Friday, September 21st

Marek Musiela - "Implied Preferences and Bespoke Portfolios":
We consider an investment problem with a performance criteria which combines the investor preferences with the market related inputs. Consequently, the optimal portfolio generates the wealth process which contains implicit information about the preferences. In this paper we show how to learn about these preferences by analysing the properties of the optimal wealth process. For example, we show, under the assumption of deterministic market price of risk, that the specification of the mean of the optimal wealth process determines the investor preferences and implicitly his bespoke portfolio. (Joint work with Thaleia Zariphopoulou).

Peter Schaller - "Consistent Incorporation of Statistical Uncertainties Into Quantile Estimates":
Besides giving an introduction into the subject, which practically arose from the problem of model risk in the context of Value at Risk estimates for financial portfolios and led to an elegant theoretical solution, the talk will also provide results not yet published in the literature.

Uwe Wystup - "About the Price of a Guarantee - A Statistical Evaluation of Returns of long-term Investments":
Retail investors saving for their retirement are currently offered several funds with guarantee features in the German market. Either the capital or parts of it or a minimal annual return are different forms of guarantees. Investment opportunities are either "certificates" issued by banks or "funds". Often investors are afraid of market crashs or an asset melt-down, the need for products with guarantee is increasing. In this paper we analyze the current market situation, discuss the most widely traded products, identify the classic types of guarantee products -- "discount", "bonus", "performance" and "CPPI" and simulate their returns in a jump diffusion model over a 25 year time horizon. As a result we find on the one hand products with guarantee attractive as they often guarantee a return only slightly below the risk-free rate, but end up with an average return of about half the benchmark index. on the other hand they perform really poor compared to some actively managed funds without guarantee, even taking into account the management fees.

Ludger Overbeck - "Risk Measures for Structured Credit Products":
In the paper we first present the basic mathematical modeling features of Collaterized Debt Obligations. Here we will concentrated on synthetic products which are based on Credit Default Swaps. Then the standard "Greeks" are examined. Different from most standard option products, the Gamma is not very informative. The non-linearity is usually measured in terms of gap- and jump-to-default risk. We present some analytic recursion methods to calculate this figures. The main focus of the paper however are the portfolio dependent risk measures, like spread and risk contributions. These measures are nowadays well known and easy to understand in linear portfolios. Portfolios of CDOs exhibit a non-linear structure. But we will show how to overcome these difficulties, in particular in the context of spread contributions. As a final topic we will show that spectral risk measures are more appropriate for the risk analysis of portfolios of CDOs than measures analyzing only a specific part of the loss distribution, like Value-at-Risk and Expected Shortfall. Especially, the role of the risk aversion weight function becomes transparent.

Session 1

Georg Pflug - "Pricing of Swing Options and Stochastic Games":
Credit portfolios, as for instance Collateralized Debt Obligations (CDO's) consist of credits that are heterogeneous both with respect to their ratings and the involved industry sectors. Estimates for the transition probabilities for different rating classes are well known and documented. We develop a coupled Markov Chain model, which uses the transition probability matrix as the marginal law plus event correlation coefficients within and between industry sectors and between rating classes to find the joint law of migration of all components of the portfolio, even for large portfolios. We avoid to use firm value correlations as proxies for event correlations. the empirical part of the study is based on a data set containing 10413 time series of ratings of individual firms from 30 OECD countries with a period of ten years. In this period, 639 defaults were observed. We show how the number of defaults in large portfolios may be approximated by mixtures of multinomial variables, which in turn can be approximated by mixtures of normal variables. We show how the percentiles of the number of defaults depend on the inter-sectoral and intra- sectoral event correlations.

Jörg Behrens - "Strategic Risk Management: Ideas and Questions":
While risk management is highly sophisticated and forms an integral part of the financial services industry, most firms still struggle to benefit from their analytical know-how when it comes to strategic planning. We discuss problems and ideas to bridge the gap between the two worlds.

Ying Jiao - "Dynamical Modelling of Successive Defaults":
We propose a new approach, based on the density process of the F-conditional survival probabilities where F represents some background filtration, to study the successive defaults in a dynamical way. We emphasize on the case "after-default" and on the necessity to model the density process a(t,u) for any positive t,u, particularly for u<t. We also explain the relationship between the density process and the classical notion --- the intensity process. in this framework, we are able to calculate all G-conditional expectations, notably on the after-default event, where G is the global market filtration which contains the default information and is strictly larger then F. Furthermore, the framework can be extended naturally to successive defaults in a systematic and recursive way. The difficulty related to the filtrations with jumps can be surpassed and the problem is reduced to model a joint density process with respect to the filtration F which we can suppose to possess "good" regularity property. The contagious default phenomenon can be explained intrinsically from the conditional dependence among credits on the filtration F (similar ideas appeared in Schoenbucher and Schubert (2001)). Finally, we apply this approach to two main types of credit portfolio derivatives --- kth-to-default basket swaps and CDOs. In fact, for both products, it suffices to study ordered defaults. (Joint work with N. El Karoui and M. Jeanblanc)

Romuald Elie - "Optimal Consumption Investment Strategy Under Drawdown Constraint":
We consider the horizon optimal consumption-investment problem under the drawdown constraint, i.e. The wealth process never falls below a fixed fraction of its running maximum. We assume that the risky asset is driven by the constant coefficients Black and Scholes model and we consider a general class of utility functions. on an infinite time horizon, we provide the value function in explicit form, and we derive closed-form expressions for the optimal consumption and investment strategy. The obtention of the solution is based on a duality argument. on a finite time horizon, we interpret the value function as the unique viscosity solution of its corresponding Hamilton-Jacobi-Bellman equation. This leads to a numerical scheme of approximation and allows for a comparison with the explicit solution in infinite horizon.

Peter Laurence - "Hedging and Pricing of Generalized Spread Options and the Market Implied Comonotonicity Gap":
In two papers, joint with Tai-Ho Wang, we provide optimal super replicating strategies for generalized spread options. These are basket options with weights that can be either positive or negative . We also provide optimal subreplicating strategies. These lead to a new trading strategy, based on the difference between the market implied co- or antimonotonic price and the traded price.

Session 2

Sotirios Sabanis - "A Note on the Q-Optimal Martingale Measure":
An important and challenging problem in mathematical finance is how to choose a pricing measure in an incomplete market, i.e. how to find a probability measure under which expected payoffs are calculated and fair option prices are derived under some notion of optimality. In an incomplete market, the choice of the equivalent martingale measure (EMM) for the underlying price process is not unique. Over the last twenty years, many authors have proposed different preference based criteria in order to choose a `suitable' pricing measure from the class of EMMs. Two of the most popular choices are the minimal entropy EMM, see for example Frittelli (2000), and the variance optimal EMM, see Delbaen & Schachermayer (1996). Recently, Hobson (2004) proposed a unifying framework called the q-optimal measure, for a wide range of EMMs choices, that includes the two aforementioned measures. The notion of q-optimality is linked to the unique EMM with minimal q-moment (if $q > 1$) or minimal relative entropy (if $q=1$). Hobson's (2004) approach to identifying the q-optimal measure (through a so-called fundamental equation) suggests a relaxation of an essential condition appearing in Delbaen & Schachermayer (1996). This condition states that for the case $q=2$, the Radon-Nikodym process, whose last element is the density of the candidate measure, is a uniformly integrable martingale with respect to any EMM with a bounded second moment. Hobson (2004) alleges that it suffices to show that the above is true only with respect to the candidate measure itself and extrapolates for the case $q>1$. Cerny & Kallsen (2006) however presented a counterexample (for $q=2$) which demonstrates that the above relaxation does not hold in general. The author will present the general form of the q-optimal measure following the approach of Delbaen & Schachermayer (1994) and prove its existence under mild conditions. Moreover, in the light of the counterexample in Cerny & Kallsen (2006) concerning Hobson's (2004) approach, necessary and sufficient conditions will be presented in order to determine when a candidate measure is the q-optimal measure.

Alexander Kulikov - "Multidimensional Coherent and Convex Risk Measures":
First the notion of coherent risk measure was introduced in the landmark paper [1] by Artzner, Delbaen, Eber and Heath. Since those papers, the theory of coherent risk measures has been evolving rapidly. But only one-dimensional risk measures are under consideration, i.e. They measure risk of one-dimensional random variables, which from the financial point of view are the prices of portfolios in base currency. This approach is valid if we have such currency. However, it is not valid, for example, when we describe the portfolio consisting of some currencies, because there is no "canonical" currency in such a case. In this case it is more natural to use multidimensional approach given by Kabanov in [3]. The notion of multidimensional coherent risk measure was introduced in [2] by Jouini, Meddeb, Touzi. Their approach aims to take into account transactional costs while exchanging one currency to another. But in their model transactional costs are not random. So they do not take into account risk connected with changing of currency exchange rates that is one of the most important risks nowadays. Here we introduce the notion of multidimensional coherent risk measure which takes into account this type of risks. This approach is similar to the approach considered in the paper [2], but the matrix of currency exchange rates is random. Besides the task of risk measurement, the task of the allocation of risk between some parts of portfolio is also very important. This problem is closely connected with the problem of risk contribution. Also we give the solution of these problems in terms of multidimensional coherent risk measures. The solution is determined via the notion of multidimensional extreme element.
References:
[1] P. Artzner, F. Delbaen, J.-M. Eber, D. Heath. Thinking coherently. Risk, 10 (1997), No. 11, p. 68-71.
[2] E. Jouini, M. Meddeb, N. Touzi. Vector-valued coherent risk measures.; Finance and Stochastics, 8 (2004), p. 531-552.;
[3] Yu.M. Kabanov. Hedging and liquidation under transaction costs in currency markets. Finance and Stochastics, 3 (1999), No. 2, p. 237-248.

Pavel Grigoriev - "Kusuoka's Formula for Dynamic Risk Measures":
In the talk the properties relevant to law-invariance for time consistent dynamic convex risk measures will be discussed. An extension of Kusuoka's representation theorem for static law-invariant risk measures for dynamic case will be proposed.

Silvia Romagnoli - "The Dependence Structure of Running Maxima and Minima: Results and Option Pricing Applications":
We provide general results for the dependence structure of running maxima (minima) of sets of variables. Using

copula functions, we derive recursive formulas for running minima and maxima. These formulas enable us to use a "bootstrap" technique to estimate the difference between the pricing kernels of European options and barrier options on a grid of dates. We also show that the dependence formulas for running maxima (minima) are completely defined from the copula function representing dependence among levels at the terminal date. The result is useful to provide pricing applications for derivatives and structured products based on multivariate running maxima (minima). Altiplanos with pay-offs determined on a discretely monitored barrier are evaluated using the dependence structure of the corresponding European products. The difference in price is simply the volume of this copula between the coordinates of the European prices and those of the running maxima (minima). (Joint work with Umberto Cherubini.)

Jan Sindelar - "Adaptive Control Applied to Financial Market Data":
Our research aim is to plan an optimal decision strategy in trading commodity futures markets. At a given time, we have to decide to buy or sell a commodity contract or stay out of the market. The decision is made using dynamic programming using many different quantities - previous price maxima and minima or variance, commitment of traders information or own engineered quantities taken out of trading experience. As a loss function we take the negative profit measured in money, where the probability density functions(PDF) are estimated using Bayesian learning. For computational solvability, we need to implement a series of approximations: predictive PDFs are computed using parametric models from an exponential family, giving us easy to adapt systems. We use point estimates to overcome the curse of dimensionality and we are trying to lower the number of dimensions (main components analysis etc.). We are trying to overcome dynamic evolution of PDFs by employing forgetting older data. Trading costs (slippage and commission) are taken into account. The theory is supported by a series of experiments indicating our ability to construct a profitable trading machine. The research is conducted in cooperation with industry (Colosseum corporation).

Session 3

Martin Hillebrand/Ashay Kadam - "Dynamic Loss Modeling for Heterogeneous Credit Portfolio":
Extant models for portfolio losses with heterogeneous default rates and heterogeneous exposure sizes have an important shortcoming viz. they require computationally expensive Monte Carlo simulations. CreditRisk+ is a notable exception that allows for computation of the loss distribution analytically. with moderate restrictions on dependency modelling, it uses generating functions to compute the loss probabilities quickly and accurately. However, this advantage is overshadowed by the fact that it is a static single period model. This is a major drawback when working with portfolio exposures having different maturities and when pricing instruments where the term structure of default rates matters. The framework proposed here incorporates time varying default rates and volatilities that may differ across names as well. Equally important is the fact that this framework does not require exposure banding (as CreditRisk+ does). The evolution of loss distribution with time can be modelled using the Cox-Ingersoll-Ross processes as latent macroeconomic processes driving the dynamic default intensities. The characteristic function of the credit portfolio loss can be obtained explicitly. Using the Fast Fourier Transform it can be inverted to obtain the portfolio loss distribution in a numerically stable manner. It may be possible to extend the setup we propose to incorporate stochastic LGD and EAD; this is the focus of ongoing work.

Rolf Klaas - "A Structural Multi Issuer Credit Risk Model Based on Square Root Processes":
In this first passage time approach the ability to pay process of an obligor is composed of two independent basic affine processes without jump component. This is exemplified for the squared Bessel processes. The default barrier is defined to be equal to zero. In order to introduce dependence between different obligors, similar to the Basel II one factor model, one process is common to all obligors belonging to the same industry sector, whereas the second process represents the idiosyncratic component. The common process is a stopped process, where the associated stopping time is the first hitting time of zero. Since the default time is the first time the credit quality process hits zero, a default can only happen after the common process has reached zero. The default probabilities, joint default probabilities and default correlations are compared to other multivariate credit risk models like Gaussian copula models. Extensions to a multi-factor model are discussed.

Giuseppe Di Graziano - "A Dynamic Approach to the Modelling of Correlation Credit Derivatives Using Markov Chains":
The modelling of credit events is in effect the modelling of the times to default of various names. The distribution of individual times to default can be calibrated from CDS quotes, but for more complicated instruments, such as CDOs, the joint law is needed. Industry practice is to model this correlation using a copula or base correlation approach, both of which suffer significant deficiencies. We present a new approach to default correlation modelling, where defaults of different names are driven by a common continuous-time Markov process. Individual default probabilities and default correlations can be calculated in closed form. As illustrations, CDO tranches with name-dependent random losses are computed using Laplace transform techniques. The model is calibrated to standard tranche spreads with encouraging results.

Tanja Veza - "The Economic Role of Jumps and Recovery Rates in the Market for Corporate Default Risk":
Using an extensive cross section of US corporate CDS panels this paper offers an economic understanding of their time-series behavior, implied loss given default, as well as risk premia attached to the risk of sudden jumps in CDS spreads. We take a parametric approach with an affine multi-factor reduced-form model accommodating jumps in both riskless and defaultable factors. Jumps improve the model's capability to capture empirical properties specific to CDS premia. CDS written on obligors in industries with long investment cycles and long-term financing exhibit significantly less frequent jumps. The probability of structural migration to default is considered so low for investment-grade obligors that investors fear distress only through rare, but devastating events. Similarly, investors assign a low probability of structural default to firms with Financials and Utilities sector affiliation. High correlation of default processes with the VIX index indicates a strong relation of corporate CDS premia to equity. Implied LGD is well identified and compares to historically realized values. Obligors with substantial tangible assets are expected to recover more in default. A clear-cut distinction in the level of LGD shows between investment-grade and speculative-grade issuers. Thus, industry practice of assuming equal LGD across ratings and sectors is not compatible with market data. Using our cross section of implied LGD we provide figures which are, on average, consistent with rating and industry.

Stefan Tappe - "Existence of Lévy Term Structure Models and Finite Dimensional Realizations":
Lévy driven term structure models have become an important subject in the mathematical finance literature. From a financial modelling point of view one would consider the volatility of such a Heath, Jarrow and Morton (HJM) term structure model to be a function of the prevailing forward curve. As wee shall see, this makes the forward rates being a so-called mild solution of an infinite dimensional stochastic differential equation in some suitable Hilbert space of forward curves. This is a key observation for our first goal of the talk, namely to provide the existence of a solution for the HJM equation in the Lévy case. For this purpose, we give some existence results for Lévy driven stochastic differential equations with Lipschitz continuous parameters in a general Hilbert space. In order to apply these results to HJM equations, we have to find an appropriate Hilbert space of forward curves. There are several reasons why, in practice, one is interested in such HJM models which admit a finite dimensional realization (FDR), that is the forward rate process proceeds on a finite dimensional submanifold of the Hilbert space of forward curves. So, our second goal is to characterize, in terms of the forward rate volatilities, those HJM models possessing an FDR. Using ideas from differential geometry, this is achieved by translating the FDR problem into a deterministic problem related to the volatility structure.

Session 4

Michel Verschuere - "Hedging Under Uncertainty: Applications to Carbon Emissions Markets":
We discuss a model for a market with two tradeable asset where the price of the first asset depends on the price of the second asset and the value of an additional source of uncertainty that can not be traded. the source of uncertainty intervenes in the drift of the dynamics defining the price of the second asset. We apply stochastic filtering theory to price the first asset in terms of the second one under the augmented filtration for price and drift component. We illustrate how our model can be applied to markets for EU carbon emission allowances and calculate the value of a digital option on the event that the ETS zone falls short allowances at the end of a trading phase. (Joint work with Umut Cetin of London School of Economics)

Philipp Mayer - "Stable Calibration Methods for Financial Market Models of Local Lévy Type":
In the last decade many research activities were undertaken to find stable calibration methods for financial market models to fit an observed option price surface. In particular the calibration of the Dupire model attracted much attention, as it is able to fit the marginals of any Itô process. the problem of fitting the local volatility function to the option surface is ill-posed and hence some effort was taken to regularize this problem (e.g. using Tikhonov-regularization as in Crepey [3] or Egger & Engl [4]. As the Dupire model is known to perform poorly when it is used for the pricing of path-dependent options in recent years more general models with a similar degree of variability were introduced in the literature (for instance the local Lévy model proposed by Carr et al. [2] or a local volatility model with jumps as considered by Andersen & Andreasen in [1]). One advantage of such models is, for example, that skewed log-returns can also be introduced via the jump term (instead of solely by means of the local volatility function). However, the calibration of these models requires amongst other things the identification of generalized “local volatility” and so-called “local speed” functions. in this talk we present a non-parametric stable calibration method based on Tikhonov regularization for such generalized Lévy market models. While the original calibration problem is more ill-posed than the Dupire calibration problem, we are able to prove stability and convergence of the regularized problem and in some cases convergence rates can be derived under the common assumption of an abstract source condition. Finally we underpin the theoretical results by numerical illustrations.