Abstracts of Keynote Speakers

**Thomas Kurtz, University of Wisconsin - Madison**

*Linear programs for singular stochastic control*

Singular stochastic control problems can be formulated as stochastic equations, as martingale problems, or as deterministic equations for process distributions. In most settings these formulations are equivalent. For optimal control problems, the third leads naturally to an infinite dimensional linear program that can be exploited for theoretical analysis and the development of computational algorithms. The equivalence of the problem formulations and the corresponding linear programs will be described in a variety of settings.

**Stanley Pliska, University of Illinois at Chicago**

*Portfolio Optimization: the Quest for Useful Mathematics*

Dating from the seminal work of Nobel Laureates Markowitz, Samuelson, and Merton, some very sophisticated optimization and stochastic control models have been developed for the purpose of effectively managing a portfolio of securities. Some of these are very sophisticated and appear to be very realistic. But aside from some possible use by some private hedge funds, these models are apparently rarely used in practice. This lecture will examine why. In the course of surveying the well known as well as some promising new mathematical approaches to portfolio management, the various methods will be compared using modest backtests with market data. While there is reason to be encouraged about the use of mathematical optimization models for portfolio management, our main conclusion is that future research on portfolio optimization needs to be more cognizant of practicalities and the realities of financial markets.
Philip Protter, Cornell University

*Liquidity risk and arbitrage pricing theory*

We review the classical theory of financial markets and explain that in order to work, they assume an infinitely liquid market and that all traders act as price takers. This theory is a good approximation for highly liquid stocks, although even there it does not apply well for large traders or for modelling transaction costs. We extend the classical approach by formulating a new model that takes into account illiquidities. Our approach hypothesizes a stochastic supply curve for a security’s price as a function of trade size. This leads to a new definition of a self-financing trading strategy, additional restrictions on hedging strategies, and some interesting mathematical issues. This talk is based on joint work with U. Cetin and R. Jarrow. Data analysis is joint work with M. Blais.

Jerome Stein, Brown University

*US Current Account Deficits: A Stochastic Optimal Control Analysis*

The United States current account deficit has been rising strongly since 1991 and exceeded 5% of GDP in 2005. This phenomenon has led economists and the financial community to ask: Has the US borrowed “too much”? What is “too much”? Does a continuing external deficit mean that the country is living beyond its means?

The economics literature does not arrive at any logically compelling, quantitative and objective evaluation of whether the United States current account deficits are sustainable and whether they are leading the US to a serious crisis. Using stochastic optimal control and dynamic programming, I derive equations for the optimum debt ratio and ratio of current account/GDP and explain how the deviation of the actual debt from the optimal debt increases the vulnerability of the economy to shocks. Using publicly available data I provide quantitative estimates of the deviation of the actual from the optimal current account deficit.

The underlying parameters that are used in the equations for optimal ratios are estimated from historical data. There are confidence limits on these estimates and historic distribution functions are not immutable. By selecting estimates within confidence limits, we show how the optimal current account deficit/GDP changes when we use “conservative” estimates of some basic parameters, rather than just their estimated sample means. Our equations for optimality can be adjusted by being “forward looking”. For example, one uses information or subjective estimates of changes in the distribution functions.
Denis Talay, INRIA, Sophia Antipolis

Stochastic control and mathematical analysis of technical analysis in finance
(with C. Blanchet-Scalliet, A. Diop, R. Gibson, E. Tanrê)

We aim to compare financial technical analysis techniques to strategies which depend on a mathematical model. In this lecture, we consider the moving average indicator and an investor using a risky asset whose instantaneous rate of return changes at an unknown random time. We construct mathematical strategies. We compare their performances to technical analysis techniques when the model is misspecified.

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