PRisMa 2012
One-Day Workshop on Portfolio Risk Management

Friday, October 5th, 2012, 9:00–18:30, Hörsaal 6 (organised by PRisMa Lab)

9.00-9.10	Prof. Dr. Uwe Schmock (FAM @ TU Wien) **Welcome**
9:10-10:00	**Prof. Dr. Thorsten Rheinländer** (FAM @ TU Wien) **Financial Alchemy** While the holy grail of medieval alchemists was to transmute common metals into more precious ones, modern dual market theory attempts to turn rather complicated derivatives into simpler ones by a change of numeraire technique where the underlying price process (given it is a martingale) acts as price deflator. We first review the classical put-call parities as well as symmetries and provide a link due to Molchanov and Schmutz via random convex sets. One of the most spectacular applications of dual markets techniques is related to the pricing of the Russian option which in its most basic form is a perpetual lookback option. According to Peskir and Shiryaev, a dual market transform allows one to evaluate the pricing expectation via a univariate rather than a bivariate distribution in the original market. However, as in the medieval counterpart, to achieve these transformations there is some magic involved, namely in the form of rather stringent assumptions on the dynamics of the price process which need not always be satisfied in practice. We will discuss these in detail, and provide a general duality result which allows via anticipative stochastic calculus to achieve more general transmutations involving additional volatility linked hedging instruments. The original parts of this presentation are jointly with Zhanyu Chen; Michael Schmutz; and Jenny Sexton.
10.00-10.30	Coffee Break
10:30-11:20	**Prof. Dr. Rüdiger Frey** (Statistics and Mathematics, WU Wien) **Dynamics of Corporate Security Prices in Firm Value Models with Incomplete Information** The talk is concerned with structural credit risk models with incomplete information of the asset value. We start with a brief discussion of incomplete information in credit risk models and a short introduction to nonlinear filtering. In the main part of the talk we explain that the pricing of typical corporate securities such as equity, corporate bonds or CDSs leads to a nonlinear filtering problem. This problem cannot be tackled with standard techniques so that we transform it to a standard filtering problem for a stopped diffusion process. This problem is analyzed via SPDE results from the filtering literature. In particular we are able to characterize the default intensity under incomplete information and we give an explicit description of the dynamics of corporate security prices. Finally, we briefly explain how the model can be applied to the pricing of bond and equity options.
11:20-12:00	**Dr. Christoph Czichowsky** (Faculty of Mathematics, University of Vienna) **Shadow Prices: Sufficient Conditions, Counter-Examples, Explicit Construction** To solve utility maximization problems under proportional transaction costs, one can sometimes replace the original market with transaction costs by a frictionless shadow market that gives the same optimal strategy and utility. In this talk we provide sufficient conditions, when this is possible, as well as counter-examples in the case the conditions are not satisfied. For the geometric Ornstein-Uhlenbeck process we explicitly construct such a shadow price to determine the growth-optimal portfolio under transaction and explain the effects resulting from the stochastic investment opportunity set in this construction. The talk is based on joint work with Philipp Deutsch and Walter Schachermayer.
12.00-13:40	Lunch Break

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13:40-14:30	**Prof. Dr. Josef Teichmann** (Department of Mathematics, ETH Zurich) **Consistent Long-Term Interest Rate Prediction** We introduce discrete-time models for the term structure of interest rates, which allow for arbitrage-free long-term prediction consistent with the current yield curve. We provide examples that being arbitrage-free and being consistent are two important properties of prediction models.
14:30-15:10	**Ramin Okhrati, PhD** (FAM @ TU Wien) **Integration Measures for Fixed Income Markets: Application in Credit Risk Spread** A consistent and integrated market should not let the agents take advantage of price differences to make a risk-free profit. The existence of classical arbitrage opportunities that can arise due to over- or under-estimating of the underlying risk, are one of the signs to indicate inefficiency in the market. As an alternative to the classical arbitrage methods to deal with this problem, we introduce a new indicator by using risk measures. First a type of arbitrage that defines itself very intuitively from the properties of risk measures, is introduced. Simply saying, if under a specific risk measure, the risk of a portfolio is less than or equal to zero then a possible positive portfolio income will be considered as an arbitrage income. A new tool to detect and measure these opportunities is established. Then, this is applied to develop a methodological procedure based on risk measures to gauge the credit quality of defaultable bonds in real bond markets. Finally, some numerical examples based on real market date are provided. (Joint work with Alejandro Balbás and José Garrido)
15:10-15:40	Coffee Break
15:40-16:20	**Dr. Kees van Schaik** (School of Mathematics, University of Manchester) **Optimal Prediction Problems for Lévy Processes** For a Lévy process X drifting to -∞, let ϑ be the time at which it (loosely speaking) attains its ultimate supremum. Now consider the problem of finding the stopping time τ that is closest (in L^1) to ϑ. This is an example of an optimal prediction problem. Such problems are closely related to classic optimal stopping problems, however in the case of an optimal prediction problem the payoff generated by some τ is typically not just a function of (τ,X_τ) but depends on the evolution of X after τ as well. Applications can be found in finance for instance (the optimal time to sell a stock e.g.). In this talk we will mainly focus on the specific example of the optimal prediction problem mentioned before (which is joint work with Erik Baurdoux, LSE, UK) and discuss for a general Lévy process how to find the optimal stopping time, thereby using established results that allow us to reformulate this problem as a classic optimal stopping problem. If time allows we might also shortly discuss some work in progress (with Jenny Sexton, University of Manchester/TU Vienna) concerning some other problems of this type.
16:20-16:50	**Sühan Altay, MSc** (FAM @ TU Wien) **Digital Double Barrier Options: Several Barrier Periods and Structure Floors** We determine the price of digital double barrier options with an arbitrary number of barrier periods in the Black-Scholes model. This means that the barriers are active during some time intervals, but are switched off in between. As an application, we calculate the value of a structure floor for structured notes whose individual coupons are digital double barrier options. This value can also be approximated by the price of a put option on the occupation time of the underlying asset, also called a corridor option. (Joint work with Stefan Gerhold and Karin Hirhager)
16:50-17:20	**Dipl.-Math. Cordelia Rudolph** (FAM @ TU Wien) **An Approximation via Iterated Panjer's Recursion for Poisson-Mixture Models** We discuss the collective risk model where the number of claims has a Poisson-mixture distribution. Since it is a common approach to choose a gamma distribution as a mixing distribution, we generalize this mixture approach to generalized gamma convolutions. A generalized gamma convolution is defined as the weak limit of a sequence of finite convolutions of independent gamma distributions. Existing recursions for such a compound Poisson-mixture distribution require the evaluation of an integral. This may cause high computational effort and also a numerical error. We circumvent the computation of this integral in each step by showing that there exists a sequence of random variables converging to the Poisson-mixture distribution which allows for the application of Panjer's recursion. Consequently, we give an error estimate with respect to the total variation distance for the approximation by this sequence. Using this error bound of a proper approximation, we present an algorithm for the calculation of the distribution of the total loss. We conclude with an example. (Joint work with Uwe Schmock.)
17.20-18.30	Bread and Wine