CFA INSTITUTE INVESTMENT PERSPECTIVES

Investment Performance Measurement

Evaluating and Presenting Results

Philip Lawton, CIPM, Editor • Todd Jankowski, CFA, Editor

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INVESTMENT PERFORMANCE MEASUREMENT

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FOREWORD

Investment management firms and their relationship managers need to be able to communicate their results to clients clearly and fairly. Investors, portfolio managers, advisers, and consultants need to be able to evaluate these results and ascertain to what extent performance was attributable to asset allocation, security selection, or other decisions. Technology staff, accountants, and compliance officers also need to understand performance measurement to design and audit systems that generate these results.

The field of performance measurement has made great strides since Gray P. Brinson, L. Randolph Hood, and Gilbert L. Beebower published their pioneering work on attribution analysis in 1986 and the Committee for Performance Reporting Standards of the Financial Analysts Federation (a predecessor of CFA Institute) proposed the development of performance presentation standards in 1987. These Standards have developed progressively over the last 20 years through the work of CFA Institute and almost 30 country sponsors. Today, the Global Investment Performance Standards (GIPS®) articulate a set of industrywide ethical principles that provide investment firms with guidance on how to calculate and report their investment results. Furthermore, a professional designation program has developed for professionals desiring to specialize in this area: the Certificate in Investment Performance Measurement (CIPM®).

This volume provides the reader with the tools necessary to measure, present, and evaluate investment performance results. It is a compilation of some of the best writings on presenting and evaluating investment performance. These include articles from the Research Foundation of CFA Institute, the *Financial Analysts Journal, CFA Institute Conference Proceedings Quarterly, CFA Magazine,* and the CIPM program. We are grateful to the distinguished team of authors for sharing their knowledge with investors and investment professionals through CFA Institute.

The 41 papers included here are organized in five sections beginning with an overview and followed by sections on performance measurement (what happened), performance attribution (why it happened), performance appraisal (how the investment manager did), and the Global Investment Performance Standards (how results should be presented).

CFA Institute is pleased to present *Investment Performance Measurement: Evaluating and Presenting Results,* the second in our CFA Institute Investment Perspectives series. We hope you will find it a useful guide and resource in performance measurement.

Robert R. Johnson, CFA
Deputy CEO
CFA Institute

INTRODUCTION

Evaluating performance insightfully and presenting it fairly are crucial to the vitality of an investment firm. Security analysts and portfolio managers make decisions under conditions of uncertainty about the relative attractiveness of market sectors and individual investments; the role of performance analysts is to explain the outcome of those decisions. At its best, the intelligent feedback provided by trained, experienced performance analysts can help the firm improve its decision process and refine its investment strategies, and the performance presentations they prepare can contribute to the firm's success in expanding client relationships and winning new business. Whether markets are rising or falling, resilient investment organizations value highly qualified performance professionals. Indeed, there is a curious countercyclicality to the demand for their expertise: It is when results are most disappointing that cogent explanations are most urgently needed.

In the chapter that opens this volume in the CFA Institute Investment Perspectives series, authors Jeffery V. Bailey, Thomas M. Richards, and David E. Tierney state that three questions arise in the process of evaluating the performance of an account—that is, a portfolio or a group of portfolios:

1. What was the account's performance?
2. Why did the account produce the observed performance?
3. Is the account's performance a result of luck or skill?

The first question falls in the domain of performance measurement, more narrowly defined in this context than in common usage. It is answered by calculating the account's rate of return over the evaluation period. Rate-of-return calculations are relatively straightforward in the case of traditional, long-only equity portfolios holding assets denominated in a single currency, but they are appreciably thornier for portfolios with more esoteric strategies. Once the return of the portfolio has been determined, it remains to judge whether the results meet the client's expectations, usually by comparing the portfolio's return with the return of a valid benchmark. Bailey, Richards, and Tierney set forth widely accepted criteria of benchmark validity and useful tests of benchmark quality.

The second question belongs to the realm of performance attribution. It is answered by applying quantitative techniques to establish the sources of the portfolio's return relative to the benchmark (i.e., to determine which investment decisions added value and, of course, which ones did not). Here, too, the mathematics of attribution analysis is fairly easy to grasp in the case of single-currency, long-only equity portfolios considered over a single evaluation period, but it is more challenging for portfolios holding both long and short positions, measured over multiple periods, or invested in fixed-income securities, derivatives, and assets denominated in multiple currencies. Attribution analysis, often accompanied by portfolio characteristics analysis, enables proficient performance professionals to discern what the firm

does well and not so well. It also facilitates productive dialogue with clients who may be reassured to find that the firm is investing as expected, following its mandate and adhering to its discipline even when the agreed-upon strategy is out of favor in the marketplace.

The third, and the most difficult and consequential, question pertains to performance appraisal. When conducting manager searches and monitoring managers' performance, institutional investors and their consultants seek to identify the investment firms most likely to produce consistently favorable results—firms whose track records arise not merely from fortunate timing but from the competent, disciplined execution of coherent, evidence-based investment strategies. Luck may change at any moment, whereas in stable organizations, skillfulness may reasonably be expected to persist. Because it is costly to terminate an advisory relationship and transfer assets to a new manager, investors must select managers prudently, and if portfolio returns prove disappointing, as they sometimes will, investors must attempt to distinguish between a simple run of bad luck and a much more serious lack, or loss, of skill. It is generally acknowledged, however, that investors cannot definitively establish, in a realistic timeframe, whether investment results are because of the manager's skill or dumb luck. In practice, therefore, performance appraisal commonly focuses on related and somewhat more decidable issues, to wit, determining whether the manager has taken acceptable risks and whether, over time, the investor has been adequately compensated for them.

In addition to evaluating decisions made on behalf of existing clients, performance professionals employed by investment firms are responsible for preparing presentations for the use of prospective clients. Working in close collaboration with numerous other organizations over the last two decades, CFA Institute has been a leader in developing voluntary performance presentation standards that protect the interests of prospective clients. The Global Investment Performance Standards (GIPS®) advance the ethical ideals of presenting investment results fairly and disclosing them fully. The Standards set forth minimum requirements and recommend best practices related to input data, calculation methodology, composite construction, disclosures, and the presentation and reporting of investment performance—all intended to ensure that a firm claiming compliance gives prospective clients complete and accurate information about its historical results. Now widely endorsed (and still evolving), the GIPS standards are a signal contribution to the investment industry, benefiting investors and investment firms around the world. It behooves anyone with an interest in performance measurement to become familiar with them.

The foregoing survey of the field of investment performance measurement accounts for the way in which we have organized the papers selected for this specialized collection from the wealth of CFA Institute publications. Participants in the Certificate in Investment Performance Measurement (CIPM®) program will recognize some papers from their study of the curriculum; this volume contains most of the Principles-level readings and several Expert-level readings.[1]

OVERVIEW

The "Overview" section contains the outstanding essay, previously mentioned, by Jeffery V. Bailey, Thomas M. Richards, and David E. Tierney. "Evaluating Portfolio Performance" is a masterful introduction to performance measurement, attribution, and appraisal. The authors explain the algebra of time-weighted and money-weighted rates of return, evaluate various types of benchmarks (notably including custom security-based benchmarks), present a widely used method of attribution analysis for individual portfolios and a systematic approach to attribution analysis at the total fund level, and give a well-considered account of the

[1]The CIPM program is described at www.cfainstitute.org/cipm.

objectives and techniques of performance appraisal, including *ex post* risk measures, quality control charts, and manager continuation policies. To those who are exploring the field for the first time, the value of this paper is inestimable; however, we recommend it no less enthusiastically to readers long acquainted with the challenges of performance evaluation.

PERFORMANCE MEASUREMENT

The section of this book devoted to performance measurement includes only one paper on rate-of-return calculations. In his important treatment of after-tax performance evaluation, James M. Poterba argues that the return calculation methodology should capture the contingent tax liability associated with unrealized gains held in the portfolio at the end of an evaluation period. For the rest, this section centers on issues surrounding the construction and selection of performance benchmarks.

Re-published here in full, Laurence B. Siegel's monograph "Benchmarks and Investment Management" recounts the historical development of benchmarking in the context of modern portfolio theory and judiciously addresses a range of fundamental and often contentious issues. By comparing the philosophies and methodologies of two major index providers, Christopher G. Luck illustrates how the choice of a benchmark can affect the behavior of active portfolio managers. Lee N. Price describes three progressively accurate techniques for approximating the after-tax return of a pre-tax benchmark. Arguing that generic, capitalization-weighted bond indices do not represent the true opportunity set for most fixed-income portfolios, William L. Nemerever suggests using derivative securities to construct alternative benchmarks. Brent Ambrose and Arthur Warga demonstrate that dollar-duration weighting results in significantly more reliable estimates of fixed-income portfolio yields than the conventional market-value-weighted approach. Finally, Crystal Detamore-Rodman presents the views of several thought leaders on selecting appropriate benchmarks, isolating pure alpha (i.e., the risk-adjusted excess return due not to market exposures but to the portfolio manager's active decisions), and constructing synthetic universes representing the portfolios that might have been formed from the benchmark's constituent securities. In their diversity, the articles assembled in this section will give thoughtful readers a solid understanding of the theoretical grounds for benchmarking and the trade-offs encountered in practice.

PERFORMANCE ATTRIBUTION

The section devoted to performance attribution analysis opens with a groundbreaking piece that first appeared almost a quarter century ago, followed by an update published in 1991 and a letter to the *Financial Analysts Journal* written by one of the authors in 2005. In their short, powerful 1986 article "Determinants of Portfolio Performance," Gary P. Brinson, L. Randolph Hood, and Gilbert L. Beebower famously presented their finding that, at the total fund level, investment policy—an investor's decisions about which asset classes to include and what normal weights to assign them—contributes far more to the variation of returns than does active management in the form of market timing and security (or manager) selection. From a performance analyst's point of view, the decisive importance of this empirical result is matched by the lasting impact of the authors' conceptual framework for decomposing returns. In "Determinants of Portfolio Performance II: An Update," Brian D. Singer joins Brinson and Beebower in presenting further, confirmatory research on the total return contributions from policy and active management decisions and in extending the analytical method to capture the

effect of internal risk positioning, for instance, by using futures, carrying cash, or hedging currency exposures. In "Determinants of Portfolio Performance—20 Years Later," L. Randolph Hood reflects on the debate that followed the appearance of the original article. "The consensus," he writes, ". . . appears to have settled in to agree with us that investment policy will be very important in subsequent results and in describing those results."

Philip Lawton and Stephen C. Gaudette explain how equity portfolio characteristics analysis can help performance practitioners discern shifts in strategy, evaluate investment style, and determine the return effects of factor exposures. Taking into account the costs of acquiring and trading on information, Daniel C. Indro, Christine X. Jiang, Michael Y. Hu, and Wayne Y. Lee investigate the relationship between mutual fund size and performance.

"Multiperiod Arithmetic Attribution" is the first of three articles by José Menchero included in this collection. The accuracy of widely used arithmetic attribution methodologies, such as the Brinson model, decays when they are applied to extended reporting periods over which portfolios are rebalanced. In light of desirable qualitative characteristics and quantitative properties, Menchero classifies and evaluates competing algorithms designed to eliminate unexplained residuals in multiperiod arithmetic attribution analyses. In "Optimized Geometric Attribution," he presents a metric-preserving method for distributing the residuals that are generated in the process of geometric buy-and-hold attribution analysis so as to minimize the distortion of sector effects. In "Custom Factor Attribution," Menchero collaborates with Vijay Poduri in presenting a framework for explaining the sources of risk-adjusted performance by attributing the information ratio (defined as active return divided by the tracking error) to custom factors that reflect the actual investment strategy and decision-making process. The method proposed by Menchero and Poduri may represent a step forward in realizing the promise of performance attribution analysis by aligning it with controllable aspects of the firm's portfolio management and risk modeling processes. In an article entitled "Return, Risk, and Performance Attribution," Kevin Terhaar illustrates the need for such consistency by describing cases where attribution analyses that disregard the firm's investment process, strategy, and risk factors can lead to erroneous results.

Managing portfolios that hold assets issued in foreign markets and denominated in foreign currencies entails making decisions that are not contemplated in domestic investing. We are pleased to republish in its entirety a seminal monograph, "Global Asset Management and Performance Attribution," in which Denis S. Karnosky and Brian D. Singer develop an analytical framework for evaluating global markets and construct a performance attribution system that isolates the effects of market allocation, currency management, and security selection on portfolio returns. Performance analysts who are familiar with the Karnosky–Singer method from formula-centered summaries in secondary sources, or indeed use it in their work, will likely find that grasping its theoretical basis contributes immeasurably to their understanding of global investment management. In "Currency Overlay in Performance Evaluation," Cornelia Paape critiques the Karnosky–Singer approach and presents a performance measurement system whose attribution variables separate the effects of active management decisions into market allocation, security selection, currency allocation, and currency selection.

PERFORMANCE APPRAISAL

The section of this book devoted to performance appraisal opens with four articles about hedge fund risks and returns. Bing Liang introduces the topic by describing salient features of hedge funds and reporting the results of a study conducted during a period of strong

performance (1992–1996). Stan Beckers focuses on the risk-adjusted returns achieved by funds of hedge funds over the 10-year period 1997–2006 and cautions that "buying beta disguised as alpha is an expensive proposition." Cynthia Harrington discusses measures investors can take to counteract hedge funds' characteristic lack of transparency and surveys commonly used risk measures.

Performance analysts may evaluate portfolio managers' track records in "up" and "down" markets, but they typically do not take the state of the economy into account. Conditional performance evaluation, however, compares a fund's returns with the returns of a dynamic strategy that matches the fund's time-varying risk exposures. In "Conditional Performance Evaluation, Revisited," a Research Foundation of CFA Institute monograph, Wayne E. Ferson and Meijun Qian review the main empirical results of previous studies, expand the list of state variables, present an analysis of mutual funds' conditional performance at the level of broadly defined style groups, and examine evidence of market-timing ability. By helping to distinguish between luck and skill, conditional performance evaluation may guide investors and consultants toward better decisions about investment managers. Conditional performance evaluation is also presented in a shorter, earlier article by Ferson and Vincent A. Warther that appears further along in this volume.

In his article "Distinguishing True Alpha from Beta," Laurence B. Siegel describes the dimensions of active management; differentiates active, or alpha, risk from policy, or beta, risk; applies those concepts to hedge funds; and draws out their policy implications for pension funds and other investors.

The Sharpe ratio, as traditionally defined, compares a portfolio's excess return (that is, its return in excess of the risk-free rate) with the total risk of the portfolio, represented by the standard deviation of returns. It is well known, however, that the theoretical foundation for the Sharpe ratio does not apply when excess returns are not normally distributed. Michael Stutzer reviews three approaches to overcoming this limitation and proposes an alternative performance index that reflects investors' preference for positive skewness. Angelo Lobosco and Dan DiBartolomeo provide a primer on returns-based style analysis—a form of constrained regression used to determine the weighted combination of market indices that most closely matches the historical return pattern of the portfolio being analyzed—and define a method for establishing confidence intervals around the weights. Andrew W. Lo investigates the statistical properties of the Sharpe ratio and reaches conclusions of considerable practical importance about, for instance, the distorting impact of serial correlation in hedge funds' monthly returns. In an updated version of "Risk-Adjusted Performance: The Correlation Correction," Arun S. Muralidhar argues that current measures of risk-adjusted performance, including the Sharpe ratio and the M^2 measure, are insufficient bases for ranking mutual funds or constructing portfolios that are likely to earn the highest alpha for a given tracking error. He proposes a new measure, M-3, as a more comprehensive alternative that incorporates the correlation between mutual fund returns and benchmark returns. Muralidhar modestly revised this paper for the present volume, making note of related research into further applications of the M-3 measure in the domain of manager selection.

The "reconstitution effect" is one of the ways in which benchmarking affects markets and institutions. Honghui Chen, Gregory Noronha, and Vijay Singal estimate that investors in funds linked to the S&P 500 Index and the Russell 2000 Index may lose more than US$2 billion a year because of arbitrage around the time of index changes. They describe the arbitrage opportunity as an unintended consequence of the widespread evaluation of index fund managers on the basis of tracking error. Indexers rebalance their portfolios on the effective date in order to minimize tracking error; arbitrageurs buy the stocks to be added to

the index when the addition is announced and sell the stocks to the indexers at a higher price on the effective date. In addition to suggesting that tracking error targets are inappropriate, the authors recommend policies that indexing firms might adopt to limit arbitrageurs' front running of index funds.

Two papers center on calculating and interpreting the information ratio, a fundamentally important measure of risk-adjusted performance that compares the benchmark-relative excess return of an investment strategy with its excess risk. Neil Constable and Jeremy Armitage consider the interaction of information ratios with "batting averages," another frequently quoted measure of success defined as the percentage of investment decisions that led to a profit. The information ratio does not describe the series of successes and failures that led to the outcome it expresses, whereas the batting average contains only directional information. Constable and Armitage demonstrate that the two measures can be usefully combined to give investors a more comprehensive view of their choices. Thomas H. Goodwin rigorously sets forth how the information ratio is defined, annualized, and interpreted, including helpful accounts of its relationship to the Sharpe ratio and the *t*-statistic.

Roger G. Ibbotson and Paul D. Kaplan reprise the question raised by Brinson et al., namely, how much of the variability of returns across time is explained by policy (about 90 percent in the sample and over the period the authors studied), and additionally ask how much of the variation in returns among funds is explained by differences in policy (about 40 percent) and what portion of the return level is explained by policy return (on average about 100 percent).

Institutional investors, such as pension plans and charitable foundations, engage managers for specific roles within diversified, multiple-asset-class, multiple-manager investment programs, and they expect the managers to invest in accordance with their mandates. Several papers selected for this volume address key aspects of manager selection and monitoring. John G. Gallo and Larry J. Lockwood present the results of an empirical study of mutual funds that underwent management changes during the 1983–1991 period. They find significant differences in performance, risk, and investment style after the management changes. Louisa Wright Sellers describes how her organization, a well-established family office, selects and monitors hedge funds and other external managers and explains what she considers catalysts for changing managers. Philip Halpern, Nancy Calkins, and Tom Ruggels share lessons derived from their own experience and comment on three possible reasons why it is so difficult for institutional investors to succeed in selecting consistently outperforming managers: The evaluation criteria are inappropriate, the search process is flawed, or the number of truly skillful managers is so small that still greater effort is required to find them. In a paper that deserves to be recognized as a classic, Ronald N. Kahn and Andrew Rudd examine in-sample and out-of-sample track records of equity and fixed-income mutual funds for evidence of persistent performance. They find evidence of persistence of selection returns among fixed-income funds but no such evidence for equity funds, and they consider the investment implications of these findings. Kahn and Rudd advocate basing active manager selections on information that goes beyond historical performance.

John P. Meier focuses on determining whether managers are doing what is expected of them. Written from the total fund perspective, his paper "Investment Performance Appraisal" is an integrative case study proficiently demonstrating the application of analytical approaches and the exercise of professional judgment in monitoring and evaluating an investment manager.

Susan Trammell's informative, nontechnical report on developments in the risk management industry closes the performance appraisal section of this work.

GLOBAL INVESTMENT PERFORMANCE STANDARDS

Presenting investment results is, as we previously observed, one of the ways in which performance professionals contribute to their firms' growth. In an industry that is based upon credibility and trust, however, the quality of performance presentations has implications greater than the fortunes of any one firm. Founded on the ideals of fair representation and full disclosure of an investment management firm's performance history, the voluntary Global Investment Performance Standards contain provisions requiring certain practices and recommending others in such areas as input data, rate-of-return calculation methodologies, and performance presentations. Philip Lawton and W. Bruce Remington recount the history and explain the provisions of the GIPS standards, with attention to many practical issues that arise in the course of firmwide implementation. (The official text of the Standards in effect as of this writing is also included as an appendix in this volume.) The development of the GIPS standards continues apace as the GIPS Executive Committee and its technical subcommittees address outstanding and emerging issues, and we encourage readers seeking the most up-to-date guidance to visit the website at www.gipsstandards.org.

SUMMARY

This volume contains the insights of 56 contributors who have spent a great deal of their professional lives focusing on performance evaluation. And as a result, the material presented here is diverse, in depth, and of great practical value. We are delighted to present this resource to the performance measurement community. We hope it serves as a foundation for future innovation in analytical frameworks that address the growing needs of asset management firms and their clients for accurate, useful information about investment results.

Philip Lawton, CFA, CIPM
Todd Jankowski, CFA

PART I

OVERVIEW OF PERFORMANCE EVALUATION

CHAPTER 1

EVALUATING PORTFOLIO PERFORMANCE

Jeffery V. Bailey, CFA
Thomas M. Richards, CFA
David E. Tierney

The *ex post* analysis of investment performance stands as a prominent and ubiquitous feature of modern investment management practice. Investing involves making decisions that have readily quantifiable consequences and that, at least on the surface, lend themselves to elaborate dissection and review. We broadly refer to the measurement and assessment of the outcomes of these investment management decisions as **performance evaluation.** At the institutional investor level, and to a lesser (but growing) extent on the individual investor level, a large industry has developed to satisfy the demand for performance evaluation services. Although some observers contend that performance evaluation is misguided, frequently misapplied, or simply unattainable with any reasonable degree of statistical confidence, we believe that analytic techniques representing best practices can lead to valid insights about the sources of past returns, and such insights can be useful inputs for managing an investment program.

The purpose of this chapter is to provide an overview of current performance evaluation concepts and techniques. Our focus will be on how institutional investors—both fund sponsors and investment managers—conduct performance evaluation. Individual investors tend to use variations of the performance evaluation techniques employed by institutional investors. We define fund sponsors to be owners of large pools of investable assets, such as corporate and public pension funds, endowments, and foundations. These organizations typically retain multiple investment management firms deployed across a range of asset categories. Fund sponsors have the challenge of evaluating not only the performance of the individual managers, but also the investment results within the asset categories and for their total investment programs.

Reprinted from *Managing Investment Portfolios: A Dynamic Process*, 3rd Edition (John Wiley & Sons, 2007):717–780.

In the section titled The Importance of Performance Evaluation, we distinguish between the perspectives of the fund sponsor and the investment manager. In The Three Components of Performance Evaluation, we divide the broad subject of performance evaluation into three components: **performance measurement, performance attribution**, and **performance appraisal**. Under the topic of performance measurement, we discuss several methods of calculating portfolio performance. The next section introduces the concept of performance benchmarks. Turning to performance attribution, we consider the process of analyzing the sources of returns relative to a designated benchmark both from the total fund (fund sponsor) level and from the individual portfolio (investment manager) level. This is followed by performance appraisal, which deals with assessing investment skill. The chapter ends by addressing key issues in the practice of performance evaluation.

THE IMPORTANCE OF PERFORMANCE EVALUATION

Performance evaluation is important from the perspectives of both the fund sponsor and the investment manager.

The Fund Sponsor's Perspective

A typical fund sponsor would consider its investment program incomplete without a thorough and regular evaluation of the fund's performance relative to its investment objectives. Applied in a comprehensive manner, performance evaluation is more than a simple exercise in calculating rates of return. Rather, it provides an exhaustive "quality control" check, emphasizing not only the performance of the fund and its constituent parts relative to objectives, but the sources of that relative performance as well.

Performance evaluation is part of the feedback step of the investment management process. As such, it should be an integral part of a fund's investment policy and documented in its investment policy statement. As discussed in Ambachtsheer (1986) and Ellis (1985), investment policy itself is a combination of philosophy and planning. On the one hand, it expresses the fund sponsor's attitudes toward a number of important investment management issues, such as the fund's mission, the fund sponsor's risk tolerance, the fund's investment objectives, and so on. On the other hand, investment policy is a form of long-term strategic planning. It defines the specific goals that the fund sponsor expects the fund to accomplish, and it describes how the fund sponsor foresees the realization of those goals.

Investment policy gives an investment program a sense of direction and discipline. Performance evaluation enhances the effectiveness of a fund's investment policy by acting as a feedback and control mechanism. It identifies an investment program's strengths and weaknesses and attributes the fund's investment results to various key decisions. It assists the fund sponsor in reaffirming a commitment to successful investment strategies, and it helps to focus attention on poorly performing operations. Moreover, it provides evidence to fund trustees, who ultimately bear fiduciary responsibility for the fund's viability, that the investment program is being conducted in an appropriate and effective manner.

Fund sponsors are venturing into nontraditional asset categories and hiring a larger assortment of managers exhibiting unique investment styles, with the addition of hedge fund managers representing the latest and perhaps most complex example of this trend. Some fund sponsors are taking more investment decisions into their own hands, such as tactical asset allocation and style timing. Others are taking a quite different direction, giving their managers broad discretion to make asset allocation and security selection decisions. As a consequence of these developments, alert trustee boards are demanding more information from their investment staffs. The staffs, in turn, are seeking to better understand the extent of their own contributions and those of the funds' investment managers to the funds' investment results. The increased complexity of institutional investment management has brought a correspondingly greater need for sophisticated performance evaluation from the fund sponsor's perspective.

The Investment Manager's Perspective

Investment managers have various incentives to evaluate the performance of the portfolios that they manage for their clients. Virtually all fund sponsors insist that their managers offer some type of accounting of portfolio investment results. In many cases, performance evaluation conducted by the investment manager simply takes the form of reporting investment returns, perhaps presented alongside the returns of some designated benchmark. Other clients may insist on more sophisticated analyses, which the managers may produce in-house or acquire from a third party.

Some investment managers may seriously wish to investigate the effectiveness of various elements of their investment processes and examine the relative contributions of those elements. Managing investment portfolios involves a complex set of decision-making procedures. For example, an equity manager must make decisions about which stocks to hold, when to transact in those stocks, how much to allocate to various economic sectors, and how to allocate funds between stocks and cash. Numerous analysts and portfolio managers may be involved in determining a portfolio's composition. Just as in the case of the fund sponsor, performance evaluation can serve as a feedback and control loop, helping to monitor the proficiency of various aspects of the portfolio construction process.

THE THREE COMPONENTS OF PERFORMANCE EVALUATION

In light of the subject's importance to fund sponsors and investment managers alike, we want to consider the primary questions that performance evaluation seeks to address. In discussing performance evaluation we shall use the term *account* to refer generically to one or more portfolios of securities, managed by one or more investment management organizations. Thus, at one end of the spectrum, an account might indicate a single portfolio invested by a single manager. At the other end, an account could mean a fund sponsor's total fund, which might involve numerous portfolios invested by many different managers across multiple asset categories. In between, it might include all of a fund sponsor's assets in a particular asset category or the aggregate of all of the portfolios managed by an investment manager according to a particular mandate. The basic performance evaluation concepts are the same, regardless of the account's composition.

With the definition of an account in mind, three questions naturally arise in examining the investment performance of an account:

1. What was the account's performance?
2. Why did the account produce the observed performance?
3. Is the account's performance due to luck or skill?

In somewhat simplistic terms, these questions constitute the three primary issues of performance evaluation. The first issue is addressed by performance measurement, which calculates rates of return based on investment-related changes in an account's value over specified time periods. Performance attribution deals with the second issue. It extends the results of performance measurement to investigate both the sources of the account's performance relative to a specific investment benchmark and the importance of those sources. Finally, performance appraisal tackles the third question. It attempts to draw conclusions concerning the quality (that is, the magnitude and consistency) of the account's relative performance.

PERFORMANCE MEASUREMENT

To many investors, performance measurement and performance evaluation are synonymous. However, according to our classification, performance measurement is a component of performance evaluation. Performance measurement is the relatively simple procedure of calculating returns for an account. Performance evaluation, on the other hand, encompasses the broader and much more complex task of placing those investment results in the context of the account's investment objectives.

Performance measurement is the first step in the performance evaluation process. Yet it is a critical step, because to be of value, performance evaluation requires accurate and timely rate-of-return information. Therefore, we must fully understand how to compute an account's returns before advancing to more involved performance evaluation issues.

Performance Measurement without Intraperiod External Cash Flows

The rate of return on an account is the percentage change in the account's market value over some defined period of time (the evaluation period), after accounting for all external cash flows.[1] (External cash flows refer to contributions and withdrawals made to and from an account, as opposed to internal cash flows such as dividends and interest payments.) Therefore, a rate of return measures the relative change in the account's value due solely to investment-related sources, namely capital appreciation or depreciation and income. The mere addition or subtraction of assets to or from the account by the account's owner should not affect the rate of return. Of course, in the simplest case, the account would experience no external cash flows. In that situation, the account's rate of return during evaluation period t equals the market value (MV_1) at the end of the period less the market value at the beginning of the period (MV_0), divided by the beginning market value.[2] That is,

$$r_t = \frac{MV_1 - MV_0}{MV_0} \tag{1.1}$$

Example 1.1 illustrates the use of Equation 1.1.

EXAMPLE 1.1 Rate-of-Return Calculations When There Are No External Cash Flows

Winter Asset Management manages institutional and individual accounts, including the account of the Mientkiewicz family. The Mientkiewicz account was initially valued at $1,000,000. One month later it was worth $1,080,000. Assuming no external cash flows and the reinvestment of all income, applying Equation 1.1, the return on the Mientkiewicz account for the month is

$$r_t = \frac{\$1{,}080{,}000 - \$1{,}000{,}000}{\$1{,}000{,}000} = 8.0\%$$

Fund sponsors occasionally (and in some cases frequently) add and subtract cash to and from their managers' accounts. These external cash flows complicate rate-of-return calculations. The rate-of-return algorithm must deal not only with the investment earnings on the initial assets in the account, but also with the earnings on any additional assets added to or subtracted from the account during the evaluation period. At the same time, the algorithm must exclude the direct impact of the external cash flows on the account's value.

An account's rate of return may still be computed in a straightforward fashion if the external cash flows occur at the beginning or the end of the measurement period when the account is valued. If a contribution is received at the start of the period, it should be added to (or, in the case of a withdrawal, subtracted from) the account's beginning value when calculating the account's rate of return for that period. The external cash flow will be invested alongside the rest of the account for the full length of the evaluation period and will have the same investment-related impact on the account's ending market value and, hence, should receive a full weighting. Thus, the account's return in the presence of an external cash flow at the beginning of the evaluation period should be calculated as

$$r_t = \frac{MV_1 - (MV_0 + CF)}{MV_0 + CF} \tag{1.2}$$

If a contribution is received at the end of the evaluation period, it should be subtracted from (or, in the case of a withdrawal, added to) the account's ending value. The external cash flow had no opportunity to affect the investment-related value of the account, and hence it should be ignored.

$$r_t = \frac{(MV_1 - CF) - MV_0}{MV_0} \tag{1.3}$$

EXAMPLE 1.2 Rate-of-Return Calculations When External Cash Flows Occur at the Beginning or End of an Evaluation Period

Returning to the example of the Mientkiewicz account, assume that the account received a $50,000 contribution at the beginning of the month. Further, the account's ending and beginning market values equal the same amounts previously stated, $1,080,000 and $1,000,000, respectively. Applying Equation 1.2, the rate of return for the month is therefore

$$r_t = \frac{\$1{,}080{,}000 - (\$1{,}000{,}000 + \$50{,}000)}{\$1{,}000{,}000 + \$50{,}000} = 2.86\%$$

If the contribution had occurred at month-end, using Equation 1.3, the account's return would be

$$r_t = \frac{(\$1{,}080{,}000 - \$50{,}000) - \$1{,}000{,}000}{\$1{,}000{,}000} = 3.00\%$$

Both returns are less than the 8 percent return reported when no external cash flows took place because we are holding the ending account value fixed at $1,080,000. In the case of the beginning-of-period contribution, the account achieves an ending value of $1,080,000 on a beginning value that is higher than in Example 1.1, so its return must be less than 8 percent. In the case of the end-of-period contribution, the return is lower than 8 percent because the ending value of $1,080,000 is assumed to reflect an end-of-period contribution that is removed in calculating the return. In both instances, a portion of the account's change in value from $1,000,000 to $1,080,000 resulted from the contribution; in Example 1.1, by contrast, the change in value resulted entirely from positive investment performance by the account.[3]

The ease and accuracy of calculating returns when external cash flows occur, if those flows take place at the beginning or end of an evaluation period, lead to an important practical recommendation: Whenever possible, a fund sponsor should make contributions to, or withdrawals from, an account at the end of an evaluation period (or equivalently, the beginning of the next evaluation period) when the account is valued. In the case of accounts that are valued on a daily basis, the issue is trivial. However, despite the increasing prevalence of daily valued accounts, many accounts are still valued on an audited basis once a month (or possibly less frequently), and the owners of those accounts should be aware of the potential for rate-of-return distortions caused by intraperiod external cash flows.

What does happen when external cash flows occur between the beginning and the end of an evaluation period? The simple comparison of the account's value relative to the account's beginning value must be abandoned in favor of more intricate methods.