PETER RITCHKEN

DERIVATIVE
MARKETS

THEORY, STRATEGY,
AND APPLICATIONS

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To Lois, Jake, and Brian

Derivative Markets: Theory, Strategy, and Applications

PREFACE

To The Student

If you picked up today's copy of the *Wall Street Journal* or the *Financial Times,* you can recount the latest scoop on derivative securities. The financial press often reports fascinating, if not startling, stories about how institutional investors, corporate treasury managers, individual traders, portfolio managers, and other finance practitioners have used, abused, and confused derivative securities and their respective markets in hedging or managing risks—often at great cost. Seemingly at supersonic speed, derivatives continue not only to transform financial markets but also to provide firms with new and more effective risk management tools that were simply nonexistent a few years ago. Major innovations lie ahead, and it is in your power to create and use them.

Actually, derivative contracts have existed for centuries. Why have the derivative markets been so active over the last two decades? In the 1970s, trading was expedited by the development of the theory of option pricing as well as organized stock option exchanges; in the 1980s, continuing deregulation and enhanced market volatilities stimulated activity. More recent catalysts include improved technology: computerized markets are instantaneously linking traders regardless of their geographical location or institutional affiliation, and powerful computer programs are facilitating the design and implementation of new financial instruments and trading strategies. In today's markets, you can design exotic financial contracts precisely to manage almost any specific risk.

Scientific breakthroughs in financial modeling, along with revolutionary changes in the structure of world financial markets and institutions, have created a job-market demand for people who know both the theory and applications of derivative instruments. To be truly marketable, you must be able not merely to identify risk exposures but also to communicate reasons for reducing risk to more manageable levels. You should also be able to identify alternative financial solutions for managing risk. While the solution is frequently obvious, some solutions require you to create new and complex derivative instruments. You should also be able to establish pricing models and trading strategies to attain specified risk management objectives. Finally, you should remember that even though solid pricing models can enable a firm to protect itself, models alone are hardly sufficient. A firm must rely upon sound investment strategies and risk management programs that are immediately responsive to the volatile markets.

To the Instructor

Designed for advanced undergraduates in finance as well as for graduate students and finance professionals, this book assumes that readers have taken introductory courses in finance and in probability and statistics. Students with a quantitative flair—especially those in the newly designed master of science programs in finance — are extremely interested in the content of this book. Most students look forward to a course in derivative markets because of the reported complexities and the high leverage afforded in these markets. This book may supplement advanced investments courses or courses often titled "Futures and Options," "Derivative Securities," "Financial Engineering," "Risk Management Strategies," "Speculative Markets," or "Financial Mathematics." While most introductory finance courses introduce derivatives and the Black-Scholes paradigm to the theory and practice of corporate finance, almost all finance majors seek more than a superficial understanding. To keep up with the scientific breakthroughs in financial modeling, and on top of the continual stream of financial innovations, students and professionals alike need a solid resource on basics of derivatives.

This book provides such a foundation. It serves as a comprehensive introduction to using derivative markets for managing risk in commodity and financial markets. The text provides insights into why practitioners use such contracts, especially as risk-transferring devices. It also features many risk management applications in a variety of settings to illustrate how to use these various contracts effectively. This book differs from most books on options and futures in that it not only provides considerable breadth of coverage but also takes a unifying approach to valuing derivative securities. It carefully illustrates all concepts and strategies with realistic examples. Its highly modular organization enables instructors to select those chapter sequences that best support course objectives and student needs. For even greater flexibility in customizing course content to fit both student ability and instructor interests, some chapters offer appendices of additional details and more rigorous material.

The text features six parts:

Part One, Forward and Futures Markets

Part Two, Option Markets

Part Three, Pricing Derivatives

Part Four, The Wide Variety of Derivative Contracts

Part Five, Interest Rate Derivatives

Part Six, Advanced Topics in Interest Rate Derivatives

Parts One and Two cover the basics of futures and options. Part Three explains how to price options contracts and how to manage risks associated with portfolios containing options. This module is most important not only because of the valuation approaches presented but also because of the risk measures developed. Part Four introduces readers to a wide variety of derivative contracts. It considers options on traded and nontraded assets, such as options on futures, forwards, and even options on options. It also analyzes stock index and foreign exchange contracts in great

detail; investigates the use of exchange-traded contracts; describes the role of customized products issued in the over-the-counter market; and looks at contracts with optionlike features, which readers may find in securities issued by firms. Part Five focuses on derivative contracts based on bond prices or interest rates, an enormous market indeed in both the organized and over-the-counter exchanges. This module begins by analyzing the yield curve and identifying the more important interest rate risk management measures. It then examines the more important exchange-traded and over-the-counter contracts. Part Six presents some of the more recent topics in pricing and hedging interest rate risk. It also describes some of the latest techniques for pricing and managing risk and follows up with several applications.

Pedagogical Features

Chapter Openers and Objectives   Most chapters begin with a quick paragraph or two bridging from the previous chapter, and upcoming content is listed so that students know where they have been and where they are heading.

Treatment of Key Equations, Symbols, and Terms   Key equations—equations containing all variables, which are used later in examples to demonstrate how a model works—are numbered so that instructors can reference them during lectures and students can find them quickly when doing homework.

Pedagogical Methodology   The book lays out each key idea according to a consistent five-step format—property, proof, strategy, exhibit, and example. Much like any mathematics text, the book builds upon properties, followed by proofs, sometimes with possible trading strategies, tabular or graphical exhibits, and applied examples. These elements are easy to find, easy to distinguish from general examples without losing track of the key equations, and easy to identify as a group or unit.

Exhibits   Many types of exhibits, lattices, and profit diagrams are presented. Some are tabular and numerical; some are graphs and excerpts from the financial presses. Many exhibits selected from the *Wall Street Journal* include a paragraph explaining how to read this daily.

Conclusion and References   Each chapter ends with a summary for quick review as well as some references and resources for future research.

Problem Sets   Each chapter features a set of challenging exercises and problems, ideal for homework assignment or in-class use. Solutions appear in the Instructor's Manual that accompanies the text.

ComputerSoftware   An easy to use software package is available to instructors who adopt this text.

Development Process and Acknowledgments

Like my first textbook on derivatives, *Options: Theory, Strategy, and Applications,* this expanded version underwent critical review. Users of *Options* recommended that I make my presentation more accessible to advanced undergraduate and MBA-level students by providing more practical examples, explaining underlying corporate intuition, and overviewing derivatives engineering processes. I also wanted to cover futures and other derivatives at a consistent level that readers cannot get when they use different books, and I wanted to add practical applications and realistic examples. The manuscript itself evolved from my lecture notes, developed in teaching an options and futures course in the MBA program at the Weatherhead School of Management at Case Western Reserve University. I covered Parts 1 through 4 and required students to complete two case studies, the first on cross hedges using futures and the second on applications of the Black-Scholes model. In another course on risk management in financial markets, I covered all the material in Parts 5 and 6, with a special emphasis on interest rate risk management. Students in both courses provided much feedback on the level of presentation and the clarity of explanations and applications.

HarperCollins College Publishers secured two rounds of expert advice. The first review panel included both research-oriented users of my *Options* text and teaching-oriented professionals from a range of programs. The second panel consisted of detail-oriented instructors who suggested further editing and minor internal reorganization.

I would like to thank all those who contributed to this development process. First are the many MBA students of my 1990–1993 classes, who really helped me with this project. I would especially like to thank Tina Gregory, Toro Ando, Trond Knudsen, Jeff Penkowski, Charles Vink, Pat Groeller, Saad Zein, and Kirk Teutschbein. I would also like to acknowledge my Ph.D. students Yul Ryu, Betty Simkins, Ivilina Popova, and Ching Pin Liou, who have helped with homework problems and examples. Software development was done with the excellent assistance of Mike Young, Vishi Cusa, and Ivilina Popova. I would also like to acknowledge the assistance of the Chicago Board of Trade. They have always responded to my questions, and their educational programs and brochures are consistently superb. There are many colleagues I would like to acknowledge. Several read chapters and provided helpful advice:

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Peter Ritchken

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BRIEF CONTENTS

CONTENTS

PART THREE   PRICING DERIVATIVES   155

PART FOUR   THE WIDE VARIETY OF DERIVATIVE CONTRACTS 255

11   The Wide Variety of Derivative Contracts 257

12   Options on Futures, Forwards, and Consumption Commodities 276

13   Stock Index Derivatives 287

PART FIVE   INTEREST RATE DERIVATIVES   409