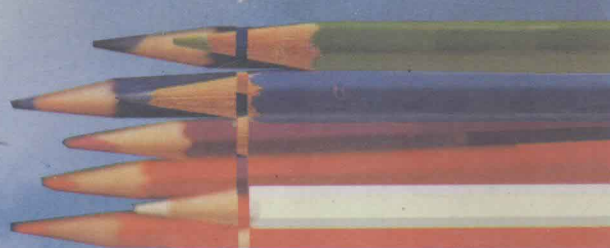


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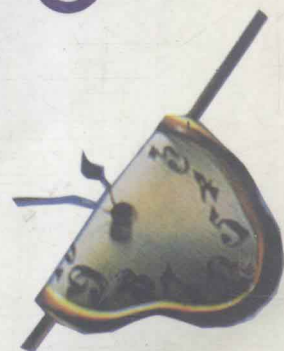


INVESTMENTS

William F. Sharpe
Gordon J. Alexander
Jeffrey V. Bailey

投资学

(第五版)



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Prentice-Hall International, Inc.

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Investment Management Equations

1. Rate of return on an asset or portfolio

$$\text{Return} = (\text{End-of-period wealth} - \text{beginning-of-period wealth}) / (\text{beginning-of-period wealth})$$
2. Actual margin in a stock purchase

$$\text{am} = \{[(n \times \text{mp}) - [(1 - \text{im}) \times \text{pp} \times n]] / (n \times \text{mp})\}$$
3. Market price at which a margin purchaser will receive a margin call

$$\text{mp} = (1 - \text{im}) \times \text{pp} / (1 - \text{mm})$$
4. Actual margin in a short sale

$$\text{am} = \{[(\text{sp} \times n) \times (1 + \text{im})] - (\text{np} \times n)\} / (\text{np} \times n)$$
5. Market price at which a short seller will receive a margin call

$$\text{np} = \text{sp} \times (1 + \text{im}) / (1 + \text{mm})$$
6. Expected return on a portfolio

$$\bar{r}_p = \sum_{i=1}^N X_i \bar{r}_i$$
7. Covariance between two securities

$$\sigma_{ij} = \rho_{ij} \sigma_i \sigma_j$$
8. Standard deviation of a portfolio

$$\sigma_p = \left[\sum_{i=1}^N \sum_{j=1}^N X_i X_j \sigma_{ij} \right]^{1/2}$$
9. Standard deviation of a two-asset portfolio

$$\sigma_p = [X_1^2 \sigma_1^2 + X_2^2 \sigma_2^2 + 2X_1 X_2 \rho_{12} \sigma_1 \sigma_2]^{1/2}$$
10. The market model

$$r_i = \alpha_i + \beta_i r_f + \epsilon_i$$
11. Beta from the market model

$$\beta_i = \sigma_{iM} / \sigma_M^2$$
12. Security variance from the market model

$$\sigma_i^2 = \beta_i^2 \sigma_M^2 + \sigma_{\epsilon_i}^2$$
13. Security covariance from the market model

$$\sigma_{ij} = \beta_i \beta_j \sigma_M^2$$
14. Variance of a portfolio (by market and unique risk)

$$\sigma_p^2 = \beta_p^2 \sigma_M^2 + \sigma_{\epsilon_p}^2$$
15. Market risk of a portfolio

$$\beta_p = \sum_{i=1}^N x_i \beta_i$$
16. Unique risk of a portfolio

$$\sigma_{\epsilon_p}^2 = \sum_{i=1}^N X_i^2 \sigma_{\epsilon_i}^2$$
17. Capital Market Line

$$\bar{r}_p = r_f + [(\bar{r}_M - r_f) / \sigma_M] \sigma_p$$
18. Variance of the market portfolio

$$\sigma_M^2 = \sum_{i=1}^N \sum_{j=1}^N X_{iM} X_{jM} \sigma_{ij}$$
19. Security Market Line (covariance and beta versions)

$$\bar{r}_i = r_f + [(\bar{r}_M - r_f) / \sigma_M^2] \sigma_{iM}$$

$$\bar{r}_i = r_f + (\bar{r}_M - r_f) \beta_i$$
20. Beta from the CAPM

$$\beta_i = \sigma_{iM} / \sigma_M^2$$
21. Two-factor model

$$r_i = a_i + b_{i1} F_1 + b_{i2} F_2 + \epsilon_i$$
22. Variance of a security (by factor and nonfactor risk, two-factor model)

$$\sigma_i^2 = b_{i1}^2 \sigma_{F1}^2 + b_{i2}^2 \sigma_{F2}^2 + 2b_{i1} b_{i2} \text{Cov}(F_1, F_2) + \sigma_{\epsilon_i}^2$$
23. Covariance between two securities (two-factor model)

$$\sigma_{ij} = b_{i1} b_{j1} \sigma_{F1}^2 + b_{i2} b_{j2} \sigma_{F2}^2 + (b_{i1} b_{j2} + b_{i2} b_{j1}) \text{Cov}(F_1, F_2)$$
24. Arbitrage Pricing Theory (two-factor model)

$$\bar{r}_i = \lambda_0 + \lambda_1 b_{i1} + \lambda_2 b_{i2}$$

$$\bar{r}_i = r_f + (\delta_1 - r_f) b_{i1} + (\delta_2 - r_f) b_{i2}$$
25. Breakeven tax rate for equivalence of tax-exempt and taxable bond yields

$$t = 1 - \text{ratio of tax-exempt to taxable bond yields}$$
26. Geometric mean (compound) annual growth rate of an index's value

$$g = (C_t / C_b)^{1/y} - 1$$
27. Real rate of return on an asset or portfolio

$$\text{RR} = [(1 + \text{NR}) / (1 + I)] - 1$$

$$\text{RR} \approx \text{NR} - I$$
28. Yield-to-maturity

$$P_b = C_1 / (1 + y)^1 + C_2 / (1 + y)^2 + \dots + (C_N + M) / (1 + y)^N$$
29. Discount factor

$$d_t = 1 / (1 + s_t)^t$$
30. Forward rate between years $t - 1$ and t

$$f_{t-1,t} = [(1 + s_t)^t / (1 + s_{t-1})^{t-1}] - 1$$
31. Duration

$$D = \left[\sum_{t=1}^T \text{PV}(C_t) \times t \right] / P_0$$
32. Relationship of duration to bond price changes

$$\Delta P / P \approx -D [\Delta y / (1 + y)]$$
33. Number of shares required to elect d directors under cumulative voting

$$n = [(d \times s) / (D + 1)] + 1$$
34. Value of a right, rights-on

$$R = (C_0 - S) / (N + 1)$$
35. Value of a right, ex-rights

$$R = (C_e - S) / N$$

36. Beta from a simple linear regression

$$\beta = [(T \times \sum XY) - (\sum Y \times \sum X)] / [(T \times \sum X^2) - (\sum X)^2]$$
37. Alpha from a simple linear regression

$$\alpha = [(\sum Y)/T] - [\beta \times (\sum X)/T]$$
38. Standard deviation of the random error term from a simple linear regression

$$\sigma_e = \{[\sum Y^2 - (\alpha \times \sum Y) - (\beta \times \sum XY)] / [T - 2]\}^{1/2}$$
39. Standard error of beta from a simple linear regression

$$\sigma_\beta = \sigma_e / \{[\sum X^2 - [(\sum X)^2/T]]^{1/2}\}$$
40. Standard error of alpha from a simple linear regression

$$\sigma_\alpha = \sigma_e / \{T - [(\sum X)^2/\sum X^2]\}^{1/2}$$
41. Correlation coefficient

$$\rho = [(T \times \sum XY) - (\sum Y \times \sum X)] / \{[(T \times \sum Y^2) - (\sum Y)^2] \times [(T \times \sum X^2) - (\sum X)^2]\}^{1/2}$$
42. Beta of the firm

$$\beta_{\text{firm}} = \beta_{\text{debt}} [(1 - \tau)D/V_u] + \beta_{\text{equity}} (E/V_u)$$
43. Beta of the firm's equity

$$\beta_{\text{equity}} = \beta_{\text{firm}} + (\beta_{\text{firm}} - \beta_{\text{debt}})(D/E)(1 - \tau)$$
44. Adjusted historical beta

$$\beta_a = a + b\beta_h$$
45. Capitalization-of-income method of valuation

$$V = \sum_{t=1}^{\infty} [C_t / (1 + k)^t]$$
46. Zero-growth DDM

$$V = D_1 / k$$
47. Constant-growth DDM

$$V = D_1 / (k - g)$$
48. Multiple-growth DDM

$$V = [\sum_{t=1}^T D_t / (1 + k)^t] + [D_{T+1} / (k - g) \times (1 + k)^T]$$
49. "Normal" price-earnings ratio with constant growth

$$V/E_0 = p[1 + r(1 - p)] / [k - r(1 - p)]$$
50. Lintner dividend payout model

$$D_t = ap^*E_t + (1 - a)D_{t-1}$$
51. Annual earnings as a random walk

$$E_t = E_{t-1} + \epsilon_t$$
52. Quarterly earnings as an autoregressive process

$$QE_t = QE_{t-4} + a(QE_{t-1} - QE_{t-5}) + b + \epsilon_t$$
53. Intrinsic value of puts and calls

$$IV_C = \text{MAX}(0, P_S - E)$$

$$IV_P = \text{MAX}(0, E - P_S)$$
54. Put-call parity

$$P_P + P_S = P_C + E/e^{RT}$$
55. Black-Scholes formula for the fair value of a call option

$$V_C = N(d_1)P_S - (E/e^{RT})N(d_2)$$

$$d_1 = [1n(P_S/E) + (R + .5\sigma^2)T] / \sigma\sqrt{T}$$

$$d_2 = [1n(P_S/E) + (R - .5\sigma^2)T] / \sigma\sqrt{T}$$

$$\sigma = d_1 - \sigma\sqrt{T}$$
56. Black-Scholes formula for the fair value of a put option

$$P_P = (E/e^{RT})N(-d_2) - P_S N(-d_1)$$
57. Fair value of a futures contract

$$F_t = P_S + I - B + C$$
58. Fair value of an index futures contract

$$F_t = P_S + RP_S - yP_S$$
59. Investment company's net asset value

$$NAV_t = (MVA_t - LIAB_t) / NSO_t$$
60. Return on an investment company's shares

$$r_t = [(NAV_t - NAV_{t-1}) + I_t + G_t] / NAV_{t-1}$$
61. Risk tolerance (as implied by a choice of a portfolio)

$$\tau = [2(\bar{r}_C - r_f)\sigma_S^2] / (\bar{r}_S - r_f)^2$$
62. Certainty equivalent return

$$u_t = \bar{r}_p - (1/\tau)\sigma_p^2$$
63. Ex post alpha

$$\alpha_p = ar_p - ar_p$$
64. Ex post alpha based on the CAPM

$$\alpha_p = ar_p - [ar_f + (a\bar{r}_M - ar_f)\beta_p]$$
65. Ex post characteristic line

$$r_p - r_f = \alpha_p + \beta_p(r_M - r_f)$$
66. Reward-to-volatility ratio (Treynor ratio)

$$RVOL_p = (ar_p - ar_f) / \beta_p$$
67. Reward-to-variability ratio (Sharpe ratio)

$$RVAR_p = (ar_p - ar_f) / \sigma_p$$
68. Ex post characteristic curve

$$r_p - r_f = a + b(r_M - r_f) + c[(r_M - r_f)^2]$$
69. Ex post characteristic lines

$$r_p - r_f = a + b(r_M - r_f) + c[D(r_M - r_f)]$$

 where: $D = 0$ if $r_M > r_f$
 $D = -1$ if $r_M < r_f$
70. Return on a foreign investment

$$r_t = r_d + r_c + r_d r_c$$
71. Standard deviation of a foreign investment

$$\sigma_f = (\sigma_d^2 + \sigma_c^2 + 2\rho_{dc}\sigma_d\sigma_c)^{1/2}$$

出版说明

为适应我国社会主义市场经济的建设和发展,为满足国内广大读者了解、学习、借鉴国外先进的管理经验和掌握经济理论的前沿动态,清华大学出版社与 PRENTICE HALL 国际出版公司合作影印出版一系列英文版经济管理方面的图书。我们所选图书均是国外再版多次的书籍。在选书过程中,中国人民大学吕一林教授、荆新教授、王建英博士、胡曙光博士以及清华大学经济管理学院宋学宝博士做了大量工作,在此表示感谢。

由于原作者所处国家的经济、政治及文化背景等与我国不同,希望读者在阅读过程中注意分析和鉴别。

我们希望这套影印书的出版对促进我国经济科学的发展会有所帮助,对我国经济管理专业的教学会有所促进。

清华大学出版社

1997年8月

P R E F A C E

Investment management once seemed a simple process. Well-heeled investors would hold portfolios composed, for the most part, of the stocks and bonds of “blue chip” U.S. industrial companies, as well as U.S. Treasury bonds, notes, and bills. The choices available to less well-off investors were much more limited, confined primarily to passbook savings accounts and U.S. Savings Bonds. If the investment environment can be thought of as an ice cream parlor, then the customers of past decades were offered only chocolate and vanilla.

Mirroring the diversity of modern society, the investment ice cream parlor now makes available a myriad of “flavors” to the investing public. Investors face a dizzying array of choices. The stocks and bonds of large U.S.-based companies and the debt securities of the U.S. Treasury remain the predominant favorites. However, to mention only a few additional choices, investors can now own the stocks of small U.S.-based companies, the stocks and bonds of companies headquartered from London to Auckland, high-yield bonds, collateralized mortgage obligations, floating-rate notes, swaps, puts, calls, and futures contracts. The list is seemingly endless, and it continues to grow. Furthermore, the ability to purchase these securities has become both increasingly less expensive and more convenient with the advent of advanced communications and computer networks, along with the proliferating market for mutual funds that has developed to serve large and small investors alike.

The difficulty of writing a textbook on investing has increased as the investment environment has become more complex. Virtually all types of securities, be they traditional or of recent origin, merit at least some discussion. The challenge to us as textbook writers therefore is daunting. We must enumerate and describe the various securities and markets in a clear and concise manner that appropriately blends theory and practice. However, with the rapid evolution that the investment industry is undergoing, we must also present a discussion of new investment management techniques. Preventing the textbook from reaching encyclopedic proportions thus becomes a difficult project in itself.

The subject matter for this edition of *Investments* has evolved considerably since 1978 when the first edition was published. For example, in the last several years international investing has expanded rapidly, securities such as swaps and mortgage derivatives have become increasingly popular, and investors have placed much more emphasis on investment “styles.” Our task has been to keep *Investments* fresh and stimulating and to continue to offer students and instructors the most thorough survey of the investment environment available. We believe that we have accomplished these objectives and hope that you agree.

We designed *Investments* for advanced undergraduate and graduate students. In doing so, we assumed that such students would have been exposed to basic economics, accounting, statistics, and algebra. Furthermore, it is our belief that serious students of investments should receive a balanced presentation of theory and practical information without being burdened by excessive details. A textbook that focuses solely on institutional features leaves students unable to appreciate the subtle and important issues faced by investment professionals.

Some people will wonder how *Investments* compares with the recently published *Fundamentals of Investments* that we have also written. Although both are intended to be comprehensive, they are dissimilar in two significant ways. First, they are organized differently. *Investments* is

written in an integrated fashion, whereas *Fundamentals* is more modular in design. Second, *Investments* is somewhat more theoretical and technical than *Fundamentals*.

As any textbook author will attest, a previous work can always be improved—even one that has been in existence as long as this one. Over the years we have received many helpful suggestions from instructors and reviewers regarding ways in which we can make *Investments* better. In each new edition we have tried to enhance the book's breadth and presentation style. In this, the fifth edition, we have implemented the following improvements from the previous edition:

- **More international content.** The globalization of the investment industry is proceeding at a rapid pace. It is imperative that students become familiar with an increasingly diverse set of international investing concepts. Chapter 26 deals directly with international investing. Moreover, throughout the text we have expanded the discussions of international securities and security markets.
- **Expanded coverage of options and futures and the introduction of swaps.** The use of these types of derivative securities has become commonplace among institutional investors. Accordingly, Chapters 20 and 21 have been extended in order to more fully present the basic concepts underlying options and futures. In addition, Chapter 24 contains an introduction to swaps.
- **Updated material.** Where appropriate, we have updated the text to keep students abreast of the latest developments in investments. We have revised tables and graphs to incorporate current information. Furthermore, we have added discussions of recent important academic research.
- **Additional end-of-chapter problems.** We have roughly doubled the number of questions and problems at the end of each chapter.
- **CFA examination questions.** To give students a sense of the knowledge required of certified investment professionals, we have added questions, where appropriate, from recent Chartered Financial Analyst examinations.
- **Answers to selected problems.** Students often wish to know if they are working in the right direction when solving end-of-chapter problems. At the end of the text, we have included answers to selected problems.
- **Redesigned chapter summaries.** To facilitate a quick review of a chapter's highlights, we have rewritten each chapter's summary in an easy-to-read bulleted format.
- **Institutional Issues.** Students typically want to know how the concepts presented in the text are applied in the "real world." In each chapter, we have added a feature entitled Institutional Issues that offers discussions concerning issues that face large institutional investors, such as pension funds and mutual funds.
- **Annotated references.** For those students who are interested in further study of subjects presented in the text, at the end of each chapter we have included an extensive set of references organized by topic.
- **New co-author.** Jeff Bailey, who contributed to the fourth edition, is now a co-author. Jeff, a CFA and a full-time practitioner with a pension fund consulting firm, has brought a wealth of knowledge about how things are done "in the trenches."

Investments contains several teaching aids that we believe instructors will find valuable. The terms highlighted within the text and listed at the end of each chapter help emphasize important concepts. The glossary allows students to quickly reference terms listed earlier in the text, thereby creating a continuity of concepts across chapters. The bulleted summaries permit students to easily identify the essential thoughts developed in each chapter.

We are particularly proud of the Institutional Issues features presented in each chapter. Specifically written for *Investments*, they are designed to give students a sense of how various investment issues and techniques are applied by practitioners. For example, the Chapter 2 feature discusses how institutional investors create market neutral portfolios utilizing short selling. The Chapter 24 feature considers how pension funds go about structuring groups of

money managers to achieve specific investment objectives. The Chapter 26 feature describes the controversial issue of whether or not to hedge the currency risk of an international portfolio. Furthermore, Ann Guenther Sherman of the Hong Kong University of Science and Technology has written two Institutional Issues features that deal with investing in Hong Kong and the People's Republic of China, which we view as the ultimate emerging market—particularly after 1997 when Hong Kong becomes part of the PRC. In summary, we believe that the Institutional Issues features will provide both interesting reading for the students and a stimulating source of classroom discussion material.

An extended supplements package also accompanies *Investments*. Included in this package are:

- Instructor's Manual. Solutions to all end-of-chapter problems are presented in a thorough and well-explained fashion. Also, a set of course outlines that are designed to accommodate a variety of teaching approaches is presented.
- Tutorial Software. This software is available at a discount price.
- Test Item File and Prentice Hall DataManager. The Test Item File gives an instructor access to hundreds of exam questions (true/false, multiple choice, and problems) and their solutions. The Prentice Hall DataManager facilitates classroom management with a computer-assisted test design system and an electronic gradebook.
- Disclosure Information Service. Designed to enhance the classroom experience, the Compact DSEC Academic Edition combines the most recent, detailed information on 100 SEC-filing public companies with advanced search software to produce a fast, easy, real-world teaching tool that resides on your personal computer.

Many people have assisted us in preparing the fifth edition of this book, and we would like to acknowledge them as well of those who helped us with earlier editions. Specifically, we would like to thank Seth Anderson, Ted Aronson, Ann Bailey, Ed Baker, Michael Barclay, Kenneth S. Bartunek, Jeffrey Born, E. Taylor Claggett, James Conley, Thomas Eyssell, Joe Finnerty, Charlie Freund, Ping Hsiao, Robert Jennings, Lee Jones, Steven L. Jones, Douglas R. Kahi, Ed Keon, Jaroslaw Komarynsky, Linda Kramer, K. C. Ma, S. Maheswaren, Linda J. Martin, Carl McGowan, Ronald Melicher, Tom Nohel, Thomas O'Brien, Martha Ortiz, James A. Overdahl, Lynne Pi, Maggie Queen, Sailesh Ramamurtie, Anthony Sanders, Frederick P. Schadler, Jandhyala L. Sharma, Arlene Spiegel, Len Washko, Robert Wolf, Steve Wunsch, Fernando Zapatero, Emilio Zarruk and Ken Zumwalt.

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We learned much by writing this book and hope that you will learn much by reading it. Although we have done our best to eliminate errors from the book, experience tells us that perfection is unattainable. Thus we encourage those students and instructors with constructive comments to send them to us.

WFS
GJA
JVB

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