Mathematics

of the
Financial
Markets

Financial Instruments and Derivatives Modeling, Valuation and Risk Issues
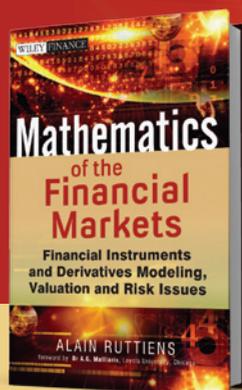
ALAIN RUTTIENS

foreword by **Dr A.G. Malliaris**, Loyola University, Chicago

Mathematics of the Financial Markets

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Alain Ruttiens

There are many books dedicated to the quantitative finance field but these are either devoted to a specific type of financial instrument, combining both the products description and use in the market and their quantitative aspects, or to a specific mathematical or statistical/econometric theory, or otherwise, with an impressive degree of mathematical formalism which needs a high degree of competence in mathematics, econometrics and quantitative methods. *Mathematics of the Financial Markets* aims to prioritise what needs mastering and presents the content in the most understandable, concise and pedagogical way illustrated by real market examples.

Divided into two parts, the book first examines the deterministic world, starting with yield curve building and related calculations (spot rates, forward rates, discrete versus continuous compounding, etc.), and continuing with spot instruments valuation (short term rates, bonds, currencies and stocks) and forward instruments valuation (forward forex, FRAs and variants, swaps & futures).The second part of the book looks at the probabilistic world, starting with the basis of stochastic calculus and the alternative approach of ARMA to GARCH, and continuing with derivative pricing: options, second generation options, volatility, credit derivatives. This part is completed by a chapter dedicated to market performance & risk measures, and a chapter widening the scope of quantitative models beyond the Gaussian hypothesis and evidencing the potential troubles linked to derivative pricing models.

The book equips the reader the mathematical knowledge needed to explain the valuation and behaviour of financial products, from traditional spot instruments to complex derivatives in the whole set of markets, from currencies and stocks to interest rates and credit underlyings.

Written by Alain Ruttiens, an expert author with twenty-five years of practical and academic experience in the financial markets, the book presents the quantitative aspects of financial markets instruments and their derivatives, in a global and coherent way. It is now more crucial than ever to be aware of what is happening, quantitatively speaking, behind the financial instruments behaviour, making this an essential read for anyone concerned with financial markets.

Praise for *Mathematics of the Financial Markets*

" *The financial industry is built on a vast collection of financial securities that can be valued and risk profiled using a set of miscellaneous mathematical models. The comprehension of these models is fundamental to the modern portfolio and risk manager in order to achieve a deep understanding of the capabilities and limitations of these methods in the approximation of the market. In his book, Alain Ruttiens exposes these models for a wide range of financial instruments by using a detailed and user friendly approach backed up with real-life data examples. The result is an excellent entry-level and reference book that will help any student and current practitioner up their mathematical modelling skills in the increasingly demanding domain of asset and risk management.*"

- **Virgile Rostand, Consultant, Toronto ON**

" *Alain Ruttiens not only presents the reader with a synthesis between mathematics and practical market dealing, but, more importantly a synthesis of his thinking and of his life.*"

- **René Chopard, CEO, Centro di Studi Bancari Lugano, Vezia / Professor, Università dell'Insubria, Varese**

" *Alain Ruttens has written a book on quantitative finance that covers a wide range of financial instruments, examples and models. Starting from first principles, the book should be accessible to anyone who is comfortable with trading strategies, numbers and formulas.*"

- **Dr Yuh-Dauh Lyuu, Professor of Finance & Professor of Computer Science & Information Engineering, National Taiwan University / Author, *Financial Engineering & Computation***

ABOUT THE AUTHOR

ALAIN RUTTIENS has a MA degree in Chemical Engineering (Faculté Polytechnique de Mons, Belgium). He joined the former Banque Indosuez in Belgium in 1981, and ended his bank career as Director of Financial Engineering Department in CBC Banque, Brussels (affiliate of KBC Bank).

Since 2004, he started his own business as Partner of NEURON sàrl, consulting on financial markets and funds management (Luxembourg). He is also Affiliate professor at the Ecole Supérieure de Commerce de Paris, and also teaching in several universities and institutions, a.o. HEC Paris, the Sorbonne University of Paris I, the Institut d'Etudes Politiques (Paris), and the Ecole Supérieure des Affaires, Beirut (Lebanon).

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