyens@cs.kuleuven.be

CP7

Asymptotic Behavior of Stochastic Volatility Models

We extend the work of Fouque, Papanicolaou and Sircar on the asymptotic behavior of stochastic volatility models with fast mean reversion for European option pricing. We identify a fast time scale that plays an important role close to expiration. By means of a multiple scale analysis, we derive a formally uniform asymptotic expansion for the option price. As a byproduct, we also obtain asymptotic formulas for the implied volatility, that are formally uniform for all times. In particular, they do not exhibit blow-up at maturity as found in previous computations.

Jorge Zubelli
IMPA
zubelli@impa.br

Max O. Souza
Departamento de Matemática Aplicada
Universidade Federal Fluminense
msouza@mat.uff.br

CP7

American Put Option Pricing for a Stochastic-Volatility, Jump-Diffusion Model with Log-Uniform Jump-Amplitudes

Analytic approximation formulas to American put option pricing are developed for an alternative stochastic-volatility, jump-diffusion (SVJD) model with log-uniform jump-amplitudes. A corrected MacMillan's quadratic approximation is applied on the time-dependence and this approximation is extended to SVJD models from diffusion models, but computation is needed for nonlinear and multidimensional terms. A finite difference and PSOR computation on the corresponding linear complementary problem (LCP) will be used to compare with the analytic approximation.

Guoqing Yan, Floyd Hanson
Dept. of Mathematics, Statistics, and Computer Science
University of Illinois at Chicago
gyan2@uic.eudu, hanson@uic.edu

CP8

Dynamic Asset Allocation Using Time Series Analysis Prediction and Control Methods.

Prediction and control methods are applied to the problem of dynamic asset allocation. Given several assets with time variable returns, we set an appropriate increasing target for overall return on assets. Multivariate time series methods are used to model the dynamic behaviour of the asset returns, and control theory is used to allocate the assets so as to attain a return as close as possible to the target. Several examples are shown using real data.

Tohru Ozaki
Institute of Statistical Mathematics
ozaki@ism.ac.jp

Valerie Haggan-Ozaki
Sophia University
v_ozaki@sophia.ac.jp

CP8

Optimal Hedging in Incomplete Markets

In an incomplete market, the perfect hedge of a short position of an option is not possible. An investor faces the problem of choosing a hedging strategy from a set of possible no arbitrage strategies. We suggest several criteria for choosing such a strategy based on risk minimization principles. We will describe a numerical solution technique using statistical and computational methods and show results for several representative options traded on the New York Stock Exchange.

Norman Josephy, Victoria Steblovskaya, Lucy Kimball
Bentley College
njosephy@bentley.edu, vsteblovskay@bentley.edu, lkimball@bentley.edu

CP8

Optimal Dividend Payout and Capital Financing Policies in the Presence of Delay and Fixed Costs

A Peura-Keppo model is considered for valuing a firm whose capital evolves according to a Wiener process with positive drift. This model extends the optimal dividend problem by introducing new equity issuance, and incorporating market imperfections including the delay and costs of raising capital. We proved the existence and uniqueness of a solution to this problem related to a system of quasi-variational inequalities, and analyzed the asymptotic behavior of optimal dividend and capital issue barriers.

Hyekyung Min, Joseph Conlon
Department of Mathematics
The University of Michigan
hyekyung@umich.edu, conlon@umich.edu

CP8

Beyond Classical Capital Allocation Pricing Model (capm)

Classic approaches to portfolio and asset allocation management are usually limited to CAPM and mean-variance portfolio (MVP) theory. Over the last decades those techniques have been further elaborated and challenged. In the presence of extreme (rare) events, "Stable" CAPM introduces a new measure of risk, by assuming that asset returns follow a joint symmetric Alpha-Stable distribution. The Black-Litterman allocation model resolves sensitivity issues in MVP by utilizing investors views. The purpose of this paper is to test those approaches by analyzing performance through empirical evidence.

Fotios Harmantzis
Stevens Institute of Technology
fharmant@stevens.edu

Marian Montagnino
Stevens Institute of Technology
Mathematics Department
mmontagn@stevens.edu

CP8

Numerical Calculation of the Probability of Ruin of An Optimal Investment of An Insurance Reserve

The estimation of the ruin probability, in finite and infinite horizon of time, of the reserve of an Insurance Company

with the possibility of investing in a risky asset has lately received a lot of attention. In this work we present the numerical estimation of this problem under the optimal investment strategy for the small claim case. We apply a generalization of Asmussen Importance Sampling method. In this case we have a process that is the sum of a Compound Poisson Risk Process plus a Geometric Brownian Process. The associated modified Lundberg equation is calculated and the positive root is used to construct the exponential change of measure. We will show that this gives place to an estimator with bounded relative error. Numerical results will be presented.

Patricia Saavedra
Mathematics Department
Universidad Autonoma Metropolitana
psb@xanum.uam.mx

MS1

Efficient Pricing of American Options in a Double-Exponential Jump-Diffusion Model

In this paper I extend the numerical technique developed by AitSahlia and Lai (2001) to the pricing of American options where the underlying asset price process follows a double exponential jump-diffusion. In particular, I show that the early exercise boundaries are well approximated by linear splines (in the Brownian scale) with very few knots, leading the way to a fast and accurate method to compute the option prices through a new decomposition formula.

Farid AitSahlia
University of Florida
farid@ise.ufl.edu

MS1

The Effects of Implementation Delay on Decision-Making Under Uncertainty

We provide a new mathematical characterization of the value function for impulse control problems with implementation delay and present a direct solution method that differs from its counterparts that use quasi-variational inequalities.

Masahiko Egami
Dept. of Math.
Uni. of Michigan
egami@umich.edu

Erhan Bayraktar
University of Michigan
Department of Mathematics
erhan@umich.edu

MS1

Perturbation Methods in the Pricing of Credit Derivatives

We study the pricing of defaultable derivatives, such as bonds, bond options and credit default swaps within the reduced form model setup. We assume a mean-reverting process (modeled either as a Vasiček or a CIR type) for the interest rate and general correlated diffusion processes for the intensity of default. Asymptotic expansions for the price functions are computed using perturbations on the intensity of default in two scales. Further, empirical evidence is presented by data fitting.

Ronnie Sircar
ORFE
Princeton University
sircar@princeton.edu

Evan Papageorgiou
Princeton University
evanp@princeton.edu

MS1

Sequential Multi-hypotheses Testing About (compound) Poisson Process

In the hypothesis testing problem, one of multiple hypotheses is correct about the unknown arrival rate and jump distribution of a compound Poisson process. We start observing the process, and the problem is to decide on the correct hypothesis as soon as possible and with the smallest probability of wrong decision. We find a Bayes-optimal sequential decision rule and describe how to calculate its parameters without any restrictions on the arrival rate and the jump distribution.

Semih Sezer
Princeton University
ssezer@princeton.edu

MS2

Asymptotics of Implied Volatility at Extreme Strikes

We derive asymptotics for the implied volatility skew at large and small strikes, extending the moment formula which relates the tail slopes to the number of moments in the underlying distribution.

Roger Lee
University of Chicago
RL@math.uchicago.edu

MS2

Asymptotic Analysis in Term Structure Models

Several types of term structure models, with and without jumps, are considered. Both short and long time asymptotics of prices of interest rate derivative securities are calculated, and the quantitative and qualitative differences of the price behavior caused by non-Gaussian innovations are analyzed. In addition, the asymptotic analysis of standard pricing procedures shows the bias of the latter, and allows one to improve the performance of these procedures.

Sergey Levendorskiy
The University of Texas at Austin
Department of Economics
leven@eco.utexas.edu

MS2

Stochastic Volatility Surface Estimation

A central problem in modern mathematical finance is that of estimating the volatility of financial time series, whether they are equity prices, exchange rates, interest rates or something else, such as options. A recent trend is to try to estimate the implied volatility of an asset from the fluctuations in the price of derivatives whose underlying it is. This

is the volatility surface estimation problem. I will review briefly the background and status of this problem, including computational issues, and I will present a variational theory for volatility surface estimation within stochastic volatilty models. I will show the form this theory takes under a fast mean reverting hypothesis and I will conclude with a calibration of the theoretical framework using SP500 options data.

George Papanicolaou
Stanford University
papanico@georgep.Stanford.EDU

MS2
Utility Indifference Valuation of Credit Derivatives

We discuss the theory of utility indifference valuation of credit derivatives, in models with stochastic intensity, characterized (in the single-name case) by reaction-diffusion partial differential equations. These are analyzed by asymptotic methods in the limit of rapidly changing intensities.

Ronnie Sircar
ORFE
Princeton University
sircar@princeton.edu

Thaleia Zariphopoulou
University of Texas at Austin
zariphop@math.utexas.edu

MS3
IPS for the computation of CDO spreads

We review some recent results on the use of Interacting Particle Systems (IPS) in the computation of rare events probabilities, and we introduce a version particularly well suited to the computation of the expectations appearing in the computations of single tranche synthetic CDOs spreads. (joint work with J.P. Fouque and D. Vestal)

Rene Carmona
Princeton University
Dpt of Operations Research & Financial Engineering
rcarmona@princeton.edu

MS3
Applications of Point Processes to Credit Modeling

We consider how point process techniques from insurance to cosmology can be applied to the pricing of credit derivatives, and explore in depth issues specific to financial modeling.

Steven Hutt
Morgan Stanley
Steven.Hutt@morganstanley.com

MS3
Stochastic Volatility effects in default risk

We study the effects of introducing stochastic volatility in the context of default risk. Specifically we consider a regime of separation of time scales to obtain a parsimonious description of stochastic volatility effects.

Knut Solna
University of California at Irvine
ksolna@math.uci.edu

MS4
A Model of UK Gas Dynamics and Applications to Multiple Interruptible Supply Contracts

We propose a spot price model for natural gas based on Schwartz and Smith. We calibrate the model parameters to UK market data using a Kalman filter and discuss the market prices of risk of the different factors and how these relate to storage inventories. Moreover, using and Extended Least Squares Monte Carlo technique, we find upper and lower bounds for interruptible gas supply contracts, ie price multi-exercise Bermudan call options on the gas spot price.

Alvaro Cartea
School of Economics and Math.
Birkbeck College, U. of London
a.cartea@bbk.ac.uk

MS4
T BA

Helyette Geman
University Paris Dauphine and ESSEC
hgeman@hotmail.com

MS4
Financial Hedging of Operational Risk

We study the problem of optimal financial hedging of operational risk in the context of managing energy assets. The operator has control of the physical asset, as well as opportunity for imperfect hedging on futures markets. In terms of control terminology, we have a combined stochastic control problem that uses both continuous control (for financial hedging) and impulse control (for selecting the operational regime). We solve the problem by separating the two types of controls and passing to a sequence of stochastic control with discretionary stopping sub-problems. This simplifies the theoretical analysis and allows for an efficient numerical implementation in the case of exponential utility. The latter situation reduces to a heap of optimal stopping problems. We then compute the solution using a regression Monte Carlo scheme. We also show that our method provides a robust way of obtaining the indifference value of operational flexibility or alternatively of access to financial markets for general risk-preferences.

Michael Ludkovski
University of Michigan
mludkov@umich.edu

MS4
TBA

Glen Swindle
M.D. Credit Swiss First Boston
glen.swindle@csfb.com

MS5
Pricing and Hedging in Illiquid Financial Markets

We present a new approach to model liquidity effects from

dynamic trading in financial markets with limited depth. The main idea is to use a utility indifference prinicple to specify a nonlinear pricing rule whose implications for wealth dynamics can be described by nonlinear stochastic integrals. For the special case of exponential utility in a Browninan framework, we provide closed-form pricing and hedging formulae and solve explicitly the problem of optimal investment in an illiquid financial market.

Peter Bank
Department of Mathematics
Columbia University
pbank@math.columbia.edu

Dmitry Kramkov
Carnegie Mellon University
Pittsburgh
kramkov@andrew.cmu.edu

MS5

Viscosity Solution Approaches for some Optimal Stopping and Control Problems in Investment with Uncertainty

Xin Guo
School of Operations Research and Industrial Engineering
Corenll University
xg29@cornell.edu

MS5

Optimal Hedging and Parameter Uncertainty

A claim on a non-traded asset is optimally hedged using a correlated traded asset, both assets following geometric Brownian motions. The optimal hedging strategy requires knowledge of the drift parameters of the price processes, which are difficult to estimate. We investigate the effect of parameter uncertainty on the performance of the optimal hedge. First, we compute hedging error distributions when erroneous values of the parameters are used to compute the optimal hedge, comparing with Black-Scholes-type strategies which assume the traded asset is a perfect proxy for the non-traded one, and which do not require knowledge of the uncertain parameters. We then assume the unknown parameters each have a Gaussian prior distribution and use techniques of filtering theory to derive the optimal hedging rules. The performance of the resulting strategies is also evaluated.

Michael Monoyios
Department of Mathematics
Oxford University
monoyios@maths.ox.ac.uk

MS5

Are Option-pricing and Utility-maximization Problems Well-posed?

The effectiveness of the utility-maximization techniques for derivative pricing or portfolio management rests on the ability to estimate correctly the parameters of the dynamics of the financial assets. In the setting of possibly incomplete financial markets, we investigate whether the small perturbations of the market coefficient processes lead to small perturbations in the pricing schemes and portfolio strategies derived from solutions the the related utility-maximization problems. Mathematically, we identify the topologies on the parameter-process space and the solution space under which the utility maxization is a continuous operation, and provide counterexamples showing that our results are, in a certain sense, best possible. Several novel results about the structure of the solution of the utility-maximization problem where the prices are continuous semimartingales are established as offshoots of the proof of the central result.

Gordan Zitkovic
Department of Mathematics
The University of Texas at Austin
gordanz@austin.utexas.edu

MS6

Markov Processes with Jumps

Discontinuous Markov processes offer analytic challenges because of the non-local character of their infinitesimal generators. We develop the theory of such processes using the jump times as regeneration points. In particular, we solve the integro-differential equations of Kolmogorov and compute various hitting distributions.

Erhan Cinlar
Princeton University
ecinlar@princeton.edu

MS6

On Indifference Pricing of Equity-Linked Insurance and Reinsurance Contracts

Insurance companies are increasingly facing losses that have heavy exposure to capital market risks through the issuance of equity-linked insurance policies. In this paper, we determine the continuous premium rate that an insurer charges via the principle of equivalent utility. Using exponential utility, we obtain the resulting premium rate in terms of a risk-neutral expectation. We also consider the related problem of pricing double-trigger reinsurance contracts, paying a function of the risky asset and losses, once the insurer has fixed her premium rate. We solve the Hamilton-Jacobi Bellman equation arising in the indifference pricing problem and show that the price satisfies a PDE with a non-linear shift term. Although a closed form solution is not, generally, attainable, we obtain analytical results in some special cases. Finally, we recast the pricing PDE as a linear stochastic control problem and provide an explicit finite-difference scheme for solving the PDE numerically.

Sebastian Jaimungal
University of Toronto, Canada
sjaimun@ustat.utoronto.ca

MS6

Optimal Surrender Strategies for Equity-Indexed Annuities

Equity-indexed annuities (EIAs) are extremely popular because they allow the investor to participate in equity growth, while providing protection from downside risk; indeed, EIA sales for 2004 were approximately $17 billion. The investor does not earn the full growth on the underlying stock or index; she sacrifices some of the upside potential for the protection of the minimum guarantee. It is natural for an investor to consider whether she might construct a portfolio that could outperform the EIA by trading between the index (and thus earning the full return of the

index fund) and a risk-free account for downside protection. We consider a free-boundary problem that governs the optimal time for an EIA investor to surrender the contract and invest on her own. We present qualitative and quantitative properties of the optimal value function and surrender boundary and discuss criteria under which a nonzero lower surrender threshold (i.e., left-hand free boundary) exists.

Kirsten Moore
University of Michigan
kmoore@umich.edu

MS6

Pricing and hedging of Guaranteed Minimum Withdrawal Benefits

Tom Salisbury
York University
salt@yorku.ca

MS7

Dynamical Asset Markets: The Mathematics of Trader Behavior

Asset market experiments are analyzed by distinguishing, ex post facto, participants who trade on fundamentals versus those who trade on momentum (i.e., buying when price is rising). The distinction is made when prices are above fundamental value, so that (in each period) those who have more offers than bids (net offerers) are classified as fundamentalists while those who have more bids than offers (net bidders) are defined to be momentum players. These data are used in conjunction with a difference equation (derived from our asset flow differential equations) for price dynamics for two groups. Surprisingly, however, the fundamental traders, who exhibit a positive coefficient for trading on valuation, also exhibit a significantly positive coefficient for trend based buying. Thus, even those who are net offerers, classified as fundamentalists, are selling less and buying more of overvalued stock when there is a strong positive recent price change. There is also evidence that some fundamentalists change strategy to momentum trading as prices soar.

Gunduz Caginalp
University of Pittsburgh
Department of Mathematics
caginalp@pitt.edu

Vladimira Ilieva
Inst. for Behavioral Finance
Newark, NJ
ilieva@u.arizona.edu

MS7

Overreaction and Optimization in Stock Markets

We study price dynamics of stocks due to behavioral effects such as overreaction. We present computational optimization model with parameter identification techniques for financial markets by using multi-scale approach. Our study on a large set of financial data shows that the proposed mathematical and statistical models can be used for prediction of price under certain conditions.

Ahmet Duran
University of Pittsburgh
ahd1@pitt.edu

MS7

Bayesian Analysis of Individual Differences in Option Valuation

Option valuation plays an important role in financial economics. More broadly, many significant economic decisions require the valuation of options. Examples of important economic decisions that involve valuing options include valuing natural resource reserves, irreversible capacity investment, college attendance and retirement. There is little reason to believe that humans are able to solve (or behave as if they solved) option valuation problems accurately. It is well documented that humans perform poorly in even simple probability assessment tasks, so to the extent that option valuation involves probabilities we might expect humans to perform poorly here as well. This raises important questions including: how do people actually behave in the presence of choices that involve options; are there individual differences in the way people make decisions involving options, and if so, what are the nature and number of ways that people assign values to options? In this project we propose to address these questions experimentally using a Bayesian classification procedure. Our approach allows inferences regarding the nature and number of "decision rules" present in a population, while at the same time avoiding strong a-priori behavioral assumptions. The results of our analysis can provide a guide to policy meant to influence responses to a wide range of decisions that involve option evaluation.

Daniel Houser
George Mason University Department of Economics & ICES
dhouser@gmu.edu

MS7

The Behavior of Jet Fuel and Crude Oil Prices: Implications for Hedging in the U.S. Airline Industry

During 2004, crude oil prices reached a historical high triggering hedging activity by airlines. In this study, I examine the rationality of recent hedging behavior by airlines and the possibility that previously documented value created by airlines in their hedging programs is partially explained by the airlines ability to cross-hedge correct forecasts of jet fuel prices. Using difference of means tests, I test the normal distribution, seasonal behavior and price behavior following new highs of jet fuel, crude oil spot and crude oil futures prices. While jet fuel prices appear to exhibit some predictable tendencies, I find little evidence that these tendencies can be successfully hedged with crude oil futures. Moreover, attempting to hedge the price behavior examined in this study will probably result in hedging program losses, especially when transaction costs are considered.

Ray Sturm
Department of Finance, University of Central Florida
RSturm@bus.ucf.edu

MS8

Analysis of Rannacher Timemarching for Option Calculations

This talk will present a convergence analysis of Crank-Nicolson and Rannacher time-marching methods which are often used in finite difference discretisations of the Black-

Scholes equations. Numerical results confirm the sharpness of the error analysis which is based on asymptotic analysis of the behaviour of the Fourier transform. The relevance to Black-Scholes applications is discussed in detail, with numerical results supporting recommendations on how to maximise the accuracy for a given computational cost.

Mike B. Giles
Oxford University Computing Laboratory
Mike.Giles@comlab.ox.ac.uk

Rebecca Carter
Mathematical Institute
Oxford University
rebecca.carter@st-hughs.oxford.ac.uk

MS8

Comparison of Numerical Methods for Pricing American Options under Stochastic Volatility

Numerical solution methods for pricing American options under Heston's stochastic volatility model are studied. After a finite difference discretization prices for options are obtained by solving a sequence of discrete linear complementarity problems. By performing numerical experiments we compare the speed and accuracy of five numerical methods which are the projected SOR method, a projected multigrid method, a penalty method, an operator splitting method, and a componentwise splitting method.

Jari Toivanen
North Carolina State University
Raleigh
jatoivan@ncsu.edu

Samuli Ikonen
University of Jyvaskyla
Samuli.Ikonen@mit.jyu.fi

MS8

Numerical Schemes for Pricing in Incomplete Markets with an Application from Commodities

We will consider a multi-factor model for oil prices in terms of stochastic supply and demand. The associated multi-dimensional Hamilton-Jacobi-Bellman equation for the utility indifference price of option contracts will be the starting point for a numerical analysis of pricing schemes on sparse grids, which are both computationally tractable for high-dimensional models and at the same time give accurate prices and sensitivities. Simulation results for realistic scenarios will be given.

Christoph Reisinger
OCIAM
Mathematical Institute
christoph.reisinger@maths.ox.ac.uk

MS8

Numerical Valuation of European and American Options with Kou's Jump-Diffusion Model

With Kou's model the value of an European option satisfies a partial integro-differential equation. A finite differences discretization on nonuniform space-time grids is performed. For the evalution of the integral term a fast formula is derived. For European options the resulting linear problems are solved using an iterative method with a few iterations. The treatments of the early exercise constraint of American options using an operator splitting method and a penalty method are studied.

Jari Toivanen
North Carolina State University
Raleigh
jatoivan@ncsu.edu

Samuli Ikonen
University of Jyvaskyla
Samuli.Ikonen@mit.jyu.fi

MS9

Robust Numerical PDE Schemes for Exotic Options

We present numerical schemes for pricing and hedging exotic options with nonsmooth payoffs, multiple strike prices, and discrete barriers. Due to such discontinuties in the solution(or its Derivatives), standard numerical PDE methods are prone to produce large and spurious oscillations in the numerical solutions which would mislead to estimating options and their Greeks accurately. The proposed methods do not suffer these drawbacks due to their strong stability properties. Numerical examples are presented to demonstrate the robustness of the methods.

Abdul M. Khaliq
Middle Tennessee State University
Department of Mathematical Sciences
akhaliq@mtsu.edu

David A. Voss
Western Illinois University
d-voss1@wiu.edu

MS9

Extrapolation Discontinuous Galerkin Method for the Valuation of Asian Options

We consider the application of the method-of-lines to the ultraparabolic characterization of the value problem associated with Asian options. More specifically, we discretize the semi-autonomous problem utilizing linear Lagrange finite elements. Temporal discretization is obtained through a coupled hp-version extrapolation discontinuous Galerkin method. Numerical examples are provided in which we adaptive both the temporal mesh and the method order from first to fifth relative to a given absolute temporal error tolerance.

Michael D. Marcozzi
Department of Mathematical Sciences
University of Nevada, Las Vegas
marcozzi@unlv.nevada.edu

MS9

Option Pricing using Radial Basis Functions

We use a radial basis function method to solve the multi-dimensional Black-Scholes equation for valuation of European options. We show how to improve the accuracy by appropriate choices of node points. The effect of the radial basis function shape parameter on the asymptotic behavior of the method is illustrated numerically. Compared with an adaptive finite difference method, the radial basis function

method is 20-40 times faster in one and two dimensions.

Jonas Persson, Elisabeth Larsson
Uppsala University, Sweden
Department of Information Technology
jonas.persson@it.uu.se, Elisabeth.Larsson@it.uu.se

Gunnar Marcusson
Försäkringsmatematik, Stockholm
Sweden
gunnar.marcusson@forsakringsmatematik.se

Ulrika Pettersson
Uppsala University, Sweden
Department of Information Technology
ulrika.pettersson@it.uu.se

MS9

Trading Maximum Drawdown and Options on Maximum Drawdown

Maximum Drawdown is becoming increasingly important in the risk management and in the portfolio optimization. In this talk, we note that the Maximum Drawdown can be traded as a derivative asset. Several related contracts, such as Call or Put options on the Maximum Drawdown, or barrier option on the Maximum Drawdown (Crash option) are also discussed. These contracts can facilitate risk management for financial institutions concerned with control of the drawdown of their portfolio. We use partial differential equation approach for pricing the maximum drawdown, and discuss the numerical methods to obtain the values.

Petr Novotny, Libor Pospisil, Jan Vecer
Columbia University
Department of Statistics
pn2123@columbia.edu, lp2185@columbia.edu,
vecer@stat,columbia.edu

PP0

Pricing of Derivatives by Fast, Hardware Based Monte Carlo Simulation

It will be shown how typical problems of financial engineering can be solved completely in hardware. As an example we have chosen the pricing of derivatives by Monte Carlo simulations. It turns out that so called FPGAs (field programmable gate arrays) can be configured to run the whole algorithm in parallel. A single chip is able to accelerate the calculation by two orders of magnitude measured against state-of-the-art personal computers.

Melanie Elm, Joachim K. Anlauf
University of Bonn, Germany
Institute for Computer Science
elm@informatik.uni-bonn.de,
anlauf@informatik.uni-bonn.de

PP0

Properties of the Phase Transitions in a Spin Market Model

In our past work, we investigated the nature of the phase transitions in a spin market model as a function of the interaction strength between local and global effects. We had found the stochastic dynamics of this stylized market model exhibit a periodicity whose dependence on the global coupling constant in the Ising-like Hamiltonian is robust to changes in the temperature and the size of the market. In this short note, we present an alternative form of the Hamiltonian; namely, we introduce a coupling constant for the local network and analyze its interaction with the existing global coupling constant with respect to phase transitions. We relate the periodicity of the dynamics discussed above to the global extrema that emerge out of the numerical approximations. Finally, we comment on the size of the local neighborhood in terms of the overall size of the market.

Robert Boyer
Drexel University
Mathematics Department
boyerrp@drexel.edu

Amal Aafif
Department of Mathematics
Drexel University
amal@drexel.edu

Muffasir Badshah
Department of Statistics, Florida State University
muffasir@stat.fsu.edu

PP0

Parametric Estimation Strategies in Molecular Simulation Using Ideas from Finance

A variety of researchers involved in molecular simulations have successfully obtained the parameters of diffusion models using the data that comes out of these simulations. This naturally raises a variety of questions about efficient estimation, inference and robustness. Some of the issues encountered in this type of endeavor are similar to those facing the computational/mathematical finance communities (especially those involved with multiscale process estimation). Work and applications concerned with parametric stationary and nonstationary estimation will be presented.

Christopher P. Calderon
Princeton University
ccaldero@princeton.edu

PP0

Portfolio Choice with Multi-Factor Stochastic Volatility

We develop a theoretical model for optimal portfolio choice in the presence of multi-factor stochastic volatility, following and extending Fleming and Hernández-Hernández (2003). The project is geared toward providing guidelines for short term portfolio managers. Possibilities of numerically computing the optimal portfolio weights and consumption rule are explored. Our attention is focused on providing rigorous proofs for characteristics of value function, portfolio weights, and optimal consumption rules, as well as efficient methods to numerically compute the dynamical systems and control policies.

Mohammad R. Jahan-Parvar, Amarjit Budhiraja
UNC Chapel Hill
mrjahan@email.unc.edu, abudhiraj@email.unc.edu