FUTURES AND OPTIONS

THEORY AND APPLICATIONS

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A recognized authority on financial markets, including futures and options markets, Professor Stoll has published more than fifty articles and monographs on subjects ranging from the forward foreign exchange market to stock market structure and volatility. His work with Professor Whaley on program trading and the "triple witching hour" is frequently cited. He is a consultant to industry and government and speaks frequently at academic and industry conferences. Professor Stoll is a member of the recently formed Shadow Securities and Exchange Commission, serves as a director of the American Finance Association and the Financial Management Association, and is president-elect of the Western Finance Association.

He is an associate editor of the *Journal of Financial Economics, The Journal of Finance, The Journal of Financial and Quantitative Analysis,* and serves on the editorial boards of *Financial Management,* the *Journal of Financial Research,* and *The Review of Futures Markets.*

Prior to coming to Vanderbilt in 1980, Professor Stoll taught at the Wharton School of the University of Pennsylvania. He has also held visiting positions at the Board of Governors of the Federal Reserve System, at the Institutional Investor Study of the Securities and Exchange Commission, at the University of Chicago, and as a Senior Fulbright-Hays Visiting Lecturer in France.

He received an A.B. degree from Swarthmore College and M.B.A. and Ph.D. degrees from the Graduate School of Business, University of Chicago.

ROBERT E. WHALEY

Robert E. Whaley is Professor of Finance, Finance Area Coordinator, and Director of the Futures and Options Research Center at the Fuqua School of Business, Duke University.

Professor Whaley is recognized as an expert in the area of option valuation. His research in this area includes developing option valuation models and approximations and testing pricing performance. His experience includes working in the futures and options industry as well as acting as consultant to investment houses, futures, option and stock exchanges, governmental agencies, and accounting and law firms concerning the pricing and use of derivative contracts. Together with Professor Stoll, he has published a number of widely-cited studies concerning the market effects of stock index futures and options and program trading. In 1987, one of their joint studies on program trading and expiration day effects received a "Graham and Dodd Award" for excellence in financial writing.

Professor Whaley has published dozens of articles in academic and practitioner journals, has authored several books and monographs, and has made presentations on futures and options to academic and practitioner audiences in the U.S., Canada, and Europe. He currently serves as associate editor of *The Journal of Finance* and the *Journal of Financial Economics,* as co-editor of *The Review of Futures Markets,* and as referee of numerous journals and granting agencies. Professor Whaley has also served on the faculties of Vanderbilt University, the University of Alberta, and the University of Chicago.

Professor Whaley received his bachelor's degree from the University of Alberta, and his M.B.A. and Ph.D. degrees from the University of Toronto.

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Finance, as a field of study and research, has attained a level of development that makes it increasingly difficult to present the latest ideas in a single textbook. *The Current Issues in Finance Series* provides a mechanism for publishing specialized volumes that cover important subjects in greater detail than is possible in a general finance text. Advanced material is covered in considerable depth, yet presented in a readable fashion. A guiding principle of the series is that the books be written by recognized experts who are in a position to provide balanced coverage and in-depth analysis of a particular subject matter.

Books in the *Current Issues in Finance Series* are intended primarily for upper-level undergraduate courses and MBA courses. They may be used as the principal text in specialized courses or as a supplementary text in courses with broader coverage. Books in the series will also be suitable for practitioners who want to become more informed on a particular topic.

The first book in the series, *Futures and Options* by Stoll and Whaley, deals with a subject that has undergone dramatic developments in theory and in practice and one that has attracted the interest of students and practitioners. The book provides coverage of both futures and options in an integrated framework. Coverage includes not only derivative contracts on traditional commodities, but also the newer financial derivatives.

I salute South-Western Publishing, and especially Elizabeth Waters and Jim Keefe, for conceiving the series and supporting its development. Students of finance stand to benefit from South-Western's commitment to the series and can look forward to the publication of additional volumes on important finance topics.

Hans R. Stoll
Consulting Editor, *Current Issues in Finance Series*

PREFACE

This book, *Futures and Options*, the first volume in the *Current Issues in Finance Series*, covers an area of finance that has had unparalleled development in the last 20 years, both in practice and in theory. Trading of futures and options contracts has exploded at the same time that academic analysis and understanding of the valuation of these contracts has made monumental strides forward. In no area of finance is the interface between academic theory and real-world practice as close as in the case of futures and options.

Most remarkable in the growth of derivatives' trading in the 1980s was the development of futures and option contracts on new underlying assets. Futures contracts, traditionally reserved for physical commodities like corn or copper, were developed on underlying assets such as bonds and stock index portfolios. Option contracts, traditionally reserved for common stocks, were developed for bonds, stock indexes and for physical commodities. Our aim in this book is to provide, for the first time, an integrated approach to understanding the relations between futures, options, and their underlying assets.

Chapters 1 and 2 of the book define futures and option contracts, explain their economic purpose, and provide information on the markets in which these contracts trade.

Chapters 3 to 9 focus on futures contracts. Chapter 3 covers the structure of futures prices—basically the cost-of-carry model. Chapter 4 shows how futures are used for hedging and develops the concept of an optimal hedge ratio. Chapter 5 discusses risk and return in futures markets. Chapters 6 to 9 apply the principles developed in chapters 3 to 5 to futures on physical commodities, stock indexes, debt instruments, and currencies, respectively.

Chapters 10 to 16 focus on option contracts. Chapter 10 describes the structure of option prices imposed by arbitrage between puts, calls, futures, and the underlying commodity. Chapter 11 shows how options on any underlying commodity are valued. A risk-neutral valuation approach is used to develop a generalized version of the Black-Scholes model appropriate for the valuation of options on any type of underlying commodity. Sections of Chapters 10 and 11 are quite technical. Less technically-oriented students can skip the derivations of the pricing relations without harm to understanding the basic determinants of option values or arbitrage links. Chapter 12 shows how options are used in various trading strategies. Position diagrams are used to illustrate outcomes of various strategies. In addition, the chapter shows how to calculate expected gains from trading strategies, how to simulate long-term options with short-term options, and how to manage portfolio risk and return dynamically. In chapters 13 to 15, options on common stocks, on stock indexes, and on debt instruments are examined in turn. Chapter 16 examines exchange-traded options on other assets such as currencies and physical commodities. In addition, valuation equations are provided for many exotic options that trade in over-the-counter markets.

This book attempts to distill the many important research contributions that define modern-day derivative security valuation and risk management. More technically-oriented readers may gather further insights by studying the original research articles upon which we have based this book. Most of these articles appear in *Selected Readings on Futures Markets: Interrelations Between Futures, Option and Futures Option Markets*, R.E. Whaley (editor), Chicago: Chicago Board of Trade, 1992.

Finally, many individuals played important roles in the development of this book and need to be recognized formally. First, the students in our classes at Vanderbilt University and Duke University, who used earlier drafts of the book, gave valuable input. Our colleagues, Cam Harvey, Jay Muthuswamy, and Tom Smith, provided useful comments and suggestions. Bill Fung was instrumental in identifying the exotic option contracts discussed in Chapter 16. Shirley Edmond and Pat Scott provided secretarial support in putting together the final manuscript. Barbara Bennett Ostdiek, Jeff Fleming, and Marshall Howard carefully scrutinized last drafts of the chapters. Susan Williams of South-Western provided diligent editorial oversight of the final manuscript. To all of these individuals (and to all of those who we may have overlooked), our heartfelt thanks.

We dedicate this book to our wives and to our children for whom we hope it is evidence that we are doing something with our time.

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