Fifth Edition

Investments

Analysis and Management

Jack Clark Francis

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Bernard M. Baruch College
City University of New York

McGraw-Hill, Inc.

New York St. Louis San Francisco Auckland Bogotá Caracas Hamburg Lisbon London Madrid Mexico Milan Montreal New Delhi Paris San Juan São Paulo Singapore Sydney Tokyo Toronto

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2 3 4 5 6 7 8 9 0 DOC DOC 9 5 4 3 2 1

ISBN 0-07-021814-5

This book was set in Times Roman by General Graphic Services, Inc.
The editors were Ken MacLeod and Ira Roberts;
the designer was Robin Hessel;
the production supervisor was Friederich W. Schulte.
New drawings were done by J&R Services, Inc.
R. R. Donnelley & Sons Company was printer and binder.

Library of Congress Cataloging-in-Publication Data

Francis, Jack Clark.
Investments: Analysis and management / Jack Clark Francis.—5th ed.
p. cm.—(McGraw-Hill series in finance)
Includes bibliographical references.
ISBN 0-07-021814-5
1. Investments. 2. Securities. 3. Financial futures. 4. Arbitrage. I. Title. II. Series.
HG4521.F685 1991
332.6—dc20 90-33289

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McGraw-Hill Series in Finance

Consulting Editor: Charles A. D'Ambrosio, University of Washington

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About the Author

Jack Clark Francis was born in Indianapolis, Indiana, received his Bachelors and M.B.A. degrees from Indiana University, and served as a Lieutenant in the U.S. Army where he was a Paratrooper and a Company Commander. He later obtained his Ph.D. from the University of Washington in Seattle. Francis then joined the finance faculty of the Wharton School of Finance, University of Pennsylvania, for four years. He also served as a Federal Reserve Economist for two years. Since leaving his position at the Federal Reserve, Dr. Francis has been a tenured Professor of Economics and Finance at Bernard M. Baruch College in New York City.

Dr. Francis has written several books. This is the fifth edition of *Investments: Analysis and Management*. He co-authored a Canadian edition of *Investments: Analysis and Management* published by McGraw-Hill Ryerson Limited; co-authored three editions of *Portfolio Analysis* published by Prentice-Hall; authored two editions of *Management of Investments* published by McGraw-Hill; and co-edited *Readings in Investments* published by McGraw-Hill. Dr. Francis has also published papers in various scholarly journals, including the *Journal of Finance, Journal of Financial and Quantitative Analysis, Financial Review, Financial Management, Journal of Economics and Business, Journal of Business Research, Quarterly Review of Economics and Business, Journal of Futures Markets, Journal of Monetary Economics, Journal of Portfolio Management,* and the *Review of Business*. In addition to writing articles for these journals, Dr. Francis has served on the editorial boards of several of them.

Dr. Francis has been a consultant for various banks, investment advisers, brokerage houses, manufacturing corporations, federal and international governmental agencies, computer time sharing companies, software firms, publishing companies, and other clients.

To Harry M. Markowitz—

He received his Ph.D. from the University of Chicago in 1954 and, early in his career, he laid the foundation for modern financial theory when he published *Portfolio Selection*.

During the 1950s and 1960s he did research for the Rand Corporation and the General Electric Corporation.

In the early 1960s he designed and helped develop the computer simulation language SIMSCRIPT.

He served as President of the Arbitrage Management Company from 1969–1972.

During the 1970s and 1980s he worked at the IBM Corporation's T.J. Watson Research Center.

He was recipient of the 1989 John Von Neumann Theory Prize awarded by ORSA/TIMS.

I first became acquainted with Markowitz as a graduate student during the late 1960s when I studied his portfolio theory and SIMSCRIPT.

In the early 1970s I had the privilege of becoming his faculty colleague at the Wharton School.

During the 1980s I had the privilege of being a faculty colleague of his again—at Baruch College.

In 1989 I was a Student in his Measure Theory seminar for doctoral students at Baruch College.

I was again his student in a Stochastic Calculus seminar for doctoral students at Baruch College in 1990.

Over the years I have known him, he has been an outstanding scholar, a fine teacher, and a charming person.

Preface

Writing five editions of a textbook that attempts to survey all aspects of investments management gives one some perspective. The experience has led me to conclude that the rate of change in the level of sophistication and the number of new products in investments is increasing. As you review the changes I have felt obliged to make in the fifth edition simply to keep the book current, the basis for my conclusion will become clear.

CHANGES IN THIS FIFTH EDITION

This fifth edition has been more substantially changed than any previous revision of *Investments: Analysis and Management*. These changes take several forms. *The most important and far-reaching change is the incorporation of arbitrage concepts into more chapters.* In addition to a whole chapter entitled Arbitrage Pricing Theory (APT), the *law of one price,* which forms the basis for arbitrage, is invoked in discussing bonds, stocks, options, futures, and international investing. The implications of APT are omnipresent.

The October 1987 stock market crash is another topic that pops up throughout the fifth edition. This historic event is a classic example of undiversifiable market risk discussed in the chapters on law, stock valuation, technical analysis, options (used to create portfolio insurance), futures, and international markets.

The global nature of investing also appears in a number of chapters. Figure 1-1 starts the coverage by illustrating the *international* scope of the October 1987 stock market crash. The divergent nature of the stock markets in 23 different countries is summarized in Table 3-9 after being discussed in the chapter about securities markets. Global mutual funds are described in the chapter about investment performance evaluation. In addition, there is an entire chapter entitled "International Investing."

The market development that I find particularly striking is *the large number of new investment products*. Portfolio insurance, exotic new kinds of options that have been embedded into various securities, stock index arbitrage, dedicated pension funds, procedures to alter the convexity of a fixed income portfolio, financial futures, options on futures, numerous synthetic positions that can be created in different ways, asset-backed securities that have different tranches, junk bonds, indexed portfolios—none of these was in existence when the first three editions of this book were written. These new products create complicated and exciting new investing opportunities and new job openings for students of investing. For the authors of investments textbooks, they create added work—and a refreshing sense of excitement.

The fifth edition also delves deeper into option theory than previous editions. An improved presentation of binomial option pricing, the mechanics of creating a protective put in order to establish portfolio insurance, and an explanation of how to value common stock by treating it as a call option on a leveraged company are among the examples of new option theory material.

ORGANIZATIONAL CHANGES

As in previous editions, most parts of the early chapters of the book (Chapters 2 through 7) may be skipped by those who present an advanced, theory-oriented course. I have endeavored to make the different sections and chapters of this book stand independently. This permits instructors to choose and reorder the chapters and thus tailor-make a course. I have substantially reorganized other aspects of this edition as well. Unlike the previous editions, Chapter 1 has been written so that even the most advanced readers should benefit from it. Furthermore, the theoretical backbone of the book is introduced earlier than in previous editions—Chapters 8 through 11 inclusive introduce hedging, arbitrage, portfolio theory, the capital asset pricing model, and APT. This sets the stage for all of the new material that is introduced in the later chapters.

TEACHING AIDS

I have created several kinds of new teaching aids for those who use the fifth edition. Every chapter now has a number of new end-of-chapter essay questions and/or problems. An average of 10 nontrivial numerical problems at the end of each chapter were added to give students practice in solving such problems. The *Instructor's Manual* contains detailed solutions to all of these problems.

In addition, students can find the answers to the numerical problems following Chapter 25 of this book. The *Instructor's Manual* also contains a bank of test questions—at least 10 true-false and 10 to 20 multiple-choice questions for every chapter. Some chapters also contain cases or other teaching aids. Attractive illustrations that can be used to create photocopies to hand out in class or transparencies for an overhead slide projector are also included in the *Instructor's Manual.*

Hand-held calculators have become more powerful and cheaper. As a result, each year more professors tell me they are teaching their investments students how to use these handy devices. In response to the growing demands of these folks, Professor Richard Taylor and I have created end-of-the-book Appendix E, entitled "Investment Analysis with Hand-Held Calculators."

USING COMPUTERS

This book does not call for the use of a computer; it is not tied to computers in any way. But, for those who want to use computers, McGraw-Hill provides an incredible amount of valuable data and software. These computer supplies are available free of charge to adopters of *Investments: Analysis and Management,* 5 ed. This software is easy to use; none of it is copy-protected. It is all menu-driven, so no computer experience is required. An end-of-book appendix describes the different kinds of data and software available.

ACKNOWLEDGMENTS

Many people have assisted me in preparing the fifth edition. All of my colleagues at Baruch College helped in some way or another. But, in particular, Professors Harry Markowitz, Doug McCann, Avner Wolf, Robert Ariel, Jae Won Lee, Giora Harpaz, Damodar Gujarati, Joel Segall, Hanan Eytan, and Joel Rentzler made special contributions that were above and beyond the call of collegial duty.

Academics at other colleges also helped me in numerous ways. Professors Jonathan E. Ingersoll of Yale University and David F. Babbel of Wharton School allowed me to reproduce a teaching note they wrote as Appendix B to Chapter 12. Professors Frank J. Fabozzi at MIT, Cheng few Lee at Rutgers University, Ronald W. Anderson at the City University of New York Graduate Center, Carl McGowan of Michigan State University, Richard Taylor at Arkansas State University, Wi Saeng Kim of Rutgers University, Gunter Dufey at the University of Michigan, Susan Jarzombek at Sacred Heart University, and James Morris at the University of Colorado are all friends who help me personally as well as intellectually. Professors W. Brian Barrett of the Uni-

versity of Miami, Diana R. Harrington at the University of Virginia, Raymond M. Leuthold at the University of Illinois, Gregory R. Niehaus of the University of Michigan, Raj Aggarwal at John Carroll University, K. C. John Wei at Indiana University, and C. Thomas Howard at the University of Denver all provided valuable assistance. The following reviewers provided many helpful comments and suggestions for this edition: Raj Aggarwal, John Carroll University; James S. Ang, Florida State University; Scott Besley, University of South Florida; Gerald O. Bierwag, University of Arizona; Stephen J. Brown, New York University; Eric Chang, University of Maryland; Ronald Christner, Loyola University; Prabin Datta, University of Arizona; Samuel A. Dyckman, Baruch College; David H. Goldenberg, Rensselaer Polytechnic Institute; Joseph Golec, Clark University; Kendall P. Hall, University of Alabama; Gloria Harpaz, Baruch College; C. Thomas Howard, University of Denver; Eric Kirzner, University of Toronto; Dorothy E. Koehl, University of Puget Sound, Washington; Jaroslav Komarynsky, Northern Illinois University; Brian Langemeir, Louisiana State University; Steven P. Lilien, Baruch College; Edward M. Miller, University of New Orleans; Robert J. Shiller, Yale University; Gary L. Tidwell, College of Charleston; James M. Tipton, Baylor University; and Kathleen Weiss, University of Michigan.

A number of gracious folks who are investment managers also aided me. I am especially indebted to Richard Bookstaber, an exprofessor of finance who is now at Morgan-Stanley; Russell Cornelius of Morgan-Stanley; Sam Eisenstadt, Senior Vice President, Value Line; Deborah Susan Francis, C.P.A., Senior Trust Auditor at Seattle First National Bank; Edward Mader, Senior Vice President, Prudential-Bache; Gary Gastineau, Vice President, Salomon Brothers; Richard O. Michaud, Vice President, Merrill Lynch; Bruce I. Jacobs, a private consultant; and Ken Hackel and Jason Wallach, who run Cash Flow Investors, Inc.

Although some of them have never met each other, numerous members of the huge McGraw-Hill family provided valuable aid in a gracious manner. It was a pleasure to work with Kenneth W. Lutz, Publisher, Trendline Services, who provided valuable artwork and computer software; Barbara Munder, Vice President at *Business Week* and creator of the Mutual Fund Scoreboard; Scott Stratford, Suzanne BeDell, Catherine Woods, and Ken MacLeod, my successive sponsoring editors; Sheila Gillams, a punctilious editing supervisor who was unfortunately transferred away from me; Ira Roberts, another highly professional editing supervisor who was a pleasure to work with; San Rao, a creative marketing manager; John Aliano, a senior editor in the Schaum's Division who was very helpful; Allan Forsyth, a McGraw-Hill alumnus and a peerless development editor; and Terry Pace, an instructor's manual editor who adds value to each of my books.

All of these folks made significant contributions to the fifth edition. I am indebted to every one of them. Whatever errors remain are clearly of my own making.

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