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Exotic Options and Hybrids

A Guide to Structuring, Pricing and Trading

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WILEY
A John Wiley and Sons, Ltd., Publication

This edition first published 2010

Registered office
John Wiley & Sons Ltd, The Atrium, Southern Gate, Chichester, West Sussex, PO19 8SQ, United Kingdom

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A catalogue record for this book is available from the British Library.

ISBN 978-0-470-68803-8 (H/B)

Typeset in 10/12pt Times by Aptara Inc., New Delhi, India
Printed in Great Britain by CPI Antony Rowe, Chippenham, Wiltshire

Further praise for Exotic Options and Hybrids

"This book brings a practitioner's prospective into an area that has seen little treatment to date. The challenge of writing a logical, rigorous, accessible and readable account of a vast and diverse field that is structuring of exotic options and hybrids is enthusiastically taken up by the authors, and they succeed brilliantly in covering an impressive range of products."

Vladimir Piterbarg, Head of Quantitative Research, Barclays

"What is interesting about this excellent work is that the reader can measure clearly that the authors are sharing a concrete experience. Their writing approach and style bring a clear added value to those who want to understand the structuring practices, Exotics pricing as well as the theory behind these."

Younes Guemouri, Chief Operating Officer, Sophis

"The book provides an excellent and compressive review of exotic options. The purpose of using these derivatives is well exposed, and by opposition to many derivatives' books, the authors focus on practical applications. It is recommended to every practitioner as well as advanced students looking forward to work in the field of derivatives."

Dr Amine Jalal, Vice President, Equity Derivatives Trading, Goldman Sachs International

"*Exotic Options and Hybrids* is an exceptionally well written book, distilling essential ingredients of a successful structured products business. Adel and Mohamed have summarized an excellent guide to developing intuition for a trader and structurer in the world of exotic equity derivatives."

Anand Batepati, Structured Products Development Manager, HSBC, Hong Kong

"A very precise, up-to-date and intuitive handbook for every derivatives user in the market."

Amine Chkili, Equity Derivatives Trader, HSBC Bank PLC, London

"*Exotic Options and Hybrids* is an excellent book for anyone interested in structured products. It can be read cover to cover or used as a reference. It is a comprehensive guide and would be useful to both beginners and experts. I have read a number of books on the subject and would definitely rate this in the top three."

Ahmed Seghrouchni, Volatility Trader, Dresdner Kleinwort, London

"A clear and complete book with a practical approach to structured pricing and hedging techniques used by professionals. *Exotic Options and Hybrids* introduces technical concepts in an elegant manner and gives good insights into the building blocks behind structured products."

Idriss Amor, Rates and FX Structuring, Bank of America, London

"*Exotic Options and Hybrids* is an accessible and thorough introduction to derivatives pricing, covering all essential topics. The reader of the book will certainly appreciate the alternation between technical explanations and real world examples."

Khaled Ben-Said, Quantitative Analyst, JP Morgan Chase, London

"A great reference handbook with comprehensive coverage on derivatives, explaining both theory and applications involved in day-to-day practices. The authors' limpid style of writing makes it a must-read for beginners as well as existing practitioners involved in day-to-day structuring, pricing and trading."

Anouar Cedrati, Structured Products Sales, HSBC, Dubai

"A good reference and an excellent guide to both academics and experts for its comprehensive coverage on derivatives through real world illustrations and theory concepts."

Abdessamad Issami, Director of Market Activities, CDG Capital

"*Exotic Options and Hybrids* offers a hands-on approach to the world of options, giving good insight into both the theoretical and practical side of the business. A good reference for both academics and market professionals as it highlights the relationship between theory and practice."

Joseph Nehme, Bachelor of Engineering AUB, ESSEC MBA,
Equity Derivatives Marketer, Merrill Lynch, London

"A great guide for experienced professionals or those just starting out in the space. Both the core concepts of structured derivatives as well as the more complex exotic's pricing and management come across with great lucidity. *Exotic Options and Hybrids* is a great complement to anybody's financial library."

Nabil Achtioui, Volatility Arbitrage Trader, Calyon, Paris

"*Exotic Options and Hybrids* serves as a good introduction into the world of structured equities and hybrids, and would be useful for both the enthusiastic novice as well as the seasoned professional who wants to recall a few concepts. Highly recommended."

Rahul Karkun, Rates and Hybrid Structuring, Bank of America, London

List of Symbols and Abbreviations

$\mathbf{1}$	Indicator function
ATM	At the money
ATMF	At the money forward
bp	Basis point, equal to 1% of 1%
EUR	Euro
GBP	Great Britain pound
ITM	In the money
JPY	Japanese yen
K	The strike of a specified option
MTM	Marked-to-market
$\mathcal{N}$	Normal cumulative distribution function
OTC	Over the counter
OTM	Out of the money
ρ	Correlation
q	Dividend yield of a specified asset
r	Risk-free rate of interest
$S(t)$	Price of asset S at time t
$S_i(t)$	Price of asset S_i at time t (multi-asset case)
σ	The volatility of a specified asset
T	Maturity of an option
USD	United States dollar

Preface

Toxic waste. . .it is a sad day when derivatives are described as toxic waste. Are these financial products really so, particularly those of exotic nature, or is it in fact people's grasp and usage of them that is the source of toxicity? While the use of derivatives increased in recent years at astounding rates, the crash of 2008 has revealed that people's understanding of them has not rivalled their spread. *Exotic Options and Hybrids* covers a broad range of derivative structures and focuses on the three main parts of a derivative's life: the structuring of a product, its pricing and its hedging. By discussing these aspects in a practical, non-mathematical and highly intuitive setting, this book blasts the misunderstandings and the stigma, and stands strong as the only book in its class to make these *exotic* and complex concepts truly accessible.

We base *Exotic Options and Hybrids* on a realistic setting from the heart of the business: inside a derivatives operation. Working from the assumption that one has a range of correctly implemented models, and the ability to trade a set of basic financial instruments, a client's need for a tailored financial product then raises these questions: How does one structure this product, correctly price it for the sale, and then hedge the resulting position until its maturity? Following a risk-centred approach, *Exotic Options and Hybrids* is a well-written, thoroughly researched and consistently organized book that addresses these points in a down-to-earth manner.

The book contains many examples involving time series and scenarios for different assets, and while hypothetical, all are carefully designed so as to highlight interesting and significant aspects of the business. Adoptions of real trades are examined in detail. To further illuminate payoff structures, their introduction is accompanied by payoff diagrams, scenario analyses involving figures and tables of paths, plus lifelike sample term sheets. By first understanding the investor's point of view, readers learn the methodology to structure a new payoff or modify an existing one to give different exposures. The names of various products can sometimes vary from one side of the industry to another, but those attributed to the products discussed in this book are commonly accepted to a great extent. Next, the reader learns how to spot where the risks lie to pave the way for sound valuation and hedging of the products. Models are de-mystified in separately dedicated sections, but their implications are alluded to throughout the book in an intuitive and non-mathematical manner.

Exotic Options and Hybrids is the first book to offer insights into the structuring, pricing and trading of modern exotic and hybrid derivatives, without complicating matters with the use of maths. The applications, the strengths and the limitations of various models are highlighted, in relevance to the products and their risks, rather than the model implementations. Readers can thus understand how models work when applied to pricing and hedging, without getting lost in the mathematical dwellings that shape related texts. While previous texts are heavily technical, others do not offer enough exposure, if any, to the more advanced and modern structures. The multitude of structures covered in *Exotic Options and Hybrids* is quite comprehensive, and encompasses many of the most up-to-date and promising products, including hybrid derivatives and dynamic strategies.

The book is formed of four parts, each containing related chapters which evolve in increasing degrees of complexity in the structures. Readers will be continuously stimulated by more advanced topics, and because of this breakdown the book can be read from front to back without loss of interest. Alternatively, readers can jump straight to a specific chapter because the book is self-contained and references to earlier chapters and sections within the book are explicitly clear. Furthermore, movement between the various angles of analysis of a specific product or concept is transparent, leaving readers free to focus on one aspect, or to read an entire treatment of a subject.

The first two chapters lay the foundations and explain not only the basic blocks of derivatives but also the setup and people involved in the creation, pricing and hedging of exotic structures. Chapters 3 to 7 define vanilla options, the risks involved in trading them and the different tools one can use to measure them. The second part of the book deals with the concept of dispersion which is of key importance in the world of exotic options. Chapters 10 and 11 focus on barrier options and digitals that are very much used in the conception of structured products. Chapters 13 to 16 constitute the third part of the book and present cliquets and related structures, mountain range options, and volatility derivatives, all of which are considered to be slightly more advanced exotic products.

After completing the discussion of exotic structures based upon equities, we move to hybrid derivatives. These chapters allow us to draw on many of the points made earlier in the book regarding correlation, dispersion and volatility, and provide a transparent insight into the world of hybrid derivatives. The first two of the four chapters on hybrids discuss the key asset classes: interest rates, commodities, foreign exchange, inflation and credit. For each asset class we look at the markets individually and gain insight into the nature of each, the various underlyings, vanilla instruments, skews and smiles and a brief look at some popular exotics in each. These are followed by a chapter that discusses the structuring of hybrid derivatives and explains how to construct meaningful combinations of the various asset classes. The last chapter on hybrids discusses the pricing intricacies of these instruments, starting from each asset class and then modelling combinations thereof. Chapter 21, the final chapter, deals with thematic indices and dynamic strategies. These assets are very different from the traditional structured products presented throughout the book, and constitute the new generation of advanced investment solutions.

We strongly believe that attentive readers of this book will learn many valuable insights in to all facets of the business of structured products. *Exotic Options and Hybrids* appeals to all the parties involved in the creation, pricing and hedging of the simplest to the most complex products. Once the heart of the business and its technical features are deeply assimilated, readers should be well equipped to contribute their own stone to the world of structured products.

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Part I

Foundations