
Portfolio Performance Evaluation

Portfolio Performance Evaluation

George O. Aragon

*W.P. Carey School of Business
Arizona State University
Tempe, AZ
George.Aragon@asu.edu*

Wayne E. Ferson

*Marshall School of Business
University of Southern California
Los Angeles, CA
ferson@marshall.usc.edu*

now

the essence of **knowledge**

Boston – Delft

Foundations and Trends[®] in Finance

Published, sold and distributed by:

now Publishers Inc.
PO Box 1024
Hanover, MA 02339
USA
Tel. +1-781-985-4510
www.nowpublishers.com
sales@nowpublishers.com

Outside North America:

now Publishers Inc.
PO Box 179
2600 AD Delft
The Netherlands
Tel. +31-6-51115274

The preferred citation for this publication is G. O. Argon and W. E. Ferson, Portfolio Performance Evaluation, Foundations and Trends[®] in Finance, vol 2, no 2, pp 83–190, 2006

ISBN: 978-1-60198-082-3

© 2008 G. O. Argon and W. E. Ferson

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted in any form or by any means, mechanical, photocopying, recording or otherwise, without prior written permission of the publishers.

Photocopying. In the USA: This journal is registered at the Copyright Clearance Center, Inc., 222 Rosewood Drive, Danvers, MA 01923. Authorization to photocopy items for internal or personal use, or the internal or personal use of specific clients, is granted by now Publishers Inc for users registered with the Copyright Clearance Center (CCC). The 'services' for users can be found on the internet at: www.copyright.com

For those organizations that have been granted a photocopy license, a separate system of payment has been arranged. Authorization does not extend to other kinds of copying, such as that for general distribution, for advertising or promotional purposes, for creating new collective works, or for resale. In the rest of the world: Permission to photocopy must be obtained from the copyright owner. Please apply to now Publishers Inc., PO Box 1024, Hanover, MA 02339, USA; Tel. +1-781-871-0245; www.nowpublishers.com; sales@nowpublishers.com

now Publishers Inc. has an exclusive license to publish this material worldwide. Permission to use this content must be obtained from the copyright license holder. Please apply to now Publishers, PO Box 179, 2600 AD Delft, The Netherlands, www.nowpublishers.com; e-mail: sales@nowpublishers.com

**Foundations and Trends[®] in
Finance**

Volume 2 Issue 2, 2006

Editorial Board

Editor-in-Chief:

George M. Constantinides

Leo Melamed Professor of Finance

The University of Chicago

Graduate School of Business

5807 South Woodlawn Avenue

Chicago IL 60637

USA

gmc@gsb.uchicago.edu

Editors

Franklin Allen

Nippon Life Professor of Finance and Economics,

The Wharton School, The University of Pennsylvania

Andrew W. Lo

Harris & Harris Group Professor, Sloan School of Management,

Massachusetts Institute of Technology

René M. Stulz

Everett D. Reese Chair of Banking and Monetary Economics,

Fisher College of Business, The Ohio State University

Editorial Scope

Foundations and Trends[®] in Finance will publish survey and tutorial articles in the following topics:

- Corporate Governance
- Corporate Financing
- Dividend Policy and Capital Structure
- Corporate Control
- Investment Policy
- Agency Theory and Information
- Market Microstructure
- Portfolio Theory
- Financial Intermediation
- Investment Banking
- Market Efficiency
- Security Issuance
- Anomalies and Behavioral Finance
- Asset-Pricing Theory
- Asset-Pricing Models
- Tax Effects
- Liquidity
- Equity Risk Premium
- Pricing Models and Volatility
- Fixed Income Securities
- Computational Finance
- Futures Markets and Hedging
- Financial Engineering
- Interest Rate Derivatives
- Credit Derivatives
- Financial Econometrics
- Estimating Volatilities and Correlations

Information for Librarians

Foundations and Trends[®] in Finance, 2006, Volume 2, 4 issues. ISSN paper version 1567-2395. ISSN online version 1567-2409. Also available as a combined paper and online subscription.

Foundations and Trends® in
Finance
Vol. 2, No. 2 (2006) 83–190
© 2008 G. O. Aragon and W. E. Ferson
DOI: 10.1561/05000000015



Portfolio Performance Evaluation

George O. Aragon¹ and Wayne E. Ferson²

¹ *W.P. Carey School of Business, Arizona State University,
PO Box 873906, Tempe, AZ (480) 965-5810,
George.Aragon@asu.edu*

² *Marshall School of Business, University of Southern California,
701 Exposition Boulevard, Los Angeles, CA 90089-142,
ferson@marshall.usc.edu, <http://www2.bc.edu/~fersonwa>*

Abstract

This paper provides a review of the methods for measuring portfolio performance and the evidence on the performance of professionally managed investment portfolios. Traditional performance measures, strongly influenced by the Capital Asset Pricing Model of Sharpe (1964), were developed prior to 1990. We discuss some of the properties and important problems associated with these measures. We then review the more recent Conditional Performance Evaluation techniques, designed to allow for expected returns and risks that may vary over time, and thus addressing one major shortcoming of the traditional measures. We also discuss weight-based performance measures and the stochastic discount factor approach. We review the evidence that these

newer measures have produced on selectivity and market timing ability for professional managed investment funds. The evidence includes equity style mutual funds, pension funds, asset allocation style funds, fixed income funds and hedge funds.

Keywords: Portfolio performance; mutual fund performance; hedge funds; managed portfolios.

Contents

1	Introduction	1
2	Classical Measures of Portfolio Performance	5
2.1	The Measures: An Overview	5
2.2	Properties of the Classical Measures	16
2.3	Professionally Managed Portfolios in Classical Measures	26
3	Conditional Performance Evaluation	35
3.1	Motivation and Example	36
3.2	Conditional Alphas	38
3.3	Conditional Market Timing	40
3.4	Conditional Weight-Based Measures	43
4	The Stochastic Discount Factor Approach	47
4.1	Relation to the Beta Pricing Approach	48
4.2	Estimation of SDF Alphas	49
5	Implementing the Measures: A Fund-of-Funds Perspective	51
5.1	Evaluating a Set of Individual Hedge Funds	51
6	Bond Fund Performance Measurement	59
6.1	Fixed Income Models	59

7 Hedge Fund Performance	63
7.1 Data Issues	64
7.2 Dynamic Risk Exposures	65
7.3 Asset Illiquidity	66
8 Recent Empirical Evidence	67
8.1 Evidence on Conditional Alphas	67
8.2 Conditional Market Timing	68
8.3 Evidence from Weight-Based Measures	69
8.4 Stochastic Discount Factor Evidence	70
8.5 Pension Fund Evidence	71
8.6 Evidence on Bond Fund Performance	72
8.7 Evidence on Hedge Fund Performance	73
9 Evidence on Managed Portfolio Performance and Market Efficiency	81
9.1 Market Efficiency and Portfolio Performance	81
9.2 Mutual Fund Examples	84
9.3 Hedge Fund Examples	88
10 Conclusions	97
Acknowledgments	99
References	101

1

Introduction

This is a good time for a review of the academic literature on evaluating portfolio performance, concentrating on professionally managed investment portfolios. While the literature goes back to before the 1960s, recent years have witnessed an explosion of new methods for performance evaluation and new evidence on the subject. We think that several forces have contributed to this renaissance. The demand for research on managed portfolio performance increased as mutual funds and related investment vehicles became more important to investors in the 1980s and 1990s. During this period, equity investment became widely popular, as 401(k) and other defined-contribution investment plans began to dominate defined-benefit plans in the United States. Under such plans, individuals make their own investment choices from a menu of employer-specified options. At the same time, “baby-boomers” reached an age where they had more money to invest, and new investment opportunities were developing for investors in Europe and Asia that increased the demand for professionally managed portfolio products. This period also witnessed an explosive growth in alternative investments, such as hedge funds and private equity vehicles.

2 Introduction

While the demand for research on investment performance has increased, the cost of producing this research has declined. Early studies relied on proprietary or expensive commercial databases for their fund performance figures, or researchers collected data by hand from published paper volumes. In 1997, the Center for Research in Security Prices introduced the CRSP mutual fund database, compiled originally by Mark Carhart, into the academic research market. Starting in about 1994, several databases on hedge fund returns and characteristics became available to academic researchers. Of course, during the same period the costs of computing have declined dramatically. In response to an increased demand and lower costs of production, the supply of research on fund performance expanded dramatically.

This chapter provides a selective review of the methods for measuring portfolio performance and the evidence on the performance of professionally managed investment portfolios. As the relevant literature is vast and expanding quickly, a complete survey is virtually impossible. This one reflects its authors' interests, and no doubt, biases.

Chapter 2 reviews the classical measures of portfolio performance developed between about 1960 and 1990. Our review emphasizes a unifying theme. We measure the total performance by comparing the returns on the managed portfolio to the returns of an *Otherwise Equivalent* (our terminology) benchmark portfolio. This is a portfolio with the same risk and other relevant characteristics as the managed portfolio, but which does not reflect the manager's investment ability. A manager with investment ability generates higher returns than the otherwise equivalent alternative, at least before fees and costs are considered. We first present the traditional measures, then review the important problems and properties associated with these measures.

Early studies frequently attempt to distinguish security selection versus market timing abilities on the part of fund managers. Timing ability is the ability to use superior information about the future realizations of common factors that affect overall market returns. A manager with timing ability may alter the asset allocation between stocks and safe assets or among other broad asset classes. Selectivity refers to

the use of security-specific information, such as the ability to pick winning stocks or bonds within an asset class. We develop this dichotomy and discuss the ability of various performance measures to capture it. This section closes with a review of the evidence for managed portfolio performance based on the traditional measures. This discussion touches on the issues of survivorship bias and persistence in performance, among other topics.

Chapter 3 discusses Conditional Performance Evaluation. Here, the idea is to measure performance accounting for the fact that the expected returns and risks for investing may vary over time depending on the state of the economy. An example motivates the approach. We then discuss simple modifications to the traditional measures that attempt to condition on the state of the economy by using lagged variables as instruments.

Chapter 4 discusses the Stochastic Discount Factor Approach to performance measurement. We show briefly how this is related to the traditional alpha, what advantages the approach may have, and some recent developments.

Chapter 5 summarizes and illustrates the main issues in implementing the performance measures using hypothetical numerical examples. The examples are from the perspective of a fund-of-fund that must evaluate the performance of a sample of hedge funds using historical returns data.

Chapter 6 presents a brief discussion of the measures for investment performance of fixed income funds and Chapter 7 discusses hedge funds. Research on these fund types is still in an early stage of development, and these types of funds seem to present unique challenges for measuring risk-adjusted performance and for interpreting performance measures.

In Chapter 8, we review the modern empirical evidence on fund performance, which begins in about 1995 when studies began to use the CRSP-Carhart mutual fund database. We review the evidence that conditional measures have produced, both on selectivity and market timing ability. Also, in the mid-1990s data on hedge fund returns and characteristics first became available to academic researchers. We include a review of the evidence on hedge-fund performance.

4 *Introduction*

Chapter 9 provides tabular summaries of the historical evidence on the performance of mutual funds and hedge funds using actual data. We describe how this evidence is related to the classical question of the informational efficiency of the markets. The various performance measures are interpreted by using and referring back to the concepts developed earlier in the text and Chapter 10 is the conclusion.

References

- Ackermann, C., R. McEnally, and D. Ravenscraft (1999), 'The performance of hedge funds: Risk, return, and incentives'. *Journal of Finance* **54**, 833–874.
- Admati, A. R., S. Bhattacharya, P. Pfleiderer, and S. A. Ross (1986), 'On timing and selectivity'. *Journal of Finance* **41**, 715–730.
- Admati, A. R. and P. Pfleiderer (1997), 'Does it all add up? Benchmarks and the compensation of portfolio managers'. *Journal of Business* **70**, 323–350.
- Agarwal, V. and N. Naik (2004), 'Risks and portfolio decisions involving hedge funds'. *Review of Financial Studies* **17**, 63–98.
- Amihud, Y. and H. Mendelson (1986), 'Asset pricing and the bid-ask spread'. *Journal of Financial Economics* **17**, 223–249.
- Aragon, G. (2005), 'Timing multiple markets: Theory and evidence from balanced mutual funds'. Working Paper, Arizona State University.
- Aragon, G. (2007), 'Share restrictions and asset pricing: Evidence from the hedge fund industry'. *Journal of Financial Economics* **83**, 33–58.
- Aragon, G. and W. Ferson (2008), 'Evaluating hedge fund performance against dynamic nonlinear benchmarks'. Working Paper, Arizona State University.

- Asness, C., R. Krail, and J. Liew (2001), 'Do hedge funds hedge?'. *Journal of Portfolio Management* **28**, 6–19.
- Becker, C., W. Ferson, D. Myers, and M. Schill (1999), 'Conditional market timing with benchmark investors'. *Journal of Financial Economics* **52**, 119–148.
- Berk, J. and R. C. Green (2004), 'Mutual fund flows and performance in rational markets'. *Journal of Political Economy* **112**, 1269–1295.
- Black, F. and M. Scholes (1973), 'The pricing of options and corporate liabilities'. *Journal of Political Economy* **81**, 637–654.
- Black, F. and J. Treynor (1973), 'How to use security analysis to improve portfolio selection'. *Journal of Business* **46**, 66–86.
- Brown, D. T. and W. J. Marshall (2001), 'Assessing fixed-income fund manager style and performance from historical returns'. *Journal of Fixed Income* **10**, 15–25.
- Brown, K., V. Harlow, and L. Starks (1996), 'Of tournaments and temptations: An analysis of managerial incentives in the mutual fund industry'. *Journal of Finance* **51**, 85–110.
- Brown, S., W. Goetzmann, and R. Ibbotson (1999), 'Offshore hedge funds: Survival and performance 1989–1995'. *Journal of Business* **72**, 91–118.
- Brown, S. J. and W. N. Goetzmann (1995), 'Performance persistence'. *Journal of Finance* **50**, 679–98.
- Brown, S. J., W. N. Goetzmann, R. Ibbotson, and S. Ross (1992), 'Survivorship bias in performance studies'. *Review of Financial Studies* **5**, 553–580.
- Busse, J. (1999), 'Volatility timing in mutual funds: Evidence from daily returns'. *Review of Financial Studies* **12**, 1009–1041.
- Busse, J. (2001), 'Another look at mutual fund tournaments'. *Journal of Financial and Quantitative Analysis* **36**, 53–73.
- Carhart, M., J. Carpenter, A. Lynch, and D. Musto (2002), 'Mutual fund survivorship'. *Review of Financial Studies* **15**, 1439–1463.
- Carhart, M. M. (1997), 'On persistence in mutual fund performance'. *Journal of Finance* **52**, 57–82.
- Carlson, R. S. (1970), 'Aggregate performance of mutual funds, 1948–1967'. *Journal of Financial and Quantitative Analysis* **5**, 1–32.

- Chang, E. C. and W. G. Lewellen (1984), 'Market timing and mutual fund investment performance'. *Journal of Business* **57**, 57–72.
- Chen, N.-F., T. Copeland, and D. Mayers (1987), 'A comparison of single and multifactor performance methodologies'. *Journal of Financial and Quantitative Analysis* **22**, 401–417.
- Chen, N.-F., R. R. Roll, and S. A. Ross (1986), 'Economic forces and the stock market'. *Journal of Business* **59**, 383–403.
- Chen, Y., W. Ferson, and H. Peters (2006), 'Measuring the timing ability of fixed income funds'. Unpublished Working Paper, University of Southern California.
- Chen, Z. and P. J. Knez (1996), 'Portfolio performance Measurement: Theory and applications'. *Review of Financial Studies* **9**, 511–556.
- Chevalier, J. and L. Ellison (1997), 'Risk taking by mutual funds as a response to incentives'. *Journal of Political Economy* **105**, 1167–1200.
- Chiu, S. and V. Rokey (1992), 'Risk incentives in mutual fund management: Theory and empirical results'. Unpublished Working Paper, University of Washington, Seattle.
- Chordia, T. (1996), 'The structure of mutual fund charges'. *Journal of Financial Economics* **41**, 3–39.
- Christopherson, J. A., W. Ferson, and D. A. Glassman (1998a), 'Conditional measures of performance and persistence for pension funds'. In: *Research in Finance*, Vol. 16. Stamford, CT: JAI Press, pp. 1–46. ISBN: 0-7623-0328-X.
- Christopherson, J. A., W. Ferson, and D. A. Glassman (1998b), 'Conditioning manager alpha on economic information: Another look at the persistence of performance'. *Review of Financial Studies* **11**, 111–142.
- Christopherson, J. A. and A. L. Turner (1991), 'Volatility and predictability of manager alpha: Learning the lessons of history'. *Journal of Portfolio Management* **5**, 5–12.
- Coggin, D., F. Fabozzi, and S. Rahman (1993), 'The investment performance of U.S. equity pension fund managers'. *Journal of Finance* **48**, 1039–1056.
- Comer, G. (2006), 'Evaluating bond fund sector timing skill'. Unpublished Working Paper, Georgetown University.

- Comer, G., V. Boney, and L. Kelly (2005), 'Timing the investment grade securities market: Evidence from high quality bond funds'. Unpublished Working Paper, Georgetown University.
- Connor, G. and R. A. Korajczyk (1986), 'Performance measurement with the arbitrage pricing theory: A new framework for analysis'. *Journal of Financial Economics* **15**, 373–394.
- Connor, G. and R. A. Korajczyk (1988), 'Risk and return in an equilibrium APT: Applications of a new test methodology'. *Journal of Financial Economics* **21**, 255–289.
- Copeland, T. and D. Mayers (1982), 'The value line enigma (1965–1978): A case study of performance evaluation issues'. *Journal of Financial Economics* **10**, 289–321.
- Cornell, B. (1979), 'Asymmetric information and portfolio performance measurement'. *Journal of Financial Economics* **7**, 381–390.
- Cox, J. C., J. E. Ingersoll Jr., and S. A. Ross (1985), 'A theory of the term structure of interest rates'. *Econometrica* **53**, 385–346.
- Dahlquist, M. and P. Soderlind (1999), 'Evaluating portfolio performance with stochastic discount factors'. *Journal of Business* **72**, 347–384.
- Daniel, K., M. Grinblatt, S. Titman, and R. Wermers (1997), 'Measuring mutual fund performance with characteristic-based benchmarks'. *Journal of Finance* **52**, 1035–1058.
- Del Guercio, D. and P. A. Tkac (2002), 'The determinants of the flow of funds of managed portfolios: Mutual funds vs. Pension funds'. *Journal of Financial and Quantitative Analysis* **37**, 523–557.
- Dimson, E. (1979), 'Risk measurement when shares are subject to infrequent trading'. *Journal of Financial Economics* **7**, 197–226.
- Dybvig, P. H. and J. E. Ingersoll (1982), 'Mean variance theory in complete markets'. *Journal of Business* **55**, 233–251.
- Dybvig, P. H. and S. A. Ross (1985), 'Performance measurement using differential information and a security market line'. *Journal of Finance* **40**, 383–399.
- Edelen, R. M. (1999), 'Investor flows and the assessed performance of open-end mutual funds'. *Journal of Financial Economics* **53**, 439–466.

- Elton, E. J., M. Gruber, and C. Blake (2001), 'A first look at the accuracy of the CRSP mutual fund database and a comparison of the CRSP and Morningstar databases'. *Journal of Finance* **56**, 2415–2430.
- Elton, E. J., M. J. Gruber, and C. R. Blake (1993), 'The performance of bond mutual funds'. *Journal of Business* **66**, 371–403.
- Elton, E. J., M. J. Gruber, and C. R. Blake (1995), 'Fundamental economic variables, expected returns and bond fund performance'. *Journal of Finance* **50**, 1229–1256.
- Elton, E. J., M. J. Gruber, and C. R. Blake (1996), 'Survivorship bias and mutual fund performance'. *Review of Financial Studies* **9**, 1097–1120.
- Elton, E. J., M. J. Gruber, and C. R. Blake (2003), 'Incentive fees and mutual funds'. *Journal of Finance* **58**, 779–804.
- Evans, R. B. (2003), 'Does alpha really matter? Evidence from fund incubation, termination and manager change'. Working Paper, University of Pennsylvania.
- Fama, E. (1972), 'Components of investment performance'. *Journal of Finance* **27**, 551–567.
- Fama, E. F. (1970), 'Efficient capital markets: A review of theory and empirical work'. *Journal of Finance* **25**, 383–417.
- Fama, E. F. and K. R. French (1996), 'Multifactor explanations of asset pricing anomalies'. *Journal of Finance* **51**, 55–87.
- Fama, E. F. and J. D. MacBeth (1973), 'Risk, return, and equilibrium: Some empirical tests'. *Journal of Political Economy* **81**, 607–636.
- Farnsworth, H. K. (1997), 'Evaluating stochastic discount factors from term structure models'. Unpublished Ph.D. Dissertation, University of Washington.
- Farnsworth, H. K., W. Ferson, D. Jackson, and S. Todd (2002), 'Performance evaluation with stochastic discount factors'. *Journal of Business* **75**, 473–504.
- Ferson, W., T. Henry, and D. Kisgen (2006a), 'Evaluating government bond fund performance with stochastic discount factors'. *Review of Financial Studies* **19**, 423–455.

- Ferson, W., T. Henry, and D. Kisgen (2006b), 'Fixed income fund performance across economic states'. In: *Research in Finance*, Vol. 23. Oxford, UK: JAI Press, pp. 1–62. ISBN-13: 978-0-7623-1346-7.
- Ferson, W. and K. Khang (2002), 'Conditional performance measurement using portfolio weights: Evidence for pension funds'. *Journal of Financial Economics* **65**, 249–282.
- Ferson, W. and M. Qian (2004), 'Conditional performance evaluation revisited'. AIMR manuscript.
- Ferson, W. and R. Schadt (1996), 'Measuring fund strategy and performance in changing economic conditions'. *Journal of Finance* **51**, 425–462.
- Ferson, W. and A. F. Siegel (2001), 'The efficient use of conditioning information in portfolios'. *Journal of Finance* **56**, 967–982.
- Ferson, W. and A. F. Siegel (2006), 'Testing portfolio efficiency with conditioning information'. Working Paper, University of Southern California.
- Ferson, W. and V. A. Warther (1996), 'Evaluating fund performance in a dynamic market'. *Financial Analysts Journal* **52**, 20–28.
- Ferson, W. E. (1995), 'Theory and empirical testing of asset pricing models, Chapter 5 in Finance'. In: M. Jarrow and Ziemba (eds.): *Handbooks in Operations Research and Management Science*. Elsevier, pp. 145–200.
- Ferson, W. E. (2003), 'Tests of multifactor pricing models, volatility bounds and portfolio performance'. In: M. H. George M. Constantinides and R. M. Stulz (eds.): *Handbook of the Economics of Finance*. North Holland: Elsevier Science Publishers (forthcoming).
- Ferson, W. E., S. Sarkissian, and T. Simin (2007), 'Asset pricing models with conditional betas and alphas: The effects of data snooping and spurious regression'. *Journal of Financial and Quantitative Analysis*. forthcoming.
- Fung, W. and D. Hsieh (1997), 'Empirical characteristics of dynamic trading strategies: The case of hedge funds'. *Review of Financial Studies* **10**, 275–302.
- Fung, W. and D. Hsieh (2000), 'Performance characteristics of hedge funds and commodity funds: Natural vs. spurious biases'. *Journal of Financial and Quantitative Analysis* **35**, 291–307.

- Fung, W. and D. Hsieh (2001), 'The risk in hedge fund strategies: Theory and evidence from trend followers'. *Review of Financial Studies* **14**, 313–341.
- Getmansky, M., A. Lo, and I. Makarov (2004), 'An econometric model of serial correlation and illiquidity in hedge fund returns'. *Journal of Financial Economics* **74**, 529–610.
- Glosten, L. and R. Jagannathan (1994), 'A contingent claims approach to performance evaluation'. *Journal of Empirical Finance* **1**, 133–166.
- Goetzmann, W., J. Ingersoll, and Z. Ivkovic (2000), 'Monthly measurement of daily timers'. *Journal of Financial and Quantitative Analysis* **35**, 257–290.
- Goetzmann, W., J. Ingersoll, M. Spiegel, and I. Welch (2005), 'Sharpening sharpe ratios'. NBER Working Paper No. 9116.
- Goetzmann, W. N. and R. G. Ibbotson (1994), 'Do winners repeat?'. *Journal of Portfolio Management* **20**, 9–18.
- Goriaev, M., T. Nijman, and B. Werker (2005), 'Yet another look at mutual fund tournaments'. *Journal of Empirical Finance* **12**, 127–137.
- Grant, D. (1977), 'Portfolio performance and the 'cost' of timing decisions'. *Journal of Finance* **32**, 837–846.
- Grinblatt, M. and S. Titman (1989a), 'Mutual fund performance: An analysis of quarterly portfolio holdings'. *Journal of Business* **62**, 393–416.
- Grinblatt, M. and S. Titman (1989b), 'Portfolio Performance evaluation: Old issues and new insights'. *Review of Financial Studies* **2**, 393–422.
- Grinblatt, M. and S. Titman (1992), 'The persistence of mutual fund performance'. *Journal of Finance* **47**, 1977–1984.
- Grinblatt, M. and S. Titman (1993), 'Performance measurement without benchmarks: An examination of mutual fund returns'. *Journal of Business* **60**, 97–112.
- Grinblatt, M., S. Titman, and R. Wermers (1995), 'Momentum strategies, portfolio performance and herding: A study of mutual fund behavior'. *American Economic Review* **85**, 1088–1105.

- Grossman, S. J. and J. E. Stiglitz (1980), 'On the impossibility of informationally efficient markets'. *American Economic Review* **70**, 393–408.
- Gruber, M. (1996), 'Another puzzle: The growth in actively managed mutual funds'. *Journal of Finance* **51**, 783–810.
- Hansen, L. P. (1982), 'Large sample properties of generalized method of moments estimators'. *Econometrica* **50**, 1029–1054.
- Hansen, L. P. and S. Richard (1987), 'The role of conditioning information in deducing testable restrictions implied by dynamic asset pricing models'. *Econometrica* **55**, 587–613.
- Heinkel, R. and N. M. Stoughton (1995), 'A new method for portfolio performance measurement'. Unpublished Working Paper, University of British Columbia.
- Hendricks, D., J. Patel, and R. Zeckhauser (1993), 'Hot hands in mutual funds: Short run persistence of performance, 1974–1988'. *Journal of Finance* **48**, 93–130.
- Hendricks, D., J. Patel, and R. Zeckhauser (1997), 'The J-shape of performance persistence given survivorship bias'. *Review of Economics and Statistics* **79**, 161–166.
- Henriksson, R. (1984), 'Market timing and mutual fund performance: An empirical investigation'. *Journal of Business* **57**, 73–96.
- Ippolito, R. A. (1989), 'Efficiency with costly information: A study of mutual fund performance, 1965–1984'. *The Quarterly Journal of Economics* **104**, 1–23.
- Ippolito, R. A. (1992), 'Consumer reaction to measures of poor quality: Evidence from the mutual fund industry'. *Journal of Law and Economics* **35**, 45–70.
- Jagannathan, R. and R. Korajczyk (1986), 'Assessing the market timing performance of managed portfolios'. *Journal of Business* **59**, 217–236.
- Jensen, M. C. (1968), 'The performance of mutual funds in the period 1945–1964'. *Journal of Finance* **23**, 389–416.
- Jensen, M. C. (1969), 'Risk, the pricing of capital assets, and the evaluation of investment portfolios'. *Journal of Business* **42**, 167–247.

- Jensen, M. C. (1972), 'Optimal utilization of market forecasts and the evaluation of investment performance'. In: G. P. Szego and K. Shell (eds.): *Mathematical Methods in Finance*. North-Holland Publishing Company.
- Kon, S. J. (1983), 'The market timing performance of mutual fund managers'. *Journal of Business* **56**, 323–347.
- Koski, J. and J. Pontiff (1999), 'How are derivatives used? Evidence from the mutual fund industry'. *Journal of Finance* **54**, 791–816.
- Kryzanowski, L., S. Lalancette, and M. To (1997), 'Performance attribution using an APT with prespecified factors'. *Journal of Financial and Quantitative Analysis* **32**, 205–224.
- Lakonishok, J., A. Shleifer, and R. Vishny (1992), 'The structure and performance of the money management industry'. *Brookings Papers on Economic Activity: Microeconomics*, pp. 339–391.
- Lehmann, B. N. and D. M. Modest (1987), 'Mutual fund performance evaluation: A comparison of benchmarks and benchmark comparisons'. *Journal of Finance* **42**, 233–266.
- Leland, H. (1999), 'Performance beyond mean-variance: Performance measurement in a nonsymmetric world'. *Financial Analysts Journal* **55**, 27–36.
- Liang, B. (1999), 'On the performance of hedge funds'. *Financial Analysts Journal* **55**, 72–85.
- Liang, B. (2000), 'Hedge funds: The living and the dead'. *Journal of Financial and Quantitative Analysis* **35**, 309–326.
- Long, J. B. (1974), 'Stock prices, inflation, and the term structure of interest rates'. *Journal of Financial Economics* **1**, 131–170.
- Malkiel, B. G. (1995), 'Returns from investing in equity mutual funds 1971 to 1991'. *Journal of Finance* **50**, 549–572.
- Mayers, D. and E. M. Rice (1979), 'Measuring portfolio performance and the empirical content of asset pricing models'. *Journal of Financial Economics* **7**, 3–28.
- Merton, R. C. (1973), 'An intertemporal capital asset pricing model'. *Econometrica* **41**, 867–887.
- Merton, R. C. (1981), 'On market timing and investment performance I: An equilibrium theory of value for market forecasts'. *Journal of Business* **54**, 363–406.

- Merton, R. C. and R. D. Henriksson (1981), 'On market timing and investment performance II: Statistical procedures for evaluating forecasting skills'. *Journal of Business* **54**, 513–534.
- Mitchell, M. and T. Pulvino (2001), 'Characteristics of risk and return in risk arbitrage'. *Journal of Finance* **56**, 2135–2175.
- Park, J. M. (1995), 'Managed futures as an investment class asset'. Unpublished Ph.D. Dissertation, Columbia University.
- Posthuma, N. and P. van der Sluis (2003), 'A reality check on hedge fund returns'. Unpublished Working Paper, Free University Amsterdam.
- Roll, R. (1978), 'Ambiguity when performance is measured by the security market line'. *Journal of Finance* **33**, 1051–1069.
- Ross, S. A. (1976), 'The arbitrage pricing theory of capital asset pricing'. *Journal of Economic Theory* **13**, 341–360.
- Scholes, M. and J. Williams (1977), 'Estimating betas from nonsynchronous data'. *Journal of Financial Economics* **5**, 309–327.
- Schultz, E. (1996), 'Vanguard bucks trend by cutting fund fees'. *The Wall Street Journal*, pp. c1–c25.
- Sharpe, W. F. (1964), 'Capital asset prices: A theory of market equilibrium under conditions of risk'. *Journal of Finance* **19**, 425–442.
- Sharpe, W. F. (1966), 'Mutual fund performance'. *Journal of Business* **1**(part II), 119–138.
- Sharpe, W. F. (1992), 'Asset allocation: Management style and performance measurement'. *Journal of Portfolio Management* **18**, 7–19.
- Shukla, R. and C. Trzcinka (1994), 'Persistent performance in the mutual fund market: Tests with funds and investment advisors'. *Review of Quantitative Finance and Accounting* **4**, 115–135.
- Sirri, E. R. and P. Tufano (1998), 'Costly search and mutual fund flows'. *Journal of Finance* **53**, 1589–1622.
- Stanton, R. (1997), 'A nonparametric model of term structure dynamics and the market price of interest rate risk'. *Journal of Finance* **52**, 1973–2002.
- Starks, L. (1987), 'Performance incentive fees: An agency theoretic approach'. *Journal of Financial and Quantitative Analysis* **22**, 17–32.

- Treynor, J. (1965), 'How to rate management of investment funds'. *Harvard Business* **41**, 63–75.
- Treynor, J. and K. Mazuy (1966), 'Can mutual funds outguess the market?'. *Harvard Business Review* **44**, 131–136.
- Vasicek, O. A. (1977), 'An equilibrium characterization of the term structure'. *Journal of Financial Economics* **5**, 177–188.
- Verrecchia, R. E. (1980), 'Consensus beliefs, information acquisition, and market information efficiency'. *American Economic Review* **70**, 874–884.
- Zheng, L. (1999), 'Is money smart? A study of mutual fund investors' fund selection ability'. *Journal of Finance* **54**, 901–933.