CONTEMPORARY MATHEMATICS

515

Mathematics in Finance

UIMP-RSME Lluis A. Santaló Summer School
Mathematics in Finance and Insurance
July 16–20, 2007
Universidad Internacional Menéndez Pelayo
Santander, Spain

Santiago Carrillo Menéndez
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Editors

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Preface

This volume contains four selected survey papers on some aspects of mathematical finance presented and discussed at the "Lluis A. Santaló Summer School" that was held in Santander (Spain) on July 2007 as part of the activities of the Universidad Internacional Menéndez Pelayo (UIMP), in collaboration with the Real Sociedad Matemática Española (RSME).

The role of stochastic differential equations in finance is well known and so is the need for solving numerically these kinds of equations. In computational finance, path-wise approximation of solutions for stochastic differential equations is required, for example, when evaluating strongly path-dependent products, such as Asian options or range accrual products. The paper by L.G. Gyurko and T. Lyons presents a general framework for deriving high-order, stable and tractable path-wise approximations of Stratonovich stochastic differential equations.

Hedge funds have been one of the hot topics in finance in the last twelve years or more. At various times, some of them have been the focus of attention of the mass media. The paper by L. Seco and F. Chen presents a systematic survey on this topic from a mathematical point of view. The authors analyze, among other issues, the different classes of hedge funds and the models used both for management and risk control.

Still in the world of hedge funds, the paper by M. Escobar, S. Krämer, F. Scheibl, L. Seco and R. Zagst introduces a new theoretical framework to price hedge funds' equity, inspired by the framework of Black and Cox for the valuation of companies' equity as call options. The proposed approach is able to fit quite well the first four moments of the distribution of real returns when used with a sample of over a thousand hedge funds.

Credit derivatives have been among the most demanded products in the financial markets. The subprime crisis has placed this kind of product in the spotlight. R. Zagst and M. Scherer present a survey of the most widely used credit derivatives and analyze the most relevant approaches and models used in the financial sector: structural-default, intensity-based, reduced-form and hybrid models which combine the advantages of structural and intensity based models. They also focus on the modeling of joint defaults, one of the key issues for the pricing and risk measurement of this class of derivatives.

The editors wish to thank the Real Sociedad Matemática Española for giving them the opportunity to organize the Summer School. Our thanks also go to Universidad Internacional Menéndez Pelayo, a nice place with excellent organization and outstanding facilities, which made it easy for us to organize the lectures series within the School. Finally, the speakers at the Summer School and authors of this volume deserve our heartfelt gratitude both for the excellent lectures delivered at

the School and for their kind cooperation while preparing the corresponding notes which compose this volume.

Santiago Carrillo Menéndez and José Luis Fernández Pérez

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This volume contains survey papers on mathematical finance based on some courses given at the "Lluís Santaló" Summer School of the Real Sociedad Matemática Española, held in July 2007 at the Universidad Internacional Menéndez Pelayo, Santander (Spain). The primary topics are pathwise approximations of stochastic differential equations, Hedge funds, and credit derivatives.

The paper by L. Seco and F. Chen provides a systematic survey of hedge funds from a rigorous mathematical point of view. The related paper by M. Escobar, S. Krämer, F. Scheibl, L. Seco and R. Zagst introduces a new theoretical framework for the pricing of hedge funds' equity, inspired by the framework of Black and Cox for the valuation of company equity as a call option.

A general framework for deriving high order, stable and tractable path-wise approximations of Stratonovich stochastic differential equations as applied to finance is the subject of the paper of L. G. Gyurkó and T. Lyons.

The paper by R. Zagst and M. Scherer is a short course on the different approaches used for pricing, hedging and risk management of credit derivatives.

Researchers and practitioners in mathematical finance will find in this book a collection of excellent, up-to-date and mathematically rigorous presentations of some of the most advanced techniques for pricing and risk management.

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