



## Analysis, Geometry, and Modeling in Finance: Advanced Methods in Option Pricing (Chapman and Hall/CRC Financial Mathematics Series)

By Pierre Henry-Labordère

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**Analysis, Geometry, and Modeling in Finance: *Advanced Methods in Option Pricing*** is the first book that applies advanced analytical and geometrical methods used in physics and mathematics to the financial field. It even obtains new results when only approximate and partial solutions were previously available.

Through the problem of option pricing, the author introduces powerful tools and methods, including differential geometry, spectral decomposition, and supersymmetry, and applies these methods to practical problems in finance. He mainly focuses on the calibration and dynamics of implied volatility, which is commonly called smile. The book covers the Black–Scholes, local volatility, and stochastic volatility models, along with the Kolmogorov, Schrödinger, and Bellman–Hamilton–Jacobi equations.

Providing both theoretical and numerical results throughout, this book offers new ways of solving financial problems using techniques found in physics and mathematics.

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#### Review

... this book is very compact and succinctly written, yet very rich in examples, exercise problems and proofs. There are many figures which support theories, both pure mathematics and mathematical finance. Among numerous tables, the comparison tables of financial models are especially helpful. ... it is a pure joy to read the current edition ... as a textbook and a quick reference guide to financial engineering. ...

?*Mathematical Reviews*, Issue 2011a

The author presents in his book powerful tools and methods, such as differential geometry, spectral decomposition, super symmetry, and others that can be also applied to practical problems in mathematical finance.

?Adriana Hornikova, *Technometrics*, August 2010

This is an extraordinary monograph, one of the few not to be missed by anybody deeply interested in stochastic financial modeling. It demonstrates in a rather striking manner how concepts and techniques of modern theoretical physics ... may be applied to mathematical finance and option pricing theory. ... it also presents original ideas never before published by researchers in finance. The monograph builds an original bridge to connect analysis, geometry, and probability together with stochastic finance, a bridge supported by both very advanced mathematics and imagination. *Mathematica* and C++ are used for numerical implementation and many end-of-chapter problems lead the reader to recently published papers.

?*EMS Newsletter*, September 2009

The book by Pierre Henry-Labordère is a quite a *tour de force*? **Advanced Methods in Option Pricing** might appear to some as an understatement. One finds in this opus many gems from theoretical physics (non-Euclidean geometry, super-symmetric quantum mechanics, path integrals, and functional derivatives) applied to financial time series modeling and option pricing theory. Some of them are in fact known in the financial literature under different names; one of the most useful aspects of this book is a precise dictionary that should allow different communities to interact more easily. The advanced methods proposed by Pierre Henry-Labordère are beautiful and fascinating and will probably help to attract still a larger number of brilliant minds to financial mathematics, both in academic circles and in trading rooms.

?Jean-Philippe Bouchaud, Chairman, CFM Professor, École Polytechnique, and Editor-in-Chief, *Quantitative Finance*

When facing complex problems that arise in the real world, one should always remember that real answers to real questions may require imagination. This book is the manifest prototype of this timeless principle.

?Peter Carr, Head of Quantitative Financial Research, Bloomberg LP, and Director of the Masters Program in Mathematical Finance, Courant Institute, New York University, USA

#### About the Author

Societe Generale, Paris, France

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