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Introduction

This special issue of *Asia-Pacific Financial Markets* is devoted to the 3rd Columbia-JAFEE Conference on the Mathematics of Finance, 27–28 March 1999, at Columbia University in the City of New York. It consists of five papers presented at the conference. The conference is a two-day event that takes place every Spring, featuring 12–14 well known speakers and attracting 100–200 participants, both from academia and from the financial industry. The program organizers are Professors Ioannis Karatzas, Takeaki Kariya and the editor of this issue. The aim of the conference is to bring together academics and practitioners who are at the forefront of the rapidly evolving area of the mathematics of finance and its related fields, to discuss questions of great current interest and to suggest open problems. The conference is also an important educational component of the recently launched Master's of Arts in Mathematics with specialization in the Mathematics of Finance, which is co-sponsored by the Department of Mathematics and the Department of Statistics at Columbia University.

Before giving a summary of the issue, the editor would like to express his gratitude to the individuals who made the issue possible. First, all the authors contributing to this volume have done so with enthusiasm and efficiency, making it an enjoyable job to be the editor of the volume. Secondly, I take this opportunity to thank Professors Ioannis Karatzas and Takeaki Kariya who have done a wonderful job in planning the program and organizing the conference in these first three years of its existence. Thanks are also due to Professor Duong Phong for his constant support to strengthening the presence of the Mathematics of Finance at Columbia University. Thirdly, this project would not have been possible without the efforts of the Co-Editors of the *Asia Pacific Financial Markets*, Professor Takeaki Kariya and Professor Tsunemasa Shiba who suggested that the volume be published, gave precise suggestions on its structure, and kept reminding everyone involved about the deadlines to be adhered to and the things to be done. Finally, the project has been strongly supported and immensely helped by Kluwer Academic Publishers; their high professionalism and constant encouragement made it possible to finalize the volume in a timely manner.

The articles here are presented in alphabetical order of the first author's last name. The first paper, 'On the Quasi Gaussian Interest Rate Models' by Akahori, studies a Markovian formulation of a model considered by Jamshidian as well as Ritchken and Sankarasubramanian. In particular, it analyzes a pathwise transformation of square integrable continuous martingales associated with the model and gives sufficient conditions for the model to be well-posed.

The ‘Methods of Partial Hedging’ by the editor of this issue is a survey paper on ways of hedging European type contingent claims, for an agent who does not have enough initial capital to perform a perfect (super)replication. Two criteria are considered: minimizing expected loss of partial hedging and maximizing the probability of perfect hedge. Results are obtained for complete and incomplete financial markets, and for markets with partial information. Moreover, results are presented on dynamic measures for the risk associated with taking a position in a contingent claim, defined as the supremum over different scenarios of the minimal expected ‘shortfall’ of hedging.

The next paper ‘Financial Modeling in a Fast Mean-Reverting Stochastic Volatility Environment’ by Fouque, Papanicolau and Sircar presents a model in which the volatility is fast mean-reverting relative to the option’s lifetime, but persistent, in the sense that it is slow mean-reverting relative to the tick-by-tick fluctuations in the underlying. Using an asymptotic analysis, a partial differential equation for pricing the option is obtained, which uses only parameters that can be easily obtained by calibration: the average volatility and the slope and the intercept of the implied volatility line, as a function of the log-moneyness-to-maturity-ratio. The explicit pricing formulas are available whenever they are available in the Black-Scholes model. As an example, the formula for a knock-out barrier option is presented.

The ‘Pricing Options under Stochastic Interest Rates: A New Approach’ by Kim and Kunitomo applies the ‘small-disturbance’ asymptotics for Itô processes to obtain an explicit asymptotic formula in a model with stochastic interest rates. The difference between this and the standard Black-Scholes formula is expressed in terms of the trend for the interest rate, the volatility of the interest rate and the correlation structure between the interest rate and the stock price processes. An asymptotic expansion of the option delta is also given. The results are illustrated by an example with the CIR interest rate process. Numerical results are reported, comparing the asymptotic method with the Monte Carlo simulations, and evaluating the size of the effects of the parameters of the interest rate process on the option price.

The final contribution ‘Bayesian Estimation of ARMA-GARCH Model of Weekly Foreign Exchange Rates’ by Nakatsuma and Tsurumi applies three estimation methods often used in Bayesian frameworks, Markov chain Monte Carlo, Laplace approximation and quadrature formula, to the problem of estimation of the parameters of the ARMA-GARCH model. Posterior probability densities are estimated for the GARCH(1,1) model. The methods are compared on simulated data, as well as on real, foreign exchange rate data.

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