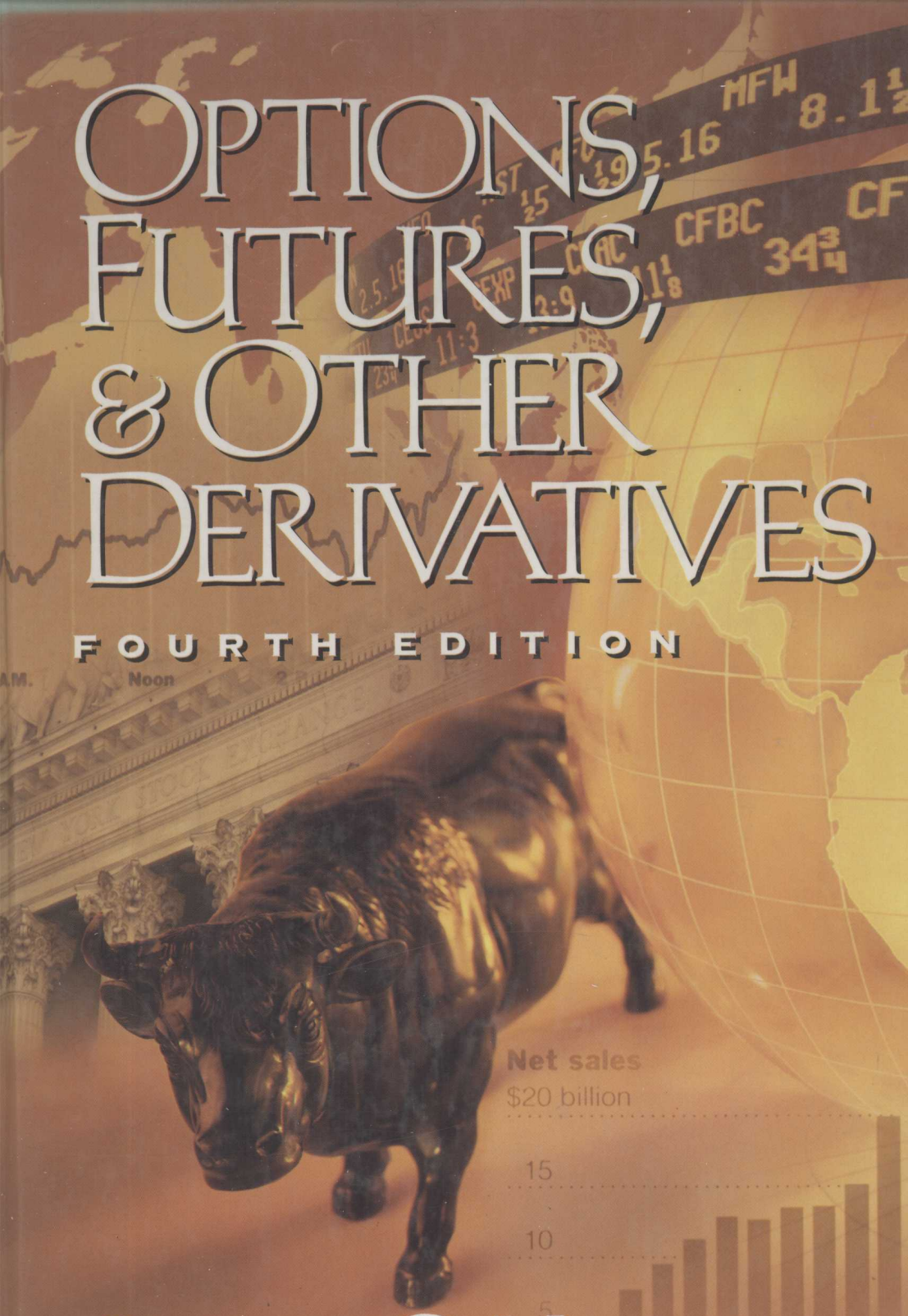
OPTIONS, FUTURES, & OTHER DERIVATIVES

FOURTH EDITION



JOHN C. HULL

OPTIONS, FUTURES, & OTHER DERIVATIVES

Fourth Edition

John C. Hull

Joseph L. Rotman School of Management
University of Toronto

PRENTICE HALL, Upper Saddle River, NJ 07458

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Preface

This book is appropriate for graduate and advanced undergraduate elective courses in business, economics, and financial engineering. It is also suitable for practitioners who want to acquire a working knowledge of how derivatives can be analyzed.

One of the key decisions that must be made by an author who is writing in the area of derivatives concerns the use of mathematics. If the level of mathematical sophistication is too high, the material is likely to be inaccessible to many students and practitioners. If it is too low, some important issues will inevitably be treated in a rather superficial way. In this book, great care has been taken in the use of mathematics. Nonessential mathematical material has been either eliminated or included in end-of-chapter appendices. Concepts that are likely to be new to many readers have been explained carefully, and many numerical examples have been included.

This book provides a unifying approach to the valuation of all derivatives — not just futures and options. The book assumes that the reader has taken an introductory course in finance and an introductory course in probability and statistics. No prior knowledge of options, futures contracts, swaps, and so on is assumed. It is not therefore necessary for students to take an elective course in investments prior to taking a course based on this book.

Changes in This Edition

This edition contains more material than the third edition. The material in the third edition has been updated and its presentation has been improved in a number of places. The major changes include:

1. A new chapter (chapter 14) has been included on value at risk.
2. A new chapter (chapter 15) has been included on estimating volatilities and correlations. GARCH models are covered in much more detail than in the third edition.
3. Chapter 19 contains much new material and explains the role played by martingales and measures in the valuation of derivatives.
4. Chapter 20 on the standard market models for valuing interest rate derivatives has been revised. It now uses the material in chapter 19 to provide a more complete discussion of the models for valuing bond options, caps, and swap options.

5. There are now two chapters on equilibrium and no-arbitrage models of the term structure (chapters 21 and 22). Chapter 21 covers equilibrium models and one-factor no-arbitrage models of the short rate. Chapter 22 covers two-factor models of the short rate, the HJM model, and the LIBOR market (BGM) model.
6. Chapter 4 on Interest Rates and Duration has been rewritten to make the material clearer and more relevant.
7. Chapter 23 on Credit Risk has been rewritten to reflect developments in this important area.
8. More material has been added on volatility smiles and volatility skews (chapter 17).
9. The sequencing of the material has been changed slightly. Volatility smiles and alternatives to Black–Scholes now appear before the chapter on exotic options, which in turn appears before the material on interest rate derivatives.
10. The notation has been improved and simplified. S_0 and F_0 are used to denote the asset price and the forward price today (that is, at time zero) and the cumbersome "$T - t$" no longer appears in most parts of the book.
11. A glossary of terms has been included.
12. Many new problems and questions have been added.

Software

New Excel-based software, DerivaGem, is included with the book. This software is a big improvement over the software included with previous editions. It has been carefully designed to complement the material in the text. Users can calculate options prices, imply volatilities, and calculate Greek letters for European options, American options, exotic options, and interest rate derivatives. Interest rate derivatives can be valued either using Black's model or a no-arbitrage model. The software can be used to display binomial trees (see for example Figure 16.3 and Figure 21.11) and provide many different charts showing the impact of different variables on either option prices or the Greek letters.

The software is described more fully at the end of the book. Updates to the software can be downloaded from my Web site

http://www.mgmt.utoronto.ca/~hull

Slides

Several hundred PowerPoint slides can be downloaded from my Web site. The slides now use only standard fonts. Instructors can adapt the slides to meet their own needs.

Answers to Questions

Solutions to the end-of-chapter problems in the first three editions were available only in the Instructor's Manual. Over the years many people have asked me to make the solutions more generally available. I have hesitated to do this because it would prevent instructors from using the problems as assignment questions.

In this edition I have dealt with this issue by dividing the end-of-chapter problems into two groups: "Questions and Problems" and "Assignment Questions". There

are over 450 Questions and Problems and solutions to these are in a book *Options, Futures, & Other Derivatives: Solutions Manual,* which is published by Prentice Hall. There are about 80 Assignment Questions. Solutions to these are available only in the Instructor's Manual.

Acknowledgments

Many people have played a part in the production of this book. The academics and practitioners who have made excellent and useful suggestions include Farhang Aslani, Jas Badyal, Emilio Barone, Giovanni Barone-Adesi, Alex Bergier, George Blazenko, Laurence Booth, Phelim Boyle, Peter Carr, Don Chance, J.-P. Chateau, Ren-Raw Chen, George Constantinides, Michel Crouhy, Emanuel Derman, Brian Donaldson, Dieter Dorp, Scott Drabin, Jerome Duncan, Steinar Ekern, David Fowler, Louis Gagnon, Dajiang Guo, Jörgen Hallbeck, Ian Hawkins, Michael Hemler, Steve Heston, Bernie Hildebrandt, Kiyoshi Kato, Kevin Kneafsy, Bill Margrabe, Izzy Nelkin, Neil Pearson, Paul Potvin, Shailendra Pandit, Eric Reiner, Richard Rendleman, Gordon Roberts, Chris Robinson, Cheryl Rosen, John Rumsey, Ani Sanyal, Klaus Schurger, Eduardo Schwartz, Michael Selby, Piet Sercu, Duane Stock, Edward Thorpe, Yisong Tian, P.V. Viswanath, George Wang, Jason Wei, Bob Whaley, Alan White, Hailiang Yang, and Victor Zak. I am particularly grateful to Eduardo Schwartz, who read the original manuscript for the first edition and made many comments that led to significant improvements, and to Richard Rendleman and George Constantinides, who made specific suggestions that led to improvements in this edition.

The first three editions of this book were very popular with practitioners and much of the material in the book has been greatly influenced by the informal contacts I have had with practitioners. The students in my elective courses on derivatives at the University of Toronto have also influenced the evolution of the book.

Alan White, a colleague at the University of Toronto (formerly a colleague at York University), deserves a special acknowledgment. Alan and I have been carrying out joint research in the area of derivatives for over 15 years. During that time we have spent countless hours discussing different issues concerning derivatives. Many of the new ideas in this book, and many of the new ways used to explain old ideas, are as much Alan's as mine. Alan read the original version of this book very carefully and made many excellent suggestions for improvement.

The staff at Prentice Hall have been a continual source of encouragement to me as this project has progressed. I would particularly like to thank Paul Donnelly, my editor, who has always shown a keen interest in the development of this book.

I welcome comments on the book from readers. My e-mail address is

hull@mgmt.utoronto.ca

John C. Hull
University of Toronto

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