Risk & Stochastics and Financial Mathematics Joint Seminar in 2010

Seminars are listed in reverse chronological order, most recent first.

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8 November - Luitgard Veraart (LSE)
The relaxed investor with partial information

We consider an investor in a financial market consisting of a riskless bond and several risky assets. The price processes of the risky assets are geometric Brownian motions where either the drifts are modelled as random variables assuming a constant volatility matrix or the volatility matrix is considered random and drifts are assumed to be constant. The investor is only able to observe the asset prices but not all the model parameters and hence information is only partial. A Bayesian approach is used with known prior distributions for the random model parameters.

We assume that the investor can only trade at discrete time points which are multiples of h>0 and investigate the loss in expected utility of terminal wealth which is due to the fact that the investor cannot trade and observe continuously. It turns out that in general a discretization gap appears, i.e for $h \to 0$ the expected utility of the h-investor does not converge to the expected utility of the continuous investor. This is in contrast to results under full information in(Rogers, L.C.G. 2001. The relaxed investor and parameter uncertainty. Finance and Stochastics, 5 (2), 131-154).

We also present simple asymptotically optimal portfolio strategies for the discrete-time problem. Our results are illustrated by some numerical examples.

This is joint work with Nicole Bäuerle and Sebastian Urban.

29 April - Yuliya Mishura (Kyiv)
Financial applications of the models with long-range dependence

In our work we move away from the semimartingale model of financial market and consider the models with so called long-range dependence. The arbitrage problems are discussed in the most general setting.

In particular, we consider financial market with risky asset governed by both the Wiener process and fractional Brownian motion with Hurst parameter $H>3/4$. Using Hitsuda and Cheridito representations for the mixed Brownian--fractional

Brownian process, we present the solution of the problem of quantile hedging and clarify in
this case the dependence of maximal possible success probability on the available initial capital $\nu < H_0$. More general problem of efficient hedging is also solved.

11 March - Hans Rudolf Lerche (Freiburg)
Blackwell Prediction

Let $x_1, x_2, \dots$ be a (not necessarily random) infinite 0-1 sequence. We wish to sequentially predict the sequence. This means that, for each $n \geq 1$, we will guess the value of x_{n+1}, basing our guess on knowledge of $x_1, \dots, x_n$. Of interest are algorithms which predict well for *all* 0-1 sequences. An example is the algorithm of Blackwell. It can be deduced from Blackwell's generalization of the von Neumann minimax theorem on games. We shall discuss this and the generalization of Blackwell's algorithm to three and more categories. The three category algorithm will be explained using a geometric model (the so-called prediction prism). The Blackwell algorithm has interesting properties. It predicts arbitrary 0-1 sequences as well or better than independent, identically distributed Bernoulli variables, for which it is optimal. Similar results hold for the three and more category generalizations of Blackwell's algorithm.

5 Feb - Tomas Björk (Stockholm School of Economics)
Time inconsistent stochastic control

We present a theory for stochastic control problems which, in various ways, are time inconsistent in the sense that they do not admit a Bellman optimality principle. We attach these problems by viewing them within a game theoretic framework, and we look for subgame perfect Nash equilibrium points.

For a general controlled Markov process and a fairly general objective functional we derive an extension of the standard Hamilton-Jacobi-Bellman equation, in the form of a system of non-linear equations, for the determination for the equilibrium strategy as well as the equilibrium value function. All known examples of time inconsistency in the literature are easily seen to be special cases of the present theory. We also prove that for every time inconsistent problem, there exists an associated time consistent problem such that the optimal control and the optimal value function for the consistent problem coincides with the equilibrium control and value function respectively for the time inconsistent problem. We also study some concrete examples.