Financial Derivatives

This book offers a succinct account of the principles of financial derivatives pricing. The first chapter provides readers with an intuitive exposition of basic random calculus. Concepts such as volatility and time, random walks, geometric Brownian motion, and Itô's lemma are discussed heuristically. The second chapter develops generic pricing techniques for assets and derivatives, determining the notion of a stochastic discount factor or pricing kernel, and then uses this concept to price conventional and exotic derivatives. The third chapter applies the pricing concepts to the special case of interest rate markets, namely, bonds and swaps, and discusses factor models and term-structure-consistent models. The fourth chapter deals with a variety of mathematical topics that underlie derivatives pricing and portfolio allocation decisions, such as mean-reverting processes and jump processes, and discusses related tools of stochastic calculus, such as Kolmogorov equations, martingales techniques, stochastic control, and partial differential equations.

Jamil Baz is the chief investment strategist of GLG, a London-based hedge fund. Prior to holding this position, he was a portfolio manager with PIMCO in London, a managing director in the Proprietary Trading Group of Goldman Sachs, chief investment strategist of Deutsche Bank, and executive director of Lehman Brothers fixed income research division. Dr. Baz teaches financial economics at Oxford University. He has degrees from the London School of Economics (M.Sc.), MIT (S.M.), and Harvard University (A.M., Ph.D.).

George Chacko is chief investment officer of Auda, a global asset management firm, in New York. He is also a professor at Santa Clara University, California, where he teaches finance. Dr. Chacko previously served for ten years as a professor at Harvard Business School in the finance department. Dr. Chacko held managing directorships in fixed income sales and trading at State Street Bank in Boston and in pension asset management at IFL in New York. He holds a B.S. from MIT, an M.B.A. from the University of Chicago, and an M.A. and Ph.D. from Harvard University.

Financial Derivatives

Pricing, Applications, and Mathematics

JAMIL BAZ
GLG

GEORGE CHACKO
Auda

CAMBRIDGE
UNIVERSITY PRESS

CAMBRIDGE UNIVERSITY PRESS
Cambridge, New York, Melbourne, Madrid, Cape Town, Singapore, São Paulo, Delhi

Cambridge University Press
32 Avenue of the Americas, New York, NY 10013-2473, USA

www.cambridge.org
Information on this title: www.cambridge.org/9780521066792

First published 2004
First paperback edition 2009

Printed in the United States of America

A catalog record for this publication is available from the British Library.

Library of Congress Cataloging in Publication Data

Baz, Jamil

Financial derivatives : pricing, applications, and mathematics / Jamil Baz,
George Chacko.

p. cm.

Includes bibliographical references and index.

ISBN 0-521-81510-X

1. Derivative securities. I. Chacko, George. II. Title.

HG6024.A3B396 2003
332.63'2 – dc21

2002041452

ISBN 978-0-521-81510-9 hardback
ISBN 978-0-521-06679-2 paperback

To Maurice and Elena J.B.

To my parents G.C.

Contents

Acknowledgments

We are as ever in many people's debt. Both authors are lucky to have worked with or been taught by eminent experts such as John Campbell, Sanjiv Das, Jerome Detemple, Ken Froot, Andrew Lo, Franco Modigliani, Vasant Naik, Michael Pascutti, Lester Seigel, Peter Tufano, Luis Viceira, and Jean-Luc Vila. A list, by no means exhaustive, of colleagues who have read or influenced this manuscript includes Richard Bateson, Eric Briys, Robert Campbell, Marcel Cassard, Didier Cossin, François Degeorge, Lev Dynkin, David Folkerts-Landau, Vincent Koen, Ravi Mattu, Christine Miqueu-Baz, Arun Muralidhar, Prafulla Nabar, Brian Pinto, David Prieul, Vlad Putyatin, Nassim Taleb, Michele Toscani, Sadek Wahba, and Francis Yared. Special thanks are due to Tarek Nassar, Saurav Sen, Feng Li, and Dee Luther for diligent help with the manuscript. The biggest debt claimant to this work is undoubtedly Robert Merton, whose influence pervades this manuscript, including the footnotes; as such, because there is no free lunch, he must take full responsibility for all serious mistakes, details of which should be forwarded directly to him.